Quentin Farmar-Bowers
Vaughan Higgins
Joanne Millar *Editors*

# Food Security in Australia

## Challenges and Prospects for the Future

Springer

Food Security in Australia

Quentin Farmar-Bowers • Vaughan Higgins
Joanne Millar
Editors

# Food Security in Australia

## Challenges and Prospects for the Future

Springer

*Editors*
Quentin Farmar-Bowers
Deakin University
Geelong
Victoria, Australia

Vaughan Higgins
School of Humanities and Social Sciences
Charles Sturt University
Wagga Wagga
New South Wales, Australia

Joanne Millar
School of Environmental Sciences
Charles Sturt University
Albury
New South Wales, Australia

ISBN 978-1-4614-4483-1 ISBN 978-1-4614-4484-8 (eBook)
DOI 10.1007/978-1-4614-4484-8
Springer New York Heidelberg Dordrecht London

Library of Congress Control Number: 2012947379



Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

# Preface

The purpose of this book is to inform the debate on food security in Australia by providing information on a range of relevant issues. This debate is needed because although Australia is a net exporter of agricultural products some Australians are food insecure and many suffer diet-related health problems. The current problems are complex due to a host of future uncertainties including those associated with climate change, globalization and increasing competition for resources both in Australia and internationally.

The process of bringing information together on food security started in mid-2010 with a call for papers on food security in Australia as a special theme for the Australian and New Zealand Agri-Food Research Network Conference held at the Gippsland campus of Monash University in December 2010. The authors of these papers and a number of other people were asked to develop their ideas into book chapters. We also asked a number of people to write 'case studies' about specific items of interest for food security in Australia. Five case studies on food equity and access are set out in chapter 11 and three case studies on food production, policy and trade are set out in Chapter 24.

Most books on food security tackle the global issue of food security in developing nations. However, we focused our work on Australia because of the concern about the future ability of our land, water and human resources to continue to provide food and maintain the unique ecology in this island continent. We hope that the information in this book will boost the food security debate in Australia, encourage people to become more *food literate* and stimulate debates about food in other countries.

This book is divided into three parts:

1. *Food equity and access* comprising eleven chapters
2. *Food production, policy and trade* has thirteen chapters
3. *Land use planning* has five chapters followed by a concluding chapter for the whole book

---

Summaries of the papers are available at: http://www.afrn.org.au/category/conference-papers/.

We start with *Food equity and access* because this is the main issue in Australia regarding food security. There is not a lack of food but rather an inability of disadvantaged households to afford nutritious food. The influence of rising food prices, remoteness and institutional capacity are discussed. Programs for food relief, community supported agriculture and local food distribution are presented as solutions to a growing issue.

The second part of the book *Food production and trade* covers challenges and opportunities for Australian food production such as climate change, water use, environment and food standards, global food chains, labour deployment, rural subdivision, local and native foods.

The third part *Land use planning* deals with concerns about urban development into farming areas, including the lack of long-term planning regarding food security or opportunities for urban agriculture.

Quentin Farmar-Bowers
Vaughan Higgins
Joanne Millar

# Acknowledgements

We would like to thank first and foremost all contributors for their commitment to the production of this book. This collection would not have been possible without their intellectual contribution and willingness to support the project. We are also grateful to the efforts of Susan Safren and Rita Beck from Springer who provided editorial advice and assistance, and who enthusiastically supported the book.

Our thanks go also to the following people who generously gave their time to review chapter drafts: Jon Altman, Godfrey Baldacchino, Andrew Butt, Michael Buxton, Jenny Cameron, Jacqui Dibden, Jane Dixon, Barney Foran, Andrea Gaynor, Gillian Hewitson, Stuart Hill, Mark Imhof, Mark Lawrence, Kristen Lyons, Freya Mathews, Alexandra McManus, John Martin, Damian Maye, Dave Mercer, Michael Mitchell, Barbara Pini, Carol Richards, Chris Rosin, Wendy Steele and Beverley Wood.

# Contents

**1 Introduction: The Food Security Problem in Australia** ...................... 3
Quentin Farmar-Bowers, Vaughan Higgins, and Joanne Millar

**Part I Food Equity and Access**

**2 Food Security in Australia: The Logistics of Vulnerability** ................ 21
Adriana Keating

**3 Ethics of Food Security** ........................................................................ 35
Emma Rush

**4 Interdisciplinary Conversations on Complexities of Food/In Security** ........................................................................ 49
Roslyn Foskey, Alan Avery, Margaret Sims, and David Brunckhorst

**5 Institutional Capacity of Local Government to Embed Food Security into Policy** ...................................................... 63
Christine Slade

**6 The Question of a Reasonable Price for Food: Policy Alternatives to Control Food Price Inflation in Developed Economies** ........................................................ 79
Brigit Busicchia

**7 Selecting Interventions for Food Security in Remote Indigenous Communities** ........................................................................ 97
Christina Pollard

**8 Hungry for Change: The Sydney Food Fairness Alliance** .................. 113
Frances Parker and Elizabeth Morgan

**9 Community Supported Agriculture and Agri-Food Networks: Growing Food, Community and Sustainability?** ................................. 129
Robin Krabbe

**10 The Emergency Relief Sector in Victoria, Australia** ........ 143
Ric Benjamin and Quentin Farmar-Bowers

**11 Case Studies on Food Equity and Access** ........ 153
Darren Ray, Leah Galvin, Claire Palermo, Erik Eklund, Stuart Auckland, Quynh Lê, Rebecca Lindberg, and Russell Shields

**Part II Food Production, Policy and Trade**

**12 The Impacts of Climate Change on Australia's Food Production and Export** ........ 173
Geoffrey Lawrence, Carol Richards, and David Burch

**13 Increasing Food Production Sustainably in a Changing Climate: Understanding the Pressures and Potential** ........ 187
Beverley Henry, Richard Conant, John Carter, Veronique Droulez, and Peter Grace

**14 Enhancing Food Security in Australia by Supporting Transformative Change** ........ 205
Sarah Park, Steven Crimp, Simon Attwood, Nadine Marshall, and Mark Howden

**15 Framing the Research Needs for Food Security in Australia** ........ 219
Quentin Farmar-Bowers

**16 Water Sovereignty and Food Security** ........ 235
Francine Rochford

**17 Food Security and Soil Health** ........ 247
Declan McDonald

**18 Australian Food Security Dilemmas: Comparing Nutritious Production Scenarios and Their Environmental, Resource and Economic Tensions** ........ 259
Graham M. Turner, Kirsten A. Larsen, Chris Ryan, and Mark Lawrence

**19 'Sustainable Standards'? How Organic Standards in the EU and Australia Affect Local and Global Agrifood Production and Value Chains** ........ 281
Amelie Bernzen

**20 How do You Eat the Elephant in the Room? Agri-Food Sustainability and King Island** ........ 297
Lea Coates

**21 A New Harvest of the Suburbs** ........ 311
Brendan Gleeson

**22 Farming in Rural Amenity Landscapes: Maintaining Food Productivity in a Changing Environment** ............ 325
Jane Roots, Joanne Millar, and Rik Thwaites

**23 Food Security in a Two-Speed Economy: Horticultural Production in Western Australia** ............ 339
Fiona Haslam McKenzie

**24 Case Studies on Food Production, Policy and Trade** ............ 353
George Wilson, Maarten Ryder, Glenn Fitzgerald, Michael Tausz, Robert Norton, Garry O'Leary, Saman Seneweera, Sabine Tausz-Posch, Mahabubur Mollah, Jo Luck, and Grant Hollaway

**Part III Land Use Planning**

**25 Is Food a Missing Ingredient in Australia's Metropolitan Planning Strategies?** ............ 367
Trevor Budge

**26 Help or Hindrance? The Relationship Between Land Use Planning and Urban Agriculture on the Gold Coast** ............ 381
Victor Pires and Paul Burton

**27 Farming the City Fringe: Dilemmas for Peri-Urban Planning** ............ 397
Darryl Low Choy and Michael Buxton

**28 By Accident or Design? Peri-Urban Planning and the Protection of Productive Land on the Urban Fringe** ............ 413
Nicole Cook and Stephanie Harder

**29 Development, Dilution, and Functional Change in the Peri-Urban Landscape: What Does It Really Mean for Agriculture?** ............ 425
Andrew Butt

**30 Final Word: Australia's Food Security Challenges** ............ 443
Quentin Farmar-Bowers, Vaughan Higgins, and Joanne Millar

**Index** ............ 449

# About the Contributors

**Simon Attwood** is a policy officer with the Australian Federal Government. He has been involved in a wide range of research, policy and extension work in the United Kingdom and Australia relating to biodiversity conservation in production landscapes, drivers and impacts of land use change, ecosystem service values of natural, semi-natural and anthropogenic habitats, and mechanisms for targeting and delivering on-farm incentive schemes.

**Stuart Auckland** has extensive experience in rural community development, having worked as project manager/researcher in a diverse range of research and project activity in the area of community health development. He has an employment background in the corporate, government and academic sectors. Stuart's current interests lie in the studies of food security, population health and in particular farmer family health, community development and health impact assessment. Stuart is currently a co-researcher in a Tasmanian Government grant that is investigating food access issues in two municipal regions of Tasmania.

**Alan Avery** is currently the Senior Mental Health Promotion Officer and Team Leader of the Mental Health Promotion and Prevention Service of Hunter New England Health Service. He has worked as a clinician, manager, Director of Nursing (twice), consultant and as academic in five different universities for over 25 years, researching and publishing in aged care, critical thinking, counselling, adult, environmental and community learning, mental health, disabilities and men's health. Alan has also worked in rural and remote communities, including in the Torres Straits.

**Ric Benjamin**, CEO Foodbank Victoria, has more than 30 years experience in Community and Emergency Relief sectors. He has held several Board member and volunteer positions before taking up the role of Executive Officer for Foodbank Victoria in July 2010. Prior to this role he had successful careers as a teacher and then in the IT industry, spanning over 20 years experience in sales, marketing, management and consulting. Ric served on the Board of Foodbank Victoria from 2004 to 2010, was President of Fareshare in 2000 and is a Fellow of Williamson Community Leadership Program.

**Amelie Bernzen** is currently a PhD candidate in economic geography, lecturer and research fellow at the Institute of Geography, University of Cologne, Germany. Her research focuses on global production networks, conventions in international trade coordination and the organic food sector in Germany and Australia.

**David Brunckhorst** has worked in public and private sectors in natural resources and environmental policy development and analysis, and in 'on-ground' public–private sector partnerships with communities integrating conservation, ecological restoration and agricultural production. He is the recipient of two international awards, including a UNESCO medal. His current research focuses on attempting to understand change at appropriate scales and contexts of social-ecological systems interdependencies, and understanding 'business-as-usual' trajectories of landscape change along with novel design of alternative landscape futures scenarios having policy and practical application to build adaptive capacity.

**Trevor Budge** AM is Associate Professor and Head of the Community Planning and Development Program at the Bendigo Campus of La Trobe University. He has a long standing research and practice interest in the links between food, land use planning and health.

**David Burch** is Honorary Professor in the School of Social Science, University of Queensland, where he conducts research and publishes on the financialization of food and agriculture. He is currently co-editing (with Jane Dixon and Geoff Lawrence) a special edition of *Agriculture and Human Values* on the changing role of supermarkets in global agri-food supply chains, and has also undertaken research for Oxfam Hong Kong on agribusiness in the Mekong region, and for Oxfam UK on global commodity trading companies.

**Paul Burton** is Professor of Urban Management and Planning and Deputy Director of the Urban Research Program at Griffith University. Previously he was Head of the School for Policy Studies at the University of Bristol, UK where he carried out research on a wide variety of urban and social policy issues. At present he is leading a project on food security, urban resilience and climate change with colleagues from the University of Queensland and Macquarie University, funded by the National Climate Change Adaptation Research Facility. Paul also leads the Growth Management Partnership between Griffith University and Gold Coast City Council and is currently a member of the Gold Coast Committee of Regional Development Australia.

**Brigit Busicchia** is a PhD candidate, researching the dimensions of food security policy in developed economies, and in particular Australia, the United Kingdom and France. Her research interests focus on how governments engage politically and economically in the debates of food security and above all, how they elaborate national food policy agendas.

**Andrew Butt** is a lecturer in the Community Planning and Development Program at La Trobe University, Bendigo. His teaching, research and planning practice has been focused on small towns and rural areas over the past 15 years. Since 2007 he has been involved in a series of studies into processes of socio-economic, cultural and environmental change in peri-urban regions of Australia, with specific emphasis on Melbourne's expanding peri-urban field.

**Michael Buxton** is Professor of Environment and Planning at RMIT University, Melbourne. He led the working party which developed the proposal for a legislated urban growth boundary and green belt zones for the 2002 Melbourne metropolitan strategy, and spent 12 years as a senior executive in the Victorian government. Michael has carried out extensive research into Australian peri-urban areas and urban form.

**John Carter** is an ecologist employed by the Department of Environment and Resource Management in the Queensland Climate Change Centre of Excellence, at the Ecosciences Precinct in Brisbane. His research activities focus on using models of plant production combined with seasonal and climate change forecasts to produce assessments of current and future conditions in grazed systems. Modelling activities include carbon inventory, estimates of greenhouse emissions and impacts of fire and grazing on ecosystems (http://www.longpaddock.qld.gov.au/about/researchprojects/aussiegrass/index.html).

**Lea Coates** is a PhD candidate with the Institute for Regional Development, University of Tasmania; Cradle Coast Campus. Her interest in food supply chains and food communities stems from more than two decades of involvement with the meat industry in Tasmania. This work forms part of her PhD thesis.

**Richard Conant** is a Professor and Smart Futures Fellow at Queensland University of Technology in Brisbane and an ecosystem ecologist at the Natural Resource Ecology Laboratory at Colorado State University. His research focuses on understanding the feedbacks between human activities and ecosystem biogeochemistry. Specifically, he is interested in how land use and land management practices impact carbon and nitrogen cycling in agricultural and grassland ecosystems. Richard is a participant in national and international efforts to quantify human impacts on carbon cycling.

**Nicole Cook** is a Lecturer in Urban Geography, in the Melbourne School of Land and Environment, University of Melbourne. Nicole's research and teaching lie at the interface of geography and planning. In 2005–2006, Nicole held a research fellowship as part of the ESRC-AHRC project *Banking on Housing; Spending the Home* at the University of Durham, UK. She is currently project leader on the AHURI funded project *Resident third party objections and appeals against planning applications.*

**Steven Crimp** is a Senior Research Scientist within the Agricultural Systems Research Program, CSIRO, with research focused on the identification and evaluation of management practices that provide resilience to both climate variability and climate change. Over the past 15 years this has involved research assessing the implications of climate variability and change on rangeland productivity, commercial seedling establishment, grazing animal heat stress, winter cereal production, Pacific staple food security, catchment hydrology, coastal vulnerability and development of daily time-step projections for use in biophysical modelling. Steven currently leads a national research team evaluating climate change resilient adaptation options for broadacre agriculture.

**Veronique Droulez** is Marketing Manager-Nutrition at Meat & Livestock Australia with qualifications in dietetics and public health. She was responsible for preparing the Heart Foundation's position on dietary fat in 2000. Veronique has worked in the red meat industry for more than 10 years assessing and translating evidence supporting the nutritional value of red meat and its role in the diet into practical advice for healthy eating.

**Erik Eklund** is Professor of History at Monash University's Gippsland Campus. His latest book, *Mining Towns: Making a Life, Making a Living*, will be published by UNSW Press in 2012. Erik has published in a diverse range of areas including labour history, regional history and heritage studies. He is currently Treasurer and Executive Member of the Australian Historical Association.

**Quentin Farmar-Bowers** has a background in agriculture, public policy and natural resource management. He obtained qualifications in agriculture, agricultural economics and business studies in England and a doctorate in sustainable development in Australia. He has spent 20 years in public service, 8 years as a consultant and has worked in Universities for the last 5 years.

**Glenn Fitzgerald** has worked for the USDA-ARS for 7 years in remote sensing and precision agriculture. Glen has since been with the Department of Primary Industries, Victoria, working as a research scientist in remote sensing and as leader of the Australian Grains Free Air $CO_2$ Enrichment (AGFACE) facility. The aim of AGFACE is to provide the grains industry with knowledge that will allow informed and considered adaptation strategy to changes in crop production systems.

**Roslyn Foskey** is a Mental Health Promotion Officer for the Hunter New England Health Service and an Adjunct Lecturer with the School of Education, University of New England. Prior to that for more than 15 years she was involved in applied rural social research on a range of issues (in particular on rural ageing). Earlier in her career Roslyn worked in community aged care, child welfare, youth work and community development.

**Leah Galvin** is currently employed with the Victorian Local Government Association. She has worked in State and Local Government on food security projects since 2002, including the VicHealth *Food For All* projects, along with several years working as part of a research team looking at children's health and obesity at Deakin University. Leah is passionate about working to address health and social inequalities with a strong interest in capacity building in workforces that are engaged with people experiencing disadvantage.

**Brendan Gleeson** was Professor of Geography at the National University of Ireland, Maynooth. In 2012 he joined The University of Melbourne as Professor of Urban Policy Studies. His most recent book, *Lifeboat Cities*, was published by UNSW Press in 2010.

**Peter Grace** is Professor of Global Change and the Director of the Institute for Sustainable Resources at Queensland University of Technology. He is a soil scientist and simulation specialist with specific expertise in carbon and nitrogen cycling and impacts on plant production and greenhouse gas emissions. He was formerly Lead Scientist—Climate Change for the Consultative Group for International Agricultural Research (CGIAR) and senior soil scientist at the International Wheat and Maize Improvement Centre (CIMMYT).

**Stephanie Harder** is a graduate planner in the Victorian public sector. Following a student exchange to the University of Utrecht in the Netherlands, Stephanie returned to Melbourne and completed her undergraduate honours thesis *Towards Localisation: peri-urban planning for a food secure future*.

**Fiona Haslam Mckenzie** has extensive experience in population and socio-economic change, regional economic development and analysis of regional and urban social indicators. Fiona currently leads the CSIRO Minerals Down Under Region in Transition Project at Curtin University and is also the Chief Investigator, leading the Regional Economies division of the Remote Economic Participation Co-operative Research Centre.

**Beverley Henry** is an Associate Professor and Principal Research Fellow in the Institute for Future Environments at Queensland University of Technology. She is also a consultant specializing in research and analysis for climate variability and change, environmental, greenhouse gas and food security issues. Beverley's research focuses on understanding sustainable productivity of agro-ecosystems. She is the Science Manager for the collaborative Managing Climate Variability Program and a member of several national and international technical and advisory groups.

**Vaughan Higgins** is Associate Professor of Sociology at Charles Sturt University. He has a broad interest in agri-environmental governance, and particularly in how agricultural policies and programs are implemented in practice. His most recent books are *Rural Governance: International Perspectives* (2007, Routledge; co-edited with Lynda Cheshire and Geoffrey Lawrence) and *Calculating the Social: Standards and the Re-configuration of Governing* (2010, Palgrave Macmillan; co-edited with Wendy Larner).

**Grant Hollaway** is a Senior Research Scientist with the Victorian Department of Primary Industries and has spent the last 20 years conducting research into the management of root and foliar diseases of cereal and pulse crops.

**Mark Howden** is a Chief Research Scientist and Theme Leader of the 'Adaptive primary industries, enterprises and communities' theme in the CSIRO Climate Adaptation Flagship. Mark's work has focused on the impacts of climate on Australian ecosystems and urban systems, and he has worked for over 22 years with farmers, catchment groups, industry bodies, agribusiness, urban utilities and various policy agencies. He has also been a major contributor to the Intergovernmental Panel on Climate Change (IPCC) Assessment reports, IPCC Regional Impacts Report and IPCC Special Report, sharing the 2007 Peace Prize with other IPCC participants and Al Gore.

**Adriana Keating** is a research economist with the Centre for Risk and Community Safety, RMIT University, Melbourne. She worked as an economist with AusAID before joining the Centre. Research includes food security and the economics of disasters under climate change, with an interdisciplinary approach and policy focus.

**Robin Krabbe** is currently completing a PhD at the University of Tasmania investigating the potential of community initiatives such as community supported agriculture (CSA) for sustainability. She has been researching CSA for some years, and has assisted in starting a small CSA in North-West Tasmania. Prior to commencing her PhD, Robin worked for the Commonwealth Scientific Industrial Research Office and the Victorian Department of Primary Industries.

**Kirsten A. Larsen** works at the Victorian Eco-Innovation Lab which focuses on increasing understanding and awareness of innovations to develop more sustainable and resilient food systems. Kirsten has a background in strategic foresight and has also worked in the Victorian Government, most recently in the Department of Premier and Cabinet on climate change and food policy. Kirsten is also a founding director of the social enterprise Eaterprises Australia, and a board member of Cultivating Community and Transition Darebin.

**Geoffrey Lawrence** is Professor of Sociology, Co-leader of the Food Security Focal Area for the Global Change Institute at The University of Queensland and a Fellow of the Academy of Social Sciences in Australia. During his career he has raised over $15 million in research grants and has published 25 books and over 300 journal articles and papers. His most recent co-authored and co-edited books are *Supermarkets and Agri-food Supply Chains* (Edward Elgar, 2007), *Food Security, Nutrition and Sustainability* (Earthscan, 2010) and *THINK Sociology* (Pearson, 2012).

**Mark Lawrence** is an Associate Professor in Public Health Nutrition at Deakin University. He has over 25 years experience working in food policy at local, state, national and international levels. Mark's research interests focus on analyzing the relationships among food systems—environmental sustainability—food security as well as analyzing policy-making associated with food fortification. He is a regular presenter at national and international conferences and has published widely. Mark is a Council Member of the World Public Health Nutrition Association, a technical advisor to the World Health Organization and a member of the National Health and Medical Research Council's Dietary Guidelines Working Committee.

**Quynh Lê's** current research interests deal with the social determinants of health, and intercultural aspects of health in Australia. With an emerging interest in population health, her research focuses on food security, migrants' well-being and social disadvantages in health care. This pathway has recently been enriched by obtaining two relevant competitive research grants dealing with food security. Quynh has over 40 publications (research books, chapters, journal articles and conference proceedings) and several research grants in these areas.

**Rebecca Lindberg** commenced at SecondBite as the Research Officer in 2009. She enjoys working with SecondBite because of their practical approach to the major challenge of the twenty-first century—how do we ensure fair food for all?

**Darryl Low Choy** is Professor of Environmental and Landscape Planning at Griffith University. He has undertaken extensive research on peri-urbanization, regional landscape values and regional open space. He chairs the Queensland Government's Rural and Greenspace Policy Forum and advises the Commonwealth and other state governments on regional scale strategic sustainability planning.

**Jo Luck** is a Principal Research Scientist in Plant Microbiology in the Biosciences Research Division, DPI Victoria. Jo has over 15 years experience working in molecular plant pathology, with 10 years experience specializing in plant biosecurity. In 2005, Jo and her team commenced a national research project on modelling the impacts of climate change on plant biosecurity and recently expanded this work to include understanding the influence of increasing atmospheric $CO_2$ on key wheat diseases. She leads two international projects: Asia Pacific Network for Global Change and a Quadrilateral Biosecurity project on the effects of climate change on pests and diseases of agriculture.

**Nadine Marshall** is a senior social scientist with CSIRO, Ecosystem Sciences and Climate Adaptation Flagship. Her research interests centre on understanding how social and ecological systems might be resilient to change, understanding vulnerability to change and developing strategies to ensure our sustainability into the future. These interests are addressed through understanding the linkages between people and the environment and the influence of climate change, regulatory change, voluntary change, environmental change and cultural change.

**Declan McDonald** has over 25 years experience in agricultural, horticultural and amenity soil management. He is currently employed by the Victorian Department of Primary Industries as a Specialist, Productive Soils. Declan has a strong interest in the alignment of policy, research and extension for sustainable soil management and has contributed to the development of national soils policy through his former membership of the National Committee on Soil and Terrain.

**Joanne Millar** is a Senior Lecturer in Environmental Planning and Policy at the School of Environmental Sciences, Charles Sturt University, Albury. Joanne is also Associate Director of the Institute for Land, Water and Society, one of the research centres at Charles Sturt University. Her research interests include social dimensions of rural development, agriculture and environmental management in Australia and South-East Asia.

**Mahabubur Mollah** is employed by the Victorian DPI. Currently, he is coordinating and managing all engineering aspects of the Australian Grains Free Air Carbon Dioxide Enrichment (AGFACE) project and conducting research to improve AGFACE performance. Mahabubar has 32 years experience in engineering research and has published widely in this area.

**Elizabeth Morgan** is a PhD candidate in the Department of Environment and Geography at Macquarie University in Sydney, researching the role of local food systems in urban food security in Australia and Britain. She has been involved in alternative food networks since her undergraduate days at St Andrews University, Scotland in the 1970s. She has worked as a journalist, in print and radio, for more than 25 years, and has lectured and tutored in journalism at Wollongong University and in communications and media, health studies, human geography and sustainability at Macquarie University at undergraduate and master's levels.

**Robert Norton** is the Regional Director—Australia and New Zealand—for the International Plant Nutrition Institute (IPNI), which is a not-for-profit, science-based research and education institute with projects in more than 50 countries. His role with IPNI is to identify and undertake plant nutrition research projects that will improve nutrient management, as well as developing educational programs to capitalize on these opportunities. Robert is the author of over 140 refereed conference and journal papers and 9 book chapters as well as another 140 conference and extension articles. He lectured in agronomy at The University of Melbourne and has supervised undergraduate and post-graduate research by students on crop adaptation, rotational effects, plant nutrition and climate change impacts.

**Garry O'Leary** has over 30 years experience on dryland agronomy research working for the Department of Primary Industries in Victoria, the CSIRO in the Murray Mallee and overseas in India and Africa. His expertise is strong in simulation modelling of a range of tropical and temperate crops from field plots to landscape analyses.

**Claire Palermo** is based at the Department of Nutrition and Dietetics, Monash University. She had a background as a community/public heath nutritionist before commencing in academia. Her research interests include assessment of economic food access and public health nutrition workforce development. She is regularly asked to support health promotion and public health practitioners assess food security in their communities.

**Sarah Park** is a Research Scientist in CSIRO. She uses a systems perspective to evaluate the vulnerability of rural livelihoods and develop integrated adaptive responses to drivers such as climate. Sarah uses quantitative modelling skills and qualitative stakeholder engagement processes to develop sustainable agricultural practices and policy-relevant information. She conducts research in both developed and developing countries and is presently leading research in Australia aimed at understanding the social, environmental and economic triggers that precipitate transformative adaptation actions. She is also undertaking a gendered perspective of vulnerability with local collaborators in Indonesia.

**Frances Parker** is an adjunct associate professor in the Centre for Social Justice and Social Change at the University of Western Sydney. She has conducted extensive action research over 30 years with farmers from culturally and linguistically diverse backgrounds operating small, intensive family farms in the peri-urban areas around Sydney. Her action research included facilitating the formation of grower associations, improving the access of women to services and highlighting the importance of peri-urban farming and local food production. She has been associated with the Sydney Food Fairness Alliance since its formation.

**Victor Pires** is a PhD candidate within the Urban Research Program at Griffith University. His research focuses on the development of an urban agriculture strategy for the Gold Coast, Australia's sixth largest city, through an examination of normative theories of policy making. Previously, he worked with the Shores Regional Organizations of Councils in Sydney, contributing to the development of *Shaping our future*, the overarching integrated strategy for the SHOROC region. Currently, Victor is part of a multi-disciplinary team led by Professor Paul Burton, which is investigating the interconnections between food security, urban resilience and climate change in Australia.

**Christina Pollard** is the chief investigator of Curtin University's Policy, Law, and Communication to Improve Public Health Research into Practice Project funded by Heathway as well as a Food and Nutrition Policy Advisor to the Western Australia Department of Health. She is also Co-Convenor of the Public Health Association of Australia's Food and Nutrition Special Interest Group and an Adjunct Research Fellow for the Public Health Advocacy Institute at Curtin University's School of Public Health. Christina has managed, implemented and evaluated government public health interventions at national, state and local levels, including the development and implementation of award winning nutrition and physical activity social marketing campaigns, Go for 2&5® and Find 30® and set up public and private sector licensing schemes to replicate 2&5® Australia wide. Most recently she has worked in an advisory role in Australian government chronic disease prevention, food regulation and food security areas.

**Darren Ray** was Director of Policy and Public Affairs at the Victorian Local Government Association from April 2007 to March 2012 (serving as Acting CEO from September 2008 to November 2009). He was first elected as a councillor to the Port Phillip City Council in 1999, retiring after three terms at the 2008 election. He was twice Mayor, in 2002–2003 and 2005–2006, and was Chair of Port Phillip's Statutory Planning Committee for many years. With nearly 20 years of advocacy experience in housing-related issues, Darren was a founding Board Member of the Australian Federation of Homelessness Organizations (AFHO), Victorian Chairperson of the National Youth Coalition for Housing and was a Board Member of the Port Phillip Housing Association from 2001 to 2008.

**Carol Richards** is an Australian Research Council Postdoctoral Research Fellow based at the School of Social Science at The University of Queensland. She has published in the area of sustainable farming and food systems, corporate power in the food supply chain and food regulation and governance. Emerging areas of research interest include the financialization of agriculture (and land grabbing), urban agriculture and food security. Carol is also the Convenor of the Australasian Agrifood Research Network and a committee member of the Australian Food Sovereignty Alliance.

**Francine Rochford** is a Senior Lecturer in the Law School at La Trobe University in Victoria. She has written extensively on the issue of water law and policy, particularly in relation to reforms to water policy. Her recent interests in water law include the constitutional framework within which water management occurs, the historical development of current water allocation principles, comparison of water law and policy, and the human right to water. Previous water-related research has considered the tortious liability of water supply authorities for contaminated water, the environmental and social impacts of water policy reform, and constraints on adaptation to emerging water policy in regional communities.

**Jane Roots** is currently undertaking her PhD in rural landscape change at the School of Environmental Sciences, Charles Sturt University, Albury, New South Wales. Jane is also co-owner of a 150 ha farming property in Indigo Shire which is used for fattening cattle, breeding Australian stock horses and growing native plantation timber. Jane has worked extensively in land management and community engagement in North-East Victoria.

**Emma Rush** is a lecturer in philosophy and ethics at Charles Sturt University. Her research focuses on applied ethics, particularly environmental ethics and public ethics. She is currently involved in new cross-disciplinary research in agricultural ethics as well as ongoing work on the sexualization of children, an area in which she has a national profile. Emma is also active in professional ethics, writing about newly professionalizing work areas as well as teaching undergraduate and postgraduate students in human services and health.

**Chris Ryan** is the Director of the Victorian Eco-Innovation Lab, having joined the University of Melbourne in 2006 as Professor and Co-Director of the Australian Centre for Science Innovation and Society. Prior to this, Chris worked with RMIT's Lab 3000 researching the potential for Information and Communications Technology to contribute to eco-innovation. Chris helped found the first multi-disciplinary undergraduate socio-environmental degree program at RMIT, and was foundation professor of Design and Sustainability at RMIT from 1990 and Director of the National (Key) Centre for Environmental Design from 1989 to 1998. His most recent book is *Imaging Sustainability* (RMIT University Press, 2007). In 2008 he was awarded an ERASMUS fellowship for work on distributed systems and resilience.

**Maarten Ryder** is a biologist who specializes in research on soil biology in agriculture, focusing particularly on the biological control of plant diseases, and on Australian native foods as new crops. He worked for the CSIRO for more than 20 years and during that time was part of the Cooperative Research Centre for Soil and Land Management, and later the Desert Knowledge Cooperative Research Centre. Maarten is now a consultant and a Visiting Research Fellow with the University of Adelaide.

**Saman Seneweera** works as a plant physiologist at the University of Melbourne. His research interest is in understanding the mechanisms of how plants respond to global climate change and abiotic stresses such as drought and temperature. Saman's long-term research focus has been on crop plant responses to climate change, particularly how elevated $CO_2$, temperature and drought modify the various physiological processes, such as growth, photosynthesis, respiration, source sink interaction, mineral nutrition and grain quality.

**Russell Shields** is the Head of Program Development for SecondBite, a member of the Council to Homeless Persons Policy Advisory Group, the StreetSmart Grants Committee and City of Melbourne Homelessness Advisory Committee. Russell is passionate about a healthy, sustainable and equitable food system for all.

**Margaret Sims** is Professor of Early Childhood at the University of New England. Prior to that she was at Edith Cowan University where she undertook various roles over many years including the Head of the Centre for Social Research, Head of the School of International, Cultural and Community Studies and Programme Director. She worked for many years in non-government agencies in New Zealand delivering early intervention, family support and inclusion support programmes. Margaret has published widely in issues relating to quality community-based service delivery for children and families.

**Christine Slade** is a PhD candidate at the University of the Sunshine Coast in the School of Social Sciences where she is researching the institutional capacity of local government to deliver socially sustainable community food security. She is also a sessional lecturer in the Geography Program particularly focusing on regional and rural sustainability. Christine's research interests include developing resilient and sustainable local/regional food systems, the contested land uses in rural and peri-urban areas, food policy development and pedagogical approaches to teaching geography in higher education.

**Michael Tausz** is Associate Professor at the Melbourne School of Land and Environment and the leader of the University of Melbourne's involvement in the AGFACE program. His research interests are in environmental and stress adaptations of crops and trees. Michael is a former Fulbright Scholar with the USDA-FS, has published more than 100 articles in Web of Science-listed journals and is highly cited according to the Essential Science Indicators. In addition to his research he is Associate Dean for Research Training in his faculty and teaches in the undergraduate and master's level coursework programs.

**Sabine Tausz-Posch** is a Research Fellow for the Australian Grains Free Air Carbon Dioxide Enrichment (AGFACE) project at the Department of Agriculture and Food Systems, The University of Melbourne. Sabine investigates agronomical, physiological and biochemical traits of crops in response to a changing environment.

**Rik Thwaites** is a Senior Lecturer, Ecotourism, in the School of Environmental Sciences, Charles Sturt University, Albury. Rik is a social scientist with interest in the dynamic interface between communities, their environments, and the policies and interventions that seek better socio-economic and environmental outcomes.

**Graham M. Turner** is a senior research scientist at CSIRO Ecosystem Sciences, Canberra, Australia. His work involves whole-of-system analysis on the long-term physical sustainability of the environment and economy. Current interests involve food security, climate adaptation and coupling physical and economic models of the national economy. Before joining CSIRO in 2000, Graham was a policy analyst (at the Australian Defence Force Headquarters); prior to that he researched ultra-insulating windows (at the University of Sydney), and undertook experimental and simulation research on industrial plasma physics (at IBM's T.J. Watson laboratory in NY, USA; and the University of Sydney).

**George Wilson** is an Adjunct Professor at the Australian National University, Fenner School of Environment and Society and Senior Visiting Fellow at the University of New South Wales, Institute of Environmental Studies. George has worked for both State and Federal Governments and British Government agencies for over 40 years in public policy, strategic analysis and scientific research. His research experience covers a wide range of scientific and industry development topics in wildlife management, animal quarantine and disease management, animal production, resource management and conservation. He has had extensive experience in the practical application of research work and has published more than 130 papers, articles, wildlife plans of management and chapters and written three books.

# Chapter 1
# Introduction: The Food Security Problem in Australia

**Quentin Farmar-Bowers, Vaughan Higgins, and Joanne Millar**

The purpose of this book is to critically examine food security issues in Australia, a country that is often assumed to be food secure. Australia, although a substantial producer of agricultural products, currently has many citizens suffering food insecurity (Temple 2008) and a growing number with diet-related health problems (AIHW 2010). Governments see diet issues as important social and economic problems because: *Many diet-related chronic diseases … are the major cause of death and disability among Australians. Poor nutrition is responsible for around 16% of the total burden of disease and is implicated in more than 56% of all deaths in Australia* (NHMRC 2011a p7). In addition to health-related food insecurities, a range of other pressures impact increasingly on the cost of food as well as its production. For example, globalization exposes food supply systems in Australia to rising resource prices as world demand increases. Australia's agricultural production is not immune to the negative aspects of climate change. Indeed Garnaut maintains that *Australian agricultural and resource industries are likely to be affected profoundly by climate change and the global response to it* (Garnaut 2010 p9). Economic and population growth, changing attitudes to biodiversity conservation, and the pressure of climate change on native biodiversity (Lindenmayer et al. 2010), also have implications for food security by increasing competition for resources, such as land and water (Alston and Whittenbury 2011; Carey et al. 2011). Consequently, the food production status of Australia will change and food security, including dietary issues, is likely to become increasingly important for Australians. In order to

Q. Farmar-Bowers (✉)
Deakin University, Geelong, Victoria, Australia
e-mail: quentin.farmarbowers@deakin.edu.au; q.farmarbowers@gmail.com

V. Higgins (✉)
School of Humanities and Social Sciences, Charles Sturt University, Wagga Wagga, NSW, Australia
e-mail: vhiggins@csu.edu.au

J. Millar (✉)
School of Environmental Sciences, Charles Sturt University, Albury, NSW, Australia
e-mail: jmillar@csu.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_1,

contextualize Australia's food security challenges, and how a more sustainable, resilient and equitable food system might be created, we need an appreciation of global food security issues.

When discussing food security, most Australians assume that the conversation is about the two billion people living in developing nations who suffer periodic or chronic famine and mal-nourishment. The global food situation is indeed catastrophic. This is the context in which Australian food security issues should be understood. Although nobody really knows how many people are undernourished in the world (protein-energy malnutrition) the Food and Agricultural Organization estimated the figure at over a billion in 2009 and approximately 925 million in 2010 (FAO 2010, 2011). Currently the FAO are reviewing the methodology for estimating undernourishment and no recent estimates are available. The impact of malnutrition on the health of vulnerable people, especially babies in their first 2 years of life, is long term (Brinkman et al. 2010). The main cause of hunger is poverty which comes about in numerous ways. For example, the ordinary operation of the economic system tends to concentrate resources in the hands of a few leaving others in poverty; military conflict destroys resources and infrastructure leaving refugees poor if not destitute; and hunger itself can lead to poverty by impairing physical and mental ability to work (WHES 2012).

A related cause of hunger is food price volatility. After falling for some decades, food prices started to rise in the mid 1990s and rose sharply in 2007 and 2008 increasing poverty and hunger (Cohen and Smale 2011) and leading to food riots in many countries (Bush 2010). The Food and Agricultural Organization food price index[1] showed that food prices fell after the 2008 peak but started to rise again in 2010 peaking in mid 2011. Prices are still high and at the time of writing in early 2012 they are rising again. The causes of the 2007/2008 food price spike and increased price volatility are controversial. They include rising energy prices, biofuels production, increasing population, and urbanization, as well as low food stocks, declining investment in agriculture and agricultural research, export bans on food and speculation (Henn 2011; McCalla 2009). High and volatile food prices are likely to continue because of the increasing demand from rising populations, economic growth and increasing biofuels production. Increasing supply side problems include scarcity of resources and declining increases in crop yields as well as weather shocks (FAO 2011).

Improving global food security is a significant and complex issue for the international community, including Australia. The United Nations' Millennium Development Goals are an important step (AusAID 2011a; UN 2011). Australia participates in overseas aid which includes food but Australia also provides technical assistance on agricultural production in Asia and Africa (AusAID 2011b; ACIAR 2011). To be sustainable, agricultural production needs to be achieved in ways that do not damage the ecological systems of the planet and be fair to future generations (Erb et al. 2009; Lawrence et al. 2012; McIntyre et al. 2009; Paoletti et al. 2011). The solutions are unlikely to be simple and are likely to require a range of organizational changes as

[1]FAO food price index available from: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/.s

well as research across a wide range of issues and topics as there are unlikely to be any single technological silver bullets (Shiva et al. 2011).

## 1.1 Concerns Over Food Security and Food Sovereignty in Australia

There seems to be two overall concerns about food in Australia. One is food security; will every Australians always be able to afford a healthy diet? There are numerous definitions of food security. One of the most widely cited definitions is provided by the FAO (2009 p 1): *Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization, and stability.*

The other is food sovereignty; will Australians control the supply and production of food in terms of quality and quantity and the resources that are used? This includes knowing where food comes from, what it contains, the circumstances of its production, and the maintenance of ecological systems that support production, and also other items that Australians value, such as biodiversity. There is also a range of definitions of food sovereignty. These are discussed by Patel (2009 p 665) and include: *Food is a basic human right. This right can only be realized in a system where food sovereignty is guaranteed. Food sovereignty is the right of each nation to maintain and develop its own capacity to produce its basic foods respecting cultural and productive diversity. We have the right to produce our own food in our own territory*.

Regarding food insecurity in Australia, the existence of malnutrition in the world has a psychological impact on many Australians. Some of the concerns about food are personal, like the money running out before all the groceries are purchased and about family members becoming overweight, obese or suffering diet-related health problems (NHMRC 2011b). These personal concerns become generalized in the community by news stories about the effects of droughts, cyclones, and floods on food production in Australia and stories about international problems such as malnutrition and famine in Africa and global food prices spikes. There is also puzzlement and concern about why some foreign governments are buying agricultural resources in Australia to secure their own food supplies, and why countries such as the United Kingdom have been putting a great effort into food policy (DEFRA 2010; SDC 2011). Hence, concerns about food sovereignty are emerging.

There are some structural issues about Australia that exacerbate these concerns. For instance, most Australians know little about food production as 68% of the population live in major cities (ABS 2008) and only 3% of Australians are working in agriculture, forestry and fisheries (DEEWR 2011). The increasing dominance of large corporations in food processing and retail adds to the feeling that our food supply depends on the decisions of just a few corporate executives pursuing a profit motive. All of which raises the feeling that despite Australia's high level of food exports (about 60% of production by volume is exported, DAFF 2010; DFAT 2011, 2012) there are food security and sovereignty issues that ought to be addressed sooner rather than later.

The questions that flow from these concerns about food include: why do some Australians go hungry, why is the average Australian diet not healthy, and where are we headed in terms of equity and sustaining the planet? Perhaps the answers to these and many other food questions lie with actions by ordinary citizens, rather than with leadership from the Australian Government. A few Australians are taking matters into their own hands by growing some of their own food in kitchen gardens and making other kind of arrangements outside the retail food supply system such as community gardens (Turner et al. 2011). Lobbying and active participation by citizens in pursuing equitable and ecologically sound solutions that reduce hunger and improve health are essential contributions to the food security debate. They provide a counter argument to the almost universally accepted idea that we have to increase production of food by 70–100% by 2050 (Tomlinson 2011).

Australians are not immune to the slow changes that have led to poverty and hunger in the world, particularly in our Indigenous and Disadvantaged Communities. For example, Boffa et al. (2009) in a report concerning alcohol, tobacco, and obesity in Indigenous Communities gave an indication of the severity of the problems and the complexity of the possible solutions. About 5% of Australians are food insecure at any one time in the sense that they run out of money before they have purchased enough food for their family. In addition, a study by Kettings et al. (2009) suggested that welfare-dependent families (almost 20% of the Australian population) could not afford healthy food habits. Rosier (2011 p 1) noted that *Food insecurity is a concern for child and family services organizations as it can impact negatively upon outcomes for children in the short- and long-term—including children's academic ability and health issues including obesity, diabetes, and heart disease*. The food security issue is wider than poverty as many Australians, who are not poor, suffer diet-related health problems, usually from too much food or from an unbalanced diet (DHA 2005). Obesity and diabetes are important issues in Australia (Zimmet et al. 2006). The data for 2004–2005 show that around 54% of adult Australians (7.4 million) were overweight or obese, up by two million since 1995 (ABS 2007). The figure rose to 61% in 2007–2008 (AIHW 2010). Such increases suggest a system failure rather than simply numerous individuals happening to put on weight.

The food security issues in Australia as a developed country are not unique as all developed nations have similar problems. For example, food insecurity in U.S. households (which is monitored by the United States Department of Agriculture) has been increasing and 14.6% of households were food insecure in 2008 (17 million households) (Nord 2009). The USDA spends about $60 billion annually on their three food assistance programs. Of course, many developing nations have immense food problems with famines that not only kill but also maim people (especially children) for life. Many developing nations also have rising middle classes that are developing the diet-related health problems similar to those in developed nations. For example, Shen et al. (2012) note that economic progress in China is leading to changes in diet and a more sedentary lifestyle. This is shifting the disease burden from infectious diseases to the same chronic diseases typical of industrialized nations, such that cardiovascular disease is now the main cause of both morbidity and mortality in rural and urban China (Shen et al. 2012).

Noting that other nations are worse off than Australia or getting similar food-related health problems is not a valid excuse for complacency at home and thinking that food security issues are being effectively handled. In regard to "looking after the welfare and well-being of our fellow Australians" we are not in competition with other nations but rather we are in competition with the future; we ought to focus on understanding then changing the social-ecological systems so that they function better in future (Gunasekera et al. 2011). Better, in this case, means more security and sovereignty in the food supply systems and ensuring the food supply systems make a positive contribution to sustainability.

Devising changes to food insecurity also requires that we focus on issues of food sovereignty. It is difficult to think of a situation in which a country or community has food security in the long term without it also having control over the production and distribution of the majority of the food it requires.[2] Food sovereignty was brought into international prominence in 1996 by the Via Campestina movement and defined as: *the right of each nation to maintain and develop its own capacity to produce the staple foods of its peoples, respecting productive and cultural diversity* (Menezes 2001 p 30). Glipo and Pascual (2005) provide a more detailed discussion of food sovereignty. Food Sovereignty is likely to be an essential element of long-term food security. Having control over food production does not mean self-sufficiency, although in many circumstances, self-sufficiency would provide substantial control over production. Such control is important not only for matching food production with needs but also for matching resource use with other uses and values society has, including maintaining the integrity of the natural environment and conserving biodiversity.

There are two major ways in which control of the food system can be lost. One is through "foreign" ownership of elements of food supply chains (Borras and Franco 2012), loss of resources to other uses and increasing food imports. This includes foreign ownership of patents, resources (such as fertilizer, water, and oil), and businesses; such as those involved in food-related manufacturing, distribution, and recycling (Myers 2010). Resources that previously went to food production can be used for other purposes such as housing development. Imports of foods can put local producers out of business, reduce skills and the opportunities to innovate, and eventually create dependency on foreign suppliers (Gathii 2012). The second way of losing control of the food system is as a consequence of natural forces. This includes land degradation (such as erosion, salinity, and acidity), water pollution, air pollution (such as troposphere ozone), and pests (animals and plants) and diseases (of plants, animals, and humans). Losses due to natural forces in Australia are ongoing and substantial despite billions of dollars being spent by industry and governments on natural resource management such as the Australian Government's "Caring for Our Country" program (DEWHA 2008).

[2] Although Pinstrup-Andersen (2009) suggests that countries with the hard cash to import its food could be considered as food secure.

Gaining food security and sovereignty are important steps towards sustainability. Not having a well fed population and losing control of the ability to feed the growing population in perpetuity are fundamental negatives in working towards sustainability. There are four reasons for saying “now is the time” to get started on achieving a food secure future for Australia. There are the moral (human rights) and the economic reasons (productive workforce) already mentioned and two practical reasons.

The first practical reason is that Australia is a financially wealthy and a food-rich nation so can afford to experiment to find ways of adjusting the social-ecological systems to create outcomes that deliver what people need for a full life, including food security. If these experiments fail, Australia currently has the capacity to recover and return to its current trajectory. The second practical reason for taking action now is that a range of external drivers are likely to exacerbate food-related problems in future. These drivers tend to move consistently in one direction; population is increasing, biodiversity declining, resources such as land, water, and energy are increasing in price, globalization is increasing and people’s values are changing. In addition the drivers tend to interact with each other. For example, people’s values are changing which includes a growing appreciation of natural systems and biodiversity. This is leading to successful lobbying for increased environmental flows in rivers which reduce water supplies for irrigation (Grant 2011). Population growth and increasing affluence in Australia is also leading to higher demand for resources and increases the competition with agriculture for land and water.

These four reasons suggest that there will never be a better time to experiment with new arrangements that deliver better outcomes for people and the environment that support them. The debate about food security in Australia is just starting and we see this book as a contribution to the debate. Finding and making the adjustments in social-ecological systems that will deliver food security and also maintain people’s other long-term needs will be a great benefit to individual families and help to maintain social stability in the face of future uncertainties. Given that other developed nations have similar food security issues, the Australian experience will be of great interest throughout the developed world and may also shed light on understanding the changing situation in many developing nations.

## 1.2 Outline of This Book

The chapters in this volume examine the various ways in which food security and sovereignty is applicable in the developed country context of Australia. For analytical purposes, engagement with these issues is presented under the three broad headings of: (1) Food equity and access (comprising eleven chapters); (2) Food production and trade (thirteen chapters); and (3) Land use planning (five chapters and a concluding chapter). Each of these topics is briefly outlined below.

### 1.2.1 Food Equity and Access

We have started with *Food equity and access* because this is the main issue in Australia regarding food security. There is not a lack of food but rather an inability of disadvantaged households to afford nutritious food. In this section, the influence of rising food prices, remoteness, and institutional capacity are discussed. Programs for food relief, community-supported agriculture (CSA), and local food distribution are also presented as solutions to a growing issue.

In chapter 2, Adriana Keating explores the weaknesses of current food supply systems in ensuring security of access to food, with a particular focus on transport and logistics. According to Keating, food security in Australia is threatened by structural, infrastructural, and management challenges within the food transport industry. She argues that while the current food logistics system is largely efficient and effective under normal circumstances, its ability to continue operating in the event of a major disaster or extreme weather event is questionable. Since Australian food transport is built around the principle of "just-in-time" movement of freight, this reduces inefficiency under normal circumstances but leaves no margins in the event of a disaster. In such an event, groups who are already food insecure are likely to be worst affected.

For Emma Rush (Chap. 3), such inequality suggests that there are broader ethical dimensions to food (in)security. Rush notes that ethical development of Australian food security strategies needs to take into account human rights as well as ecological obligations. However, the current emphasis in Australia on market-based solutions to policy problems poses challenges in taking into account *both* these values. This creates trade-offs which may threaten efforts to address food insecurity. Rush argues that only through the reform of current market approaches and the integration of ethical evaluation into policy practice, can food security strategies be developed which appropriately respond to Australia's global justice and environmental obligations. The complexity of responding to food security is a theme developed further by Ros Foskey and co-workers in chapter 4. This chapter takes a novel approach, interweaving the four authors' different disciplinary perspectives to develop a model which draws attention to the complex web of interrelationships and interdependent factors involved in food security issues. Using this model, Foskey and co-workers argue that a number of factors intersect—including social, cultural, economic, political, bureaucratic, and environmental aspects of the regional foodscape—to influence access to food. Consequently, increasing food production alone is unlikely to represent an adequate response to improving food security.

Christine Slade (Chap. 5) contends that greater local government involvement in food security issues might represent part of the solution to ensuring accessible and affordable food, particularly to socially vulnerable groups. Indeed, she observes that food security policy-making is already on the agenda of a number of councils in Australia. Yet, although local councils can play a significant role in food insecurity solutions, legislative, resource and organizational mechanisms and practices currently limit local government activity. Even though food security may be embedded in policy, the short-term nature of projects and funding poses difficulties for longer term implementation. Slade argues that greater support is needed from the Federal and state governments to support local government initiatives through legislative provisions and increased funding. However, as Brigit Busicchia points out in chapter 6, the adoption in Australia of free market principles may limit the willingness of governments to intervene in issues which are viewed as more efficiently resolved through market mechanisms—an issue raised also by Rush in chapter 3. Focusing on the issue of food price inflation, Busicchia compares policy responses to higher food prices in the UK, Australia, and France. While food price inflation in Australia and the UK has reached in excess of 40% over the past 10 years, it has been contained to 20% in France. Busicchia argues that such differences are a reflection of the UK and Australia's reluctance to intervene in the control of food price inflation, and to leave such matters to the market. In contrast, France has adopted a more interventionist approach and has managed to contain food prices through government regulation of the domestic food distribution and retailing sectors.

The final four chapters in this section engage with the important question of how existing food insecurities related to equity and access might be addressed. Christina Pollard, in chapter 7, outlines a practical approach to developing and selecting interventions to improve food security in remote Indigenous Communities. It is well known that Indigenous Australians suffer a disproportionate burden from diet-related diseases. In remote communities this is exacerbated by poor access to good quality and affordable nutritious food. Simply increasing the supply and affordability of food in these communities is unlikely, however, to contribute to improvements in food security. Pollard argues that interventions must address both supply and demand issues. In doing so, policy-makers need to take three steps when selecting which interventions are suitable to improving access to nutritious food, and enhancing public health: (1) define the problem; (2) consider what could or should be done; and (3) appraising the full range of intervention options to choose which is most likely to be workable.

In chapter 8, the focus shifts from interventions which may be pursued through the formal political sphere, to the role of grassroots movements in addressing food insecurities. Parker and Morgan in this chapter examine the values, achievements, issues of concern, and future of the Sydney Food Fairness Alliance (SFFA), a movement that has emerged out of a concern for Australia's food future. The authors trace how the SFFA has grown in just over 5 years from two individuals to a membership of over 200. The SFFA has been very successful as an umbrella group representing a wide range of stakeholders in the food system. Parker and Morgan contend that the group has been a major contributor to the growing concern in Australia over food security, sovereignty, and sustainability. Robin Krabbe in chapter 9 is also interested in the capacity of grass roots movements to promote food security and sustainability. Rather than focusing on a specific group, Krabbe explores the role of CSA—a produce box scheme in which fresh produce is provided directly from one or more farmers to a group of consumers—in working towards a more sustainable and equitable food system. She notes that CSA is capable of creating the kind of relationships, networks, and social learning needed for sustainability. However, due to the high prices usually charged by producers, CSA has been criticized for failing to contribute to food security for low-income groups. Krabbe contends that only by forging links with broader food networks and political processes can CSA build capacity for collective action and contribute to the development of more sustainable and secure food systems. Examples of such networks are already evident in Australia through the SFFA (Chap. 8) and the Australian Food Sovereignty Alliance.

In chapter 10, the focus shifts from grassroots movements to the role of organizations in addressing food access and equity issues. Ric Benjamin, in this chapter, examines the role of Foodbanks Australia—the largest group of organizations providing food bank operations in Australia—in supplying food to welfare agencies. Benjamin argues that Foodbank plays a crucial role supplying much of the food that emergency relief agencies give to people in need as meals or as take-home supplies. Providing food helps emergency relief organizations meet their clients' immediate physical needs and develops trust enabling other services, such as counseling to address the underlying causes, to be offered and accepted by clients. Yet, while Foodbanks have a distinct role to play in providing food to emergency relief agencies, they face a range of challenges such as responding to the level of need at any one time, providing a constant source of fresh and culturally appropriate food products, and addressing the broader causes of food insecurity, such as social inequality. The final chapter in this section (Chapter 11) sets out five case studies.

### *1.2.2 Food Production, Policy, and Trade*

The second section of the book, *Food production, policy and trade,* examines the multiple challenges and opportunities for Australian food production such as climate change, water use, environment and food standards, global food chains, labor deployment, and rural subdivision.

The first two chapters in this section focus primarily on the pressures climate change poses for food production in Australia. In chapter 12, Geoffrey Lawrence and co-workers trace the history of Australian agricultural exports and evaluate Australia's food production and export capacity against scientific predictions of climate change impacts—particularly the higher frequency and severity of floods, fires, and droughts. They argue that the higher frequency and severity of floods, fire, and drought, and reduced water availability are likely to compromise the production of key export commodities—wheat, beef, dairy, and sugar. Calls to produce more food using new technologies have been proposed as one solution to this problem, but these are likely to generate significant environmental problems. Given the ongoing tensions between a commitment to sustainability and the achievement of greater efficiencies through industrialized farming methods, Lawrence and co-workers believe that it may be very difficult to achieve sustainable food production in the face of climate change. Chapter 13, by Beverley Henry and co-workers, engages also with the impacts of climate change on agricultural production. They agree with Lawrence and co-workers that simplistic proposals will not provide a long-term sustainable solution to the decline in productivity growth. However, Henry and co-workers argue that an answer may lie in understanding the ecological functionality of landscapes and matching management of agricultural systems and use of natural resources to landscape capacity in a changing climate. They outline a simplified mixed grain and livestock farm case study to (a) highlight the risks associated with overly simplistic solutions; and (b) the need for increased investment in research to inform the development of practical strategies for increasing food production in Australian agro-ecosystems while managing the impacts of climate change.

Park and co-workers, in chapter 14, build on the insights of the previous chapter and argue that given the complexity of food security challenges, research and development needs to play a greater role in facilitating effective change management in the Australian agricultural sector. They note that as transformative changes in farming practices are likely to be increasingly required into the future, a better understanding of the decision-making processes used to manage change may enhance the effectiveness of the R&D delivered to today's agricultural producers. Park and co-workers identify a number of factors that may hinder or facilitate attempts to transform, and how R&D investments can better support agricultural producers maintain and increase their contribution to the nation's current status as a net exporter of food. In chapter 15, Quentin Farmar-Bowers considers how research might best be framed in order to take account of the complexity of food security, so that effective solutions can be formulated. To ensure that food security is not dealt with in isolation from other concerns, he proposes two inter-related ideas for framing research. The first conceptualizes food security as part of a larger social-ecological system which is controlled by feedbacks. The second frames food security as one of many "securities" that people need from the operation of a social-ecological system. Farmar-Bowers proposes that understanding the dynamics of these securities, and how social-ecological systems operate to provide them, is a useful frame for future research since it provides crucial insights into how changes can be made so as to maintain the full range of securities people need for a healthy and productive life. The next three chapters outline some of these different "securities."

Water is arguably one of the important biophysical securities needed for the operation of a social-ecological system. This issue is discussed in depth by Francine Rochford in chapter 16. Rochford argues that there is a growing trend by some foreign interests to acquire Australian freshwater resources to supplement future food supplies for their population. This is occurring through the purchase of rural land with significant water resources attached, the purchase of water detached from land, and the purchase of water for actual and "virtual" export via trade in commodities. She notes that the dominance of market-based rationalities in Australia means that there are few constraints to this process. Less value is placed on primary production and primary producers than that of competitor nations, which raises crucial questions regarding Australia's future water sovereignty and thus domestic food security. Soil, the focus of chapter 17, is another important biophysical security. In this chapter, Declan McDonald observes that there exists growing concern with the interdependence between food security and soil health along with the need to balance production with sustainable resource use. Yet, global demand for food and fiber places increasing pressure on natural resource condition, and the focus on increasing production has overshadowed consideration of long-term soil condition. McDonald proposes a hybrid model of productive agriculture which builds soil improvement into every aspect of the production process. He argues that without greater attention to soil security, there will be no food security.

A third security discussed in this section of the book is availability of nutritious food. Graham Turner and co-workers, in chapter 18, outline three possible future scenarios for food availability in Australia. One scenario, labeled as *Adjustment*, assumes free markets and high levels of international trade; *Control*, as the second scenario, assumes strong policy and regulatory intervention in the market to ensure the domestic supply of core foods; the third, *DIY*, envisages a more decentralized future with mostly local government intervention. Turner and co-workers argue that comprehensive food security is not achieved in any scenario, particularly when the potential impacts of constraints in other critical resources are considered. Overall, the scenarios show that the ability to supply a nutritious diet to Australians over the coming decades is likely to prove considerably challenging.

Given the challenges involved in addressing food security, what are the options for industries and communities in developing resilient and sustainable food systems? One option, explored in chapter 19 by Amelie Bernzen, is the use of environmental standards. Through a comparison of two national organic standards systems, the European Union and Australia, she analyses the key drivers behind their implementation, and the positive as well as challenging consequences which arise for the affected actors along the organic value chain at different geographical locations. Bernzen argues that there is potential for organic standards to improve agri-food sustainability and thus contribute to food security. However, strong government regulation is important in promoting the growth of organic agriculture. In Australia, there is currently very little government support for the organic industry. A further issue is that while organic standards explicitly prescribe more environmentally friendly farming and production methods, there is debate concerning the capacity of these standards to enhance long-term environmental and social sustainability. Bernzen concludes that more research is needed on this issue so that the potential for organic standards to contribute to food security can be better assessed.

In chapter 20, Lea Coates explores the implications of transnational ownership and control of local food products for community resilience and food security. Using the case study of King Island, she notes that two of the most successful island brands are owned by transnational corporations, leaving the community exposed to global food "shocks" and economic decisions made elsewhere. In an effort to gauge the resilience of King Island's food systems Coates examines four questions as posed by Constance (2008): agrarian, environmental, food and social equity questions that can be used to measure agri-food sustainability. She argues that in the King Island context, these questions provide a useful starting point, but cannot be satisfactorily answered. Consequently, Coates concludes that further research is required to assess the capacity of island communities—such as King Island—to enhance local sustainability in a global economy which renders them increasingly vulnerable.

The next three chapters in this section turn to the spatial dimensions of food production, and the consequences for resilient and sustainable food systems. Chapter 21, by Brendan Gleeson, focuses on the issue of urban food security. He contends that threats such as climate change, environmental degradation, and growing food inequalities pose deep challenges for food production and distribution systems. These challenges are likely to be experienced most acutely in cities. Gleeson notes that as a highly urbanized nation, urban food resilience is a major issue for Australia and requires greater attention by planners and policy-makers. In order to start addressing this issue, he proposes a new "harvest of the suburbs" in which food production is integrated as part of suburban development. Despite acknowledging the many barriers to suburban agriculture, Gleeson argues that this represents an effective pathway towards a more productive, self-sufficient, and resilient urban form. In chapter 22, Jane Roots and co-workers explore food production and security issues in rural amenity landscapes. They observe that farmers in these landscapes face challenges and opportunities from increased land prices, subdivision of land, more diverse communities, to competition for water resources, changing commodity markets and community expectations. Using a qualitative case study of a small, agriculturally diverse Shire in North East Victoria, the chapter explores local food production and security issues from the perspectives of farmers, local and state government officers, councillors and agribusiness representatives. Roots and co-workers find that while there is general optimism about the economic future of agriculture, the results reveal a loss of government connection with the farming community. They argue that if amenity landscapes are to continue producing food for local consumption and export, a more proactive governance approach is needed to engage with the farming community.

Chapter 23 by Fiona Haslam McKenzie, focuses on the security of food production in Western Australia, a state which has experienced rapid economic growth due to the resources boom. Despite the enviable international liveability status, Haslam McKenzie contends that the Western Australian economy and community more generally has become increasingly polarized by the resources boom. The increase in population has put unprecedented pressure on the housing industry and community infrastructure. The pressure on housing supply is contributing to the development of the most productive land around Perth. Consequently, the availability of fertile lands for horticultural production in close proximity to urban centers has become increasingly scarce, leading in turn to rising fresh food prices. While new food producing areas are emerging in the North West of the state, they come at a considerable environmental and economic cost to those who can least afford it. The final chapter in this section (Chap. 24) sets out three case studies.

### *1.2.3 Land Use Planning*

The third section *Land use planning* deals with concerns about urban development into farming areas, including the lack of long-term planning regarding food security, or opportunities for urban agriculture. In chapter 25, Trevor Budge examines the historical relationship between cities, their food supply and the planning of large metropolitan areas, and how this relationship has changed. Budge observes that food was once central to development and land use in cities. However, over time this was relegated to an inconsequential role in metropolitan planning. Concerns about food production and access—related to peak oil, climate change, and population health—are contributing to a realization in some cities within the developed world that food needs to once again be incorporated into metropolitan planning strategies. Budge argues that Australian metropolitan areas need to consider adopting similar agendas. In order to ensure the future economic, social, and environmental sustainability of cities, food needs to become a key component of future metropolitan planning. Victor Pires and Paul Burton, in chapter 26, agree with Budge that food should be an integral component of metropolitan planning. Focusing specifically on the Gold Coast, Australia's sixth largest city, Pires and Burton consider the relationship between urban agricultural practices and land use planning. Through the analysis of key planning policies and instruments, they explore the possibilities and barriers for agriculture to become a greater part of the urban realm and contribute to increasing local food security. Specifically, Pires and Burton argue that despite State and local government recognizing the need to increase the proportion of local food production, the Gold Coast Planning Scheme does not specifically mention the benefits associated with urban agriculture and in fact discourages urban agriculture-related land uses.

In chapter 27, Darryl Low Choy and Michael Buxton are interested in the relationship between planning systems and food production in peri-urban regions. Low Choy and Buxton note that Australian peri-urban agriculture is highly significant and makes a major contribution to state and national agricultural production. However, peri-urban areas on the fringes of metropolitan and regional urban centers in Australia have witnessed unprecedented rapid urban growth during the last three decades, and this has contributed to the loss of good quality agricultural land and landscape fragmentation. Low Choy and Buxton report the findings of a scenario planning exercise centered on one of Australia's fastest growing metropolitan regions—the greater Melbourne region. They then provide a post scenario planning review of that region's peri-urban agricultural viability and the adequacy of its associated planning policies. Without a more integrated approach to planning at all levels of government, peri-urban areas will be unlikely, they argue, to contribute to Australia's food security. Chapter 28, by Nicole Cook and Stephanie Harder, echoes many of the dilemmas raised by Low Choy and Buxton. They agree that while peri-urban regions have taken on renewed importance as sites of food production, agriculture in these areas is subject to competing pressures—not least demand for housing and rural living. Cook and Harder are interested in the planning instruments and processes at the heart of these pressures. Through an in-depth case study of a Local Planning Scheme in the Rural Shire of Morabool, Victoria, they show that the preservation of agricultural land is a contingent achievement, rather than a strategic, coordinated attempt to maintain local and regional food economies. Cook and Harder argue that without a coherent food policy framework at a State level, or a concise statement regarding strategic planning, land use and development for the

Shire, the protection of agricultural land is likely to remain uneven and ad-hoc. In chapter 29, Andrew Butt examines the consequences of competing land markets and landscape objectives for peri-urban agriculture. With a focus on farming enterprise change in the context of peri-urban Melbourne, Butt argues that net agricultural output has not changed significantly. Yet, the make-up and the long-term status of farming enterprises have altered, resulting in risks for viability at a regional level into the future. The diminished certainty this situation provides suggests risks for future industry structure and output and food production in the rural regions closest to the largest population centers.

Broadly, the chapters in this collection argue that food security is a critical issue for Australia. There exist many challenges regarding equitable access to high quality and nutritious food, sustainable agri-food production, and the availability of land for growing food close to population centres. This book provides an information base and ideas to help make sense of these many challenges. In addition, it suggests that two actions will greatly help food security. First, an ongoing debate between government, industry and civil society is needed on these challenges as sustainable solutions will require their collaboration. Second, that much more integration of food security into government policy at all levels would provide the leadership needed if Australia is to meet its future food needs.

## References

ABS. (2007). *Australian social trends, overweight and obesity, Catalogue No. 4102.0*. Canberra, ACT: Australian Bureau of Statistics.

ABS. (2008). *Australian Social Trends 2008, Catalogue No. 4102.0*. Canberra, ACT: Australian Bureau of Statistics.

ACIAR. (2011). *Annual report 2010–2011*. Canberra, ACT: Australian Centre for International Agricultural Research (ACIAR). Retrieved March 17, 2012, from http://aciar.gov.au/files/node/14074/aciar_annual_report_2010_2011_full_version_pdf_21236.pdf

AIHW. (2010). *Australia's health 2010*. Australia's health no. 12. Cat. no. AUS 122. Canberra, ACT: Australian Institute of Health and Welfare. Retrieved March 24, 2012, from http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442452962

Alston, M., & Whittenbury, K. (2011). Climate change and water policy in Australia's irrigation areas: a lost opportunity for a partnership model of governance. *Environmental Politics, 20*(6), 899–917.

AusAID. (2011a). *The Millennium Development Goals: The fight against global poverty and inequality*. Canberra, ACT: AusAID, Australian Government. Retrieved March 3, 2012, from http://www.ausaid.gov.au/keyaid/mdg.cfm

AusAID. (2011b). *Annual report 2010–2011*. Commonwealth of Australia. Retrieved March 3, 2012, from http://www.ausaid.gov.au/anrep/rep11/pdf/anrep10-11entirereport.pdf

Boffa, J., Tilton, E., Legge, D., & Genat, B. (2009). *Reducing the harm from Alcohol, Tobacco and Obesity in Indigenous Communities*, *Key Approaches and Actions.* Produced for the National Preventative Health Taskforce. Retrieved March 3, 2012 from http://www.health.gov.au/internet/preventativehealth/publishing.nsf/Content/0FBE203C1C547A82CA257529000231BF/$File/commpaper-indig-boffa.pdf

Borras, (Jr), S. M., & Franco, J. C. (2012). Global land grabbing and trajectories of agrarian change: A preliminary analysis. *Journal of Agrarian Change, 12*(1), 34–59.

Brinkman, J., de Pee, S., Sanogo, I., Subran, L., & Bloem, M. W. (2010). High food prices and the global financial crisis have reduced access to nutritious food and worsened nutritional status and health. *The Journal of Nutrition Supplement: The Impact of Climate Change, the Economic Crisis, and the Increase in Food Prices on Malnutrition, 140*, 153S–161S.

Bush, R. (2010). Food riots: Poverty, power and protest. *Journal of Agrarian Change, 10*(1), 119–129.

Carey, R., Krumholz, F., Duignan, K., McConell, K., Browne, J. L., Burns, C., et al. (2011). Integrating agriculture and food policy to achieve sustainable peri-urban fruit and vegetable production in Victoria, Australia. *Journal of Agriculture, Food Systems, and Community Development*, ISSN: 2152–0801 online, http://dx.doi.org/10.5304/jafscd.2011.013.003, pp. 181–195. Retrieved March 10, 2012, from http://www.foodalliance.org.au/Submissions/2011/Integrating%20agriculture%20and%20food%20policy%20to%20achieve%20sustainable%20peri-urban%20fruit%20and%20vegetable%20production%20in%20Victoria,%20Australia.pdf

Cohen, M. J., & Smale, M. (2011). Global food-price shocks and poor people—an overview. *Development in Practice, 21*(4–5), 460–471.

DAFF. (2010). *Australia's Agriculture, Fisheries and Forestry at a glance, 2010*. Canberra: Department of Agriculture, Fisheries and Forestry, Australian Government. Retrieved March 10, 2012, from http://www.daff.gov.au/__data/assets/pdf_file/0003/1539831/aag-2010.pdf

DEEWR. (2011). *Australian Jobs 2011*. Canberra, ACT: Department of Education, Employment and Workplace Relations. Retrieved March 10, 2012, from http://www.deewr.gov.au/Employment/ResearchStatistics/Documents/AustralianJobs.pdf

DEFRA. (2010). *Food 2030*. London: Department for Environment, Food and Rural Affairs, HM Government. Retrieved November 19, 2011, from http://archive.defra.gov.uk/foodfarm/food/pdf/food2030strategy.pdf

DEWHA. (2008). *Caring for our country, Outcomes, 2008–2013*. Department of the Environment, Water, Heritage and the Arts and the Department of Agriculture, Fisheries and Forestry. Canberra, ACT.

DFAT. (2011). *Trade at a glance*. Canberra, ACT: Department of Foreign Affairs and Trade. Retrieved March 24, 2012, from http://www.dfat.gov.au/publications/trade/trade-at-a-glance-2011.pdf

DFAT. (2012). *Agriculture and the WTO, web page*. Department of Foreign Affairs and Trade. Retrieved March 24, 2012, from http://www.dfat.gov.au/trade/negotiations/trade_in_agriculture.html

DHA. (2005). *Food for health, Dietary guidelines for Australians, A guide to healthy eating*. Canberra, ACT: National Medical Research Council. Department of Health and Ageing. Retrieved March 3, 2012, from http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/n31.pdf

Erb, K., Haberl, H., Krausmann, F., Lauk, C., Plutzar, C., Steinberger, J., et al. (2009). *Eating the Planet: Feeding and Fuelling the World Sustainably, Fairly and Humanely: a Scoping Study*: *Social ecology working paper 116*. Vienna: Institute of Social Ecology. IFF, Faculty for Interdisciplinary Studies, Klagenfurt University, Commissioned by FOE and CIWF, and summary report: Eating the planet? How we can feed the world without trashing it (2009). Retrieved March 10, 2012, from http://www.ciwf.org.uk/what_we_do/factory_farming/eating_the_planet.aspx

FAO. (2009). *Declaration of the World Summit on Food Security, World Summit on Food Security, Rome, 16–18 November 2009*. Rome: Food and Agriculture Organisation of the United Nations. Retrieved March 10, 2012, from http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf

FAO. (2010). *The State of Food Insecurity in the World Addressing food insecurity in protracted crises*. Rome: Food and Agriculture Organization of the United Nations.

FAO. (2011). *The State of Food Insecurity in the World: How does international price volatility affect domestic economies and food security?* Rome: Food and Agriculture Organization of the United Nations.

Garnaut, R. (2010). Climate change and the Australian agricultural and resource industries. *The Australian Journal of Agricultural and Resource Economics, 54*, 9–25.

Gathii, J. T. (2012). *Food Sovereignty for Poor Countries in the Global Trading System*. Albany Law School Research Paper No. 44 of 2011–2012. Loyola Law Review, 57, 2012. Retrieved March 25, 2012, from http://ssrn.com/abstract=2002244

Glipo, A., & Pascual, F. G., Jr. (2005). *Food Sovereignty Framework, paper used in, Nyéléni 2007—Forum for Food Sovereignty*. 23rd–27th February 2007. Sélingué. Mali. Retrieved March 4, 2012, from http://www.nyeleni.org/spip.php?article89; http://www.nyeleni.org/IMG/pdf/FoodSovereignityFramework.pdf

Grant, T. (2011). *Major Snowy River Flows.* Media Release, Monday October 10, 2011, Troy Grant MP, Parliamentary Secretary for Natural Resources, New South Wales Government. Retrieved March 3, 2012, from http://www.water.nsw.gov.au/About-us/Ministerial-media-releases/Ministerial-releases/default.aspx

Gunasekera, D., Newth, D., & Finnigan, J. (2011). Reconciling the competing demands in the human-earth system: Ensuring food security. *Economic Papers, 30*(3), 296–306.

Henn, M. (2011). The speculator's bread: What is behind rising food prices? *EMBO Reports, Science & Society Series on Food and Science, 12*(4), 296–301.

Kettings, C., Sinclair, A. J., & Voevodin, M. (2009). A healthy diet consistent with Australian health recommendations is too expensive for welfare-dependent families. *Australian and New Zealand Journal of Public Health, 33*(6), 566–572.

Lawrence, G., Richards, C., & Lyons, K., (2012). Food security in Australia in an era of neoliberalism, productivism and climate change. *Journal of Rural Studies*, doi:10.1016/j.jrurstud.2011.12.005

Lindenmayer, D. B., Steffen, W., Burbidge, A. A., Hughes, L., Kitching, R. L., Musgrave, W., Stafford Smith, M., & Werner, P. A. (2010). Conservation strategies in response to rapid climate change: Australia as a case study. *Biological Conservation, 143*, 1587–1593.

McCalla, F. A. (2009). World food prices: Causes and consequences. *Canadian Journal of Agricultural Economics, 57*, 23–34.

McIntyre, B. D., Herren, H. R., Wakhungu, J., & Watson, R. T. (Eds). (2009). *Agriculture at a Crossroads: Global Report*. International Assessment of Agricultural Knowledge, Science, and Technology for Development. Washington, DC: Island Press. Retrieved March 4, 2012, from http://www.agassessment-watch.org/

Menezes, F. (2001). Food sovereignty: A vital requirement for food security in the context of globalization. *Development, 44*(4), 29–33.

Myers, P. (2010). *Australia should look to its food security, before all the farm is sold*. Opinion, Sydney Morning Herald, October 14, 2010. Retrieved March 3, 2012, from http://www.smh.com.au/opinion/society-and-culture/australia-should-look-to-its-food-security-before-all-the-farm-is-sold-20101013-16jyw.html

NHMRC. (2011a). *Australian Dietary Guidelines Incorporating the Australian Guide to Healthy Eating, Providing the scientific evidence for healthier Australian diets, Draft for Public Consultation, December 2011*. National Health and Medical Research Council. Retrieved March 10, 2012, from https://www.eatforhealth.gov.au/sites/default/files/files/public_consultation/n55_draft_australian_dietary_guidelines_consultation_111212.pdf

NHMRC. (2011b). *NHMRC Annual Report 2010–2011*. Canberra ACT: National Health and Medical Research Council. Accessed March 10, 2012, from http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/nh153_nhmrc_annual_report_2010_11.pdf

Nord, M. (2009). *Food Insecurity in Households with Children: Prevalence, Severity, and Household Characteristics*. Economic Information Bulletin-56. U.S. Department. of Agriculture, Economic Research Service. Retrieved November 20, 2012, from http://www.ers.usda.gov/Publications/EIB56/EIB56.pdf

Paoletti, M. G., Gomiero, T., & Pimentel, D. (2011). Introduction to the special issue: Towards a more sustainable agriculture. *Critical Reviews in Plant Sciences, 30*, 2–5.

Patel, R. (2009). What does food sovereignty look like? *Journal of Peasant Studies, 36*(3), 663–706.

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security, 1*, 5–7.

Rosier, K. (2011). *Food insecurity in Australia: What is it, who experiences it and how can child and family services support families experiencing it?* Australian Institute of Family Studies August 2011. Canberra: Australian Government. Retrieved March 3, 2012, from http://www.aifs.gov.au/cafca/pubs/sheets/ps/ps9.html

SDC. (2011). *Looking back, looking forward Sustainability and UK food policy 2000–2011*. London: Sustainable Development Commission. Retrieved March 10, 2012, from http://www.sd-commission.org.uk/data/files/publications/FoodPolicy10_Report_final_w.pdf

Shen, J., Goyal, A., & Sperling, L. (2012). The emerging epidemic of obesity, diabetes, and the metabolic syndrome in China. *Cardiology Research and Practice*, Article ID 178675, 5, doi:10.1155/2012/178675

Shiva, V., Barker, D., & Lockhart, C. (Co-ordinators). (2011). *The GMO Emperor has no cloths, a global citizens report on the state of GMOs—False promises, failed technologies: Synthesis report.* Retrieved March 3, 2012, from http://www.navdanyainternational.it; http://www.navdanya.org; http://image.guardian.co.uk/sys-files/Environment/documents/2011/10/19/GMOEMPEROR.pdf

Temple, J. B. (2008). Severe and moderate forms of food insecurity in Australia: Are they distinguishable? *Australian Journal of Social Issues, 43*(4), 649–668.

Tomlinson, I. (2011). Doubling food production to feed the 9 billion: A critical perspective on a key discourse of food security in the UK. *Journal of Rural Studies*, doi:10.1016/j.jrurstud.2011.09.001

Turner, B., Henryks, J., & Pearson, D. (2011). Community gardens: Sustainability, health and inclusion in the city. *Local Environment: The International Journal of Justice and Sustainability, 16*(6), 489–492.

UN. (2011). *The Millennium Development Goals Report 2011*. New York, United Nations.

WHES. (2012). *2012 World Hunger and Poverty Facts and Statistics*. World Hunger Education Service. Retrieved March 24, 2012, from http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.html

Zimmet, P. Z., Philip, W., & James, T. (2006). The unstoppable Australian obesity and diabetes juggernaut. What should politicians do? (Editorial). *Medical Journal of Australia, 185*(4), 187–188.

# Part I
# Food Equity and Access

# Chapter 2
# Food Security in Australia: The Logistics of Vulnerability

**Adriana Keating**

## 2.1 Introduction

Despite Australian Government recommendations that all households hold a store of food, water and other essentials to last them for 14 days in the event of an emergency (http://www.pantrylist.com.au/), uptake of this advice remains low. Many Australians would be shocked to know that no food stockpiles are held for use in the event of an emergency. Government emergency infrastructure planning classifies food security as a secondary concern. In short, the majority of Australians take food security for granted. Research presented in this volume suggests that this complacency towards food security is a significant risk to Australians. Local, regional, national and global food systems have immense influence on, and interaction with, social welfare, the state of the environment and economics. Food systems are the foundation of human health and wellbeing, so understanding and managing the weaknesses and vulnerabilities within complex food systems are essential to society. As Australia's population ages and grows, and climate change impacts food systems, the need to ensure effective food systems will only increase.

Following four decades of predominantly declining trends, between 2002 and mid-2008 global food prices increased by 64% (FAO 2008). These price increases were caused by a convergence of stressors including adverse weather conditions, increases in oil prices which impacted production, transport and the market for biofuels, growing demand for meat and dairy from the growing middle classes in India and China, and a reduction in food reserve stock levels as a matter of international trade policy over the 1990s (OECD-FAO 2008; Garnaut 2008). The FAO (2008) estimates that these price movements increased the number of chronically food insecure people in the world, the vast majority of whom live in developing countries,

A. Keating (✉)
Centre for Risk and Community Safety, RMIT University, Melbourne, VIC, Australia
e-mail: adriana.keating@rmit.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_2,

by 75 million, reversing modest gains in hunger reduction achieved in the mid-1990s. Counter to what these dramatic increases in global food prices may indicate, Malthus has not yet been vindicated—there is no shortage of food in the world today. Hunger has increased as the world has gotten richer and produced more food than ever before (FAO 2008). Hunger, under-nutrition and food insecurity are the result of social, economic and political factors, not inadequate food supply.

This chapter aims to provide an overview of the dynamics of food systems and food security in Australia, particularly in regards to transport and logistics. Food (in)security is the result of complex interactions within multiple systems; the chapter starts by defining and exploring the concept of food security and possible sites of compromise. Vulnerability to chronic food insecurity is outlined next and particular threats to food security due to supply chain logistics, management and infrastructure are identified and explored, and how these are expected to be exacerbated under climate change. Following is a discussion of disasters and their potential to induce transitory food insecurity events which is compounded by the freight logistics system operating in Australia. Again these challenges are expected to be exacerbated in the future due to climate change.

## 2.2 Conceptualizing Food Security

There has been significant revision of the concept of 'food security' in the last 40 years, reflecting the complex nature of food policy. The mid-1970s saw a macro and goal-oriented definition, where food security was seen as 'availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices' (1974 World Food Summit). Literally hundreds of definitions of food security had been developed since the 1970s. The concept evolved to focus on the behaviour and status of particularly vulnerable and affected people, and later added a temporal dimension. By the mid-1990s food security had expanded further to consider protein and micronutrient deficiencies, as well as socially and culturally determined food preferences. At the same time ideas relating to human rights and human security entered the food security arena. The definition in wide use today was established at the World Food Summit in 1996 as when 'all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO 2001).

Ericksen (2008) proposes a framework for assessing how food system activities (producing, processing and packaging, distributing and retailing, and consuming food) lead to food system outcomes that contribute to food security. Food security is defined as food utilization, food access and food availability. The outcomes from food system activities also contribute to, and are impacted by, social welfare and environmental security (see Fig. 2.1). This framework is useful because it highlights the links between social welfare and environmental security to food security in a way that reflects the inherent feedbacks that makes food systems analyses so

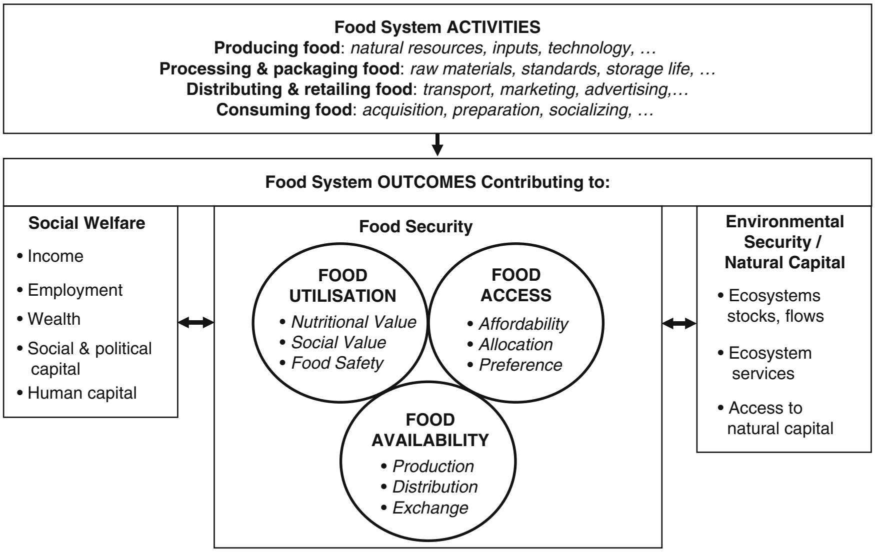



**Fig. 2.1** Components of food systems. *Source*: Ericksen (2008:239)

complex. For example, food security is an essential component of social welfare, and aspects of social welfare such as employment influence food security. Similarly environmental security contributes to food security, and can also be degraded by actions designed to improve food security. Environmental security and sustainability may depend very much on social and political capital (a component of social welfare) and so on. This framework is drawn upon throughout the chapter.

In teasing out how food security is realized it is interesting to note the differences and interactions between food utilization, food access and food availability. For example, food may be affordable (food access) but not distributed due to some blockage in the distribution network (food unavailability) and as such the food supply is insecure.

## 2.3 The Australian Food Supply Chain

The 'paddock to plate' chain is a concept that can be used when looking at food systems and food security, and refers to the movement and transformation of food through the food system activities identified by Ericksen (2008). Food that is domestically produced in Australia is generally produced on farms (the paddock). Farm produce requiring processing and packaging is transported, via road or rail freight, to a processing and packaging site. The food product is transported, again via road or rail freight, to the store or supermarket warehouse.

The Australian food supply chain utilizes road, rail and port infrastructure and is structured around a network of intermodal hubs. At multiple points during the transport stage food products may pass through an intermodal hub where it is warehoused and loaded onto a different transport mode. When food reaches the store or supermarket warehouse, it is transferred to the wholesale or retail outlet where it is purchased and consumed. The risks and vulnerabilities to Australia's food system that are identified below fit into the paddock to plate chain at different, although complex and dynamically interrelated, points.

The average Australian household spends around 12–14% of its after tax income on groceries (ACCC 2008). The Coles and Woolworths supermarket chains form a duopoly that controls approximately 70% of packaged grocery sales, and approximately 50% of fresh product sales. There has been concern over the impact this market power may be having on the choice and price available to consumers, as well as margins extracted from producers, processors and distributors. However, the ACCC grocery price inquiry found that '[g]rocery retailing is workably competitive, but there are a number of factors that currently limit the level of price competition' (ACCC 2008:2).

## 2.4 Chronic Food Insecurity in Australia

While the majority of the world's food insecure people live in developing countries, Australia and other developed countries have some unique issues relating to food insecurity. There are individuals and groups in Australia who suffer chronic (ongoing) food insecurity. Food utilization, food access and food availability are all important in determining food (in)security in Australia.

While we know that some Australians do suffer from chronic food insecurity, there are significant knowledge gaps on their number and distribution. Burns (2004) outlines the results of the Australian National Nutrition Survey (NNS) which included one question relating to food security. This question asked respondents aged over 16 years 'In the last 12 months were there any times that you ran out of food and couldn't afford to buy more?' A total of 5% of respondents answered 'yes' to this question. Some groups were more at risk of food security than the average—23% of unemployed people, 23% of single parent households and 20% of rental households (Burns 2004). These statistics may underestimate food insecurity because they are based on one limited question; the NNS survey does not address issues such as access to food or the nutritional value of food available.

The NNS statistics indicate that people who are in low socio-economic groups have reduced food affordability which is the foremost determinant of chronic food insecurity in Australia. Availability is also a key aspect, for example having affordable food outlets in the neighbourhood is an issue facing some rural and remote communities (VicHealth 2005). Similarly, people unable to get to the shops to buy food and carry it home face food availability issues due to mobility restrictions or physical infrastructure. These issues may increase in the future as Australia's population ages, with the proportion of the population over 65 years of age, and in particular over 85 years of age increasing significantly (Treasury 2010). VicHealth (2005) argues that socially and culturally appropriate food is not always available to people, highlighting a problem with food utilization.

Chronic food insecurity in Australia is related to the characteristics of food insecure people, the characteristics of their environments, and how these interact with each other within the food system. Personal and environmental characteristics can compound to increase food insecurity. For example people on low incomes may also live in low socio-economic areas lacking adequate food infrastructure (VicHealth 2005). A lack of availability and affordability of healthy foods in rural areas is contributing to higher levels of chronic food insecurity and poorer health (Burns et al. 2004; Harrison et al. 2007).

Food insecurity is of particular concern in remote Indigenous communities. The majority of people living in remote Indigenous communities source their food from the community store, a set-up that is exposing residents to several breakdowns in food security outcomes (NRHA 2006; Shannon 2002). The food available for purchase in community stores may be expensive relative to both the national average and relative to the incomes of community members. Food utilization is challenged by a lack of 'health hardware' in the home such as refrigerators, storage and preparation spaces (NRHA 2006).

The food security issues faced by both Indigenous and non-Indigenous Australians living in rural and remote areas are partly due to logistical challenges. The long transportation distances required to get food to these areas drives up the price of the food and reduces the availability of perishables. Transport infrastructure may also be limited and subject to disruption due to events such as flooding.

Evidence suggests that there is in fact a strong link between poverty, food insecurity and obesity in developed countries (Burns 2004). Burns (2004) finds that the risk of obesity is 20–40% higher for Australian women who are food insecure. The reason for the link between food insecurity and obesity is still unclear however hypotheses point towards issues surrounding the psychological impact of the threat of inadequate food, and more importantly food affordability, preference and availability (VicHealth 2005).

### *2.4.1 Freight Logistics and Chronic Food Insecurity*

This section outlines infrastructure and regulatory problems with Australia's transport industry relating to road, rail and intermodal hubs that are increasing the risk of chronic food insecurity amongst vulnerable groups. Bottlenecks, inadequate infrastructure and an inappropriate regulatory system are believed to be increasing the price of freight transport. These price increases are passed onto food consumers, and thus increase the vulnerability of lower income groups to chronic food insecurity. This effect is compounded for consumers living in rural and remote areas. Similarly, problems with bottlenecks and inefficient freight transport can leave fresh and dairy produce in transit for longer than optimal times, reducing its nutritional value.

There are over 810,000 km of roads and 44,000 km of rail in Australia, and demand on this transport infrastructure is expected to double over the next two decades (AFPRG 2006). Food and live animal transport by road freight has seen an annual growth rate of 4% between 1995 and 2001. This is the highest freight growth rate for any commodity except mineral fuels, lubricants and related materials, presumably due to the mining boom (BTRE 2003). Growth in demand for transport infrastructure is concerning because Australia's transport infrastructure is already under stress from bottlenecks, inadequate rail systems and congestion (Sims 2007). BRTE (2006) estimates that approximately 76% of Australia's non-bulk freight is transported by road. There is growing interest in increasing rail's share of Australia's freight load because of the growing demand and also due to concerns regarding higher greenhouse emissions from road transport which impacts climate change (and hence food security), and a desire to reduce road congestion in urban areas.

Without comprehensive policy reform and investment, the capacity of the rail network to take a larger share of growing demand is questionable. While Australia's east–west rail corridor has a significant share of the east–west freight task, use of rail on the east-coast north–south corridor has declined steadily since the 1970s to only 10% of the freight task. Australia's rail networks are under stress; infrastructure in some areas has not been upgraded in many years, lines have been closed, service is unreliable and pricing is uncompetitive. For many food and agriculture businesses road freight is now the only viable option. The need for more pick-up and drop-off services when using rail also increases its price (AFPRG 2006, Australian Logistics Council 2008). This price increase can flow onto the cost of food, hence reducing food availability, particularly when the food has been transported over significant distances.

Another significant challenge to the food supply chain as demand grows is the current network of intermodal terminals, where freight moves from one transport mode to another. Australia's intermodal terminal sector comprises services to international imports and exports, which is largely port-oriented, and the domestic system concerned with the movement of non-bulk cargo. Some terminals simply provide cargo exchange and container storage services, while others 'value-add' in terms of warehousing, container repairs and cleaning, truck repair, and insurance and banking services (Meyrick 2006).

Forecasting by Ernst & Young (2006) found that increases in freight demand will exceed the capacity of existing intermodal terminal infrastructure in coming decades. Intermodal terminals in Melbourne, Brisbane and Sydney are constrained by land availability. Inconsistent policy approaches focusing on one transport mode rather than the whole system have contributed to these problems. There are inadequate transport links through urban centres to reach some ports—the quality of rail access to on-dock terminals is a problem for the Port of Melbourne (AFPRG 2006; Meyrick

2006). There is little further data and information on the status of, and projections for, Australia's intermodal terminals. This information is critical if current problems faced by the industry are to be addressed (Meyrick 2006). The problems faced by intermodal terminals are particularly important for the food industry because food transport is characterized by the utilization of multiple transport modes.

Reform in road and rail pricing has been suggested as a way of addressing the need for improvements in efficiency and infrastructure investment in the sector. The Productivity Commission (2006) argues that the regulatory system is undermining the productivity of the road sector, and productivity and competition in the rail sector. Rail in its current form cannot provide a competitive alternative service to road. Similarly, the ability of rail to compensate for congestion issues in urban areas is dependent on the capacity of the urban rail network to absorb increased cargo traffic (Meyrick 2006). Infrastructure problems are compounded by and in some cases linked to, cumbersome, confusing and overlapping state and territory regulatory regimes (Sims 2007).

The Productivity Commission (2006) argues that prices for heavy vehicle use of roads (a) do not reflect enough of the real costs of road use in terms of truck weight and distance travelled, (b) are not accurate enough as they are conservative aggregate estimates and (c) must increase to match infrastructure spending requirements. In response to the Commission's report the Council of Australian Governments (COAG) endorsed a reform of road pricing (COAG 2008). A key step towards improving the road pricing system would be to use more sophisticated price calculation instruments to consider truck size, weight and distance travelled, so road use could be better valued and pricing send more appropriate price signals. While substantive economic modelling on food prices in relation to transport supply chains has not been undertaken, it is fair to propose that if demand for land fright services increases under the current infrastructure and regulatory environment, the price of freight services will increase. In the food industry this could be passed onto consumers and as such may increase vulnerability to chronic food insecurity for people on low incomes and in rural and remote areas.

Adding to supply side problems is a transport and logistics industry that is plagued by high staff turnover and a shortage of managers (Meyrick 2006). Queensland and Western Australia saw a decline in the number of drivers compared to the number of trucks between 1996 and 2001. Driver shortages are a particular problem for long haul operations and in rural and remote areas (BTRE 2003). Driver shortages could further reduce the food security of rural and remote Australians in terms of food availability, food access (affordability, preference) and nutritional value via longer transit times. The industry requires human resource analysis and policies to improve staff retention.

### *2.4.2 Chronic Food Insecurity Under Climate Change*

Climate change is causing a steady increase in average yearly temperatures (see Hennessy et al. 2008; CSIRO 2007b) and poses a significant risk to food security in

Australia at several points along the paddock to plate chain. On the supply side production is vulnerable; by the end of this century runoff in the Murray-Darling Basin is expected to cease, spelling the end for irrigated agriculture in Australia's food bowl. As temperatures rise the areas suitable for a particular crop, for example, will shift, requiring constant adjustment by farmers (Quiggin 2007). Increasing temperatures are also predicted to bring about increased pest, disease and weed management issues that could impact food production (Stokes and Howden 2008). Predicted disruptions in production will impact food availability by increasing the price of food. People with characteristics that make them vulnerable to chronic food insecurity will be worse off as climate change increases many food system stressors.

The stresses on the food transport industry outlined above may be compounded by the fact that freight transport in Australia is highly dependent on fossil fuels. The capacity of the industry to adapt to a low-carbon economy, which may be pursued for climate change mitigation, is paramount if food prices are to remain affordable. Higher transport costs will be passed onto food consumers, increasing the risk of chronic food insecurity. Dependence on fossil fuels by the freight transport industry is also increasing the threat of climate change, which feeds back into the food system.

A national or international carbon trading scheme would also impact food security. On the one hand, agriculture is a significant contributor to Australia's emissions and if it were included in a carbon trading scheme it is likely that food prices would increase. On the other hand food security and environmental sustainability are intrinsically linked and without climate change mitigation food security will suffer. Within the parameters of the existing food system climate change mitigation via carbon pricing will be felt disproportionately by those on lower incomes, who spend a greater share of their income on necessities (Garnaut 2008; Larsen 2008).

Food wastage contributes to environmental damage and climate change. Australians throw away $5.2 billion worth of food annually and this translates into significant financial costs to the community as well as greenhouse gas emissions from rotting food. Food wastage not only translates into direct greenhouse gas emissions but also adds to the environmental cost of food production and processing (Baker et al. 2009). Baker et al. (2009:5) conservatively estimate that the amount of greenhouse gas emissions associated with household food waste is similar to that of the manufacture and supply of iron and steel in Australia. Population growth coupled with declining household size (associated with increased food waste) provides a recipe for ever increasing food wastage in Australia.

## 2.5 Disasters and Transitory Food Insecurity in Australia

Australians are also at risk of transitory food insecurity events where there is a sudden shock to the food system and food is temporarily unavailable. Disasters such as a disease pandemic or flooding along major transport routes, and short- to medium-term market shocks can cause disruptions in the food supply chain. Dense urbanization along the east-coast and narrowly concentrated food supplies have contributed to Australia having one of the most concentrated food supply systems in the world (Haug et al. 2007). This makes Australia particularly vulnerable to rapidly developing food shortages in the event of a disaster.

The Department of Industry, Tourism and Resources (2006) identifies a human disease pandemic, such as an influenza pandemic, as a serious threat to food security. Such a pandemic is predicted to develop and spread quickly in waves each of which could last months. The pandemic would have the most significant impact on Australian food businesses through a massive drop in staffing levels, with 30–50% of staff absent at the pandemic's peak. Such a significant reduction in staff could severely disrupt the entire supply chain. Disruptions could also drive the price of food upwards, further compromising food affordability for those already vulnerable in a time of crisis.

Spurred on by concern for market efficiency and as a matter of international trade policy (OECD-FAO 2008), Australia does not currently hold any food reserves for use in the event of a major disruption to the food supply. Australians in general are unprepared for a food shortage. As supermarkets provide a significant majority of food to consumers, these private businesses would be the locus of food distribution during a disaster, a role for which they are unprepared (FoodLegal 2008), these issues are discussed below.

### *2.5.1 Freight Logistics, Disasters and Transitory Food Insecurity*

It is conceivable that an event such as a disease pandemic, major power disruption or natural disaster could cause disruption in the food logistics system and spark transitory food insecurity if the system is unable to operate under the abnormal circumstances. Lack of food stocks for use in the event of a disaster further compromises the ability of the food supply system to operate under abnormal circumstances. Infrastructure pressures outlined above could also increase the vulnerability of the food logistics industry in the event of a disaster.

The road freight sector in particular is characterized by high competition and tightening profit margins (BTRE 2003). Food supply chain management is characterized by 'just-in-time' logistics structures where sophisticated logistics management systems, designed to improve efficiency, result in food being sourced, transported and delivered to retailers as quickly as possible. These logistics structures operate effectively during normal circumstances. However, the lack of margins means that a disruption can throw the whole system into disarray. If the food supply chain were disrupted, supermarkets (which are responsible for the majority of food retailing in Australia) would only be able to continue supplying food for less than a week.

The road freight sector encompasses both contractors and in-house logistics operations. While there are currently more in-house operators compared to contract operators, evidence suggests that this balance is shifting. Owner drivers and small freight businesses represent two thirds of the industry although only 12% of its income

(BTRE 2003). The effect of the number and size of the businesses in the industry during a disaster is uncertain. On the one hand a lot of small operators may provide the industry with flexibility in times of disaster. Alternatively, many small operators with no central organizer could prove to be ineffective outside of normal circumstances.

The inventory systems that currently operate in Australian supermarkets hold minimal buffer stock and stock replenishment is triggered by customer demand via electronic monitoring of stock levels. These systems are dependent on consistent purchasing patterns. A major disruption to the food supply would likely prompt panic buying, with consumers changing their buying patterns from small, frequent purchases, to larger, less frequent purchases, which may further throw food chain management into disarray (FoodLegal 2008).

A disaster in or around a key intermodal terminal could put strain on the food supply and possibly induce transitory food insecurity in some areas. Australia's major domestic freight terminals are located in capital cities, and each state has an intra-state network of smaller terminals. For example a large, food-contaminating disaster at Dynon Rail Precinct at the Port of Melbourne (Victoria's largest intermodal terminal, transferring both international and domestic freight) could compromise the food supply. Effective disaster management requires managers and staff who have been fully briefed and are confident in abnormal, pressing circumstances. With regards to the transport industry, high staff turnover and need for increased management competencies do not engender confidence in the capacity of the transport logistics industry to operate effectively in the event of a disaster.

Staffing levels would also be a significant problem for supermarkets during a disaster such as an influenza pandemic. With 30–50% of staff absent due to illness or quarantining, already compromised supermarkets would be under significant strain (Department of Industry, Tourism and Resources 2006). This issue could be compounded by the young demographic of some supermarket staff.

### *2.5.2 Freight Logistics, Disasters and Transitory Food Insecurity Under Climate Change*

Drought has been a feature of Australian agriculture since before records began and is expected to increase under climate change. The most recent El Niño-induced drought lasted from 2002 to 2008, and was the longest, hottest drought on record (Jones, cited in Wahlquist 2008). In 2002–2003 alone, the drought caused a 20% drop in the gross value of farm production (DAFF 2004). It has been suggested that the severity of this drought may have been increased by effects of climate change (Murphy and Timbal 2008). The most direct effect of drought on food security is by reduction in food production and hence food availability.

Climate change also will increase the frequency and severity of extreme weather events such as fire and flooding (Garnaut 2008). These are predicted to result in higher average food prices, and increased frequency of price shocks, for both locally produced and internationally traded products (Quiggin 2007). As discussed above, an increase in disasters coupled with a food transport and distribution industry that is already ill-equipped to deal with disasters may increase the frequency of transitory food insecurity events. If, as predicted by Garnaut (2008), Australia becomes increasingly dependent on food imports, this is a major vulnerability in the face of increased frequency and severity of food supply shocks.

The increased frequency and severity of extreme precipitation events has the potential to cause significant damage to food transport infrastructure such as roads, rail, bridges, airports, ports and especially tunnels. Port and coast infrastructure are at particular risk when storm surges combine with rises in sea level. Rail operations could be increasingly compromised if climate change increases the frequency of lightning strikes (CSIRO 2007a). Historical records of environmental conditions such as rainfall, wave height, etc, have informed the construction of Australia's transport infrastructure (Australian Logistics Council 2008). Under climate change Australia is already experiencing historical firsts in terms of temperatures, rainfall levels, etc. These trends are expected to put our transport infrastructure under further strain. Climate change risk assessments need to be carried out on existing and proposed supply chain infrastructure.

## 2.6 Conclusions

Analysis and planning for transport infrastructure is hampered by significant data and information gaps relating to the transport industry. Data is not consolidated to a central database, and inappropriate secondary sources are often the only information available to planners and policy-makers (BTRE 2003; Meyrick 2006). Consolidation of existing data, and collection of good quality raw data, on the transport industry to inform planning decisions would be extremely beneficial for planning purposes.

Food security in Australia has been analysed using a food systems analytical tool that highlights the complex and dynamic interconnectedness of food security, social welfare and environmental sustainability. The status of food security in Australia is complex and ever evolving, as are the vulnerabilities to both chronic and transitory food insecurity. These vulnerabilities exist for different groups at different times, and are realized at different points along the 'paddock to plate' chain.

Socio-economic status and geographical remoteness are the major contributors to chronic food insecurity in Australia at present. An ageing population may also increase the prevalence of food insecurity in the community. Australia does not currently have comprehensive data or information on the extent or nature of chronic food insecurity in the community. Australia does not hold any official food reserves for use in the event of a shock to the food supply. Global economic and food market movements, a local disease pandemic, or extreme weather events could all disrupt food production and distribution. People who are already vulnerable to, or experiencing, chronic food insecurity will be most affected in the event of a disaster.

An efficient and well-operating food logistics system is essential for food security. Significant infrastructure upgrades are required if the food system is to meet the demands of an increasing population in the future. While the current system is largely efficient and effective under normal circumstances, its ability to continue operating in the event of a major disaster is questionable. The food logistics system is built around the principle of 'just-in-time' movement of freight; this reduces inefficiency under normal circumstances but leaves no margins in the event of a disaster. This chapter has identified several issues in relation to the logistics and management of Australia's food logistics system.

Climate change will increase the frequency and severity of extreme weather events, as well as inducing a more gradual change in climatic conditions that will have significant impacts on food production in Australia. Agriculture is a significant contributor to greenhouse emissions, and must be lowered to reduce the extent of climate change. Ironically, methods of adaptation that reduce greenhouse emissions from agriculture may reduce the availability of food, compromising food security.

## References


AFPRG. (2006, February). Creating our future: Agriculture and food policy for the next generation. Agriculture and Food Policy Reference Group report to the Minister for Agriculture, Fisheries and Forestry, Canberra. Retrieved November 14, 2011 from http://www.daff.gov.au/__data/assets/pdf_file/0005/248387/creating_our_future_part_b.pdf.

Australian Competition and Consumer Commission. (ACCC). (2008). Container stevedoring (Monitoring report no. 10). Retrieved December 4, 2008 from http://www.accc.gov.au/content/index.phtml/itemId/847651.

Australian Logistics Council. (2008, July). Infrastructure programs for addressing supply chain blockages (Final draft report). Retrieved November 14, 2011 from http://www.infrastructureaustralia.gov.au/public_submissions/published/files/169_australianlogisticscouncil_SUB2.pdf.

Baker et al. (2009, November). What a waste: An analysis of household expenditure on food (The Australia Institute Policy Brief No. 7). Retrieved November 14, 2011 from http://apo.org.au/research/what-waste-%E2%80%93-analysis-household-expenditure-food.

BTRE. (2003). An overview of the Australian road freight transport industry (Working paper no. 60). Bureau of Transport and Regional Economics http://www.bitre.gov.au/publications/77/Files/wp60.pdf Retrieved 14 November 2011.

BTRE. (2006). Freight measurement and modelling in Australia (Report no. 112), Bureau of Transport and Regional Economics, Canberra, ACT.

Burns, C. (2004). A review of the literature describing the link between poverty, food insecurity and obesity with specific reference to Australia. Retrieved December 4, 2008 from http://www.secondbite.org/resources/documents/A_review_of_the_literature_describing_the_link_between_poverty_food_insecurity_and_obesity_w.pdf.

Burns, C., et al. (2004). Food cost and availability in a rural setting in Australia, *Rural and Remote Health*, 4(311). Retrieved January 5, 2009 from http://rrh.deakin.edu.au.

COAG. (2008, March). Report to the council of Australian Governments, Council of Australian Governments Reform Council. Retrieved March 26, 2012 from http://www.coag.gov.au/coag_meeting_outcomes/2008-03-26/docs/CRC_report_to_COAG_2008.pdf.

CSIRO. (2007a). Infrastructure and climate change risk assessment for Victoria. Prepared for Victorian Government, Melbourne, VIC. Retrieved February 18, 2008 from http://www.greenhouse.

vic.gov.au/CA256F310024B628/0/2021C307264A6473CA2572DD00055CBB/$File/Climate+change+and+Infrastructure+Final.pdf.

CSIRO. (2007b). Climate change in Australia, CSIRO, Canberra, ACT. Retrieved February 5, 2009 from www.climatechangeinaustralia.gov.au/resources.php.

Department of Agriculture, Fisheries and Forestry (DAFF). (2004). Australia—Our natural resources at a glance, Commonwealth of Australia 2004. Retrieved February 5, 2009 from http://www.daff.gov.au/__data/assets/pdf_file/0020/92603/nrm_at_a_glance.pdf.

Department of Industry, Tourism and Resources. (2006). Business continuity guide for Australian businesses. Retrieved January 5, 2009 from http://www.innovation.gov.au/Pandemic_Business_Continuity/Documents/BusinessContinuityGuideForAustralianBusinesses20060627130327.pdf.

Ericksen, P. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change, 18*(1), 234–245. doi:10.1016/j.gloenvcha.2007.09.002.

Ernst & Young. (2006). North–south rail corridor study—Detailed study report, Commissioned by the Department of Transport and Regional Services. Retrieved February 19, 2009 from http://www.auslink.gov.au/publications/reports/north_south_corridor.aspx.

FAO. (2001). The state of food insecurity in the world 2001, Food and Agriculture Organization of the United Nations, Rome, Italy. Retrieved March 27, 2010 from http://www.fao.org/docrep/003/y1500e/y1500e00.htm.

FAO. (2008). The state of food insecurity in the world 2008. High food prices and food security—threats and opportunities, Food and Agriculture Organization of the United Nations, Rome, Italy. Retrieved November 14, 2011 from ftp://ftp.fao.org/docrep/fao/011/i0291e/i0291e00.pdf.

FoodLegal. (2008). The need for national food reserves. Submission to Senate Select Committee Inquiry into Food Production in Australia. Retrieved January 5, 2009 from http://www.aph.gov.au/senate/committee/agric_ctte/food_production/submissions/sub06.pdf.

Garnaut, R. (2008) The Garnaut climate change review. Final Report, Commonwealth of Australia. Retrieved February 10, 2009 from http://www.garnautreview.org.au.

Harrison, M., et al. (2007). The increasing cost of the basic foods required to promote health in Queensland. *Medical Journal of Australia, 186*(1), 9.

Haug, A., et al. (2007). A food "lifeboat": food and nutrition considerations in the event of a pandemic or other catastrophe. *MJA, 187*(11/12), 674–676.

Hennessy, et al. (2008). An assessment of the impact of climate change on the nature and frequency of exceptional climatic events. Commonwealth of Australia 2008. Retrieved March 5, 2009 from http://www.daff.gov.au/__data/assets/pdf_file/0007/721285/csiro-bom-report-future-droughts.pdf.

Larsen, K. (2008). *Sustainable and secure food systems for Victoria: What do we know? What do we need to know?* Victorian Eco-Innovation Lab: University of Melbourne.

Meyrick. (2006). National intermodal terminal study. Final Report, prepared for Department of Transport and Regional Services, Wollongong NSW. Retrieved February 18, 2009 from http://www.infrastructure.gov.au/transport/publications/pdf/10781_MA_DOTARS_NIMTS_Final_report_13020_Final.pdf.

Murphy, B., & Timbal, B. (2008). A review of recent climate variability and climate change in southeastern Australia. *International Journal of Climatology, 28*(7), 859–879.

National Rural Health Alliance (NRHA). (2006). Providing fresh food in remote Indigenous communities. Position Paper, March 2006. http://nrha.ruralhealth.org.au/cms/uploads/projects/providing%20fresh%20food%20%2830aug06%29.pdf .

OECD-FAO. (2008). OECD-FAO agricultural outlook 2008–2017, highlights. Retrieved January 5, 2009 from http://www.fao.org/es/ESC/common/ecg/550/en/AgOut2017E.pdf.

Productivity Commission. (2006). Road and rail freight infrastructure pricing overview. Australian Government 2006. Retrieved March 7, 2009 from http://www.pc.gov.au/__data/assets/pdf_file/0003/47532/freight.pdf.

Quiggin, J. (2007). Drought, climate change and food prices in Australia. School of Economics and School of Political Science and International Studies, University of Queensland. Retrieved January 5, 2009 from http://www.acfonline.org.au/uploads/res/Climate_change_and_food_prices_in_Australia.pdf.

Shannon, C. (2002). Acculturation: Aboriginal and Torres Strait Islander nutrition. *Asia Pacific Journal of Clinical Nutrition*, 11(Supplemental: S576–S578).

Sims, R. (2007, September). Infrastructure roadman for reform. Paper prepared for the Business Council of Australia. Retrieved January 4, 2009 from http://www.bca.com.au/Content/101167.aspx.

Stokes J. & Howden M. (eds) (2008). *An overview of climate change adaptation in Australian primary industries—impacts, options and priorities.* Prepared for Land and Water Australia by the CSIRO Climate Adaptation National Research Flagship. Canberra, ACT: CSIRO.

Treasury. (2010). Australia to 2050: Future challenges. Australian Treasury, Canberra, ACT. Retrieved November 11, 2011 from http://www.treasury.gov.au/igr/igr2010/report/pdf/IGR_2010.pdf.

VicHealth. (2005). Healthy eating—food security investment plan 2005–2010, Victorian Health Promotion Foundation. Retrieved December 6, 2008 from http://www.vichealth.vic.gov.au/en/Programs-and-Projects/Healthy-Eating/Food-Security.aspx.

Wahlquist, A. (2008, October 11). Longest, hottest drought on record, says Bureau of Meteorology. *The Australian.* Retrieved March 10, 2009 from http://www.theaustralian.news.com.au/story/0,25197,24478392-11949,00.html.

# Chapter 3
# Ethics of Food Security

**Emma Rush**

## 3.1 Introduction to Ethics

The central question for ethics is: 'How should we live?' This general question then gives rise to a host of more specific ethical questions, many of which will be of the form: 'What is the (ethically) right thing to do in this (specific) situation?' A range of ethical theories, some of which date back more than 2,500 years, provide different ways of answering such questions. So in ethics, as in many other areas of study, there is typically greater agreement about what the problems are than there is about solutions. Nonetheless, the academic discipline of ethics typically offers two valuable contributions to discussion of specific questions with an ethical dimension (in our case, how to achieve and maintain food security in Australia). The first contribution is a clearer articulation of the ethical issues involved in such questions. The second contribution is ethical evaluation of the proposed solutions to such questions; different proposed solutions typically have different ethical implications, so it is useful to be aware of these when making decisions about which solution or set of solutions to implement. Both these contributions stem from the use of conceptual frameworks that have been developed through the long history of study of ethical problems. In this section, key concepts for considering the ethical dimensions of pursuing food security in Australia will be introduced and briefly discussed. These include: consequentialism; deontology; instrumental and intrinsic value; anthropocentrism and stewardship.

Although there are many different ethical theories available, the two major categories of ethical theory are generally agreed to be consequentialism and deontology. *Consequentialist* theories make ethical judgments on the basis of consequences: when considering proposed strategies for achieving and maintaining food security

E. Rush (✉)
Charles Sturt University, Wagga Wagga, NSW, Australia
e-mail: erush@csu.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_3,

in Australia, the ethically best strategy will be the one that is predicted to result in the best overall consequences. Objections to consequentialist judgments tend to query either the definition of 'best' or the reliability of the prediction process. *Deontological* theories justify their ethical judgments on the basis of appeal to rules or principles: when considering proposed strategies for achieving and maintaining food security in Australia, the ethically best strategy will be the one that conforms to the relevant principles. A number of principles are referred to in the discussion below, including *non-maleficence* (the principle of 'do no harm') and *distributive justice* (the principle that benefits and burdens should be distributed fairly). Objections to deontological judgments tend either to query the principles selected as being the most relevant, or to argue that the consequences of following the principles are unacceptable.

Within a secular framework, it is generally accepted that the object of ethical concern is other human beings; that is, our ethical obligations are directed toward other people. This was generally assumed by major Western deontological and consequentialist theories until the 1960s. Since the early 1970s, however, writers in environmental ethics have argued that we also have obligations toward the natural environment (Brennan & Lo, 2008). Whereas previously it had been assumed that the natural environment was only *instrumentally* valuable (i.e. valuable for its use to human beings), environmental ethicists argued that the natural environment had *intrinsic* value (i.e. that it—or the sentient parts of it—had value in itself, regardless of its use for human beings). This opened the possibility of ethical conflict between human beings and the natural environment. Although a range of theories of environmental ethics are available, the main contrast among these theories relevant for discussion here is the contrast between a strictly anthropocentric (human-centred) approach and a stewardship approach. An *anthropocentric* approach continues to maintain the view that the natural environment is simply instrumental to human interests; therefore, the only reason we would protect the natural environment is to further the interests of human beings. A *stewardship* approach, on the other hand, allows for at least some intrinsic value in the natural environment, seeing 'legitimate human aspirations as tempered by respect for other forms of life' (Mepham, 1998, p.107).

Some suggest that a prudent, long-term anthropocentrism, sometimes described as 'enlightened self-interest', is all that is needed to adequately protect the natural environment (see for example Norton, 1991). However, environmental philosophers have argued that such a position is fundamentally unstable: where humans are the only intrinsically valuable entity, an enlightened (prudent, long-term) approach to the natural environment is vulnerable to being undermined by more immediate self-interest. Therefore, only genuine ethical concern for the natural environment can ensure consistently protective behaviour toward it (Plumwood, 2002, p.116). This seems logically correct, and given that the human tendency to focus on immediate self-interest has been an important cause of the environmental degradation we currently face, continuing to cling to a fundamentally self-interested position with respect to the natural environment involves unacceptable risk (Butler, 2009a). For this reason, I will take a stewardship approach in discussion below.

## 3.2 Food Security in Australia: The Framing of the Problem

A broad definition of food security has been adopted in this collection: 'The ultimate aim … [of] … food security is to arrive at a healthy and well-nourished population that can take on, to the maximum of its capacities, the development of its own community, area or country' (Roetter & Van Keulen, 2008, p.27). By this definition, food security is not about mere survival: rather, it is about people being able to pursue a good life. The food system is central to this, and will be the focus throughout this chapter.

Not all Australians currently enjoy food security by this broad definition. Pressures on global food supply (due to climate change, peak oil, peak phosphate, land degradation and alternative uses of agricultural land) at the same time as increasing global demand (due to population increases and diet changes) mean that global food prices are likely to increase substantially in future. As a result, it seems likely that the proportion of food-insecure Australians will also increase, raising the question: Given this global context, what action can be taken to achieve and maintain food security in Australia?

In the remainder of the chapter, I outline the ethical dimensions of both the *framing of the problem* of food security in Australia and some of the *proposed solutions* to it.

## 3.3 Ethical Dimensions of the Framing of the Problem

The first thing to be said about the framing of the problem above is that it is basic to the principle of democratic government that government develops strategies to promote the interests of its citizens, to whom it is ultimately accountable. Ensuring national food security is clearly one such strategy. Failure to protect citizen's interests in such a fundamental way would profoundly undermine the moral legitimacy of government. While the underlying ethical imperative here is broadly accepted, controversy remains over precisely what action government should take in order to protect citizens' interests with respect to national food security. The ethical dimensions of the major broad types of proposed solution to the problem of food security are outlined in the next section.

The second thing to be said about the framing of the problem above is that the definition of food security used appears to be anthropocentric, involving food security for human beings only. An important factor in global biodiversity decline is food insecurity for other forms of life, major causes of which are habitat loss, pollution and climate change (World Wildlife Fund, 2010, p.12). A definition of food security based on the ethos of stewardship might also include as an aim the maintenance of existing indigenous biodiversity, incorporating the recovery of species currently under threat. From a stewardship point of view, governments must move beyond the anthropocentrism implicit in the primacy of citizens' interests to give equal value to the protection of the natural environment within their borders.

The third thing to be said about the framing of the problem above is that it clearly locates action to be taken in Australia within a broader global context. While the national interest is ethically primary for governments, there is no obvious reason why the ethical obligations of nations must stop at national borders. For example, the very definition of the national interest and what types of action are acceptable to promote it may be understood to be tightly constrained by global human rights and environmental obligations, even while the national interest remains primary. The degree to which the ethical imperative for government to promote the national interest should be constrained by international ethical obligations is always controversial, so one common objection to an international understanding of ethical obligation, and standard responses to it, are sketched below.

When people with a cosmopolitan world view argue that ethical obligation is to some degree international (Kleingeld & Brown, 2006), the objection is commonly made that proximity is crucial to ethical obligation: that is, that our responsibilities are greater to those we are closer to than those further away from us. Proximity may be conceptualized in a variety of ways: personal relationships, geographical proximity, causal proximity and so on.

A limited response to the argument that proximity is primary is to draw attention to the ways that we are closer to other nations than we might think. In a globalized world, consumption in industrialized nations like Australia uses resources (and waste sinks, particularly with respect to carbon emissions) all over the world (World Wildlife Fund, 2010). Our lives are therefore connected in a causal way with the world beyond our national borders. Our consumption contributes to environmental degradation elsewhere, and also to any human suffering consequent on that degradation. So where the problems of other nations stem from such degradation, it is simply not tenable to hold that it all has nothing to do with us. Given our lifestyles, the idea of causal proximity actually underlines our ethical responsibility. We may have greater ethical responsibilities to those within our own national borders, but this does not mean that we have no responsibility beyond these borders, only that our international ethical obligations may be less demanding than our national ones. A standard minimalist ethical principle is to do no harm to others (sometimes known as the principle of non-maleficence). If we followed such a principle, our obligation would be to ensure that others are not left worse off through our interactions with them. Current market exchanges do not necessarily achieve such ethical neutrality, since comprehensive mechanisms are not yet consistently available to ensure that any social and environmental damage caused in production and service delivery is fully incorporated in the price of products and services. This creates a niche in the market for ‘ethical trade’ (Fair Trade Association Australia and New Zealand, 2011), but this is currently a niche market rather than the norm.

The stronger response to the argument that proximity is primary is to argue that if we accept that all human beings are fundamentally equal and deserving of certain basic rights (such as the right to adequate food for health and well-being), then we are ethically obliged to promote the fulfilment of such rights for all. This would hold whether or not our lives were causally connected with the lives of people elsewhere; all that is required in this case is proximity in terms of species, with the underlying idea being that, as human beings, we owe other human beings respect. The recent concept of earth rights, developed to highlight the existence of human rights within an ecological context, holds in parallel that as ecological beings, we owe other ecological beings respect (Cullinan, 2002). If such rights are accepted, ethical debate then revolves around determining precisely how much we are ethically obliged to do.

While there is much more to the arguments between cosmopolitans and others who object to their views than can be included in this chapter, below, I take the cosmopolitan position that if the development of national strategies for food security is to be ethical, it must incorporate non-trivial acknowledgement of, and response to, the ethical claims of others beyond our borders. Considering the nature of ethical claims already being made from beyond national borders, it seems reasonable to say that future claims will involve both human rights and ecological protection, as explained in the following paragraphs.

There is a *human right* to adequate food for health and well-being (Article 25(1) of the Universal Declaration of Human Rights). As global food insecurity increases in future, the proportion of people in the world who do not have access to adequate food for health and well-being will increase. As a result, Australia is likely to be under increasing ethical pressure to directly assist, either by contributing food exports to help alleviate hunger or by accepting increased numbers of refugees.

Ecological damage has negative implications for human welfare as well as for the natural environment. At a minimum, to avoid further undermining human food security, better *ecological protection* will be necessary—and it will be still more necessary if a stewardship approach is accepted. The two examples which follow illustrate some of the particular challenges that better ecological protection poses for strategies aiming to address food security in Australia which also recognize international human rights obligations. Australia's per capita greenhouse gas emissions are among the highest in the world (Garnaut, 2011), while at the same time fossil fuels are a major input for agricultural production. Equally, biodiversity is in serious decline in many parts of Australia, while one of the greatest threats to biodiversity is removal of native vegetation, most commonly for agricultural production (Beeton et al., 2006). A diverse range of advocates for environmental and social justice issues are already placing ethical pressure on Australia to improve its performance with respect to greenhouse gas emissions and biodiversity conservation (see for example Australian Conservation Foundation, 2010; Australian Religious Response to Climate Change, 2011; Coutts, 2010; The Wentworth Group, 2002, 2006 and World Vision Australia, 2011). If these ethical requirements are taken seriously, then they will significantly limit national strategies for the future increase in agricultural production that would assist Australia to respond to human rights at an international level.

The potential for conflict between human rights and ecological protection is noted in discussions of food security (see for example Pitcher & Lam, 2010), as it is within discussion of sustainability more broadly. It will become increasingly difficult to avoid trade-offs between these two values as the pressures undermining food security (for both human beings and other species) increase (Butler, 2009b). However, it remains essential to remember that conflicts between human rights and ecological protection are often framed by standard market-based economics, which has been criticized from a range of theoretical perspectives for its failure to automatically internalize such values (see for example Daly & Cobb, 1989; Galbraith, 1969 and Waring, 1988). Many solutions have been proposed to modify market-based economics in order that it better reflect such social and ecological values. Such solutions begin from standard modifications such as welfare economics and eco-taxation, then extend beyond this to the development of indicators more complex than GDP in order to better reflect to policy makers the real social and ecological position of a nation (Hamilton & Sadler, 1997), and finally stretch all the way to the systemic solutions proposed by ecological economics (Daly & Farley, 2004). Transition to an economics that provides a more holistic representation of socially and ecologically contextualized human reality poses some very evident challenges. However, were it to be achieved, it would facilitate the development of more ethical policy, since market-based drivers are an important element in the policy-setting context, and currently there is no guarantee that such drivers incorporate ethical values. For the present, those concerned about ethical policy must query the ethical legitimacy often accorded to market-based drivers throughout policy-related discussion—and to be alert for their influence when this is not explicitly acknowledged in the representation of a policy problem. Economics is only a means to ultimate human ends like human rights and ecological protection. To the extent that it undermines such ends, it can be rightly criticized.

In conclusion, ethical development of food security strategies within Australia must take account of broader human rights and ecological obligations. It is worth noting that in a highly globalized world, there are also pragmatic political reasons for keeping such obligations in mind (Singer, 2002). Moreover, the role of economics in the representation of policy problems must always be submitted to ethical scrutiny: market-based economics does not necessarily (let alone systematically) internalize important social and ecological values.

## 3.4 Ethical Dimensions of Proposed Solutions to the Problem

Australia is a pluralist society, and pluralism implies that there will be no universally supported ethical food security strategy for Australia. Instead, there will be many competing views. In such a situation, the role of ethics is not to determine the right policy, but to assess whether specific proposed policies are ethically acceptable (Mepham, 1998, p.99). Thus, in the previous section, I argued for some important general limits on what could be considered ethical food security strategies in Australia. In this section, I outline the ethical dimensions of some specific solutions proposed as a part of such strategies. Since it is not possible to discuss all proposed solutions, I have selected a sub-set with the aim of highlighting some of the major issues. It should be noted that both policy procedures (how policy decisions are made) and the substance of specific policies can be ethically evaluated. Typically, the structure of a policy will be evaluated using deontological theories while the performance (or predicted performance) of a policy will be evaluated using consequentialist theories (Mepham, 1998, p.100).

Since the problem of food security in Australia is one aspect of the wider problem of sustainability (World Commission on Environment and Development, 1990), it is unsurprising that proposed solutions tend to fall into the two general categories seen in sustainability literature more broadly: technological and social. It is generally accepted that an intelligent combination of both types of solution will be necessary to meet the scale of future challenges, although opinions differ as to the precise character of this combination. I discuss the two categories separately, as these broad general types of solution tend to raise slightly different ethical issues.

The promise of a raft of *technological solutions* is appealing to policy makers for two reasons. Firstly, it minimizes the need for difficult ethical reflection on our industrialized way of life in relation to either the poor or to the natural environment, by suggesting that the general trajectory of Western progress might be able to be maintained into the future and extended to developing nations. To date, this trajectory has been based on ever-increasing usage of ecosystem services per capita (World Wildlife Fund, 2010), but the ingenuity of human beings combined with our increasing technological power may yet enable the reversal of this trend, and even enable the restoration of degraded ecosystems. Although such an outcome appears increasingly unlikely before major and irreversible ecological impacts occur, minimizing the need for ethical reflection upon our way of life enables avoidance of what would be a very politically unpopular admission: that the steadily rising standard of living (as measured by GDP) which has been the norm in Australia's recent political history might not be able to be sustained indefinitely. The political use of technological solutions to largely avoid this underlying issue is highly ethically problematic, from both a human rights and a stewardship point of view, as such avoidance exposes both human beings and the natural environment to very significant risks. Altering the political and policy discourse to focus on the full range of considerations that affect the quality of life in Australia and to encourage a more caring attitude toward the world around us (both socially and ecologically) would seem to be ethically preferable. Such concerns may be partly responsible for the recent rise of the Australian Greens Party to national prominence.

The second reason that the promise of a raft of technological solutions is appealing to policy makers is that the development of such solutions can be outsourced to researchers and to industry: collective resources may be required (via higher taxation or the reallocation of existing government resources) but otherwise there is no need for citizen involvement until the point of adoption of relevant new technologies. Ironically, this political advantage leads to a significant ethical problem with technological solutions: they are not participatory. Such solutions are likely to increase the power of the already relatively powerful (the corporate sector and researchers, compared with the national citizenry at large). From the point of view of distributive justice, this could be considered a problem even if such distribution of power had no further ethical consequences. However, given the complexity of the food security issue, it is quite likely that the relatively narrow sectors of society which are allocated responsibility for dealing with it will be unable to see all the consequences of proposed solutions. Both deontological and consequentialist considerations thus support the need for dialogue between researchers and corporations and the general citizenry throughout the research process, although effective dialogue of this kind is difficult to achieve due to the same power imbalances which make it important to strive for.

In summary, interrogating two generally appealing aspects of technological solutions reveals associated general ethical problems which require consideration. Somewhat more specific ethical problems then tend to be associated with the three broad types of technological solution proposed to food security issues. These are: firstly, *extension (or further development) of the technological trajectories of the recent past*; secondly, *application of radically new technological developments, including genetic modification and nanotechnology* and thirdly, a *systems approach*, which may incorporate aspects of both the first two types of technological solution as well as aspects of social solutions. I briefly sketch each broad type of technological solution below, noting some of the major ethical issues each presents.

*Extension of, or further development along, the technological trajectories of the recent past* is considered a promising strategy by some. For example, Butler suggests ‘a dramatic increase in the development of better cultivars, and the introduction of higher-yielding plants to those parts of the world where the Green Revolution has not yet penetrated widely’ (Butler, 2009a, p.582). But intensification of production in the recent past has often been achieved through strategies that had many other ethical costs. To give just a couple of examples of such costs: increased disempowerment of local farmers relative to global corporations; a reduction in biodiversity, both agricultural, through the use of fewer varieties, and ecological, through the increased invasive potential of agricultural varieties that are more drought-resistant; and a reduction in animal welfare in many intensive animal production situations (for a more extensive discussion of these and related issues, see Khan & Hanjra, 2009 and Shiva, 1989). Thus, the ethical benefits of more intensive production in the recent past have been gained at substantial ethical cost. Continued intensification may not be a very ethically promising strategy unless careful attention is paid to avoiding the repetition of such costs.

*Application of radically new technologies*, such as genetic modification and nanotechnology, is sometimes proposed to resolve ethical issues which arise from intensification (Thompson, 2010). For example, why not genetically engineer battery chickens to feel no pain, or to have minimal mental capacities, so they are not bored? Such an example illustrates the difference between a consequentialist and a deontological ethical approach. If our ethical concern is limited to the harmful consequences of intensive poultry farming (such as physically suffering and mentally bored birds), then new technologies can eliminate such problems. But if our ethical concerns are also deontological (on principle, it does not seem right to treat other living things, or the natural world in general, simply as a means for human ends), then the proposal of genetic modification as a solution will increase, rather than reduce, our ethical concern. (This deontological concern may underlie the complaint that a technology is ‘not natural’. Such concern is sometimes dismissed as religious superstition, but it does not require a religious worldview.) Yet concerns about new technologies are not purely deontological: relatively little experience with such technologies limits our capacity to foresee the full consequences of their interaction in the broader environment, which is of significant concern, especially given the history of unintended consequences of new technological developments.

*Systems approaches* attempt to address the problem of unintended consequences. Under a systems approach, specialists 'such as agriculturalists, biologists, economists, sociologists and ethicists' work together 'in formulating appropriate questions, proposing, conducting and appraising relevant research and integrating the results' (Mepham, 1998, p.108). There is no doubt that such approaches are ethically preferable from a consequentialist point of view, but deontological evaluation of the underlying ethical orientation of such teamwork remains important. Is the understanding of and intervention in existing systems (which is the goal) based on a narrow anthropocentric worldview, which aims at ever more precise manipulation of the natural world to fulfil human needs, or is it based in a more inclusive stewardship approach? Within the aim of fulfilling human needs, which humans (wealthy or poor, male or female and so on) are the interventions in the system aiming to serve? Use of a narrowly anthropocentric worldview, where the natural environment is simply a means to human ends, may lead to an under-emphasis on the social dimension of solutions to the problem of food security. In nations like Australia, where per capita consumption of ecological resources is far higher than could ever be sustained on a globally equitable basis, one component of any overall ethical strategy is likely to be that humans themselves need to change, both in terms of individual lifestyles and in terms of the industry and policy structures which currently enable such resource-intensive lifestyles.

These kinds of questions reflect technological domination of systems approaches to the detriment of insights from the humanities and social sciences. This leads us to consider the second major type of solution proposed to deal with the issue of food security: social solutions. *Social solutions* to the problem of food security may be conceived at both an *individual* level (personal change, or changes at the level of an individual community or business) and a *collective* level (policy change or industry-wide change). I discuss these in turn below.

At an *individual* level, social solutions are appealing in that they can often be implemented relatively quickly and they allow citizens to engage directly with matters that concern them. Some Australians are already contributing to social solutions that would play a more significant role in addressing issues related to food insecurity, were they implemented more widely. One simple example of individual practices is vegetarianism: a random representative survey carried out by Newspoll in 2010 suggested that approximately 2% of the Australian population eat no meat (The Vegetarian/Vegan Society of Queensland Incorporated, 2010).

Individualist solutions in themselves do not provoke significant ethical problems. However, from a broader perspective, they are not equally available to different groups within Australian society (raising a distributive justice consideration), and most seriously, leaving matters up to individual conscience does not guarantee changes of the necessary magnitude to ethically address the issue of food security in Australia (remembering that an ethical response to this issue must incorporate Australia's global human rights and environmental obligations). Nonetheless, both individual practices and community-based activities play a role in trialling and demonstrating solutions that might be adopted more broadly in future.

At a *collective* level, social solutions seem to be less appealing for policy makers than technological 'fixes', as they are likely to be more difficult to implement, often requiring co-ordination across different policy portfolios. They also have potentially greater political costs, as they require changes to the status quo. Such changes may be thought to raise ethical issues, in that the current interests of some will usually be negatively affected by changes to the status quo. However, consequentialist ethics allows for such harm to the interests of some, provided that the overall good done outweighs the harm, while deontological ethics also allows for such harm, provided that processes are fair (e.g. distributive justice requires that the burdens and benefits of changes are shared fairly) and rights are upheld.

Legislation and regulation are essential instruments for achieving collective solutions, and public education is often an important component to support legislative and regulatory measures (e.g. as seen in public health education campaigns such as the 'Quit' campaign against tobacco smoking, which was used in conjunction with stricter regulation of smoking in public places and higher taxation of tobacco products). Ideally, government would use these instruments to achieve meaningful change at a national level with respect to factors driving increasing global food insecurity, such as climate change, land degradation, increasing population, increasing demand for resource-intensive foodstuffs and so on. Unfortunately, a major challenge for collective change in Australia is the hesitance of governments to apply additional regulation to existing markets. An example of such hesitance is the lack of political leadership until very recently with respect to an emissions trading scheme in Australia. Yet, as noted above, market-based drivers do not guarantee the ethical achievement of food security in Australia: the 'free market' is a market 'whose rules are freed from any social responsibility or any recognition of our embedment in a constraining ecological order' (Plumwood, 2002, p.24). Currently, market-driven considerations distort consensual and democratic processes. Government intervention will therefore be required.

With respect to proposed collective social solutions, one issue which has recently provoked community concern is the purchase of large tracts of Australian agricultural land by foreign interests.[1] Unfortunately, discussion of this issue has tended to be polarized between a xenophobic 'close the borders' attitude and free-trade ideology, under which any trade barriers are taboo. Yet there is a reasonable middle position to be taken: if a national government's first ethical responsibility is to its own citizens, then in a context where food insecurity is predicted to increase, limiting the extent to which other nations can acquire the agricultural land that is the basis for much of the national food supply would appear to be ethically justified. Although unfashionable in an era of market globalization made possible by the availability of

[1]It was reported in late 2010 that an investigation into foreign investment in farming would be jointly carried out by the Rural Industries Research Development Corporation (RIRDC), the Australian Bureau of Agricultural and Resource Economics and Sciences and the Australian Bureau of Statistics (Callick & Kerr, 2010). For more details about the relevant project ('Foreign Investment and Australian Agriculture'), which is in progress at the time of writing, please see the RIRDC website at http://www.rirdc.gov.au/.

cheap oil, self-sufficiency in essentials has long been recognized as preferable to trade dependence with respect to national security. While self-sufficiency may be economically inefficient from the perspective of free-trade, as already noted, standard market-based economics does not automatically promote broader social and ecological goals. From a broader systems approach, national self-sufficiency with respect to food can be seen to promote internal social and economic resilience in the face of future contingencies, and thus any associated economic inefficiency may be entirely politically justifiable, particularly when global food insecurity is predicted to increase. In addition, limiting the extent to which other nations can acquire agricultural land may also be justified on the basis of the broader ecological stewardship responsibilities of national governments. Even those who identify Australia as their home-place have not always been successful at caring for the land, including the indigenous species which depend upon it (Australian Conservation Foundation and the National Farmers Federation, 2000; Reeve, 1988). It is quite likely that if foreign interests see Australian land solely as a source of food, they will have still less internal incentive to care for it.

Another controversial issue in Australia relevant to proposed collective social solutions is that of the human population size and dynamics. The average child born in an industrialized nation uses far more ecological resources than the average child born in poorer nations, and thus contributes correspondingly more to the underlying causes of food insecurity. Although historically, large families were the norm, especially in the era preceding the ready availability of effective contraception, given the current global context, it is ethically desirable that much smaller families continue to become the norm in the industrialized world. Yet a range of government policies relevant to achieving this are not structured to promote such a norm. For example, welfare payments and associated taxation relief operate to encourage parents to have a larger number of children (e.g. Family Assistance, 2011a, b). Public views on this matter span the spectrum between those who advocate an unlimited human right to reproductive freedom and those who argue that broader ethical responsibilities (both social and ecological) demand a restriction of this right. Moving beyond proposed solutions within the national borders, a further important role for Australian governments, as for all industrialized world nations, is to support international initiatives to address the causes of global food insecurity via collaborative work.

In summary, proposed solutions to the problem of food security in Australia all have ethical limitations. I would argue that the most ethically defensible solution is a systems approach, which is in principle inclusive of the full range of types of solution discussed above, but which requires sustained interdisciplinary collaboration in order to critically inform the design and implementation of specific solutions. For complex problems like the issue of food security, such careful and critically reflexive design and implementation of solutions is particularly important, in order that interventions effectively contribute to the resolution of problems without creating a further array of equally difficult problems as unintended consequences. Moreover, I would argue that any systems approach to food security must be firmly based on recognition of a democratic government's primary responsibility to the human rights of its own people and ecological stewardship within national borders, but also acknowledge the weight of global human rights and ecological obligations. Such a position will underline the importance of social strategies alongside technological ones in the systems approach: the ethical role of technological solutions is to support the global advancement of human rights and ecological protection, not to prop up fundamentally globally inequitable and ecologically unsustainable lifestyles in industrialized nations like Australia (World Wildlife Fund, 2010). While the broad definition of food security adopted in this collection goes beyond mere survival to a good life (see section above: 'Food security in Australia: the framing of the problem'), the achievement of human rights and ecological protection provides the basis for a good life which is also ethical. In contrast, the kind of 'good life' which is dependent on (globally inequitable and ecologically unsustainable) industrialized-world levels of resource consumption must be critically scrutinized.

## 3.5 Conclusion

Given Australia's global context, if an ethical solution to food security in Australia is to be found, it is clear that 'substantial, visionary resources' must be committed to address the issue (Butler, 2009b, p.595). Formally institutionalizing ethical evaluation of specific proposed solutions in terms of both human rights and ecological stewardship may be a worthwhile step. Nonetheless, any such evaluation is likely to struggle to compete with economic considerations, so it is probably equally important to direct our attention toward reform of current market-based economics, with the aim of reducing its capacity to distort policy and political decision-making away from the ultimate ethical ends of human rights and ecological protection.

## References

Australian Conservation Foundation. (2010). National agenda for a sustainable Australia. Melbourne: ACF. Retrieved 20 October 20, 2011 from http://www.acfonline.org.au/uploads/res/National_Agenda_for_a_Sustainable_Australia_2010.pdf.

Australian Conservation Foundation and the National Farmers Federation. (2000). Repairing the country—A five point plan. Melbourne: ACF & NFF.

Australian Religious Response to Climate Change. (2011, February). Climate change: Public policy positions. Retrieved October 20, 2011 from http://www.arrcc.org.au/images/stories/reports/Public_Policy_Positions.pdf.

Beeton, R.J.S., Buckley, K. I., Jones, G. J., Morgan, D., Reichelt, R. E., & Trewin, D. (2006 Australian State of the Environment Committee) (2006). Australia state of the environment 2006. Independent report to the Australian Government Minister for the Environment and Heritage. Retrieved January 19, 2011 from http://www.environment.gov.au/soe/2006/index.html.

Brennan, A. & Lo, Y. (2008). Environmental ethics. In E. N. Zalta (Ed.), *Stanford encyclopedia of philosophy* (no page number as only available online). Retrieved January 20, 2011 from http://plato.stanford.edu/entries/ethics-environmental/.

Butler, C. D. (2009a). Food security in the Asia-Pacific: Malthus, limits and environmental challenges. *Asia Pacific Journal of Clinical Nutrition, 18*(4), 577–584.

Butler, C. D. (2009b). Food security in the Asia-Pacific: Climate change, phosphorus, ozone and other environmental challenges. *Asia Pacific Journal of Clinical Nutrition, 18*(4), 590–597.

Callick, R. & Kerr, C. (2010, 24 November). Probe into foreign farm investment. *The Australian*. Retrieved November 12, 2011 from http://www.theaustralian.com.au/news/nation/probe-into-foreign-farm-investment/story-e6frg6nf-1225959771271.

Coutts, G. (2010). Tuvalu PM vows to continue to climate fight. Radio Australia. Retrieved October 20, 2011 from http://www.tuvaluislands.com/news/archives/2010/2010-10-05.html.

Cullinan, C. (2002). *Wild law: Governing people for earth*. Claremont, South Africa: Siber Ink.

Daly, H., & Cobb, J. (1989). *For the common good: Redirecting the economy toward community, the environment and a sustainable future* (2nd ed.). Boston: Beacon.

Daly, H., & Farley, J. (2004). *Ecological economics: Principles and applications*. Washington, D.C.: Island Press.

Fair Trade Association Australia and New Zealand. (2011). Welcome to the home of fair trade. Retrieved November 10, 2011 from http://www.fta.org.au/.

Family Assistance Office (2011a). Baby bonus. Retrieved October 20, 2011 from http://www.familyassist.gov.au/payments/family-assistance-payments/baby-bonus/.

Family Assistance Office (2011b). Large family supplement. Retrieved October 20, 2011 from http://www.familyassist.gov.au/payments/family-assistance-payments/large-family-supplement.php.

Galbraith, J. K. (1969). The affluent society (2nd, rev. ed.) London: Hamilton.

Garnaut, R. (2011). *The Garnaut review 2011: Australia in the global response to climate change*. Cambridge University Press: Melbourne. Retrieved October 20, 2011 from http://www.garnautreview.org.au/update-2011/garnaut-review-2011.html.

Hamilton, C. & Sadler, H. (1997). The genuine progress indicator: A new index of changes in wellbeing in Australia (Discussion Paper 14). Canberra: The Australia Institute. Retrieved February 15, 2011 from https://www.tai.org.au/documents/dp_fulltext/DP14.pdf.

Khan, S., & Hanjra, M. A. (2009). Footprints of water and energy impacts of food production—Global perspectives. *Food Policy, 34*, 130–140.

Kleingeld, P. & Brown, E. (2006). Cosmopolitanism. In E. N. Zalta (Ed.), *Stanford encyclopedia of philosophy* (no page number as only available online). Retrieved January 21, 2011 from http://plato.stanford.edu/entries/cosmopolitanism/#3.

Mepham, B. (1998). Agricultural ethics. In R. Chadwick (Ed.), *Encyclopedia of applied ethics* (pp. 95–110). San Diego: Academic.

Norton, B. (1991). *Towards unity among environmentalists*. New York: Oxford University Press.

Pitcher, T.J. & Lam, M.E. (2010). Fishful thinking: Rhetoric, reality and the sea before us. *Ecology and Society*, 15(2), 12 [online]. Retrieved November 12, 2011 from http://www.ecologyandsociety.org/vol15/iss2/art12/.

Plumwood, V. (2002). *Environmental culture: The ecological crisis of reason*. London: Routledge.

Reeve, I. (1988). *A squandered land: 200 years of land degradation in Australia*. Armidale, The Rural Development Centre: University of New England.

Roetter, R. P., & Van Keulen, H. (2008). Food security. In R. P. Roetter, H. Van Keulen, J. Verhagen, M. Kuiper, & H. H. Van Laar (Eds.), *Science for agriculture and rural development in low-income countries* (pp. 27–56). Dordrecht: Springer.

Shiva, V. (1989). *Staying alive: Women, ecology and development*. London: Zed Books.

Singer, P. (2002). *One world: The ethics of globalization*. New Haven: Yale University Press.

The Vegetarian/Vegan Society of Queensland Incorporated. (2010). A pound of flesh. Retrieved February 11, 2011 from http://www.scribd.com/doc/26880337/APF-VVSQ.

The Wentworth Group. (2002). Blueprint for a living continent: A way forward from the Wentworth Group of Concerned Scientists. World Wildlife Fund Australia, Sydney. Retrieved October 20, 2011 Retrieved February 11, 2011 from http://www.wentworthgroup.org/uploads/6.%20blueprint_for_a_living_contintent.pdf.

The Wentworth Group. (2006). Australia's climate is changing Australia. World Wildlife Fund Australia, Sydney. Retrieved October 20, 2011 from http://www.wentworthgroup.org/uploads/3.%20Aust.Climate_is_Changing_Australia.pdf.

Thompson, P. (2010). Why using genetics to address welfare may not be a good idea. *Poultry Science, 89*, 814–821.
Waring, M. (1988). *If women counted: A new feminist economics*. New York: Harper & Row.
World Commission on Environment and Development. (1990). *Our common future*. Melbourne: Oxford University Press.
World Vision Australia. (2011). Climate change: What is our response? Retrieved October 20, 2011 from http://www.worldvision.com.au/issues/Climate_Change/WhatIsOurResponse.aspx.
World Wildlife Fund. (2010). Living planet report. World Wildlife Fund, Switzerland. Retrieved February 11, 2011 from http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/2010_lpr/.

# Chapter 4
# Interdisciplinary Conversations on Complexities of Food/In Security

**Roslyn Foskey, Alan Avery, Margaret Sims, and David Brunckhorst**

## 4.1 Introduction

Food security and insecurity is more than a primary production-related issue. The food security-related policies and actions decided upon and implemented in Australia today will continue to have wide-reaching impacts on health and wellbeing for future generations of Australians.

This chapter is written as a result of a dialogue between the four authors, Foskey, Avery, Brunckhorst and Sims; each bringing different disciplinary and professional perspectives. All four authors have extensive experience working in interdisciplinary environments. Such interdisciplinary approaches are vital in responding to 'real world' issues that defy 'easy categorisation' (Jacobs and Amos 2010, p. 2).

The authors began an 'epistemologically oriented' (Huutoniemi et al. 2010, p. 85) conversation focused on theory-building at the intersection of different disciplines, a process acknowledged as playing 'a vital role within the repertoire for producing knowledge' (Zahra and Newey 2009, p. 1061). The goal of this iterative conversation has been to synthesize knowledge across disciplinary boundaries in order to develop an interdisciplinary model of food security (a process outlined in MacMynowski 2007).

R. Foskey (✉)
Hunter New England Health Service, New Lambton, NSW, Australia

University of New England, Armidale, NSW, Australia
e-mail: rfoskey@une.edu.au

A. Avery
Hunter New England Health Service, New Lambton, NSW, Australia

University of New castle, Callaghan, NSW, Australia
e-mail: Alan.Avery@hnehealth.nsw.gov.au

M. Sims • D. Brunckhorst
University of New England, Armidale, NSW, Australia
e-mail: msims7@une.edu.au; dbrunckh@une.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_4,

Our conversations have highlighted how food security lies at the centre of a complex web of inter-relationships. Food security is complex and non-linear. The model developed draws on the work of David Brunckhorst and colleagues, in understanding the geography of 'eco-civic' regions, delineated by resident communities of interest, local social networks and community cohesion together with bio-physical, ecological and land use attributes. Eco-civic regions optimize geographic representation of both community civic interest and its natural resources in a 'place'. Our model also incorporates research of co-author, Margaret Sims which proposes a transfer, through the genome, of the effects of food insecurity experienced by one generation, on to at least the two following generations. Epigenetic[1] research suggests that improvements in food security may have apparently paradoxical consequences for human wellbeing where better nutrition does not always result in better health outcomes.

## 4.2 A Model of Food Security

The model encompasses the themes emerging from our discussions. Figure 4.1 represents the seed of food security. It comprises six layers: food production at the outer edge followed by food availability, food distribution, food affordability, food choice, with food security as the central kernel. Figure 4.2 highlights how access to food interacts with political, structural, environmental, social, economic and cultural factors in complex ways. This demonstrates the importance of embedding an interdisciplinary and cross-sectoral approach in the development and implementation of policy and practice relating to food security. We suggest this is essential if Australia is to adequately respond to the food security-related implications of climate change.

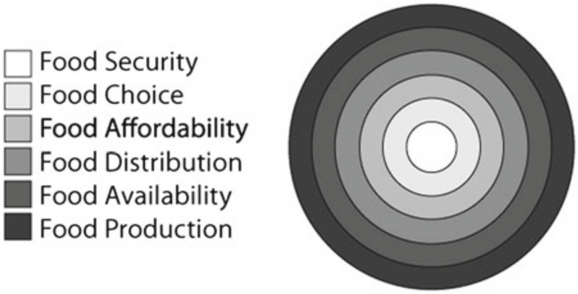
The outer layer in Fig. 4.1 is food production. There are many determinants of food production in Australia: social, economic, political and environmental, all ranging from local to regional and including national and global dimensions. Food production is often inefficient; for example when grain is fed to stock in the production of red meat, and when it is diverted to other uses (such as the production of bio-fuels) (Wardle and Baranovic 2009).

The next circle in Fig. 4.1 represents food distribution: the ways food is processed and distributed across Australian society. Food distribution incorporates the 'crude' power of national and multinational corporations, combined with the increasing, but more 'subtle' entry of these corporate players into small-scale and alternate food networks (Goodman et al. 2010, p. 12). There is evidence that decisions made on the basis of political and corporate interests impact on the availability of food to consumers, the social fabric of agricultural communities and public health outcomes (Hattersley and Dixon 2010).

Decisions made by food processors on economic grounds are impacted, in the Australian setting, by the dominance of two supermarket chains both on food distri-

[1] Epigenetics is defined as "… a functional modification to the DNA that does not involve an alteration of sequence" (Meaney 2010a p. 57).

**Fig. 4.1** The seed of food security



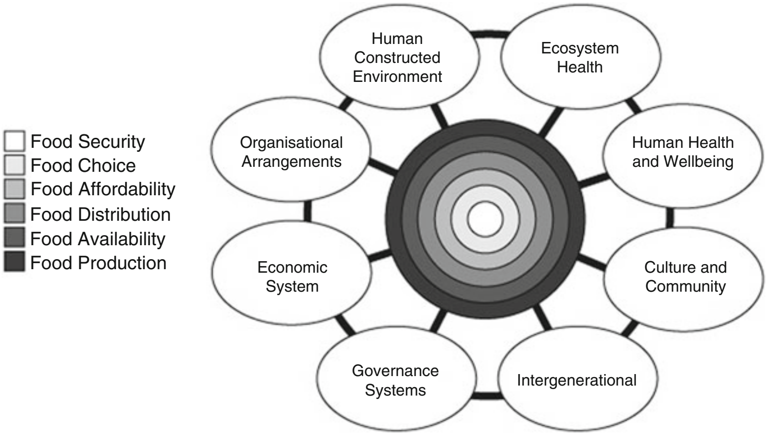




**Fig. 4.2** Improving equitable access to food security—interconnected systems

bution and the next layer in Fig. 4.1, that of food availability (Burns and Inglis 2007; Tong et al. 2010). This refers to the types and range of foodstuffs available to regional Australians, along with its nutritional quality.

The next layer in Fig. 4.1: food affordability is a significant equity issue, even within a country such as Australia that is, nominally at least, an economically advantaged and stable society (Harrison et al. 2010). A significant proportion of Australian society finds it difficult to afford a healthy diet (Kettings et al. 2009). This, in turn, leads onto the next layer, that of food choice which needs to be understood as more than the choices being made by consumers at the local store or supermarket check-out (Rose 2010). The figure's food choice layer emphasizes that food consumption is influenced through the production, processing, distribution, cost and the marketing of food products.

This leads us to the central 'kernel' of food security. Our interdisciplinary dialogue highlights the issue is more than a question of quantity of food being produced. There is evidence indicating that over the past decade within Australia the gap in the cost of a healthy diet and less healthy dietary alternatives has been widening. This results in a widening gap between the nutritionally advantaged and nutritionally disadvantaged food consumer (Harrison et al. 2010).

In Fig. 4.2 the seed of food security becomes the centre of a web of interconnected systems and elements. Production, processing, distribution, storage and marketing of foodstuffs intersect with organizational arrangements, political context and economic system, along with governance systems at local state, national and international levels. We note that food security is intimately linked with the health and sustainability of natural ecosystems together with the human-constructed environment; including transport infrastructure; the state of human health and wellbeing and the cultural and community context. Food security has crucial intergenerational dimensions beyond those usually considered.

## 4.3 Interdisciplinary Dialogue

In this section we share the interdisciplinary and intersectoral dialogue which underlies the development of our model. Rather than smoothing this into a single voice, thus silencing our differing perspectives on food security, we acknowledge each author's contribution by including the initials of the author at the beginning of each paragraph.

RF = Ros Foskey
AA = Alan Avery
DB = David Brunckhorst
MS = Margaret Sims

## 4.4 Food In/Security

The conversation begins by identifying the interconnections between food security, climate change, access to adequate nutrition and the social gradient in health.

RF: Social research usually identifies food insecurity as limited, or uncertain, availability of nutritionally adequate and safe foods; and/or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Huang et al. 2009). Across the globe there are predictions that climate change will exacerbate the already huge problem of food insufficiency, or under-nutrition, within the human population (Crahay et al. 2010).

MS: There is evidence identifying a significant proportion of Australians are disadvantaged, and that these people cannot afford a healthy diet based on today's prices. While there is not the food insufficiency we see in countries in Africa for example, where children are starving, we know that many families in Australia are impacted by food insecurity.

RF: People who experience food insecurity in Australia will tend to consume a less varied diet, to have a lower intake of fruit and vegetables, and consume a diet that is nutritionally inadequate (Gorton et al. 2010). These diets high in fat, sugar, salt, and red meat increase the risk of chronic disease (Bone and Nurse 2010). A recent Australian study found that a diet based on national health guidelines consumes around 20% of the income of the average household, but 30–40% of the income of welfare-dependent families (Kettings et al. 2009).

RF: There is a relationship between the food available at local stores and localised consumption patterns (Rose 2010). We can observe this pattern within our daily lives. Yet, as Rose (2010) also notes, we need to be wary of rushing to simplistic descriptions of causality for this does not adequately capture the complex factors which underlie the food choices made by different groups in Australian society, or indeed any society.

AA: The built environment is emerging as important for obesity prevention. Among adults, availability of supermarkets has been positively associated with the consumption of fruits and vegetables and inversely associated with obesity (Bell et al. 2008). However, fast food outlets are often co-located with supermarkets and this trend is especially prevalent in lower socio-economic areas (Burns and Inglis 2007; Tong et al. 2010).

## 4.5 Food Security as Complex and Non-Linear

Expanding on the comments by Avery on the built environment, in the next part of our dialogue we considered the interlinking systems influencing food in/security.

RF: An ecosystem approach to food security recognizes that humans, in all our cultural diversity, are an integral component of natural ecosystems, and encompasses the essential structure, processes, functions and interactions among organisms and their environment (FAO 2005). The application of the ecosystem approach to food security incorporates three objectives: sustainable use of food, the fair and equitable sharing of natural resources, and conservation of the environment for future generations (FAO 2005).

DB: The underlying ecological resource bases are important to community placemaking and well-being together with provision of ecosystem services, human settlements and resource use (Brunckhorst et al. 2006). Eco-civic regions, at various scales, elucidate social-ecological contexts optimizing civic engagement in resource and food production issues and sustainability (Brunckhorst 2010).

AA: Health ecology is a paradigm that reflects this complex set of interactions between the human and more-than-human environment (Bunch et al. 2011). Health ecology stresses a delicate (ecological) balance between positive and negative life forces in the world of people, including interaction with the environment (Avery and O'Loughlin 2003).

AA: Many people think individuals are solely responsible for their own health and health status. However health relates more broadly to groups, communities, societies and to the physical environments that keep us alive and nurtured (Tong et al. 2010). We also know that mental health is far more than just a focus on mental illness (Slade 2010). Mental health ecology is an approach to practice that I have been involved with developing and researching with others world-wide.

## 4.6 Contextualizing Food In/Security

This next part of the dialogue reflects that well-worn phrase ‘you are what you eat’ as we consider how eating influences place-making through socio-economic factors, living conditions, values, cultural identity and social relationships. All of these conditions entwine with food politics, to produce particular, contextualized consumption patterns.

DB: Landscape patterns reflect people and communities, resource production and related industries, economies and political institutions, biodiversity and ecological systems interacting at various scales. Actions to sustain ecological systems need to be integrated across these regional landscapes (Brunckhorst 2010). To me, ‘integration’ is a holistic understanding of whole interdependent social-ecological systems, rather than an approach that tries to reassemble previously separated components (Brunckhorst 2010).

AA: In our everyday lives we often focus on immediate individual human-centred needs, concerns and situations but mental, social and environmental factors in our world determine not just our survival but also our sense of well-being and overall health (Slade 2010). If we ignore a component—food security, financial security or education and learning—other factors fundamental to living may suffer as a consequence across groups and generations.

RF: In traditional approaches to health promotion on nutrition-related issues, the tendency has been to focus on trying to achieve behavioural change around the dietary behaviours of individuals or groups (Scrinis 2010) but there is not a simple relationship between diet and health. Factors, such as oral health, not always canvassed in the research literature on food security, will influence the foods that an individual consumes (Quandt et al. 2010).

MS: In addition, we have to take into consideration epigenetic effects. Children growing up in a disadvantaged environment develop different neurobiological responses to environmental triggers such as stress. Nutritional deprivation early in life (or in utero) alters biochemistry in ways to take advantage of poor levels of nutrition, so that improving the diet in later life increases risks associated with obesity (Shanahan and Hofer 2005). Better nutrition is not always associated with better outcomes in this context.

RF: This links to a point made by Butler and Dixon (2010) on the importance of incorporating an evolutionary perspective, and longer timelines into research on food and nutrition.

DB: The interactions of ecosystems, social systems and economic systems in relation to food security exhibit characteristics of complex, networked, and cross-scale systems (Brunckhorst 2005). Synthesizing spatial data on food production, processing, distribution and retail arrangements along with the data on ecological systems, landscape use patterns, social systems, and health outcomes is necessary to help us to shape a new agenda around human health, climate change and food security (Brunckhorst 2010).

AA: The 'mental' of mental health ecology is also important. As humans we transfer the things that we think about, including our beliefs, values, attitudes and understandings and feelings about our world, into action or practice and these influence other peoples' ways of thinking, feeling and their actions/practices as well (Slade 2010).

## 4.7 Food Production, Marketing and Food Choice

The focus of our dialogue turns here to identifying the connections between the food system and broader eco-civic arrangements.

RF: Attention to the interconnections within food systems means that action to improve food security encompasses how food in Australia is being produced, processed, packaged, distributed and marketed, both to the Australian population and globally. In the current marketing system food security can be compromised in a crisis situation. Simms (2008) pointed out that, in Britain, in such situations it would take just 2 days for the major supermarket chains to run out of food. Similar timeframes could apply to Australia as the distribution and marketing systems for food products is increasingly centralized (Wardle and Baranovic 2009).

DB: In terms of future climate change scenarios, in Australia and New Zealand, we should be looking at maybe less food varieties, less processing, and less packaging. Reducing food processing, packaging and miles travelled provides fresher produce and healthier outcomes. Maybe we can't have as much food choice in the future, but we can still have an acceptable variety of healthy balanced diets.

RF: Over recent decades one notable shift occurring in food production systems across the developed world has been a trend towards higher consumption of red meat. This trend has been identified as a contributor to climate change through methane production, deforestation and transportation (Bone and Nurse 2010). A diet high in the consumption of red meat, has also been associated with an increased risk of heart disease, diabetes and some cancers, in particular bowel cancer. This means that reducing the level of red meat consumption among Australians could be a win–win situation bringing both health benefits to the human population, and reducing human-induced climate change (Bone and Nurse 2010).

RF: In the Australian context we need to consider which species we choose to consume as meat. I am thinking here of the work of Stayner (2007), who modelled the economic viability of a kangaroo industry for farmers located in the Rangelands of New South Wales.

DB: Indeed, kangaroo meat is known to be leaner and healthier than many other red meats and it comes from a source which is wonderfully adapted to Australian conditions of drought and flood. It could be a unique and sustainable food source for Australians, and for export.

## 4.8 Intergenerational Implications of Food Insecurity

This focus on production and consumption options led the dialogue on to the consideration of the health and wellbeing impacts of food in/security across generations of Australians as a consequence of climate change.

RF: There is increasing recognition of the impacts of food insecurity and nutritional insufficiency on the physical health of Australians. The wider significance of the environment as a health determinant and the consequences for mental health and wellbeing across the generations remain less well recognised (Horton et al. 2010). Recent research has established links between the environment, food in/security, stress and depression across all generations from the very young to the very old (e.g. Collins 2009; Saniotis and Irvine 2010).

MS: Food insecurity is one of the factors that contributes to parental stress. Evidence is clear that stressed parents are less effective in their parenting role (Zubrick et al. 2008). Growing up in a stressful environment can alter children's genome, resulting in increased stress reactivity (Meaney 2010a), which evidences itself in poorer physical and mental health, increased emotional reactivity, and poorer developmental outcomes (Bales and Carter, 2009; Mayes et al. 2009). These effects are transmitted across generations (Meaney 2010a, b; Strathearn 2010). Poor nutrition itself, without the intervening impact of parenting quality, also affects stress reactivity, so the combination of poor nutrition and poor parenting create a significant risk factor for poor child outcomes.

RF: It has also been suggested that older rural Australians are particularly vulnerable to cumulative mental health effects of climate change (Saniotis and Irvine 2010). Berry et al. (2008, p. 20), recommend alongside interventions responding to mental ill-health effects of climate change, a need for more emphasis on preventative approaches. This will require contextualized policies and responses to help focus 'public attention on anticipating and coping with considerable unpredictability of risk'.

## 4.9 Wellbeing Benefits of Local Food Production

Avery then refocused our dialogue to localized dimensions of human–environment interactions in the context of climate change, in particular the health and wellbeing benefits flowing from active involvement in home and community gardening.

AA: Most Australians rely on the commercial marketplace for access to food, purchasing mainly through supermarket chains (Burns and Inglis 2007). There are, however, examples of successful community garden schemes world-wide, often operating on organic and permaculture methods of farming, most acting as sites for poor, often inner city, high density communities to socially interact, learn and survive (Flachs 2010; Frayne et al. 2009). In contrast in regional Australia it has mainly been the middle classes involved in such schemes.

RF: This highlights the importance of the social and economic context of human contact with the environment. Over the past century there have been significant shifts in agricultural production, which together with shifts in gender roles and reductions in farm income have significantly reduced the labour input on Australian farms, leading to more sole farm operators. We humans are a social species and there can be significant negative health, wellbeing and longevity impacts when we live solitary lives, or are located on the periphery of social networks (Cacioppo et al. 2009; Rosenquist et al. 2009).

AA: Duchemin et al. (2009) examined the 30-year history of urban agriculture in Montreal (Canada) and specifically the Community Gardening program managed by the city government, along with six collective gardens managed by community organizations. Whilst there had been many changes over the 30-year history of the gardens, they provided many positive and significant benefits to the city, especially for disadvantaged people living within the city (Duchemin et al. 2009). The benefits included: organically grown urban food production, functional exercise and increased social interaction.

AA: This leads to consideration of how, as Australians we engage with the environment. For example, green exercise incorporates outdoor activities, usually exercise or functional exercise (gardening, weeding, clearing bush, planting, digging and so on). In a meta-analysis (Barton and Pretty 2010) 'green activity' was associated with positive, long-term health outcomes. The evidence included self-esteem and mood improvements across genders (especially for males) and a range of ages, although diminishing with advanced age. Participants with mental illnesses showed the greatest improvements in self-esteem.

AA: Field research conducted by Van den Berg and Custers (2010) also demonstrated differences between two groups, one undertaking 'gardening' and the other 'reading' in terms of measuring mood and salivary cortisol levels (stress). Improvements in mood with reductions in cortisol were significant for the group involved in gardening, in comparison with the reading group.

RF: Our conversation highlights the link between the design of our food systems, and human health and wellbeing. The future viability of our food supply requires that we take a broad public health perspective, an approach based on a sustainable, ecological paradigm (Bunch et al. 2011).

## 4.10 Eco-Civic Regionalization and the Foodscape

This turned the dialogue back to a broader focus with Brunckhorst describing how the concept of eco-civic regionalization operates through shared community interests. He linked this to the design and management of food systems at regional, and broader, scales.

DB: Understanding the spatial attributes of communities of interest minimises potential exclusion of people from civic affairs with which they have an interest (Brunckhorst et al. 2006). These areas include ecosystems and resources of interest, hence such eco-civic regions might guide the design and management of food systems at local, regional, national and even international levels. Narrow sectoral interventions, rather than taking a food system-wide approach, are unlikely to bring sustainable benefits. There are rural regions where the environmental externalities around food production are already severe, and the policy response highly contested, as demonstrated in negotiations around water rights within the Murray-Darling Basin (Reeve and Brunckhorst 2007).

RF: Corporate interests also shape the foodscape. Australia has a high level of concentration of ownership in the food retail sector. Coles and Woolworths are said to hold 80% of the total market for foodstuff and half of the market in fresh produce Australia-wide (Wardle and Baranovic 2009). For the consumer the market power of the large supermarket chains can then impact on the affordability, accessibility, quality, and available choice of healthy food options (Wardle and Baranovic 2009).

RF: In 2008 the Australian Competition and Consumer Commission identified a food retail industry-wide profit margin of between 35 and 45% on fruit and vegetables (Wardle and Baranovic 2009). A recent Queensland-wide study found that the Australian Consumer Price Index for all foodstuffs increased by 32.5%, but that the increase in the cost of a healthy food basket was even greater at 50% (Harrison et al. 2010). Meanwhile, there are indications that the nutritional value of fresh foods has been declining, affected by storage and harvesting techniques and the time lag between harvesting, processing and sale to the consumer (Wardle and Baranovic 2009).

RF: Dixon and her colleagues (2007) suggested that the food system, both in Australia and globally, is tending to bifurcate into two zones of production that both reflect and compound existing health inequalities. The first zone is the standardised agri-food production process producing food marketed to the general population. The second zone involves more localized, specialized niche production processes trading on the basis of environmental, nutritional, or health qualities and marketed mainly to a more cashed up, educated and elite clientele (Dixon et al. 2007).

AA: As recent flood events help to highlight when something goes wrong with any component of the food production and distribution system, there is no food security for the majority of the population. When prices increase for food products people are at increased risk of socially determined health and welfare problems (Hong 2000).

## 4.11 Ethical Foodscapes

This led to the final part of our dialogue linking food security to ethical considerations, along with ecological sustainability, human wellbeing and equitable access to resources.

RF: Research across a range of disciplines helps to highlight the importance of political and policy responses which actually engage with, and challenge, the sorts of agricultural production, food processing and marketing practices which are resulting in Australians increasingly consuming unhealthy diets of energy-dense processed foods (Gorton et al. 2010).

DB: Scientific inquiry has highlighted how human history and policy are critically entwined with ecosystems. Agri-food systems need to be examined as social-ecological systems, rather than the fragmented matrix of existing institutional arrangements (Brunckhorst 2010).

RF: There is a need for the articulation of an alternate vision for the agri-food system, one based on principles of long term sustainability (Gorton et al. 2010; Sumberg 2009). We need to increase the resilience of the food production system. This is more likely to be secured through diversifying our food sources, rather than through the 'simplification and reductionism' which tended to characterize past expert-led interventions in agri-food systems (Herron 2010, p. 2).

AA: Global monoculture and market based agricultural ideology can ignore the importance of food diversity, nutrition, physical health, incomes and the subsequent impact on the mental and social health of communities. This leaves food consumers at risk of inadequate nutrition when events such as droughts, floods, pestilence and climate change impact on food distribution at a global level (Berry et al. 2010).

RF: There is a complex relationship between food security, climate change, institutional arrangements, community relationships, human and environmental health and wellbeing. Context relevant policies and responses could improve food security. This includes focusing 'public attention on anticipating and coping with considerable unpredictability of risk' associated with climate change (Berry et al. 2008, p. 20).

## 4.12 Conclusion

Our dialogue incorporates multiple disciplinary and sectoral perspectives on the issue of food security, highlighting the complexity of the issue. This novel approach demonstrates the value of cross-sectoral, cross-disciplinary and community-wide discussions on food security. Through our dialogue we have drawn attention to the interconnection of food security, the human constructed environment, ecological health and human health and wellbeing.

We examined why improved food security will not automatically flow from improvements in the levels of food production by Australian agri-businesses. Multiple factors intersect to influence access to food, for both individuals and groups in Australian society including the social, cultural, economic, political, bureaucratic and environmental dimensions of the regional foodscape. We believe, in order to function effectively, food systems must be conceptualized as open systems, scaling from local to regional to national to global contexts. It is also vital that we acknowledge how the effects of shifts in access to food are not confined to a particular point in time. The impact of food insecurity on human health, as we have identified through our dialogue, crosses not only spatial and systemic boundaries but also human generations.

## References

Avery, A. & O'Loughlin, S. (2003). *Health ecology model and reflection on organizational wellness*. Paper presented at 1st Mental Health and Wellness Ecology Conference, Duval College, University of New England, Armidale (Published in Proceedings).

Bales, K., & Carter, S. (2009). Neuroendocrine mechanisms of social bonds and child–parent attachment, from the child's perspective. In M. De Haan & M. Gunnar (Eds.), *Handbook of developmental social neuroscience* (pp. 246–264). New York: Guilford.

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science and Technology, 44*(10), 3947–3955.

Bell, J. F., Wilson, J. S., & Liu, G. C. (2008). Neighbourhood greeness and 2-year changes in body mass index of children and youth. *American Journal of Preventive Medicine, 35*(6), 547–553.

Berry, H., Butler, J., Burgess, C., King, U., Tsey, K., Cadet-James, Y., Rigby, C., & Raphael, B. (2010). Mind, body, spirit: Co-benefits for mental health from climate change adaptation and caring for country in remote Aboriginal Australian communities. *NSW Public Health Bulletin, 21*(5–6), 139–145.

Berry, H., Kelly, B., Hanigan, I., Coates, J., McMichael, A., Welsh, J., & Kjellstrom, T. (2008). *Rural health impacts of climate change*. Canberra: National Centre for Epidemiology and Population Health, ANU College of Medicine and Health Sciences, Australian National University.

Bone, A., & Nurse, J. (2010, January). Health co-benefits of climate change action: how tackling climate change is a 'win win win.' *Chemical Hazards and Poisons Report*, 47–54.

Brunckhorst, D. (2005). Integration research for shaping sustainable regional landscapes. *Journal of Research Practice, 1*(2), Article M7.

Brunckhorst, D. (2010). Using context in novel community-based natural resource management: Landscapes of property, policy and place. *Environmental Conservation, 37*(1), 1–7.

Brunckhorst, D., Coop, P., & Reeve, I. (2006). Eco-civic' optimisation: A nested framework for planning and managing landscapes. *Landscape & Urban Planning, 75*, 265–281.

Bunch, M. Morrison, K., Parkes, M., & Venema, H. (2011). Promoting health and wellbeing by managing for social-ccological resilience: The potential of integrating ecohealth and water resources management approaches, *Ecology and Society*, *16*(1), 1–6. http://www.ecologyand-society.org/

Burns, C. M., & Inglis, A. D. (2007). Measuring food access in Melbourne: Access to healthy and fast foods by car, bus and foot in an urban municipality in Melbourne. *Health & Place, 13*(2), 877–885.

Butler, C., & Dixon, J. (2010, December 1). *Plentiful food? Nutritious food?*, Paper presented to the Agri-Food XVII Conference of the Australian and New Zealand Agri-Food Network, Monash University, Gippsland Campus, Melbourne.

Cacioppo, J., Fowler, J., & Christakis, N. (2009). Alone in a crowd: The structure and spread of loneliness in a large social network. *Journal of Personality and Social Psychology, 97*(6), 977–991.

Cacioppo, J., & Hawkley, L. (2009). Perceived social isolation and cognition. *Trends in Cognitive Science, 13*(10), 447–454.

Collins, L. (2009). The impact of food insecurity on women's mental health: How it negatively affects children's health and development. *Journal of the Association for Research on Mothering, 11*(1), 251–262.

Crahay, P., Mitchell, A., Gomez, A., Israel, A., Salpeteur, C., Mattinen, H., Detert, H., et al. (2010). The threats of climate change on undernutrtition—A neglected issue that requires further analysis and urgent actions. *United Nations System Standing Committee on Nutrition, Climate change food and nutrition security implications News., 38*, 4–10.

Dixon, J., Omwega, A., Fiel, S., Burns, C., Donati, K., & Carlisle, R. (2007). The health equity dimensions of urban food systems. *Journal of Urban Health: Bulletin of the New York Academy of Medicine, 84*(1), i118–i129.

Duchemin, E., Wegmuller, F., & Legault, A.-M. (2009). *Urban agriculture: Multi-dimensional tools for social development in poor neighbourhoods*. Field Actions Science Report. www.factsreports.org.

Flachs, A. (2010). Food for thought: The social impact of community gardens in the Greater Cleveland Area. *Electronic Green Journal*, *1*(30), 1–10. http://escholarship.org/uc/item/6bh7j4z4.

Food and Agriculture Organization of the United Nations (FAO). (2005). Glossary, *Water for Food and Ecosystems Conference,* 21 January–4 February 2005, The Hague, The Netherlands. http://www.fao.org/ag/wf32005/glossary_en.htm.

Frayne, B., Battersby-Lennard, J., Fincham, R., & Haysom, G. (2009). *Urban food security in South Africa: Case study of Capetown, Msunduzi and Johannesburg* (Development Planning Division Working paper Series No. 15). DBSA: Midrand.

Goodman, M., Maye, D., & Holloway, L. (2010). *Ethical foodscapes?: Premises, promises and possibilities*, London: Department of Geography, Kings College. http://www.kcl.ac.uk/schools/sspp/geography/research/epd/working.html.

Gorton, D., Bullen, C., & Mhurchu, C. (2010). Environmental influences on food security in high-income countries. *Nutrition Review, 68*(1), 1–29.

Harrison, M., Lee, A., Findlay, M., Nicholls, R., Leonard, D., & Martin, C. (2010). The increasing cost of healthy food. *Australia and New Zealand Journal of Public Health, 34*(2), 179–186.

Hattersley, L., & Dixon, J. (2010). Supermarkets, food systems and public health. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food security, nutrition and sustainability* (pp. 188–203). London: Earthscan.

Herron, H. (2010). Editorial. *SCN News*, 38, United Nations Standing Committee on Nutrition.

Hong, E. (2000, December 4–8). *Globalisation and the impact on health: A third world view* (pp. 57–59). Report prepared for The Peoples' Health Assembly, Savar. http://www.twnside.org.sg/title/health.pdf.

Horton, G., Hanna, L., & Kelly, B. (2010). Drought, drying and climate change: Emerging health issues for ageing Australians in rural areas. *Australasian Journal on Ageing, 29*(1), 2–7.

Huang, J. Oshima, K., & Kim, Y. (2009). *Does household food insecurity affect parental characteristics and child behavior? Evidence from the Panel Study of Income Dynamics (PSID)* (CSD Working Papers 09–70). St Louis, MO: Center for Social Development, George Warren Brown School of Social Work, Washington University.

Huutoniemi, K., Klein, J., Bruun, H., & Hukkinen, J. (2010). Analyzing interdisciplinarity: Typology and indicators. *Research Policy, 39*, 79–88.

Jacobs, N., & Amos, M. (2010). Removing barriers to interdisciplinary research. http://arxiv:/1012.4170v1, Cornell University Library.

Kettings, C., Sinclair, A., & Voevodin, M. (2009). A healthy diet consistent with Australian health recommendations is too expensive for welfare-dependent families. *Australian & New Zealand Journal of Public Health, 33*(6), 566–572.

MacMynowski, D. P. (2007). Pausing at the brink of interdisciplinarity: Power and knowledge at the meeting of social and biophysical science. *Ecology and Society*, 12(1), 1–20. http://www.ecologyandsociety.org/vol12/iss1/art20/.

Mayes, L., Magidson, J., Lejeuz, C., & Nicholls, S. (2009). Social relationships as primary rewards: The neurobiology of attachment. In M. De Haan & M. Gunnar (Eds.), *Handbook of developmental social neuroscience* (pp. 342–377). New York: The Guilford Press.

Meaney, M. (2010a). Epigenetics and the biological definition of gene x cnvironment interactions. *Child Development, 81*(1), 41–79.

Meaney, M. (2010b). *Maternal care and gene—environment interactions defining development*. Paper presented at the 2nd Biennial International Association for the Study of Attachment Conference, St Johns College, Cambridge. http://www.iasa-dmm.org/index.php/iasa-conference/.
Quandt, S., Chen, H., Bell, R., & Savoca, M. (2010). Food avoidance and food modification practices of older rural adults: Association with oral health status and implications for service provision. *The Gerontologist, 50*(1), 100–111.
Reeve, I., & Brunckhorst, D. (2007). Spatially bounded regions for resource governance. *Australasian Journal of Environmental Management, 14*(3), 142–154.
Rose, D. (2010). Access to healthy food: A key focus for research on domestic food security. *The Journal of Nutrition, 140*(6), 1167–1169.
Rosenquist, J., Fowler, J., & Christakis, N. (2009). Social network determinants of depression. *Molecular Psychology*. doi:10.1038/mp. 2010.13.
Saniotis, A., & Irvine, R. (2010). Climate change and the possible health effects on older Australians. *Australian Journal of Primary Health, 16*(3), 217–220.
Scrinis, G. (2010). *Forms and eras of nutritionism*. Paper presented to the Agri-Food XVII Conference of the Australian and New Zealand Agri-Food Network, December 1, 2010, Monash University, Gippsland Campus.
Shanahan, M., & Hofer, S. (2005). Social context in gene-environment interactions: Retrospect and prospect. *The Journals of Gerontology Series B, 60*(Sp. Iss. 1), 65–76.
Simms, A. (2008). Nine meals from anarchy: oil dependence, climate change and the transition to resilience. In *Schumacher Lecture 2008*, Schumacher North, Leeds, New Economics Foundation, London.
Slade, M. (2010). Mental illness and well-being: The central importance of positive psychology and recovery approaches, *BMC Health Services Research, 10*(26), 1–14. http://222.biomedcentral.com/1472-6963/10/26.
Stayner, R. (2007). *Economic analysis and business development of sustainable wildlife enterprises trial sites*. Report prepared for the Rural Industries Research and Development Corporation (RIRDC Publication No. 07/042) Kingston, ACT.
Strathearn, L. (2010). *The intergenerational transmission of attachment: What the brain has to say*. Paper presented at the 2nd Biennial International Association for the Study of Attachment Conference, St. Johns College, Cambridge. http://222.iasa-dmm.org/images/uploads/Land-%20 intergenerational.pdf.
Sumberg, J. (2009). *Re-framing the great food debate: The case for sustainable food*. London: New Economics Foundation.
Tong, S., Mather, P., Fitzgerald, G., McRae, D., Verrall, K., & Walker, D. (2010). Assessing the vulnerability of eco-environmental health to climate change. *International Journal of Environmental Research and Public Health, 7*(2), 546–564.
Van den Berg, A. E., & Custers, M. H. G. (2010). Gardening promotes neuroendocrine and affective restoration from stress, *Journal of Health Psychology, 16*, 3–11. Retrieved August 30, 2010 from http://hpq.sagepub.com/content/early/2010/06/01/1359105310365577.
Wardle, J., & Baranovic, M. (2009). Is lack of retail competition in the grocery sector a public health issue? *Australian and New Zealand Journal of Public Health, 33*(5), 477–481.
Zahra, S., & Newey, L. (2009). Maximizing the impact of organization science: Theory-building at the intersection of disciplines and/or field. *Journal of Management Studies, 46*(6), 1059–1075.
Zubrick, S., Smith, G., Nicholson, J., Sanson, A., & Jackiewica, T. (2008). *Parenting and families in Australia*. Canberra: Commonwealth of Australia.

# Chapter 5
# Institutional Capacity of Local Government to Embed Food Security into Policy

**Christine Slade**

## 5.1 Introduction

Competing with a history of a heavily entrenched 'services of property'[1] agenda, the development of human service provision within Australian local government has experienced a long, uneven and frustrating road. This journey has been characterized by a distinct lack of state and federal government support in terms of recognition, role clarification, coordination and funding. The Victorian government reforms of the 1990s and early 2000s did not 'mandate local government human services [and] they remain largely voluntary activities of individual municipalities without agreed inter-governmental legislative authority or functional clarity' (Lowell 2005:161).

Food security[2] is a rather new addition to this 'services to people' agenda. Public health concerns about the increasing prevalence of diet-related diseases and disadvantage (Burns 2008:90–96) connected to 'obesogenic environments' (Sacks et al. 2009:76), and an individual's right to food (Chilton and Rose 2009:1203–1204; Neff et al. 2009:284) have strengthened the call for equitable food access within developed countries. Links being forged between food security and sustainability[3] issues—such as food system impacts—land use conflicts

[1] A minimalist agenda that consists of road, rates and rubbish services that limits the gap between available local government resources and community expectations (Allender et al. 2009:20; Dollery et al. 2003:4).

[2] A common definition states that 'food security exists when all people at all times have both physical and economic access to sufficient, safe and nutritious food that meets their dietary needs for an active and healthy life' (Food & Agriculture Organization 2011).

[3] Criteria for sustainability in this chapter judges food system impacts based on environmental, health, quality and social values (see Lang 2010:279).

C. Slade (✉)
University of the Sunshine Coast, Sunshine Coast, QLD, Australia
e-mail: cslade@usc.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_5,

concerning preservation of high quality agricultural land, water scarcity and ongoing climate change concerns (see Larsen et al. 2011) have added momentum to the push for more sustainable outcomes from government. In summary, policies need to encourage food systems which aim 'to feed everyone sustainably, equitably and healthily'; that addresses 'availability, affordability and accessibility'; are 'diverse, ecologically sound and resilient'; and build skills and capacities for the future (Lang 2010:279).

Difficult questions of responsibility and capacity arise as these sustainability problems are complex and inter-sectoral with 'few policy roadmaps to follow or regulatory tools to support their implementation' (Mendes 2008:943). There is no one federal government department responsible for food security. It was only in December 2010, following the state government elections in Victoria, that the incoming government linked an agricultural ministerial portfolio with food security. Responsibility for food security policy at the community level lies predominantly with local government despite the fact that there is 'little organizational expertise, no prior consensus over its perceived appropriateness as a local governance issue and no legislative imperative to intervene' (Mendes 2007:97). Therefore, limitations exist on local government's capacity to perform as councils are 'obliged to formulate and implement policy in an increasingly complex environment' (Dollery et al. 2003:2; Aulich 1999:12) reliant on external funding and subject to devolution and cost shifting (Johnson 2003:41). At the same time they are required to prioritize, plan strategically and incorporate efficiently a plethora of needs and services demanded from upper levels of government and the community (Dollery et al. 2006:555–556; Kiss 2003:102; Commonwealth Grants Commission 2001; Goss 2001:18).

Local government capacity can be measured in a number of ways. Gargan (1981:650–652) believes that a management perspective is insufficient and should be expanded to include expectations, resources and community problems. Grindle and Hilderbrand (1995:445) define public sector 'capacity as the ability to perform appropriate tasks effectively, efficiently and sustainably'. Importantly, capacity levels are also determined by broader contexts and can change over time (Honadle 2001:81; Grindle and Hilderbrand 1995:443; Gargan 1981:652). This idea is further developed by Batley and Larbi (2004:18–19) who suggest that governmental capacity can be analysed at three levels: firstly the organization's internal capacity, such as human resources, decision making and administrative arrangements, assets and financial resources; secondly as a member of a network of organizations working in collaboration; and thirdly within a broader institutional context which includes political control, the macro-economy, civil society and the private sector.

The aim of this chapter is to contribute to the growing knowledge available about local government's capacity to include community food security principles in policies. Using the three-tiered approach to institutional capacity (Batley and Larbi 2004:17–19) as a guide, the chapter discusses the external and internal influences involved and illustrates how participating municipalities have endeavoured to embed food security within their policy frameworks. It then briefly discusses the complex systemic issues of accessibility, control of business mix and public transport before finally exploring the factors that could assist the longevity of these policies once they have been adopted.

## 5.2 Background and Methodology

The contextual lens for this chapter is two health promotion based food security projects seeking to embed food security principles within local government policies. Twenty-six in-depth interviews were undertaken by the author (as an independent researcher) with local government staff and associated project members (APMs) from the 12 councils participating in the VicHealth *Food for All* program and the Victorian Department of Health's *Food Access and Security Policy Development* project (see Table 5.1). All interviewees were female except for one. The interview objectives were to understand the factors that influence the embedding of food security principles into council policies; to discover any barriers faced during the projects that limited local government's institutional capacity in this policy development process; and their understanding of how local government could contribute to food security in a sustainable manner. The interview data were systematically organized into themes using NVivo software, with findings compared to published literature and theory. Quotations from various interviewees, categorized by participant roles, i.e. local government officer (LGO), manager (M) or APM, are used in this chapter to support the findings and to further illustrate pertinent concerns from project participants. Additionally, over 50 'high level' municipal plans, and other relevant policies,[4] were examined in order to provide further evidence of the effectiveness of each project's influence on policy development.[5] The document analysis examined food security principles within individual municipal policies using five themes that detail the main areas of food policy concern: preservation of high quality agricultural land; food access; food security; food supply/sustainable food system and social justice/equitable access principles. The findings are shown in Table 5.2 later in the chapter.

Project One, the *Food For All* program, was funded by the Victorian Health Promotion Foundation (VicHealth) from 2005 to 2010. Phase 1 (2005–2008) involved nine councils engaged in eight projects while Phase 2 (2009–2010) included six of the councils from the first phase. Initial selection criteria asked councils to describe how the program would 'build on or interact with other key strategic plans and activities such as the Municipal Public Health Plan (MPHP)' and to give 'a commitment to implementing an integrated planning approach within the local government authority to reduce systemic and infrastructure barriers to healthy food access' (VicHealth 2004:7).

Project Two is the Victorian Department of Health's (formerly part of Department of Human Services) *Food Access and Security Policy Development* project involving three urban councils (2009 to mid-2011) which sought to partner with local government in developing integrated council policy around food security. The Expression of Interest prerequisite criteria were similar to Project One but also required evidence of senior management support (Department of Human Services 2008:1).

---

[4] It should be noted here that council 'policies' are embedded in strategic 'plans' so often the two terms are functionally interchangeable (Blau and Mahoney 2005:13).

[5] The author recognizes that other factors outside of these two projects can also contribute to food security themes included in policy documents.

**Table 5.1** Demographic summary of municipalities participating in projects, 2009–2010

*Project One: VicHealth Food For All*

| Council | Council Category | Special category | Estimated population at June 2009 | Area sq km | Rate base 09–10 ($Ms) | Rate % income 09–10 |
|---|---|---|---|---|---|---|
| Brimbank | City | Metro<br>GW<br>CALD | 185,890 | 123 | 92,859 | 65 |
| Cardinia | Shire | Interface<br>Growth Area<br>GW | 68,641 | 1,281 | 42,526 | 56 |
| Casey | City | Metro<br>Growth Area<br>GW | 247,357 | 813 | 112,274 | 55 |
| Frankston | City | Metro<br>GW<br>CALD | 128,576 | 130 | 69,880 | 62 |
| Greater Dandenong | City | Metro<br>GW<br>CALD | 137,600 | 130 | 76,005 | 57 |
| Maribyrnong | City | Metro<br>CALD | 71,523 | 31 | 57,271 | 58 |
| Melton | Shire | Interface<br>GW | 100,000 | 527 | 53,206 | 59 |
| Swan Hill | Rural city | Rural | 22,116 | 6,117 | 18,848 | 43 |
| Wodonga | City | Rural | 35,733 | 433 | 26,264 | 58 |

*Project Two: Department of Health Food Security Policy*

| Council | Council category | Special category | Estimated population at June 2009 | Area sq km | Rate base 09–10 ($Ms) | Rate % income 09–10 |
|---|---|---|---|---|---|---|
| Banyule | City | Metro | 123,521 | 63 | 58,342 | 57 |
| Darebin | City | Metro<br>CALD | 139,608 | 53 | 74,340 | 66 |
| Hobsons Bay | City | Metro<br>CALD | 87,486 | 64 | 66,826 | 69 |

*Source*: Adapted from Department of Planning & Community Development (see http://www.dpcd.vic.gov.au/localgovernment/find-your-local-council)

*Notes*:

Interface councils are described as 30 % urban and 70 % rural, forming the interface between regional and metropolitan Victoria. These areas face significant planning, infrastructure and funding challenges (Interface Councils n.d.)

Green wedges (GW) are 'predominately non-urban areas outside the Urban Growth Boundary, set aside to help conserve rural activities, significant natural landscape features and resources between metropolitan Melbourne's growth corridors'. Changing land use, development pressure and increasing awareness of environmental issues and threats place pressure on councils' managing these areas (Municipal Association of Victoria n.d.)

CALD is the acronym for culturally and linguistically diverse groups who have 'languages and cultures that are not considered the mainstream' (Maribyrnong City Council 2006:7)

**Table 5.2** Food security related principles in current council policies

| Council name | Themes in document: Council plan (CP) | MPHP | MSS | Community plan/vision | Food security policy |
|---|---|---|---|---|---|
| *Project One: VicHealth Food For All* | | | | | |
| Brimbank | FA, SJ | In Com Plan | FA, SJ | FA, FS | n/a |
| Cardinia | AG | FA, FS | AG | n/a | n/a |
| Casey | – | – | AG | AG, FA, SJ | n/a |
| Frankston | – | FA, FS, FSU | AG | FSU, SJ | n/a |
| Greater Dandenong | FA, FS | FA, FS, SJ | AG, SJ | FS, SJ | n/a |
| Maribyrnong | FA, FS, SJ | In Council Plan | FA, SJ | n/a | FA, FS, FSU, SJ 2002, AG, FA, FS, FSU, SJ 2011 |
| Melton | – | FS, FSU | AG | – | n/a |
| Swan Hill | – | FA, FS | AG | – | n/a |
| Wodonga | FSU, SJ | FA, FS | AG, FA | n/a | FA, FS, FSU 2005 |
| *Project Two: Department of Health Food Access and Security Policy* | | | | | |
| Banyule | SJ | FS | FA | – | Currently being prepared |
| Darebin | SJ | FA, FS, SJ | FSU, SJ | n/a | FA, FS, FSU, 2010 |
| Hobsons Bay | – | FA, FS | – | n/a | FA, FS, SJ 2008 |

*AG* preservation of high quality agricultural land; *FA* food access; *FS* food security (includes elements of affordability, culturally appropriate, nutritious); *FSU* supply/sustainable food system; *SJ* justice, equitable access

## 5.3 External Factors Influencing the Policy Development Process

The capacity of local government is positioned within a broader institutional context (see Batley and Larbi 2004:19) as state government mandates legislative requirements for the development of local policies and plans. Additionally, physical municipal boundaries are obligatory creating diversity in terms of geographical size, population numbers, social needs and rate revenue.

### *5.3.1 Legislative Context*

Policy formulation is a legislatively mandated requirement for Victorian local governments, with three high level documents theoretically driving council agendas: the Council Plan (CP); the MPHP and the Municipal Strategic Statement (MSS).

Firstly, the *Local Government Act 1989* Section 125, Part 6 requires councils to 'prepare and approve a Council Plan within the period of 6 months after each general election or by the next 30 June, whichever is later' which contains objectives, strategies, monitoring indicators and a Strategic Resource Plan for the next 4 years (Victorian Government 2010a:193–195). It also needs to include a public consultation process (Department of Planning and Community Development 2010).

Secondly, the *Public Health and Wellbeing Act 2008* requires councils to prepare MPHPs within 12 months of a council election. The MPHP must include an examination of municipal health data, identify resulting goals and strategies; involve the local community in the development, implementation and evaluation the Plan; show how council has partnered with the Department of Health and other agencies in the development of the goals and strategic planning; and also be consistent with the CP and MSS (Victorian Government 2011:33–34). Most councils submitted their current MPHPs to the State government for approval in 2009, with the next Plan due in 2013.

Finally, the *Planning and Environment Act 1987*, Section 12A requires councils to 'prepare a municipal strategic statement for its municipal district' in line with Victorian planning objectives, which needs to contain 'the strategic planning, land use and development objectives'; strategies for achieving those objectives; 'a general explanation of the relationship between those objectives and strategies and the controls on the use and development of land in the planning scheme'; and any other matters at the direction of the Minister (Victorian Government 2010b:27–28). An important directive is that the MSS must align with the current CP.

### *5.3.2 Council Diversity*

Table 5.1 illustrates the diversity within individual municipalities in terms of population size, geographical area and rate base for all the councils involved in the two projects. Specialized categories reveal further diversity in terms of urban/rural location and population. Distinct characteristics are apparent, such as Maribyrnong City Council's area of only 31 km$^2$ but with a population of over 71,000, with many residents who are culturally and linguistically diverse (CALD), compared to Swan Hill, a rural council of 6,117 km$^2$ with 22,116 residents and a limited rate base.

## 5.4 Internal Factors Influencing the Capacity to Develop Policy

Within this externally mandated and diverse context, municipal embedding of food security principles in policy is also influenced by internal organizational factors (see Batley and Larbi 2004:18–19; Grindle and Hilderbrand 1995:446) such as timeframes, relationship building across departments, support from higher levels within council and available resources.

### 5.4.1 Timeframes

Incorporating food security into policy takes time, particularly in councils where it is a little-known concept, as in most participating councils in Project One. A few councils launched into policy development as they commenced their food security programs. Others needed to gain understanding about their own food insecurity as a municipality, collect evidence to support their claims and to raise awareness and develop strategic relationships, both internally and externally, before they ventured into advocating any policy inclusions. Officers worked tirelessly to raise awareness. Two LGOs from different councils shared that:

> It takes a long time because you are having these conversations with different people, different departments, at times all together trying to come up with consensus on one path, which is the strategy or something like that but there are so many different facets to councils and there are departments I haven't even met yet (LGO1).
>
> We have been working hard. There hasn't been a lot of understanding of food security. We have had to go into meetings, both internal and external [where] there hasn't been an understanding of what is meant, how you could improve food security and there hasn't necessarily been even an interest. So that has grown over time. Change has certainly happened over time (LGO2).

### 5.4.2 Relationship Building Across Council Departments

Developing mutual relationships with other departments within council was a critical element in the policy incorporation process in both projects. Often this evolved on an opportunistic basis, depending on the interest of individual departments. The aim was to establish an integrated policy approach with shared responsibility, where staff in various departments across council could discover links in their existing work and how food security principles could be incorporated without extensively increasing their workloads. This process required the food security officers to understand and communicate professionally with multiple areas across council. Such experiences were shared by two interviewees:

> I am not talking about a policy just being as a document but more that integrated way of working across departments … talking to your economic area, talking to your planning area, talking to whoever it is, about what role do they play in food security … the outcome may have been a hardcopy document and a strategy and that sort of thing but it was actually the conversations that happened across departments (M1).

> So, it's about the way you approach it. It's not just I'm asking you to do something for me on top of what you are doing already … this relates to your area in this way, talking in their language …. Talking to them in a way they can understand and relate and then showing that they are already doing things … can we possibly scope some work that we can do together on this topic, some new initiatives (LGO1).

### 5.4.3 Higher Level Support

Horizontal communication and relationship building were an integral part of the policy-making process. Yet there were difficulties in influencing policy decisions at management and councillor levels when the dedicated food security officer was a part-time, lower ranked employee as shared by a LGO and APM below:

> There are other barriers including getting higher level support. So for strategies and so forth to be endorsed you need councillor support and understanding. So while at the coordinator, and I dare say even now the manager level, there's a real understanding of food security, what it is, how we can influence it, I am not able to confidently say that there is that understanding at the higher levels where the bigger decisions are made. So that's really about the last of the barriers and that's a significant one (LGO2).

> They anticipated and wanted policy and planning change but they perhaps they didn't understand how local government works and what a challenging environment it is for a part-time low level project officer to influence high level and middle level policy across the board, not just in human services or social planning but also in infrastructure planning (APM1).

Research by Allender et al. (2009:25) found that 'councils which involved all areas of their organisation in policy development appeared to provide the strongest and most sustainable policy intervention', particularly when combined with strong leadership. This has been keenly supported by one of the participants:

> So my work was greatly facilitated by support at a very senior level. It just really made things a lot easier (LGO3).

### 5.4.4 Resources Available

Much food security work requires human energy to drive the agenda rather than having large financial capacity. As Project One was a large-scale pioneering food security project there was a continual problem with recruiting and retaining staff. Only two councils managed to resource existing staff members. The positions required mature community development workers with an understanding of local government and food security issues, which were demanding criteria in themselves. Furthermore, funding often only allowed for part-time positions, which left new staff members learning 'on the job' at an accelerated pace and unable to fully address the complex and time consuming aspects of embedding food security within council departments and policies. A wealth of food security knowledge and experience left with each staff departure.

Learning from the staffing difficulties in Project One, two existing employees in Project Two undertook food security policy work as an extra part of their portfolio, resulting in large workloads but easier policy formation because of the continuity in relationship building and understanding of organizational culture.

## 5.5 Diverse Responses to Incorporating Food Security into Policy

Raising the awareness of food security priorities took time and energy with no guarantee of success. Municipalities varied considerably in their motivation and requirements concerning food security issues. A ‘one size fits all’ approach was not appropriate given the range of council capacity. Maxwell (1996:162) suggests that policy needs ‘to recognize the diversity of food insecurity causes, situation and strategies’, recommending as appropriate the idea of ‘horses for courses’. Table 5.2 demonstrates the diverse policy approaches and themes taken by participating councils.

Seven participating councils embedded some form of food security principles within their Council Plan, including an overall social justice and equity perspective, emphasizing access to food, and/or other elements of food security. Cardinia Shire and Wodonga City Councils accentuated sustainable food system priorities. The MPHP is the ‘natural’ fit for food security priorities as the legislated policy within Council to action municipal health and wellbeing concerns (Allender et al. 2009:21). All 12 councils, except one, used this opportunity to incorporate varied combinations of food access, food security, food supply and social justice principles. In keeping with integrated planning principles Maribyrnong City Council embedded their MPHP within the Council Plan.

The MSS is the most challenging area in which to embed food security principles due to its regulatory nature, as shared by one LGO:

> I think that’s why people who are really focused on a single agenda, like food security, want to see the words ‘food security’ in the MSS and I feel and I think it is probably more strategic to have the principles of food security in there rather than a one liner that says ‘We will address food security’(LGO4).

There has been only limited and debatable success in the MSS policy area, with councils seeking to address the preservation of productive agricultural land, social justice principles and the need for functional and accessible food outlets to varying intensity levels.

Four councils within the two projects have developed ‘stand alone’ food security and/or access policies, with another one currently being developed. Maribyrnong City Council wrote their first Food Security Policy in 2002 (This policy has very recently been reviewed to inform their second Food Security Policy 2011–2013). The other councils developed their policies as part of the projects being examined. The reasons for such a policy process have been varied: an initial step in policy making but later deciding to integrate with other policies; a need within council to have a dedicated policy for a particular agenda and/or placing an emphasis on the food security agenda. A key to success with stand alone policies is having a specific action plan corresponding to the policy to allocate responsibilities, monitor progress and to provide accountability.

The Food Security Policy adopted by Darebin City Council in late 2010 shows a shift towards merging desired health-driven community food security with environmental and sustainability issues, showing an increased ‘whole of council’ commitment and shared responsibility by other departments. Likewise, the Maribyrnong City Council Food Security Policy 2011–2013 acknowledges the anticipated impacts of environmental and sustainability concerns on food supply and access. Both agendas provide a potential 'common discourse' about 'the future direction of sustainable agriculture, environmentalism, and social welfare advocacy' (Gottlieb and Fisher 1996:23) which could be beneficial for local government.

Multiple other lower level policies provide opportunities for the embedding of food security principles. For example, community garden policies are being discussed and progressed in some municipalities due to the regulatory difficulties over granting permits, insurance, soil contamination and land ownership, management concerns regarding garden leadership and maintenance arrangements and difficulties in institutional partnership arrangements when the land is owned by one authority and used by another party. Another area of interest is council's own procurement policies looking at buying local produce and supporting local growers, and/or social enterprises.

## 5.6 Limitations of Local Government Policy Making

Since the beginning of Project One in 2005 understanding of the systemic obstacles facing local governments seeking to tackle municipal food security issues has grown. Perception of constraints have emerged due to lack of clarity in legislative and planning principles, with the possibility of lengthy and costly appeal processes in the event of stepping out into unexplored territory. Individual MSSs can have broad supportive objectives giving an impression of ease in implementation. However, in practice the statutory requirements or regulatory enabling tools are not available (Budge and Slade 2009:6). For example, 'accessibility' can be included within the Victorian Planning Framework providing a regulatory link with physical activity but there is no context for shop diversity. As it stands, local government has very limited powers to determine the business mix of retail areas as illustrated by a participant below:

> If there is a shopping strip and five fast food outlets open they can't say 'No, we want one fruit and veggie shop, one health food shop and one fast food shop'. They can't do that. It's actually not allowable (APM1).

Therefore, healthy food choices can be limited for those people unable to access appropriate shops further away by car or public transport. Food access mapping undertaken by a number of participating councils has shown that public transport routes do not always match residents with nutritious food retail options while fast food outlets, often providing unhealthy food choices, are more numerous and readily available (Burns 2008:91). Such complex obstacles cannot be tackled by local government alone and require collaboration at all government levels as explained by one participant.

> I think the biggest change needs to be made, like I said, further up the ladder, in terms of state and federal government, where the changes around transport connections, and having residential estates that are close to food outlets, and not allowing the planning scheme, I guess, to put in rows after rows of XXX and XXX [fast food chains]. There are lots of things that could be done to improve it but won't come from local government level because we don't have support we need from that [state and federal] level (LGO5).

## 5.7 Now It Is in Policy What's Next?

As food security principles are being embedded into some local government plans and policies, and the projects are drawing to a close, the question of sustainability arises. What will happen in the event of management restructuring, changes in senior staff or CEO, amalgamation, future elections of councillors, demographic changes and new state government agendas? To face such significant changes any policy position in local government needs to be one embracing diversity and flexibility as commented by an APM below:

> It is really a fascinating, fascinating area and what part does local government have, personally I would say we can't be too precious and prescriptive about it because it has to be relevant and that relevance changes. So you have staff changes, and you've population changes, ageing population, new migrants, whatever, whatever, you know, it is a really dynamic environment so whatever local government does needs to be agile (APM3).

Policies do formalize objectives, priorities and actions at least within its designated timeframe or until review but one of the important keys to implementation is to have accompanying action plans, detailing strategic tasks, designating responsible departments, incorporating a monitoring process and specific timeframes.

> Policy for policy sake is nothing. You have to have policy backed by action plans … go about policy development and action planning in a very inclusive way (APM2).

Additionally, the importance of leaders and staff who will energize and drive the food security agenda was a significant theme among participants.

> So in terms of the sustainability element certainly staff and champions and conceptual drivers and continuity of effort, all those things are important (AM3).

Project-oriented external short-term funding was a barrier to this momentum building as any more work on food security potentially stops when the funding ceases unless there is ongoing commitment by councils or a higher level of government. This was an important concern shared by a local government interviewee as the projects were coming to a close.

> *Food For All* was all about integrating it into council, but I think if you want food security integrated into council you need to provide the dollars for an officer to work through that. They still integrate it into council but to keep the momentum and the energy happening. I am trying to think of an example. It would be like asking council to do an aged and disability service which we do through HACCS. If HACCS ceases the DHS funding it is going to fall over because you actually need people managing that project right through (LGO6).

Barling et al. (2002:558) suggests that 'departmentalism is entrenched in government' with separation of responsibilities for food over different government tiers and departments hindering progress towards integrated food policy (Rideout et al. 2007:570). Such a 'piecemeal approach fails to recognize the linkages' (Pothukuchi and Kaufman 1999:218) with other policy areas. The higher tiers of government and delegated authorities need to address broader food issues with a coordinated approach, develop umbrella policies, release funds, human resources and practical assistance in order that a synergy is created to provide equitable food security on the local level. The importance of a more coordinated approach is highlighted by the one of the interviewees:

> There is a lot of barriers like that beyond local government beyond disadvantaged groups, beyond individuals, that need to be tackled by those people in leadership in the government [referring to higher tiers of government] So it is not individual departments, it is across government departments. So that is the barriers of the involvement (M2).

One solution is the potential synergy with environmental/sustainability departments to broaden the food system policy development, using 'environmental reinvestment lenses to recognize the interconnections between our food system and our urban and natural environment' (Toronto Food Policy Council 2000:10).

## 5.8 Conclusion

The findings of this research have shown that local government does have a level of institutional capacity to incorporate food security principles, such as availability, access and equity, into high level municipal policies and plans. The external legislative context extends this capacity with policy opportunity through the Council Plan, the MPHP and Food Security Policies, but constrains the capacity to link land use planning with food and health (Budge and Slade 2009:8) through lack of guidance and 'regulatory tools'(Mendes 2008:943). Looking internally, barriers in staff recruitment and retention, the need for cross department relationship building due to an ingrained silo culture and the development of short-term projects due to limited funds make food security policy development progress difficult. Increasing pressure on priorities and services from other government levels and the community (Dollery et al. 2006:555–556), combined with human services as 'largely voluntary activities of individual municipalities' (Lowell 2005:161), limits council take up of new sustainability problems like food security. There is an urgent need for higher tiers of government to recognize the food security agenda and provide coordinated support for local government initiatives, particularly through legislation and funding. Then, as food insecurity increasingly presents itself within municipalities there would be inter-governmental solidarity in furthering sustainable solutions.

## References

Allender, S., Gleeson, E., Crammond, B., Sacks, G., Lawrence, M., Peeters, A., & Loff, B. (2009). Moving beyond 'rates, roads and rubbish': How do local governments make choices about healthy public policy to prevent obesity? *Australia and New Zealand Health Policy, 6*, 20. doi:10.1186/1743-8462-6-20.

Aulich, C. (1999). From convergence to divergence: Reforming Australian Local Government. *Australian Journal of Public Administration, 58*(2), 12–23.

Barling, D., Lang, T., & Caraher, M. (2002). Joined-up food policy? The trials of governance, public policy and the food system. *Social Policy & Administration, 36*(6), 556–574.

Batley, R., & Larbi, G. (2004). *The changing role of government: The reform of public services in developing countries*. Hampshire: Palgrave Macmillan.

Blau, G., & Mahoney, M. (2005). The position of health impact assessment in local government in Victoria. Melbourne: Deakin University. http://www.health.vic.gov.au

Budge, T. & Slade, C. (2009) Integrating land use planning and community food security. A new agenda for government to delvier on sustainability, economic growth and social justice. A report prepared for the Victorian Local Governance Association by the Community Planning and Development Program, La Trobe University, Bendigo Campus.
Burns, C. (2008). The vulnerable and the disadvantaged. *The Australian Economic Review, 41*(1), 90–96.
Chilton, M., & Rose, D. (2009). A rights-based approach to food insecurity in the United States. *American Journal of Public Health, 99*, 1203–1211.
Commonwealth Grants Commission. (2001). *Review of the Operation of the Local Government (Financial Assistance) Act 1995.* http://cgc.gov.au.
Department of Human Services. (2008). Food security policy development EOI process.
Department of Planning and Community Development. (2010). Find your local council. http://www.dpcd.vic.gov.au/localgovernment/find-your-local-council.
Dollery, B., Marshall, N., & Worthington, A. (2003). *Reshaping Australian local government*. Sydney: UNSW Press.
Dollery, B., Wallis, J., & Allan, P. (2006). The debate that had to happen but never did: The changing role of Australian local government. *Australian Journal of Political Science, 41*(4), 553–567.
Food & Agriculture Organization. (2011). *Basic definitions.* http://www.fao.org/hunger/basic-defintions/en/.
Gargan, J. J. (1981). Consideration of local government capacity. *Public Administration Review, 41*(6), 649–658.
Goss, S. (2001). *Making local governance work*. Hampshire: Palgrave.
Gottlieb, R., & Fisher, A. (1996). Community food security and environmental justice: searching for a common discourse. *Agriculture and Human Values, 13*(3), 23–32.
Grindle, M., & Hilderbrand, M. (1995). Building sustainable capacity in the public sector: What can be done? *Public Administration and Development, 15*, 441–463.
Honadle, B. (2001). Theoretical and practical issues of local government capacity in an era of devolution. *The Journal of Regional Analysis and Policy, 31*(1), 77–90.
Interface Councils (n.d.). Submission No. 146: Inquiry into sustainable cities 2025. http://www.aph.gov.au.
Johnson, A. (2003). Financing local government in Australia. In B. Dollery, N. Marshall, & A. Worthington (Eds.), *Reshaping Australian local government*. Sydney: UNSW Press.
Kiss, R. (2003). Reasserting local democracy? In B. Dollery, N. Marshall, & A. Worthington (Eds.), *Reshaping Australian local government*. Sydney: UNSW Press.
Lang, T. (2010). Conclusion—Big choices about the food system. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food security, nutrition and sustainability* (pp. 271–287). London: Earthscan.
Larsen, K., Turner, G., Ryan, C., & Lawrence, M. (2011) *Victorian food supply scenarios: Impacts on availability of a nutritious diet*. Melbourne: Victorian Eco-Innovation Lab (University of Melbourne), CSIRO and Deakin University. http://www.ecoinnovationlab.com.
Lowell, R. (2005). Localising Human Services. In *A history of local government human services in Victoria.* Melbourne: Australian Scholarly.
Maribyrnong City Council. (2006). Culturally and linguistically diverse policy and action Plan 2006–2011.
Maxwell, S. (1996). Food security: A post-modern perspective. *Food Policy, 21*(2), 155–170.
Mendes, W. (2007). Negotiating a place for 'sustainability' policies in municipal planning and governance: The role of scalar discourses and practices. *Space and Polity, 11*(1), 95–119. doi:10.1080/13562570701406683.
Mendes, W. (2008). Implementing social and environmental policies in cities: The case of food policy in Vancouver, Canada. *International Journal of Urban and Regional Research, 32*(4), 942–967. doi:10.1111/j.1468-2427.2008.00814.x.
Municipal Association of Victoria (MAV) (n.d.). About green wedges and open space. http://www.mav.asn.au
Neff, R., Palmer, A., McKenzie, S., & Lawrence, R. (2009). Food system and public health disparities. *Journal of Hunger & Environmental Nutrition., 4*(3–4), 282–314.

Pothukuchi, K., & Kaufman, J. L. (1999). Placing the food system on the urban agenda: The role of municipal institutions in food systems planning. *Agriculture and Human Values, 16*, 213–224.

Rideout, K., Riches, G., Ostry, A., Buckingham, D., & MacRae, R. (2007). Bringing home the right to food in Canada: Challenges and possibilities for achieving food security. *Public Health Nutrition, 10*(6), 566–573. doi:10.1017/S1368980007246622.

Sacks, G., Swinburn, B., & Lawrence, M. (2009). Obesity policy action framework and analysis grids for a comprehensive policy approach to reducing obesity. *Obesity Reviews, 10*(1), 76–86.

Toronto Food Policy Council. (2000). Food secure city submission to the Toronto Official Plan. http://www.toronto.ca/health.

VicHealth. (2004). Food for all improving access to food for healthy eating a food security program funding guidelines for local government authorities.

Victorian Government. (2010a). Local Government Act 1989. Version 11 of 1989 incorporating amendments as at 24 September 2010. http://www.austlii.edu.au.

Victorian Government. (2010b). Planning and Environment Act 1987. No. 45 of 1987 incorporating amendments as at 24 September 2010. http://www.austlii.edu.au.

Victorian Government. (2011). Public Health and Wellbeing Act 2008. No. 46 of 2008 incorporating amendments as at 2 January 2011. http://www.austlii.edu.au.

# Chapter 6
# The Question of a Reasonable Price for Food: Policy Alternatives to Control Food Price Inflation in Developed Economies

**Brigit Busicchia**

## 6.1 Introduction

With food so intimately related to human wellbeing and survival, the commercialization of these commodities has always presented strong social and political challenges. Historically, although not always a high profile policy area, food policy was commonly nested in agricultural planning which often consisted of a body of coherent measures or programs and was kept under governmental control (Bello & Baviera, 2009). The gradual dominance of free-market ideology has replaced planning with markets, with economists arguing for the phasing out of agricultural subsidies, and has shifted market power and control from producers to retailers, the new gatekeepers to the consumer class (Lang, Barling & Caraher, 2009).

This chapter presents food price development in the context of modern developed economies and examines how food price inflation is managed in selected countries, viz Australia, the United Kingdom and France. The focus on these three countries controls for some country specific factors; for example, Australia and the UK share liberal market economy principles; Australia and France share comfortable levels of national food self-sufficiency; France and the UK have economies of a similar size and are often referred to as the 'strong states' (Eising, 2009) with comparable decision making rights in European Community (EC) politics. Their respective centralized political structures allow state institutions to define and implement policies relatively autonomously, much more than is the case for Australia. Notwithstanding these similarities, important variations remain among the three countries, which allows for assessing the importance of domestic political structures, modes of interest intermediation and varieties of capitalism upon policy development.

The chapter is divided into three sections. First, it provides a short overview of food price inflation-related international developments with some discussion on the

B. Busicchia (✉)
Macquarie University, Sydney, Australia
e-mail: brigit.busicchia@gmail.com

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_6,

causes of international food price volatility. The section argues that food regime analysis explains, to a considerable degree, the dimensions of food relations and their pivotal roles in agricultural price volatility and the ensuing world food crisis of recent times (McMichael, 2009a). By linking international relations of food production and consumption to periods of capitalist accumulation (Friedmann, 2009) food regime analysis explains how the current corporate food regime is now reorganized around market principles and no longer around state planning politics, and how it has transformed national farm lobbies into corporate food regime lobbies (McMichael, 2009b). The restructuring of the international food system also bears consequences for food systems of developed economies by fostering the growth of transnational corporate power, particularly that of supermarkets (Dixon, 2007).

The second section provides a brief discussion on the implications of international price volatility by comparing national food price inflation levels between the three countries. It presents the policy responses of these countries in the face of food price inflation. The section uses a 'varieties of capitalism' (Hall & Soskice, 2001) approach as a theoretical framework to ascertain how states engage in the control of food price inflation, and to examine the level of coordination between business interest organizations and the state. In contrast to France, Britain and Australia's liberal market economies have gradually devolved the coordination of national food supply chain to the private sector (Fulponi, 2006) which has created a policy silence around the issue of food price inflation in both jurisdictions. The French approach to regulating relations and practices within the food retailing sector exemplifies its state interventionist nature, and in particular within the agricultural sector.

The final section summarizes the key findings and concludes with a discussion of a number of policy implications. Overall, although the weight of agricultural commodity prices over the making of consumer food prices has been steadily decreasing, shocks to international agricultural prices have led actors of the food supply chain to engage in cautionary practices of price increase. Increases are transmitted at every stage of the chain, from processing to distribution and retailing, resulting in an over-proportioned price response when compared to the original price surge.[1] The French case study suggests that policy intervention over the food retail sector, to some extent, helps to correct asymmetrical price developments between international commodity prices and consumer prices.

## 6.2 Causes for International Food Price Surges

According to the monthly United Nations Food and Agriculture Organization (FAO) Food Price Index (FFPI) published in September 2011,[2] food prices on international markets had surpassed their highest levels since June 2008. The FAO Food Price

[1] Conseil Economique, Social et Environnemental: 'Les modalites de formation des prix alimentaires' March 2009.

[2] *Source*: FAO website: www.fao.org/worldfoodsituation/FoodPricesIndex/en/ retrieved 10 September 2011.

Index, which monitors the monthly change in a basket of commodities including meat, dairy, cereals, oils and sugar, had risen over the last 12 months to August 2011 by 26%, a record high in nominal terms according to data going as far back as 1990.

Statistical data support the evidence that the 2008 and onwards food price crises have been sparked by extremely poor harvests caused by severe weather events disrupting agricultural production in major agricultural countries. According to the USDA World Supplies and Estimates, world wheat production had declined by more than 5% between 2010 and 2011 and overall grain production had also fallen by 2% for the same period of time.[3] Stronger demand, weaker supplies and a global restructuring of the agri-food business have led to the depletion of international stocks since the beginning of the millennium. Large precautionary inventories commonly held by governments and private grain dealers have been allowed to shrink as everyone has come to believe that countries suffering crop failures could always import the food they needed (Krugman, 2008). As a result, whilst international cereal stock levels corresponded to about 110 days of consumption in the late 1990s, by 2007, these had dropped to only 50 days,[4] sacrificing food reserves for corporate 'food security' (McMichael, 2009a).

To better understand the forces at play, food regime analysis is drawn upon to explain agricultural prices volatility and the ensuing world food crisis of recent times (McMichael, 2009a). An important element of the food regime analysis is the shift of perspective from food as a 'commodity' to food as a 'relation' with all its implications at the geopolitical, social, cultural and ecological levels. As such, it examines patterns of food circulation and the role of food politics within not only the geopolitical spheres but equally in the areas of development and industrialization, and in the transition process to a global form of capitalism (McMichael, 2009b). While food production remains situated at local and national levels, the trends of global sourcing combined with new international trading rules, the dismantling of national regulations and the increasing influence of transnational capital are forging new power relationships within the food system (Fold & Pritchard, 2005).

According to McMichael, the current 'corporate food regime' embodies the tensions between the 'globalization project' institutionalizing corporate power in the world food system and cultural survival through food sovereignty principles. The 'globalization project' replacing the 'development project', was pivotal for the integration of agriculture into international trade agreements, and this was achieved with the creation of the World Trade Organization (Friedmann, 2009). The WTO regime of liberalization and privatization which has progressively outlawed artificial price support, and in general any form of state intervention, has facilitated the integration of transnational agribusiness into international food markets with the resulting effect of privatizing food security in the hands of corporations (McMichael, 2009a).

---

[3] World wheat production output was estimated at 684.31 million tons in 2009/2010. By 2010/2011 it had dropped to 648.70 million tons. *Source*: USDA World Supplies and Estimates available at www.usda.gov/oce/commodity/wasde/latest.pdf, Retrieved November 2011.

[4] *Source*: US Department of Agriculture.

Inflationary trends exacerbated by bio-fuel offsets and financial speculation on agricultural commodities have certainly contributed to the 2007–2008 food price surges, but long-term structural forces have been more central to the crisis (Bello & Baviera, 2009). The dismantling of national marketing boards, the elimination of agricultural subsidies and the liberalization of trade and investment are the key long-term structural processes at play, turning any large supply shocks into a world food crisis (McMichael, 2009a). One important outcome of these long-term structural adjustments is that most countries and in particular developing and transitional economies have suffered significant degradation of their agricultural sectors and are no longer self sufficient. The loss of national food self-sufficiency compounded with low global stock levels becomes a favourable environment for a 'perfect storm', a situation for which the dangerous combination of different developments, in this instance supply shortfalls combined with low stock levels, leads to an unavoidable state of crisis (Bello & Baviera, 2009).

## 6.3 The Effect of International Food Crises on Developed Economies

The current corporate food regime has departed from previous regimes in that state governments are gradually relinquishing the coordination of food supply to large supermarket chains or transnational corporations (Fulponi, 2006). Governments of liberal market economies, such as Australia and the United Kingdom, have opted for policies of market coordination through globalization and free trade, actively allowing the private sector to control the future of the food supply. The growing role of these large transnational and national supply chains only reinforced by greater market concentration is unquestionably shaping the current agri-food business. The development of an Australian national food plan[5] by a group of private sector actors (mainly representing the retail and food processing industries) is an example of the devolvement of coordination from state to agri-food business, and of the privatization of food security as suggested by McMichael.

The aim here is not to present an exposé of price transmission from international to national markets. This section aims at reporting how food prices fluctuate in developed economies when shocks occur at international levels. Figure 6.1 offers a comparison of food price index development between international and the selected domestic markets, Australia, the United Kingdom and France. The price surge experienced in 2008 on the international scene was not transmitted to the same extent to the domestic markets of the selected countries. However, while none of

[5] In December 2010, the Australian government announced a National Food Policy Group to advise government on issues and policies affecting Australia's food chain (Press Release DAFF 10/062L). Members of the National Food Policy Group represent food and grocery retailers, transport and logistics operators, food manufacturers, farmers, and grains growers.

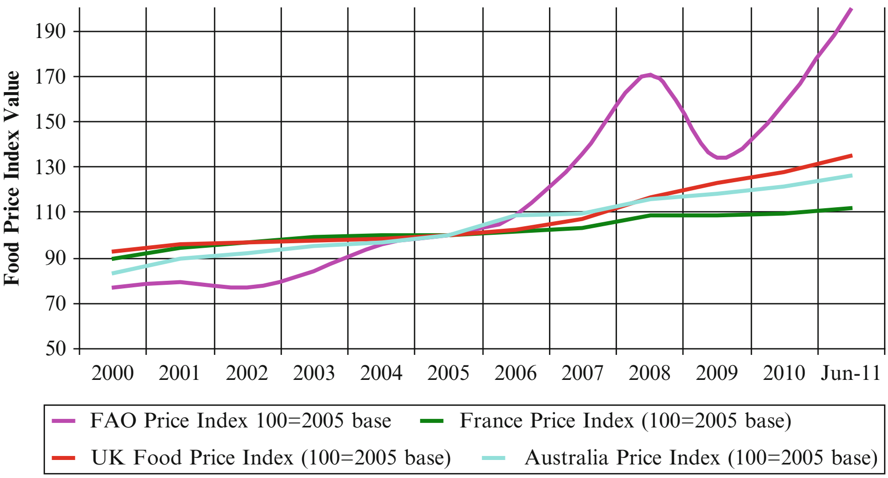



**Fig. 6.1** Food price indexes—comparison between international FPIs and selected countries FPIs: (*Source*: Compiled by the author based on data collected from ABS, INSEE, ONS and FAO web sites. FAO Food Price index consists of five commodity group price indices including cereals, dairy, oils and fats, meat and sugar. (*Source*: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/ retrieved 10 September 2011) ABS Food Price Index includes dairy products, bread and cereals, meat and seafood, fruits and vegetables, soft drinks and catering foods.)

these countries experienced a sharp surge in food prices, food prices remained high or 'sticky' in spite of world agricultural commodity prices falling back in the mid 2009 to their 2007 levels.

According to the European Commission the slower rate of decline in consumer food prices, once the international market prices had eased off, mainly lay with a slow and weak response from food processors and distributors to agricultural commodity price variations (European Commission, 2009). The European Commission argues that the discrepancies observed between commodity and consumer food price developments relate to the lack of competitive structure at certain steps of the supply chain and to a certain extent to systemic structural weaknesses (European Commission). Food price developments between agricultural commodity prices and consumer food prices over the 2007–2009 period were collected by the EC and are presented in the following Fig. 6.2. Overall, a surge on the international agricultural commodities markets was rapidly followed by rises in food producer and food consumer prices. The easing-off of international agricultural commodity prices did not trigger a corresponding effect on local food producer and consumer prices. Whereas it took about six months for food producer prices to decline and stabilize (at a higher level than at which they originally started from), food consumer prices began to stabilize only one year later at levels 10% higher than their pre-crisis values.

Whilst explaining price transmission between international and domestic markets is not the objective of this chapter, the presentation of national responses to international price surges may further inform this work. Statistical data from Australia, France and the United Kingdom were collected and compiled to produce

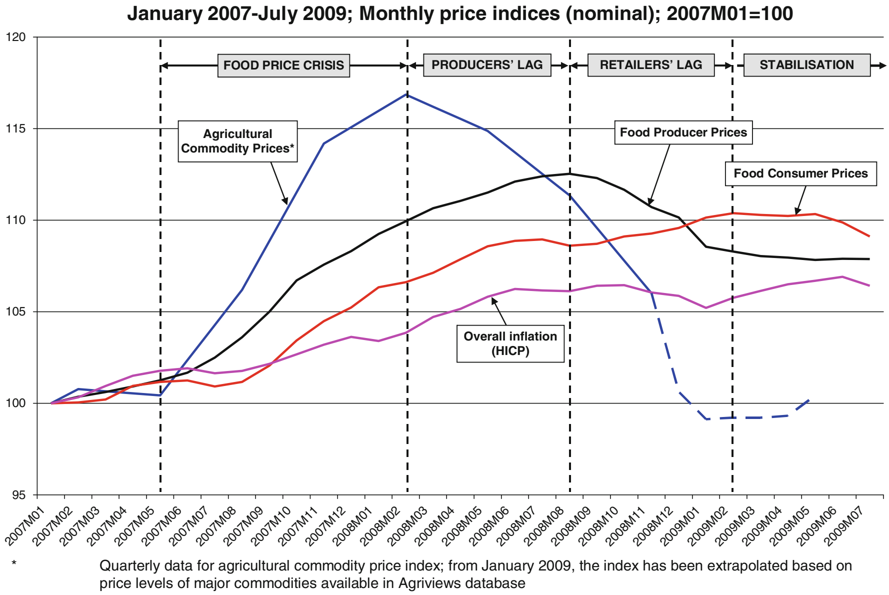



**Fig. 6.2** Price developments in the food supply chain in the European Union

Fig. 6.3, a comparison of food price inflation between these different jurisdictions and the international commodity markets. While acknowledging the ABS, INSEE or ONS food index structures may differ from the FAO food basket, some level of comparison is still possible between these datasets. In developed economies, where the processing of food is particularly important, raw ingredients represent 25–35% of the finished retail price.[6]

Notwithstanding international influences on domestic markets, local food production plays equally an important role in the movements of local food prices. For instance in 2006, when severe drought conditions affected most of the Australian cropping areas the food price inflation recorded an annual high of 8.6%. Yet, when the international prices surged significantly in 2007 (in excess of 25% according the FAO Food Price Index) Australia was enjoying a period of good harvesting for fruit and vegetables keeping food price inflation for this period to a low 1.2%. Whilst the three countries were clearly impacted by international price surges in 2008, the United Kingdom showed less resilience in the face of international price surges which may be partially explained by a low level of national food self-sufficiency (around 60%). In contrast, France contained its food price inflation to 5.5% at the height of the 2007 crisis, most probably explained by strong local production (France is the second largest food exporter in the world behind the United States[7])

[6] *Source*: 2009 Report from The Conseil Economique Social et Environemental, quoting OECD Agricultural Perspectives 2008–2017.

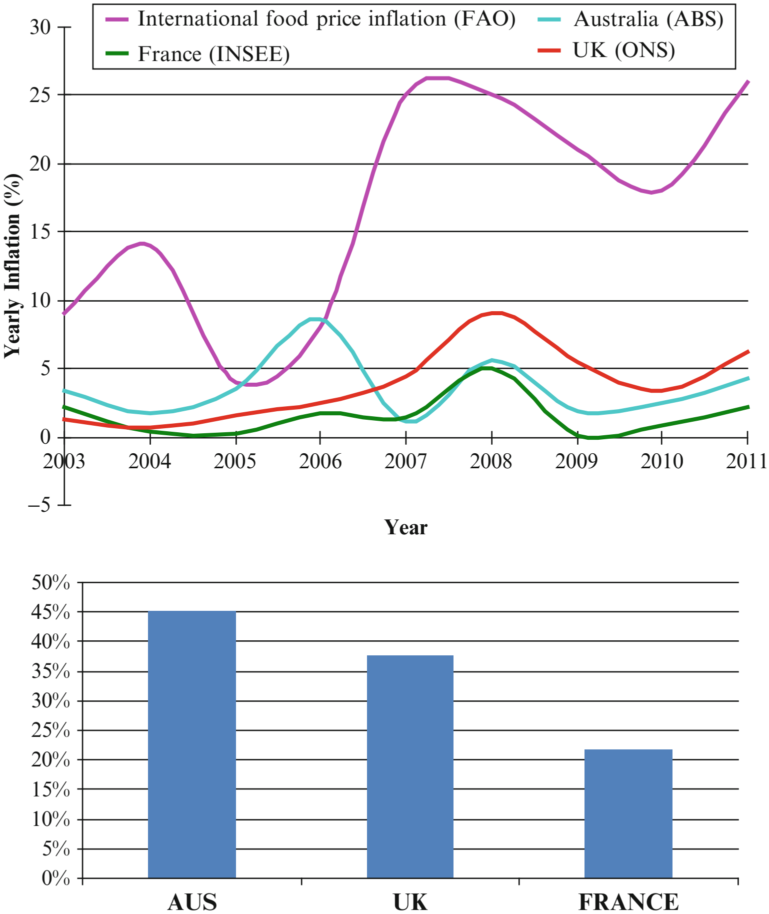



**Fig. 6.3** Food price inflation. Comparison between FAO and selected countries: (*Source*: Compiled by the author based on data collected from ABS, INSEE, ONS and FAO web sites. FAO Food Price index consists of five commodity group price indices including cereals, dairy, oils and fats, meat and sugar. (*Source*: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/ retrieved 10 September 2011) ABS Food Price Index includes dairy products, bread and cereals, meat and seafood, fruits and vegetables, soft drinks and catering foods.). (**a**) Overall food price inflation for the period between 2000 and 2010

and a series of public policies aimed at stimulating competition within the retail sector, which are discussed later in this chapter.

Overall, between 2000 and 2010, food prices have increased by 45% in Australia, by 22% in France and by 37% in the United Kingdom. If, on average, consumers from developed economies spend between 10 and 15% of their income on the

[7] *Source*: Australian Food Statistics 2008—Department of Agriculture, Fisheries and Forestry. In 2007 France's food exports represented 5.9% of the total world food trade in value.

purchase of food[8] high food prices inflation bring distributional issues under the spotlight. The impact of high food price inflation on low-income households is much greater than that experienced by higher-income populations, potentially exposing these communities to greater welfare loss.

### 6.3.1 Australia

Australia experienced an extremely high food price inflation rate of 8.6% in 2006 after a sustained drought period affecting most of the Australian cropping areas. This confirmed that the Australian food economy is very sensitive to shocks impacting on its local food production. By 2007, agricultural production had increased and food prices eased off, particularly for fruits and vegetables. By March 2008, food inflation in Australia was running at 5.7% from the previous year's level and was considered a key driver of that particular year's overall inflation (4.2%).[9] As international food prices fell in the following year the domestic food price index kept slightly above its 2008 level, producing food price inflation of 1.9% for 2009. By mid 2011 the Australian food price inflation was again surging in excess of 4%.

### 6.3.2 The United Kingdom

According to the UK Office of National Statistics (ONS, food inflation was running at an annual rate of 9.1% in December 2008.[10] The rise in international commodity prices of 33% over the June 2007 to June 2008 period, led to an increase of the producer price index of 15% and consumer food price index of 11%.[11] Despite the international food index falling by late 2008, the UK food index has continued to rise significantly as shown in Fig. 6.4b. At the height of the 2008 crisis, the poorest 10% of UK households spent 16.8% of their expenditure on food, a figure that was just 7% for the richest 10%.[12]

Food prices arguably contribute to social tensions in a number of emerging countries but are also causing concern and tension in the UK, where food prices have risen more rapidly than most other OECD economies. The anomaly of UK

[8] The average proportion of household income spent on food varies around 35–60% in the developing world.

[9] *Source*: ABS Consumer Price Index, March 2008.

[10] *Source*: Office of National Statistics – News release 16 December 2008. Seen at www.statisitics.gov.uk/pdfdir/cpi1208.pdf Retrieved October 2011.

[11] *Source*: Eurostat Database—European Food Prices Monitoring Tool

[12] *Source*: Report 'Family Food 2009' from UK Department of Environment, Food and Rural Affairs (Defra).

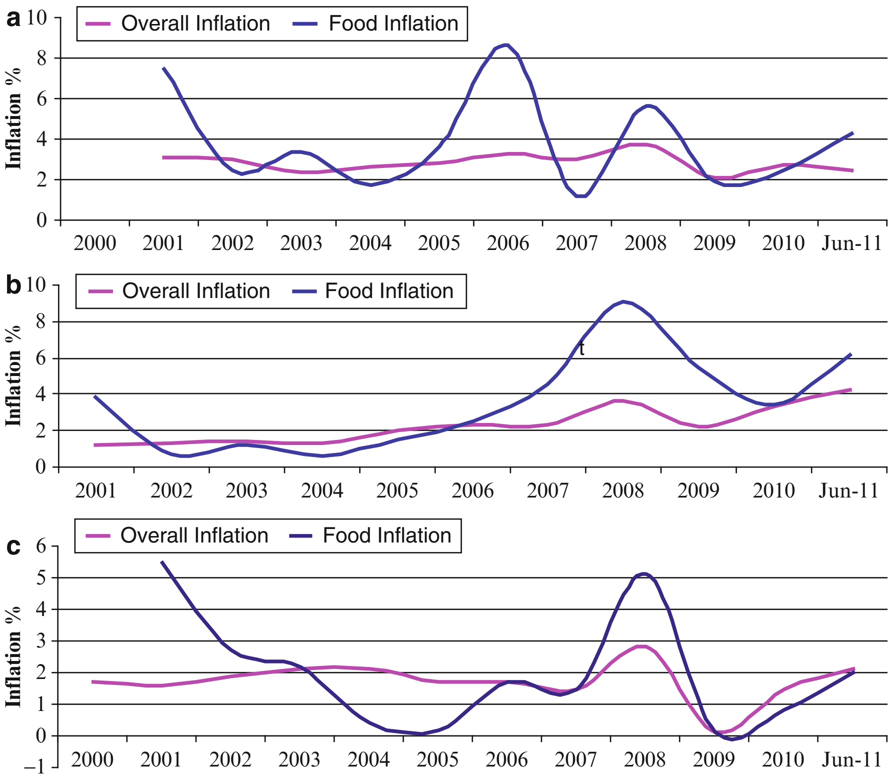



**Fig. 6.4** (**a**) Comparison Overall Inflation and Food Price Inflation, Australia: (Source: Compiled by author based on data from Australian Bureau of Statistics http://www.abs.gov.au/ Retrieved October 2011.). (**b**) Comparison Overall Inflation and Food Price Inflation, UK: (Source: Compiled by the author based on data from UK Office of National Statistics from http://www.statistics.gov.uk/statbase Retrieved October 2011.). (**c**) Comparison Overall Inflation and Food Price Inflation, France: (Source: Compiled by author from INSEE series available from http://www.indices.insee.fr/ Retrieved October 2011.)

price increase when compared to other European countries may soon bring political attention to the issue.

### 6.3.3 *France*

In June 2004, in an attempt to stimulate consumption, the French government negotiated a 2% retail price reduction with food manufacturers and grocery retailers. Although these negotiations were never legislated, it is estimated that grocery prices dropped by 1.5% by the end of 2004.[13] This is reflected in Fig. 6.4c. The annual food

[13] *Source*: French Senate website: http://www.senat.fr/rap/a04-076-8/a04-076-86.html Retrieved October 2011.

inflation for the period between 2004 and 2005 was less than 0.5%. In April 2008, in line with the rest of the European Union, food price inflation in France was running at a high 5.5% pa[14] mainly attributed to surges in cereal and dairy prices. According to a report published in March 2009 by the French Economic, Social and Environmental Committee,[15] in late 2007 the rise of international agricultural commodity prices of 22% led French food manufacturers to increase their prices by 9%, ultimately pushing up food retail prices by 5.6%. These figures corroborate the general understanding that the cost of raw ingredients represents about 25–30% of the final retail price. The report also noted that while food manufacturers and retailers were quick at transmitting any price increase the trend was not as pronounced when commodity prices were easing off.

By 2009, food price inflation in line with the national overall inflation was back to a low 0.1%. French households spend considerably more on their food basket than their European neighbours. It is estimated that about 15% of the overall household expenditure is spent on food and non-alcoholic beverages.

## 6.4 Policy Responses in Developed Economies

Although the three countries chosen as case studies are exposed to similar international price pressures, their respective national food price inflation responses are presenting significant differences. Over the period of the last 10 years, food price inflation rates of both liberal market economies, Australia and the United Kingdom, have been around 40%. In contrast, France has been able to contain its food price inflation rate to half the level experienced in Australia and the UK, to about 20% for the same period. This outstanding difference calls for exploring how these countries have engaged with the problem of rising food price inflation. Of particular interest to this chapter is the examination of the respective national policy responses and how they may have led to these significant variations. Acknowledging that nations exhibit varying modes of state-society relations in accordance to their respective economic and political institutions (Hall & Soskice, 2001), the prevailing ideas about these relations greatly mediate, at a national level, pressures arising from the international scene (Schmidt, 2002).

There are few policy instruments available to governments to control price inflation. Encouraging retail competition is one of the most commonly suggested policies in the political economy literature, an issue that has taken on greater significance in food retail distribution in light of the increased concentration of grocery retail operators (Clarke, Davies, Dobson & Waterson, 2002). The discrepancies observed between commodity and consumer food price developments have

[14] Europa—Press Release STAT/08/76 dated 2 June 2008.

[15] The 'Conseil Economique Social et Environnemental' is the third constitutional assembly of the French republic advising the government and parliament in the development of public policies. The report is available on line at www.conseil-economique-et-social.fr/rapport/rapsec/RS083920.pdf Retrieved November 2011.

prompted the European Commission (EC) to propose solutions to correct the asymmetric response of food prices to commodity price fluctuations (European Commission, 2009). The EC has recognized that pervasive inequalities in bargaining power (between producers and distributors) combined with an inefficient food supply chain in transmitting price changes would exacerbate price volatility in commodity markets. The EC has recommended to its member states a series of policy measures to control unfair trade practices, prevent anti-competitive practices and to increase transparency. Whilst France has integrated the proposed EC recommendations into its national policies, Britain has been reticent to follow the proposed changes, mainly due to its concerns about encroachments of the EU possibly undermining British democracy (Schmidt, 2006).

The exploration of state policy responses in the face of rising food price inflation captures important ways in which the institutions of the political economy affect economic behaviour and induce economic actors to cooperate with policymakers. Broadly speaking, liberal market economies encourage firms to rely on market mechanisms to coordinate their endeavours as opposed to the coordinated market approach of strategic interaction supported by non-market institutions (Hall & Soskice, 2001). In all three contrasting cases, Australia, the United Kingdom and France that are discussed below, the firms involved in the food distribution networks are central to the adjustment of food price inflation.

### *6.4.1 Australia*

In Australia, the political relations between food, agriculture and society are characterized by a neo-liberal discourse, strongly advocating that the liberalization of agriculture will ultimately lead to future wealth accumulation, but very remotely engaging with the resulting distributional outcomes of such policies (Pritchard, 2005). Furthermore, the focus on efficiency gains to the national economy has framed the food policy debate around ‘efficiency logics’, making it apolitical and consequently creating policy silences over socio-economic outcomes. As such, the development of a national food policy has not been considered a key priority by the federal government and as a result, Australia does not have a national food policy in place nor does it have any instrument to monitor its food security. The efficiency logic is commonly supported by the fact that Australia has been traditionally a net food exporter[16] although this trend was recently reversed when Australia became a net food importer, showing a trade deficit of $1.8 billion for 2009.[17]

[16] Over the past 5 years the value of Australia’s food exports has been declining at an average of 5% a year in real terms, as seasonal conditions have generally been less than ideal in many regions. The 2006–2007s drought contributed to a 6% fall in the value of Australia’s food exports to $24.2 billion in real terms (Australian Food Statistics 2008, p.14).

[17] *Source*: The Australia Food & Grocery Council (AFGC) ‘State of the Industry Report’—October 2010.

The OECD reported that Australia has had one of the higher food price rises in the developed world and data indicate that food prices increased by 41.3% between 2000 and 2009. Some analysts attribute this to a near duopoly amongst Australian retailers, where two retailers account for approximately 70% of packaged grocery sales and about 50% of fresh product sales (Zumbo, 2010). The market control of supermarkets is not only related to the size of their operations and to the concentrated nature of the industry but also derived from their re-invented status of significant authority figures through either third party association or communicating strategies to build reputations of health or respectability (Dixon, 2007). Exercising such cultural and economic power attracts the scrutiny of consumer associations, producer groups and government regulators.

In July 2008, completing an inquiry into the competitiveness of standard grocery items, the Australian Competition and Consumer Commission (ACCC) advised that grocery retailing was workably competitive and did not identify anything fundamentally wrong with the grocery supply chain and concluded that competition between retailers was sufficient (ACCC 2008). Although conceding that food prices had risen significantly in Australia, the ACCC expressed the opinion that causes of such inflation were rooted in other domestic or international factors difficult to capture precisely but that, 'the potential contribution of any weakening of price competition in grocery retailing/wholesaling to food price inflation was limited.' (ACCC. p. xiv)

Soon after the release of the inquiry report, the Australian Competition and Consumer Commission (ACCC) launched the 'Grocery Choice' web site, a grocery price monitoring platform where retail prices from different sources were to be listed. Unlike the French price observatory, the proposed web site was not designed to monitor profit margins. Australia's opposition parties criticized the web site as wasteful, failing to deliver transparency and meaningful information[18] and by June 2009, the web site was abolished by the Federal Government. Since then, no other price monitoring instrument has been implemented or even suggested.

In December 2010, as a result of an electoral promise the Federal Government established a new National Food Policy Working Group[19] composed of representatives from the food retailing sector, food manufacturing, the National Farmers Federation and Australia's chief scientific research body the CSIRO. The group is expected to advise the government on food policy development and in particular on the drafting of Australia's National Food Plan. In June 2011, to inform the development of the national food plan, the Australian government released an 'Issues Paper' inviting public consultation around the topic of food policy, in which it reiterated its commitment to trade liberalization and market-based policy approach.

[18] The Senate Economics Reference Commission Report Grocery Choice Website, September 2009 states in its executive summary that 'The Inquiry has revealed that the Government's Grocery Choice initiative was characterised by waste and mismanagement' (p. 9).

[19] The National Food Policy Working Group is composed of representatives from Woolworths, Linfox, Simplot, Boost Juice, National Farmers Associations, Elders, Graincorp, ACTU, CSIRO, AFGC.

### 6.4.2 United Kingdom

Against the backdrop of the surge in commodity prices, the UK Cabinet Office in 2008 defined the objectives of a future food strategy, and by January 2010 a national Food Security Strategy 'Food 2030' was launched. The Strategy sets out a rather simple direction for food policy promoting consumer information and sustainability. Since the inception of the strategy, food security is being monitored across five areas: global availability, diversity of supply, food chain resilience, affordability, and safety and confidence.

In accordance with the meta-narrative that argues that the public interest is best served by creating space for capital (Pritchard, 2005), the British government advocates that improving market efficiency will enhance global food security and by the same token contain price volatility. The United Kingdom is an example of how the rollback of state regulation has allowed the coordination of the food supply sector by transnational corporations, namely global supermarket chains (Friedmann, 2005; Fulponi, 2006). Supermarkets have transformed the British urban landscape as the expansion of the superstore concept during the 1980s and 1990s went virtually unchecked by planning constraints. By 1996, when planning legislation was finally instituted, there were more than 1,000 superstores over Britain (Steele, 2008:113–141). The large food retailers known as the 'Big Four', Tesco, Asda, Sainsbury's and Morrisons continue to dominate the grocery retail sector. Although the UK Competition Commission acknowledges that market concentration impacts greatly upon prices and on ways and scales at which food is produced, the expansion of the superstore model continues to be permitted by authorities. From 2008 to 2010, these chains of supermarkets were granted permission to build 577 new stores.[20]

The UK, as already mentioned, is suffering from noticeable consumer food price increases compared to other European economies, and some analysts from the banking sector argue that the UK food retail system is passing on higher prices than any other European operators, and these practices are not justified by local cost variations.[21] In 2006, the UK Competition Commission was engaged to investigate trade practices of grocery retailers in the United Kingdom. Its final report (UK Competition Commission (CC), 2008) found that the national grocery supply chain was efficient at delivering low prices to consumers but it also advised that the transfer of risk and unexpected costs by grocery retailers to their suppliers was common practice and should be addressed by the reinforcement of the Grocery Supplier Code of Practice (GSCOP) to curb possible abuse from large retailers onto their suppliers. The Commission was not concerned by market concentration and did not consider Tesco's market share of national grocery sales (about 30%) as a threat or barrier to entry by other participants. While the new Conservative administration has signalled its support to the GSCOP, its adjudicator will only be appointed in 2014 allowing current practices to continue.

[20] *Source*: BBC News available at: http://www.bbc.co.uk/news/uk-england-12039041 Visited November 2011.

[21] *Source*: UBS Global Economic Perspectives, 26 February 2011.

### 6.4.3 France

Not only is state power highly centralized in France but as John Zysman (1978, p. 265) describes it 'In France, one does speak of the state (l'état) as a powerful, independent force in political life … and the almost metaphysical notion of l'état as the unified authority of society has a powerful symbolic value in French politics.'

France, like many of its European counterparts, suffers from market concentration in the food retailing industry. There are at least six large food and grocery retailers in France, supplying about 65% of the food and grocery market. Three of these large retailers control 50% of the national food market. The French government plays an active role in monitoring and regulating anti-competition practices amongst these large players by controlling market access, protecting smaller operators and by negotiating target price variations with key players. Over the last 40 years, the French government has put in place legislation to regulate and assess the viability of large commercial centres (distinct from building application process, this legislation considers the long-term benefits to local communities and existing retailing centres),[22] to forbid loss-leader practices,[23] and recently to ban the practice of retrospective rebates paid by the supplier to the large retailer.[24] In 2004, the government negotiated with large retailers and food producers to bring food retail prices down by 2%. The 2008 reform of the national economy (Loi de la Modernisation de l'Economie) has opened access to other large retailers to compete with the existing and powerful operators. A brief review of the French political economy literature including official reports from the government[25] indicates that despite these measures, food price inflation is still occurring and that the volatility of international agricultural commodities (and more specifically when prices are easing off on the international markets) leads to asymmetric price transmission.

In line with the EC recommendations to promote transparency and competition along the food supply chain, France launched its 'Observatoire de la Formation des Prix et des Marges' (www.franceagrimer.fr) (Observatory of Price Development and Profit Margins) to compare food price developments with other European countries but more importantly to monitor and analyse the price transmission from international markets to end-consumers. The price monitoring available to public viewing, is reported monthly and submitted to the French parliament once a year for negotiations between governmental agencies and the food industry sector. The observatory tracks price development at the various stages of the food supply chain, from farm gate to end consumer, showing the price evolution by product. In 2011

[22] Reference to the following legislations: Loi Royer 1973 and Loi Raffarin 1996.

[23] Reference to following legislations: Loi Galland 1996 and Loi Dutreuil 2003.

[24] Reference to the 'Loi de Modernisation de l'Economie 2008'.

[25] 'Price Formation from Producer to Consumer' March 2009—Report from the 'Conseil Economique Social et Environnemental' and available on line at www.conseil-economique-et-social.fr/rapport/rapsec/RS083920.pdf Retrieved October 2011.

the observatory submitted its first report to parliament and reported levels of supermarket gross margin (being the difference between retail price and cost of sale) varying between 20 and 60% of the retail price (Prix Alimentaires, 2011).

Acknowledging the challenges presented by climate change on the environment, the economy and society, but also pressed by the upcoming reform of the Common Agriculture Policy (CAP) in 2013 and Common Fisheries Policy (CFP) reform in 2012, France has embarked on a major reform of the national agricultural and fisheries sectors. This structural approach to agricultural policy, and to food policy, took shape when in July 2010 a new law on 'modernization' of agriculture was passed by the French Senate. The new law is an example of the French statist tradition where the re-regulation of the agricultural market is central to the reform. In addition to the agricultural reform measures, the new law articulates the objectives of the first ever national food policy integrating health, environmental sustainability and socio-economics aspects. One of the central objectives of this key reform is the protection of the farming community against price volatility and price fixing by large retailers. Mechanisms to ensure revenue protection for farmers include enforcing long-term contractual arrangements between farmers and large retailers. Mechanisms to protect against environmental risks are also being implemented through governmental insurance schemes. The reform also includes the legislation of a national food relief program for disadvantaged groups.[26] The government expects that the revitalization of the agricultural sector will not only ensure food security, but also offer increased opportunities for employment and tourism.

## 6.5 Conclusions

In all three case studies, food prices development has shown to exhibit 'stickiness' in spite of the easing of rises in international agricultural commodity prices. Asymmetric price transmission is important for policy purposes as its presence is evidence of market failure and therefore signals issues of redistribution and the associated net welfare losses (Meyer & von Cramon-Taudabel, 2004).

The distinguishing mark of the corporate food regime lies in the politics of neo-liberalism (McMichael, 2009b) which is apparent in the Australian and British case studies, where both national food economies are organized primarily around market principles. In line with their respective endorsements of a global food security and the neo-liberal strategy to 'depoliticise' the economy, both governments have been silent about the significant food price inflations. In 2008, in the wake of international food price surges, the Australian Competition and Consumer Commission

[26] The law no. 2010–874 dated 27 July 2010, also known as the law of modernisation of agriculture and fisheries (Loi de la Modernisation de l'Agriculture et de la Peche) defines in great details the necessary requirements to meet these key objectives.

(ACCC) advised the Australian government that it could not be certain what factors accounted for the national food price increases. Despite the UK Competition Commission reporting that, some attention had to be placed on anti-competitive practices in explaining high retail prices, the British government viewed price formation as a matter for private negotiation between actors of the supply chain.[27] In contrast, the French government concluded that high food prices were strongly associated with anti-competitive practices from the grocery retail sector and that it justified government intervention.

It is common in liberal market economies to criticize state intervention as unwarranted intrusion on business and personal freedom when first introduced. However, in other countries such interventions are regarded by their citizens as the defence of an essential right. Therefore, depending on which rights and obligations are regarded as legitimate and accepted, the same state action could be considered an 'intervention' in some societies while it could be seen as a 'protection' of rights in other (Chang, 2002). On the one hand, the Australian and British governments have considered intervention to control food price inflation unnecessary and have addressed high food price inflation with policy silences. This is problematic in itself as it ignores the social and health costs associated with high food prices. On the other hand, France, following the European Commission policy recommendations, has increased significantly the transparency along the food supply chain to encourage retail competition and improve resilience to price volatility.

I argue that the long standing French tradition of legislating and engaging with the grocery retail industry and its anti-competitive practices can be associated with lower rates of food price inflation. Therefore, there is reason to believe that the regulation of anti-competitive behaviour by firms with market power is a key strategy for the Australian government to exert some control over the inflation of food prices, and this should be investigated further.

## References

Australian Bureau of Statistics (ABS): http://www.abs.gov.au/ausstats/abs@.nsf/mf/6401.0 Retrieved in October 2011.

Australian Competition and Consumer Commission. (2008). *Report of the ACCC inquiry into the competitiveness of retail prices for standard groceries*. Canberra: ACCC.

Australian Food Statistics. (2008). Australian Department of Agriculture, Fisheries and Forestry 2009.

Baker, D., Fear, J., & Deniss, R. (2009, November). What a waste: An analysis of household expenditure on food. *Policy Brief No.6*.

Bello, W., & Baviera, M. (2009). Food wars. *The Monthly Review*, *61*(3).

Besson, E. (2008, December). State secretary to the evaluation of public policy—France. Formation des Prix Alimentaires (Food Prices Development). Report presented to the French Prime

[27] *Source*: OECD—UK Response July 2011, Survey of activities in food price formation, transparency and monitoring along the chain. Available at www.oecd.org/dataoecd/48/41/48961029.pdf Retrieved November 2011.

Minister. http://lesrapports.ladocumentaitonfrancaise.fr/BRP/084000760/0000.pdf Retrieved in September 2011.
Clarke, R., Davies, S., Dobson, P., & Waterson, M. (2002). *Buyer power and competition in european food retailing*. Cheltenham: Edward Elgar.
Chang, H.-J. (2002). Breaking the mould: An institutionalist political economy alternative to the neo-liberal theory of the market and the state. *Cambridge Journal of Economics, 26*(5), 539–559.
Delforce, R., Dickson, A., & Hogan, J. (2005). Australia's Food Industry: Recent changes and challenges. *Australian Commodities, 12*(2), 379–390.
Dixon, J. (2007). Supermarkets as new food authorities. In D. Burch & G. Lawrence (Eds.), *Supermarkets and agri-food supply chains* (pp. 29–50). Cheltenham: Edward Elgar.
Eising, R. (2009). *The political economy of state-business relations in Europe. Interest mediation, capitalism and EU policy-making*. London: Routledge.
European Commission. (2009, October 28). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. *A better functioning food supply chain in Europe.* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0591:FIN:EN:HTML Retrieved September 2011.
European Commission (2010) *Eurostat: Income and living conditions in Europe*. In: Atkinson AB, Marlier E (eds). Luxembourg: Publications Office of the European Union.
FAO (2010, December). *Global information and early warning system (GIEWS), crop prospects and food situation*. http://www.fao.org/giews/english/cpfs/index.htm Retrieved September 2011.
Fold, N., & Pritchard, B. (2005). *Cross-continental food chains*. London: Routledge.
Friedmann, H. (2005). From colonialism to green capitalism: social movements and emergence of food regimes. In F. Buttel & P. McMichael (Eds.), *New directions in the sociology of global development, research in rural sociology and development* (pp. 227–264). Oxford: Elsevier.
Friedmann, H. (2009). Discussion: moving food regimes forward: reflections on symposium essays. *The journal of Agriculture and Human Values, 26*(4), 335–344.
Fulponi, L. (2006). Private voluntary standards in the food system: The perspective of major food retailers in OECD countries. *Food Policy, 31*(1), 1–13.
Gamble, A. (1985). *Britain in decline: economic policy, political strategy, and the British state*. London: Macmillan.
Gilbert, C. L., & Morgan, C. W. (2010). Food price volatility. *The Royal Society Biological Sciences., 365*, 3023–3034. doi:10.1098/rstb.2010.0139.
Hall, P., & Soskice, D. (2001). *Varieties of capitalism: The institutional foundations of comparative advantage*. Oxford: Oxford University Press.
Heady, D., & Fan, S. (2008). Anatomy of a crisis: The causes and consequences of surging food prices. *The journal of the International Association of Agricultural Economists., 39*, 375–391.
INSEE—Institut National de la Statistique et des Etudes Economiques (National Institute of Statistics and Economic Studies) France. http://www.indices.insee.fr/bsweb/servlet/bsweb?action=BS_SERIE&BS_IDBANK=000637406&BS_IDARBO=06000000000000 Retrieved in November 2011.
Krugman, P. (2008). Grains gone wild. *The New York Times*. www.nytimes.com/2008/04/07/opinion/07krugman.html Retrieved September 2011.
Lang, T., Barling, D., & Caraher, M. (2009). *Food policy: Integrating health, environment and society*. Oxford: Oxford University Press.
McMichael, P. (2009a). A food regime analysis of 'the world food crisis'. *Agriculture and Human Values, 26*, 281–295.
McMichael, P. (2009b). A food regime genealogy. *The Journal of Peasant Studies, 36*(1), 139–169.
McMichael, P. (2009c). The world food crisis in historical perspective. *The Monthly Review*, *61*(03).
Meyer, J., & von Cramon-Taudabel, S. (2004). Asymmetric price transmission: A survey. *Journal of Agricultural Economics, 55*(3), 581–611.
Observatoire de la Formation des Prix et des Marges des Prix Alimentaires (2011) (Observatory of Price Development and Margins of Food Prices). Rapport au Parlement (Report to the Parliament). http://www.franceagrimer.fr/Projet-02/04infos_eco/observatoire/110627/Resume-4-pages_v2.pdf Retrieved November 2011.

Organisation for Economic Co-operation and Development (OECD): Agricultural Outlook 2010–2019. Highlights 2010.
Prime Minister's Science, Engineering and Innovation Council (PMSEIC) (2010). Australia and food security in a changing world ISBN 978 0642 72551 6.
Pritchard, B. (2005). Implementing and maintaining neoliberal agriculture in Australia. Part II: Strategies for securing neoliberalism. *International Journal of Sociology of Agriculture and Food*, *13*(2).
Schmidt, V. (2002). *The future of European capitalisms*. Oxford: Oxford University Press.
Schmidt, V. (2006). Adapting to Europe: Is it harder for Britain? *The British Journal of Politics & International Relations, 8*, 15–33.
Southgate, D., Graham, D., & Tweeten, L. (2007). *The world food economy*. Oxford: Blackwell.
Steele, C. (2008). *Hungry city*. London: Random House.
UK Competition Commission (CC). (2008). The supply of groceries in the UK—Market investigation. http://www.competition-commission.org.uk/rep_pub/reports/2008/538grocery.htm Retrieved October 2011.
UK Department of Environment, Food and Rural Affairs (Defra) (2004). Investigation of the determinants of farm-retail price spreads. Resource document by London Economics. http://www.londecon.co.uk/publication/investigation-of-the-determinants-of-farm-retail-price-spreads Retrieved October 2011.
UK Department of Environment, Food and Rural Affairs (Defra). The 2007/2008 agricultural price spikes—Causes and policy implications. http://archive.defra.gov.uk/foodfarm/food/security/price.htm Retrieved October 2011.
United Nations Conference on Trade and Development (UNCTAD). (2006). *The least developed countries report—Developing productive capacities*. http://www.unctad.org/en/docs/ldc2006_en.pdf Retrieved September 2011.
Zumbo, F. (2010). Interview presented in the age—Education resource centre: Rising food prices: Can competition help? http://education.theage.com.au/cmspage.php?intid=152&intversion=15 Retrieved October 2011.
Zysman, J. (1978). The French State in the international economy. In P. J. Katzenstein (Ed.), *Between power and plenty* (pp. 255–293). Madison, WI: The University of Wisconsin Press.

# Chapter 7
# Selecting Interventions for Food Security in Remote Indigenous Communities

**Christina Pollard**

## 7.1 Introduction

Complex and diverse environmental, economic, social and cultural factors are part of the determinants of health of Indigenous people living in remote communities in Australia. The community store plays a key role in the provision of food and other services in these communities (Altman et al. 2002; House of Representatives and Aboriginal and Torres Strait Islander Affairs Committee 2009) (Fig. 7.1).

This chapter focuses on the potential role of community stores in remote Indigenous communities to improve food and nutrition security and subsequent health outcomes and describes store-based government policy approaches to improving nutrition and health of Aboriginal people.

## 7.2 Remote Indigenous Australian Communities

Australia is a vast land with a low population density of 2.8 people per square kilometre (p/km$^2$) which varies by geographical location (from <0.1 p/km$^2$ in remote areas to >100 p/km$^2$ in inner-city areas) (Australian Bureau of Statistics 2010a, b). Most Australians reside in major cities, with only 2.3% living in remote or very remote areas, yet population estimates of Indigenous Australians suggest that about 25% of Australian Indigenous people and 38% of Indigenous children live in remote areas (Australian Institute of Health and Welfare 2009; Australian Bureau of Statistics 2008). The Northern Territory and Western Australia, large proportions of the Indigenous population live in remote areas, 81 and 41% respectively.

C. Pollard (✉)
Western Australia Department of Health, Curtin University's Policy, Law, and Communication, Perth, WA, Australia
e-mail: C.Pollard@curtin.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_7,

**Fig. 7.1** Poor quality and storage of fresh produce in a community store

Remoteness is measured by geographical location and access to goods, services and social interactions. There are over a thousand remote or very remote Indigenous communities in Australia, many with a population of less than a hundred people. About 175 community food stores provide the main source of food for many of these communities (House of Representatives and Aboriginal and Torres Strait Islander Affairs Committee 2009).

## 7.3 The Health Status of Indigenous Australians

Aboriginal and Torres Strait Islander people or Indigenous Australians, comprise approximately 2.5% of the overall Australian population, and is relatively young compared to the non-Indigenous population with 65% aged under 30 years of age, and almost half under 20 years. Indigenous children comprised 4.8% of the Australian child population in 2007, and although they represent a relatively small proportion of the Australian population, they represent 38% of the Indigenous population (Australian Institute of Health and Welfare 2009).

Indigenous Australians are the least healthy of all Australians. Significant gaps exist between the health status of Aboriginal and non-Aboriginal people and, for some health conditions, the gaps are widening (Kunitz 2000). Bailie and Wayte (2006) broadly described the health problems faced by people in remote communities using three interrelate categories: infectious diseases; problems resulting from social disruption and despair; and 'lifestyle related' disease (poor nutrition and lack of exercise and emotional stress) (Bailie and Wayte 2006). There is a significant disproportionate risk of lifestyle-related chronic diseases, low birth weight and poor dental health among Australian Indigenous people, that is, in part, preventable through diet. 'Lifestyle related' implies individual choice, but must include the significant environmental and supply side barriers that make it difficult to make lifestyle choices to reduce chronic disease risk in these communities.

Food has a direct influence on health and the prevention of non-communicable disease through improving nutrition (World Health Organization 2003). It has been estimated that poor diet contributes to approximately 19% of the Indigenous health gap overall (Vos et al. 2007a). Indigenous Australians have a lower life expectancy than their non-Indigenous counterparts, 12 years less for males and 10 years less for females in 2010 (Australian Institute of Health and Welfare 2011), although rates vary between jurisdictions and location including the extent of remoteness. Chronic disease including obesity, hypertension, cardiovascular disease, diabetes and renal failure accounts for about 80% of the mortality gap (Council of Australian Governments 2009). Australian infant mortality rates are very low overall, but Indigenous infant mortality rates, particularly those living in remote areas, are about three times higher. Indigenous mothers are twice as likely to have low birth weight infants, again, even more likely in very remote areas. Australian Indigenous children have almost twice the number of decayed, missing or filled teeth at 12 years.

## 7.4 Food Security, Progress and Government

At a country level, food security is closely linked to population health and economic development, a measure of a country's progress (Vos et al. 2007b). In 2009, the Australian Government expressed the relationship between health and progress as:

> 'People hope to have a long life, free from pain, illness or disability. Good health for all brings social and economic benefits to individuals, their families and the wider community' (Health: Key Points 2009). It has been asserted that 'The ultimate aim… [of] …food security is to arrive at a healthy and well-nourished population that can take on, to the maximum of its capacities, the development of its own community, area or country' (Roetter and Van Keulen 2008).

Government policy responses to food security focus on different issues at a global, national and household level. Global responses are generally about meeting the demand for food; ensuring primary food production and distribution networks meet the needs for the expanding world population by encouraging agricultural sustainability and international free trade (Hazell and Wood 2008). National policy responses usually also consider economic conditions, agro-ecological factors, wealth distribution and social justice issues (Ehrlich et al. 1993). At the household level, the local food supply and accessibility (ability to access food) which depends on financial and physical resources are the focus (Kamphuis et al. 2006).

Government agricultural agencies often lead and implement government policy responses to food insecurity, with health as minor or secondary consideration. Health agencies are becoming more involved in food security policy development. The World Health Organization Assembly resolution 56.23 in 2003, called for Member States to develop national food and agricultural policies consistent with the protection and promotion of public health, highlighting food safety and sustainable food security through promotion of food products consistent with a healthy diet, fiscal policies, food programmes and agricultural policies (World Health Organization 2003).

The Australian Government's 2004 Food Security Strategy focuses on trade liberalisation policy to increase global food security and uses the 1996 World Food Summit definition as food security:

> when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle (Australian Government 2004).

The strategy recognises an available and reliable food supply at all times and asserts that at community level the security is simply a matter of access to food.

The Australian government's domestic food security response occurs in the areas of health, agriculture and trade, if at all. Governments' commitment to implement policies to improve food security is key to the success of the 1996 World Food Summit pledge to reduce respectively the proportion and number of people who suffer from hunger and malnutrition by half by the year 2015. However, there is little evidence of the likelihood of reaching this target. Government food security policy responses need to focus on increasing the supply of nutritious foods, the distribution of food and the causes of food insecurity to be effective.

Australians living in remote Indigenous communities are susceptible to food insecurity (Australian Institute of Health and Welfare 2008b). The increased susceptibility to food insecurity for Australians living in remote Indigenous communities coupled with significantly poorer health outcomes has lead the Council of Australian Governments (COAGs) to consider strategies to improve both the supply and demand for nutritious foods in remote Indigenous communities to address these health disparities (Council of Australian Governments 2009). Improving the supply (affordability, quality and availability) and consumption of nutritious foods in remote areas is one important strategy to improve the health of Indigenous people (Australian Institute of Health and Welfare 2008a).

Little is known about the food purchasing and dietary consumption patterns of people residing in very remote Indigenous communities in Australia. Community store turnover provides apparent consumption data and has been used to assess the impact of interventions intended to improve dietary change such as the food BasicCard, which aims to quarantine money for allowable purchases e.g. food, whilst banning tobacco, alcohol, pornography and gambling products purchases through licenced retailers (Brimblecombe et al. 2010). These stores often operate as relatively closed markets serving small populations of isolated Indigenous communities, often providing a not-for-profit community service (Altman et al. 2002). However, it should be noted that it is likely that the community store is not the only available food source in these remote areas where fishing and hunting in groups is part of the food culture (Altman 2007). Also, food sharing is a common practice among Indigenous Australians, so traditional food consumption information, based on the individual, may need to be interpreted with caution.

## 7.5 Food Supply in Remote Communities

The food supply in remote Indigenous communities is poor. Perishable food delivery is irregular, the variety of food available is limited and often of low quality, food prices are high and food storage and preparation facilities are inadequate (Council of Australian Governments 2009). Supply chain logistics, in part, determine food security. The integrity of the food supply chain and storage facilities determines the quality of food available for sale, particularly perishable foods. All food costs more in remote areas. Surveys consistently find that healthy food baskets cost about 20–43% more in remote areas than in major cities (Harrison et al. 2007; House of Representatives Standing Committee on Aboriginal and Torres Strait Islander Affairs 2009; Landrigan and Pollard 2011; Givoni and Palermo 2010; Commonwealth Government 2011). The increase in the cost of healthy food rises faster than the Consumer Price Index for Australia. Most of the increase is due to the increasing cost of foods in very remote areas rather than in the major cities (Queensland Government 2007; Harrison et al. 2007, 2010; Commonwealth Government 2011). The cost of a basic healthy food basket was 32.6% higher in stores that were more than 2,000 km from Brisbane in 2006 (Harrison et al. 2010).

### *7.5.1 Transport: More than Just Kilometres*

Remote community food stores require most goods and services to travel long distances by road or barge. Road conditions influence the time required to transport these goods, it can take ten times as long in areas where there are simply no direct routes due to terrain. The Kimberly Echo on April 1 (2011) reported that:

> Floods have forced a re-route of Kimberley supplies through two States and the Northern Territory in a return journey covering the same distance as New York to Shanghai.

Transport logistics contend with extreme outside temperatures, long distance hauls, poor road conditions (and sometimes road closures due to flooding). Adequate refrigeration is needed so that perishable foods arrive in good condition—with regard to both quality and food safety. Some remote communities only have food delivered fortnightly or monthly. The 2008 Australian Parliamentary enquiry into food stores servicing remote Indigenous communities found that the food costs were high because of transport logistics required to deliver food to small communities in isolated geographical locations (House of Representatives and Aboriginal and Torres Strait Islander Affairs Committee 2009).

### *7.5.2 Food Business or Essential Service?*

Market forces and business drivers dictate grocery store locations and food prices. Global grocery chains (e.g. Woolworths and Coles) service areas of high population density but most grocery stores in regional or remote areas are independently owned. A community food store has 'one of the main purposes of the business as the provision of grocery items and drinks' (Northern Territory National Emergency Response at 2007: An Act to respond to the Northern Territory's National emergency, and for related purposes 2007). As the main, and sometimes the 'only', provider of food in many of these isolated areas, typically servicing communities of less than 150 people, the Indigenous community food store could be considered an 'essential service' rather than a viable business. Store governance, financial and retail management practices influence their ability to provide a consistent and affordable food supply to the community. Store ownership and management varies. Some communities own and run the store, others are subsidised by government, or managed by a management company, usually not-for-profit (in some cases establish by government) (House of Representatives and Aboriginal and Torres Strait Islander Affairs Committee 2009). Food businesses are required to meet regular regulatory requirements to enforce basic standards in food safety. Staff need to be adequately trained and standards maintained. There may be only limited training opportunities, if any, in remote communities. Building conditions are often poor and maintenance services are not readily available and/or very expensive.

### *7.5.3 Capacity to Access Food in Remote Indigenous Communities*

Food security depends on the available food supply and capacity to access that food. A family's capacity to access food in remote Indigenous communities depends on their financial and physical resources, food budgeting and preparation skills, knowledge and attitudes. Stores may provide banking facilities and are often in a position to provide the infrastructure to assist with income management (Fig. 7.2).

Some stores offer a tab, credit or 'Book-up' for food when community members do not have enough money to purchase foods (Australian Securities and Investments Commission 2005). Money management issues are relatively common for people on very low incomes, particularly if people run up big debts and cannot pay them off. Book-up systems may assist in emergency food relief in some communities provided they are transparently operated with achievable repayments (Altman et al. 2002). Where this is not the case there have been issues regarding theft, fraud and disclosure of PIN numbers.

Food access in remote communities may be dependent on personal transport. Many people use the community food store as their main source of food because the nearest option is in the next town which, due to distance, requires travel by car. Ready access to motor vehicles is low for Indigenous households in remote areas, 52 compared to 90% of non-Indigenous households (Australian Health Ministers' Advisory Council 2006).

**Fig. 7.2** Roads, terrain and weather hinder food transportation

Socioeconomic status influences the amount of disposable income available to be spent on food. Consumption of a healthy diet is more expensive in remote areas. Food costs in remote northern Australia found that food prices were most expensive in the NT, probably due to the fact that the NT is almost entirely a remote area. The price of a healthy food basket costs 24–29% more in very remote areas compared to the capital city in each jurisdiction (Landrigan and Pollard 2011) (Table 7.1).

Employment rates and household income levels of families living in remote areas are lower since many families are dependent on welfare. Welfare recipients need to spend a significantly greater proportion of their disposable income on food to achieve a healthy diet than those on an average income; 36–50 compared to 15–20% (Kettings et al. 2009; Landrigan and Pollard 2011; Commonwealth Government 2011).

### *7.5.4 The Solution: Addressing the Demand Side as Well as the Supply*

Improving the affordability, quality and availability of foods and beverages consistent with dietary recommendations is likely to increase their consumption, particularly perishable foods (fruit, vegetables and dairy foods). But, simply increasing supply and affordability of food does not mean community members will purchase and eat it. Strategies are required to increase the 'demand' for nutritious foods whilst reducing the purchase of foods and drinks high in sugar, fat and salt. Achieving both these steps would see a dietary pattern consistent with dietary guidelines and help to protect Indigenous people in remote Australia from diet-related chronic disease.

**Table 7.1** Market Baskets Comparison per Fortnight for Perth (2010), Darwin (2008) and Brisbane (2006) Inflated with Consumer Price Index (CPI) Increases to September 2010 (Landrigan and Pollard 2011)

| Basket | State mean $ | Major cities $ | Inner regional $ | Outer regional $ | Remote $ | Very remote $ | Increase from major cities to very remote % |
|---|---|---|---|---|---|---|---|
| WA HFAB | 542 | 508 | 507 | 501 | 568 | 627 | 23.5 |
| QLD HFAB[a] | 511 | 498 | 513 | 536 | 527 | 618 | 24.2 |
| WA NTMB | 550 | 505 | 510 | 508 | 578 | 652 | 29.1 |
| NT MB[b] | 706 | 572[c] | – | 704 | 654 | 717 | 25.2 |

[a]The Brisbane CPI for food increase from June 2006 to September 2010 of 11.6% was used to inflate QLD prices
[b]The Darwin CPI for food increase from June 2008 to September 2010 of 6.2% was used to inflate NT prices
[c]The Darwin supermarket price was used for the cost of the basket in a Major city

## 7.6 Background to Australian Government Food Security Policy

Australian Governments have been working to reduce this geographically distributed inequity for many years, particularly to reduce the impact of food insecurity and poor health among Indigenous Australians:

- 2001—Health Ministers approve the *National Aboriginal and Torres Strait Island Nutrition Strategy and Action Plan, 2000–2010 (NATSINSAP)*—priority action areas: food supply in remote communities; food security; environmental and household infrastructure; workforce; and monitoring systems. (Strategic International Nutrition Alliance 2001).
- 2002/2003—Northern Australian Health Ministers committee releases *Food North: Food for Health in Northern Australia* with options to improve food availability and affordability (Office of Aboriginal Health 2003).
- 2004—*Food Security Strategy* announces initiatives to enhance food security in the developing world (Australian Government 2004).
- 2005—*Remote Indigenous Stores and Takeaways* (RIST) develops a national approach to improving access to healthy foods. *Indigenous Business Australia* commits to improve community stores sustainability and *Outback Stores* is established to improve the supply, quality and range of nutritious food.
- 2006—*Aboriginal and Torres Strait Islander Health Performance Framework* reports improvements but emphasises addressing chronic disease determinants, particularly nutrition.
- 2007—*Northern Territory National Emergency Response Act 2007* (NTER) responds to the *Board of Inquiry into the Protection of Aboriginal Children from Sexual Abuse* (Northern Territory Government 2007). A community stores licencing scheme improves supply and consumption of nutritious food using income management and employment reforms.

- 2008—House Standing Committee on Aboriginal and Torres Strait Islander Affairs, *Everybody's Business: Remote Aboriginal and Torres Strait Community Stores* report outlines options for the role and management of community stores and strategies to improve nutrition, transport, food supply and affordability, regulation, policy and interventions (House of Representatives and Aboriginal and Torres Strait Islander Affairs Committee 2009).
- 2009—COAGs *National Remote Indigenous Food Security Strategy* (NRIFSS) announced to improve health through supply and demand side strategies to increase the consumption of healthy food (Council of Australian Governments 2009). NTRE evaluation reports that income management increased household expenditure on food and children, more young men shopping and reductions in drinking and gambling, and half parents said their children eat more, weigh more and were healthier (Australian Government 2010). Income management disadvantages: less discretionary cash, managed money restrictions, blanket coverage discriminatory. NATSINSAP review highlights poor nutrition and the need for ongoing specific actions and adequate resourcing for implementation.
- 2010—range, quality and affordability of nutritious food improved through income management and store licencing—income management extended to 66 community stores assisting 16,600 people. Strategies are needed to increase demand for and consumption of healthy food even with 83 stores licenced and reports of 71% of income management money allocated towards food (Australian Government 2009a, b). National Preventative Taskforce recommended subsidies for remote area transport of fresh foods (National Preventative Health Taskforce 2009).

Over the decade, in response to consultations, internal and external advocacy, and research providing evidence to inform actions, governments appear to be more willing to strategically address the problem through a comprehensive range of interventions, including 'hard' policy options such as regulation and fiscal measures.

## 7.7 Steps to Develop a Strategic Policy Approach to Improve Food Security

A system-wide approach is required when developing policies and interventions to reduce diet-related diseases (Hawkes 2007, 2008; Hawkes et al. 2006). Specific influences and points of leverage along the entire food supply chain can be used to modify the foods available for purchase and consumption as well as food choice (Hawkes 2008). A systematic approach consists of four main steps: firstly, define the public health problem and its key determinants; secondly, work out what can be done and what should be done; thirdly, assess and select appropriate actions; and fourthly monitor and evaluate intervention impacts to inform the policy cycle (National Public Health Partnership 2000b).

### 7.7.1 Step 1: Defining the Problem—Food Security and Its Determinants

How you define and measure a problem influences how you respond. This is particularly true for policy development. Achieving an agreed and specific definition of food security and its determinants is essential, as well as an understanding of the determinants. A clear definition provides the context for action and assists with identifying the desired outcomes. Farrell (2007) asserts that the Australian government's definition of remote Indigenous communities as being in a very remote location with a population of more than 100 people and predominantly of Aboriginal or Torres Strait Islander origin' would exclude 75% of the 1,187 discrete remote communities with populations of less than 50 (Farrell 2007).

Pinstrup-Andersen reminds us that 'food security' is a valuable concept if it is used with a clear understanding of what it means, its interactions and how it interacts with behaviour and non-food factors (Pinstrup-Andersen 2009).

The Australian government considers the ability of individuals, households and communities to acquire appropriate and nutritious food on a regular and reliable basis using socially acceptable means, is determined by people's local 'food supply' and their capacity and resources to 'access and use food'(Council of Australian Governments 2009). Food supply refers to:

> 'the availability, cost, quality, variety and promotion of foods for local population groups that will meet nutritional requirements' and food access refers to 'the range of physical and financial resources, supports, and knowledge, skills and preferences that people have to access and consume nutritious food' (Council of Australian Governments 2009, p 3).

As discussed, food security determinants are complex, interdependent and vary according to the context. Policy should be considered at an individual, sub-population and a population level. The food insecure may vary in age, gender, socioeconomic status, geographic location and ethnicity. A food security model to select interventions should assess information about factors that affect supply, access and consumption of food (Pinstrup-Andersen 2009). Figure 7.3 is a schematic of food security determinants in remote Indigenous communities in Australia.

Food security would be achieved through equitable access to a reliable supply of safe, nutritious, culturally appropriate and affordable food; social and economic status providing an adequate income, and food consumption consistent with dietary recommendations.

The COAGs NRIFSS aimed to deliver improved health outcomes by improving the supply and consumption of healthy food through a series of small, coordinated actions. Each state and territory has different local conditions and current activities e.g. the number and location of stores, store ownership, community readiness and existing interventions. The NRIFSS built on the NTER and aims to improve food security through a nationally coordinated approach to increase the supply of and demand for nutritious foods through community stores and for the partnerships to increase the capacity and infrastructure to sustain these changes. The systematic approach to identifying the problem, determinants and potential solutions engaged a number of sectors.

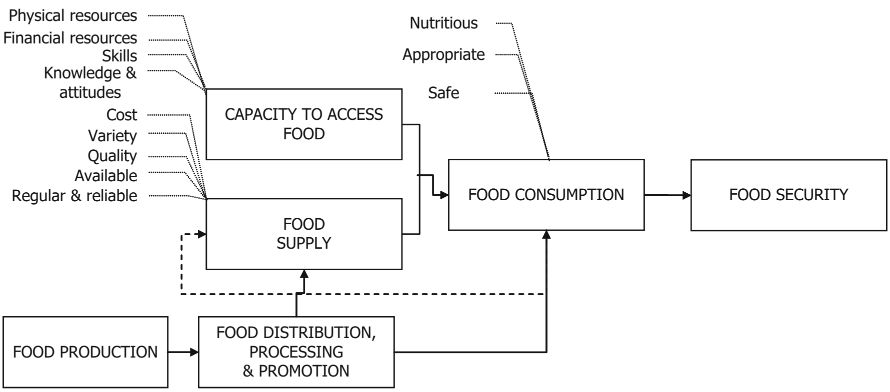



**Fig. 7.3** Food security model

| Focus area / Type of intervention | Store governance | Best retail practice | Stocking healthy food | Financial management | Subsidies for healthy food | Freight subsidies | Local food production | Banking & Credit | Take Away food | Increasing demand healthy | Workforce & training | Monitoring & reporting |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Legislation | | | | | | | | | | | | |
| Policy | | | | | | | | | | | | |
| Training & Skills Development | | | | | | | | | | | | |
| Promotion of healthy Food | | | | | | | | | | | | |
| Monitoring and research | | | | | | | | | | | | |
| Strategic Leadership | | | | | | | | | | | | |
| Infrastructure support | | | | | | | | | | | | |

**Fig. 7.4** Ranking grid potential remote indigenous community store food security interventions

## 7.7.2 *Step 2: What Could or Should Be Done?*

Better health is the ultimate outcome, but many of the determinants of the problem lie outside health's sphere of influence or are often the responsibility of other sectors, for example, agriculture, transport, education or trade. A comprehensive range of interventions need to be considered (National Public Health Partnership 2000a). Effective intervention development looks for opportunities for action at all levels and builds on what has gone before. Governments look to existing strategies, particularly those which have been well described and evaluated (often within the peer reviewed literature or through relevant consultation) to identify the critical factors for success. For example, two effective interventions to improve the food supply and increase the purchase of healthy foods in remote community stores were considered were regulatory interventions and creating demand through price elasticity.

Regulatory interventions apply policy and laws to protect public health and safety can increase the supply of nutritious food. The NT National Emergency

Response Act, number 129, 2007 Part 7-Licensing of community stores (NTER) increased the supply of foods to remote stores, but acknowledged that:

> the licensing scheme has not done enough to improve the affordability of food items, particularly fresh healthy food. (Australian Government 2009a, b pg 19).

Replication of this intervention was not realistic due to the cost of implementation (over $100 million over 4 years in the NT) and different regulatory environment in states not allowing for replication of the Emergency Response Intervention. However, given the effectiveness of the intervention, other ways to achieve the same end were sought, through the notion of a voluntary licencing scheme.

Price elasticity of demand options can influence food choice. A 10% reduction in the cost of vegetables could facilitate a 7% increase in purchase (Bond et al. 2010) and a 10% increase in soft drinks price would reduce consumption by 8–10% (Andreyeva et al. 2010). Food pricing surveys show opportunities to reduce the comparative cost of fruit, vegetables and dairy foods in remote stores (Landrigan and Pollard 2011; Queensland Government 2007).

Income management including the use of a food BasicsCard, quarantining a proportion of welfare payments for use at the store dis-allowing the purchase of alcohol, tobacco and pornography appears to have had a temporary effect on food purchasing (Brimblecombe et al. 2010). However, there are conflicting findings concerning longer term outcomes. Government reports show a range of benefits (Australian Government 2009a, b) whereas other authors suggest limited impact and question the value for those most at risk (Brimblecombe et al. 2010; Farrell 2011).

### *7.7.3 Step 3: Appraising Interventions to Decide Options*

Intervention selection requires a critical appraisal of options. A comprehensive portfolio of strategic and effective interventions is required to reach public health outcomes. The NRIFSS aimed to identify a small set of coordinated and specific actions to improve food security by:

1. Improving the supply of healthy food in remote Indigenous community.
2. Increasing the consumption of healthy food in remote Indigenous community.
3. Improving the way sectors worked together.

The relative strengths and weaknesses of interventions are systematically assessed against criteria (National Public Health Partnership 2000a; Pollard et al. 2008). Discussing intervention assessments leads to a shared understanding of what is being proposed. Views on the potential effectiveness of interventions will vary based on and experience. Ample opportunity should be provided to share the reasoning behind each sector's ranking to form an agreed understanding of the relative benefit, or not, of each intervention type (see Figure 7.4).

Relying on the available evidence, their knowledge and professional judgement, each decision-maker weights each intervention to select priorities for action. Seven intervention types across 12 priority areas are ranked against each criterion (effectiveness, sustainability, feasibility and political acceptability (National Public Health Partnership 2000a, b)) to assess their suitability. The grid is deceptive in its simplicity, but it is a broad-brush assessment that works best when well-informed decision makers are at the table and when evidence of effectiveness of interventions is available. As always, the devil is in the detail. Once interventions are assessed, difficult decisions relating to potential partners, funding and specific responsibilities need to be considered.

Ministers agreed on specific strategic actions that could be undertaken by the Commonwealth of Australia, QLD, WA, SA and the NT (Council of Australian Governments 2009). Strategic actions were to develop national community stores standards (e.g. retail and financial management, governance, infrastructure, nutrition promotion and food safety); a Quality Improvement Scheme; incorporate stores under the Corporations (Aboriginal and Torres Strait Islander) Act 2006 to ensure high standards of governance and accountability of stores; and a national healthy eating action and workforce plan.

### *7.7.4 Step 4: Continuous Improvement Cycle*

Specific and measurable goals and targets help manage policy implementation, and require a prediction of the amount of change that would reasonably be expected in a given time (Nutbeam et al. 1993). Aboriginal and Torres Strait Islander Social Justice Commissioner and the Steering Committee for Indigenous Health Equality targets to close the Indigenous health gap include; that *>90 per cent of indigenous families have access to a healthy food basket for a cost of less than 25 per cent of their available income* (Aboriginal and Torres Strait Islander Social Justice Commissioner and the Steering Committee for Indigenous Health Equality 2008). This would require monitoring of food pricing, household income, expenditure and welfare payments. Targets measuring change in food security in remote Indigenous community are difficult due to the lack of monitoring and surveillance of the issues and reliance on proxy measures (Webb et al. 2006). Comprehensive monitoring and evaluation of the impact of food security interventions using indicators such as food chain management outcomes (quality, affordability, reliability), access (income, economy), supply, purchasing, consumption and nutrition is warranted with an emphasis on those most at risk—infants, children and the elderly.

## 7.8 Conclusion

Policy makers need to take four steps when choosing which interventions to improve food security. Define the problem, consider 'what could or should be done?', appraise the intervention options and then monitor the impacts to continue the improvements. Sustained action across all sectors is required to address the structural and systemic problems that have resulted in food insecurity in many remote Indigenous communities.

## References

Aboriginal and Torres Strait Islander Social Justice Commissioner and the Steering Committee for Indigenous Health Equality. (2008). *National Indigenous Health Equality Targets Outcomes from the National Indigenous Health Equality Summit Canberra, March 18–20*. Human Rights and Equal Opportunity Commission.

Altman, J. C. (2007). Alleviating poverty in Indigenous Australia: The role of the hybrid economy. In *Topical issue* (Vol. 10, pp. 1–9). Canberra: Centre for Aboriginal Economic Policy Research, The Australian National University.

Altman, J., McDonnell, S., & Ward, S. (2002). *Indigenous Australians and competition and consumer issues: A review of the literature and an annotated bibliography*. CAEPR Working Paper No. 12/2002. Centre for Aboriginal Economic Policy Research. Canberra.

Andreyeva, T., Long, M. W., & Brownell, K. D. (2010). The impact of food prices on consumption: A systematic review of research on the price elasticity of demand for food. *American Journal of Public Health, 100*(2), 216–222.

Australian Bureau of Statistics. (2008). *4704.0- The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples*. Canberra.

Australian Bureau of Statistics. (2010a). *Regional Population Growth, Australia, 2009–10*. Retrieved May, 2011, from http://www.abs.gov.au/Ausstats/abs@.nsf/mf/3218.0

Australian Bureau of Statistics. (2010b). *Year book Australia, 2009–10*. Retrieved May, 2011, from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/CEBE696C34C36C6ECA25773700169C5E?opendocument

Australian Government. (2004). *Food security strategy*. Canberra: AusAID Public Affairs Group.

Australian Government. (2009a). *Report on the Northern Territory Emergency Response Redesign Consultations*. Canberra: Commonwealth of Australia.

Australian Government. (2009b). *Future Direction for the Northern Territory Emergency Response: Discussion Paper*. Canberra: Commonwealth of Australia.

Australian Government. (2010). *Closing the Gap. Prime Minister's Report 2010*. Canberra: Commonwealth of Australia.

Australian Government. (2011). *Northern Territory emergency response evaluation report 2011*. November 2011. Canberra, Department of Families, Housing, Community Services and Indigenous Affairs.

Australian Health Ministers' Advisory Council. (2006). *Aboriginal and Torres Strait Islander Health Performance Framework 2005*. Canberra.

Australian Institute of Health and Welfare. (2008a). *Aboriginal and Torres Strait Islander Health Performance Framework, 2008 report: Detailed analyses*. AIHW Cat. No. IHW 22, Canberra.

Australian Institute of Health and Welfare. (2008b). *Australia's Health 2008*. Canberra: AIHW.

Australian Institute of Health and Welfare. (2009). *A picture of Australia's children 2009*. Canberra: AIHW.

Australian Institute of Health and Welfare. (2011). *Contribution of chronic disease to the gap in mortality between Aboriginal and Torres Strait Islander people and other Australians*. Cat. no. IHW 48.

Australian Securities and Investments Commission. (2005). *Dealing with book up: A guide*. Canberra.

Bailie, R. S., & Wayte, K. J. (2006). Housing and health in Indigenous communities: Key issues for housing and health improvement in remote Aboriginal and Torres Strait Islander communities. *Australian Journal of Rural Health, 14*(5), 178–183.

Bond, C., Williams, M., Crammond, B., & Loff, B. (2010). Taxing junk food: Applying the logic of the Henry tax review to food. *The Medical Journal of Australia, 193*(8), 472–473.

Brimblecombe, J. K., McDonnell, J., Barnes, A., Dhurrkay, J. G., Thomas, D. P., & Bailie, R. S. (2010). Impact of income management on store sales in the Northern Territory. *Medical Journal of Australia, 192*(10), 549–554.

Council of Australian Governments. (2009). *National strategy for Food Security in Remote Indigenous Communities*. Retrieved February 9, 2011, from http://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/docs/nat_strat_food_security.pdf

Ehrlich, P. R., Ehrlich, A. H., & Daily, G. C. (1993). Food security, population and environment. *Population and Development Review, 19*(1), 1–32.

Farrell, D. (2007). *Housing and infrastructure in Aboriginal and Torres Strait Islander Communities. Australia 2006 (Reissue)* (Vol. 4710.0). Canberra: Australian Government.

Farrell, J. (2011). Income quarantining—the cure or the cause? *Parity, 24*(6), 33–35.

Givoni, N., & Palermo, C. (2010). Monitoring the cost of healthy food. *Australian and New Zealand Journal of Public Health, 34*(4), 433–434.

Harrison, M., Coyne, T., Lee, A., Leonard, D., Lowson, S., Groos, A., et al. (2007). The increasing cost of the basic foods required to promote health in Queensland. *Medical Journal of Australia, 186*(1), 9–14.

Harrison, M., Lee, A., Findlay, M., Nicholls, R., Leonard, D., & Martin, C. (2010). The increasing cost of healthy food. *Australian & New Zealand Journal of Public Health, 34*(2), 179–186.

Hawkes, C. (2007). Regulating and litigating in the public interest: Regulating food marketing to young people worldwide: Trends and policy drivers. *American Journal of Public Health, 9*(11), 1962–1973.

Hawkes, C. (2008). Agro-food industry growth and obesity in China: What role for regulating food advertising and promotion and nutrition labelling? *Obesity Review, 9*(Suppl 1), 151–161.

Hawkes, C., Asfaw, A. et al. (2006). Evidence on the determinants of dietary patterns, nutrition and physical activity, and the interventions to maintain or to modify them: A systematic review. London, *The International Food Policy Research Institute to the World Cancer Research Fund,* American Institute for Cancer Research.

Hazell, P., & Wood, S. (2008). Drivers of change in global agriculture. *Philos Trans R Soc Lond B Biol Sci, 363*(1491), 495–515.

Health: Key Points. (2009). In *Measures of Australia's progress 2006* (Vol. 1307.0, pp. 32–29). Australian Bureau of Statistics.

House of Representatives, Aboriginal and Torres Strait Islander Affairs Committee. (2009). *Everybody's business. Remote aboriginal and Torres Strait community stores*. Canberra: Parliament of the Commonwealth of Australia.

Kamphuis, C. B. M., Giskes, K., de Bruijn, G.-J., Wendel-Vos, W., Brug, J., & van Lenthe, F. J. (2006). Environmental determinants of fruit and vegetable consumption among adults: A systematic review. *British Journal of Nutrition, 96*(4), 620–635.

Kettings, C., Sinclair, A., & Voevodin, M. (2009). A healthy diet consistent with Australian health recommendations is too expensive for welfare-dependent families. *Australian & New Zealand Journal of Public Health, 33*, 566–572.

Kunitz, S. J. (2000). Globalization, states, and the health of indigenous peoples. *American Journal of Public Health, 90*(10), 1531–1539.

Landrigan, T., & Pollard, C. (2011). *Food access and cost survey, Western Australia, 2010*. Perth: Department of Health in Western Australia.

National Preventative Health Taskforce. (2009). *Australia: The healthiest country by 2020. National Preventative Health Strategy—the roadmap for action 30 June 2009*. Canberra: Australian Government.

National Public Health Partnership. (2000a). *Deciding and specificying an intervention portfolio. Public health planning and practice improvement*. Melbourne: National Public Health Partnership.

National Public Health Partnership. (2000b). *A planning framework for public health practice. Public health planning and practice improvement*. Melbourne: National Public Health Partnership.

Northern Territory Government. (2007). Ampe Akelyernemane Meke Mekarle "Little Children are Sacred" In our Law children are very sacred because they carry the two spring wells of water from our country within them. *Report of the Northern Territory Board of Inquiry into the Protection of Aboriginal Children from Sexual Abuse*. Darwin.

Northern Territory National Emergency Response at 2007: An Act to respond to the Northern Territory's National emergency, and for related purposes. (2007).

Nutbeam, D., Wise, M., Bauman, A., Harris, E., & Leeder, S. (1993). *Goals and targets for Australias health in the Year 2000 and beyond*. Sydney: Commonwealth of Australia.

Office of Aboriginal Health. (2003). *FoodNorth: Food for health in North Australia*. Perth: Department of Health in Western Australia.

Parliament of Australia. House of Representatives Standing Committee on Aboriginal and Torres Strait Islander Affairs. (2009). *Inquiry into community stores in remote Aboriginal and Torres Strait Islander communities: Comments against terms of reference*, Canberra.

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security, 1*, 5–7.

Pollard, C. M., Lewis, J. M., & Binns, C. W. (2008). Selecting interventions to promote fruit and vegetable consumption: From policy to action, a planning framework case study in Western Australia. *Australia and New Zealand Health Policy, 5*, 27.

Queensland Government. (2007). *The 2006 Healthy Food Access Basket (HFAB) Survey*.

Roetter, R., & Van Keulen, H. (2008). Food security. In R. Roetter, H. Van Keulen, J. Verhagan, M. Kuiper, J. Verhagen, & H. Van Laar (Eds.), *Science for agriculture and rural development in low-income countries* (pp. 27–56). Dordrecht: Springer.

Strategic International Nutrition Alliance. (2001). *Eat well australia: a strategic framework for public health nutrition/national aboriginal & Torres Strait Islander nutrition strategy & action plan*. Canberra, Melbourne: National Public Health Partnership.

The Kimberley Echo. (2011). *Reporter Kim Macdonald, Truckies' epic drive to deliver food April 1, 2011, 7:05 am*. Retrieved March 26, 2011, from http://au.news.yahoo.com/thewest/regional/kimberley/a/-/news/9218807/truckies-epic-drive-to-deliver-food/

Vos, T., Barker, B., Stanley, L., & Lopez, A. (2007a). *The burden of disease and injury in Aboriginal and Torres Strait Islander peoples 2003*. Brisbane: School of Population Health, The University of Queensland.

Vos, T., Goss, J., Begg, S., & Mann, N. (2007b). *Projection of health care expenditure by disease: A case study from Australia*. Centre for Burden of Disease and Cost-effectiveness, School of Population Health, Australian Institute of Health and Welfare, University of Queensland.

Webb, P., Coates, J., Frongillo, E. A., Rogers, B. L., Swindale, A., & Bilinsky, P. (2006). Measuring household food insecurity: Why it's so important and yet so difficult to do. *The Journal of Nutrition, 136*(5), 1404S–1408S.

World Health Organization. (2003). *World Health Assembly resolution WHA57.17—Global strategy on diet, physical activity and health*. Geneva: WHO.

# Chapter 8
# Hungry for Change: The Sydney Food Fairness Alliance

**Frances Parker and Elizabeth Morgan**

## 8.1 Introduction

The Sydney Food Fairness Alliance is one of a growing number of nascent food movements in Australia to have emerged out of concern for the country's food future, as well as the deleterious effect the present food system is having on its citizens' health and the continent's fragile environment (Coveney 2000; Lockie et al. 2002). Until recently, food security has been perceived as a matter of concern for developing countries but not for Australia, which is generally seen as a country in which food is plentiful (Edwards and Mercer 2010) and which is a major food exporter to the rest of the world (Ingram et al. 2010).

The formation of the Alliance in 2005 preceded the current surge of public interest in the food system, particularly since 2007, which can be attributed to concerns about the global food crises, the effect of climate change and peak oil on food production, the recent drought, the loss of agricultural land due to urbanization as well as mining (Mason and Knowd 2010; Merson et al. 2010), together with a consumer-led desire for fresh local food and gourmet foods, and fears about food security among some sections of the community. Approximately one million Australians (about 5% of the population) are "food insecure" at an individual, or household level, meaning that at some stage they have run out of food and are unable to buy more (Nolan et al. 2006). In addition, there is considerable apprehension about rising levels of obesity, with its deleterious effects on health and a precursor of prevalent chronic diseases such as diabetes and cardiovascular problems (Friel 2010). There is less overt recognition that obesity

F. Parker
Centre for Social Justice and Social Change, University of Western Sydney,
Sydney, NSW, Australia

E. Morgan (✉)
Department of Environment and Geography, Macquarie University in Sydney,
Sydney, NSW, Australia
e-mail: elizabeth.morgan@mq.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_8,

disproportionately affects those on low incomes. Food security is no longer viewed as solely a difficulty faced by other less-developed countries; it is being recognized as an Australia-wide problem with the potential to affect everyone's life, from the level of household sustenance to national food resilience. Australia is not as food secure as many would claim (Dixon et al. 2011).

Food security as a human right lies at the heart of the Alliance's philosophy, and equitable and sustainable food policies for New South Wales are a core focus of its advocacy. Many food-related new social movements (NSMs) have a single or narrow focus, such as specific food production methods (permaculture, organics), food manufacturing and processing (such as the debate on genetically modified foods; sugars, additives, and preservatives in processed foods), the rights of animals, and health (obesity), for example. The Alliance arguably occupies a distinctive niche among these organizations and individuals taking action on food security in Australia for two principal reasons; first, it is an eclectic alliance of individuals and organizations, private and public, many of whom hold contradictory views on food security, the food system, what needs to change, how and by whom; second, it operates in a specific, geographically defined urban/peri-urban space (Sydney). It attempts a whole-of-food-system synergy by providing a forum for all stakeholders to coalesce and network through a single entity. According to a key alliance member:

> We have come up with an idea whose time has come [but] we now need to move beyond the rhetoric to implementation, not only on a local scale as demonstrated by individual small projects, but at a broader level by effectively addressing issues such as urban planning. There are wide gaps in the food system.

The Alliance's structure and activities clearly position it as an NSM. It is engaged in collective action on a specific issue, in this instance, food security/justice, and operates outside the political sphere while aiming to influence and affect societal change (Larana et al. 1994; Wright and Middendorf 2007). It seeks a socially just and equitable food system for NSW, through food policies shaped by a consultative, bottom-up, stakeholder-driven process, acknowledging that "trust and cooperation are now crucial considerations in the development of public policy" (Coveney 2000 p. S98). However, the Alliance, like other food justice movements, can struggle to make its voice heard and effect change in a system that is largely apathetic, possibly due to a general lack of knowledge.

Its membership is very diverse reflecting the range of interests it envisages will influence and shape state food policies. In 2011, there were more than 200 individual and group members, representing a wide range of stakeholders in the food system: primary producers, farmer networks, community gardeners, academics, and professionals working in a wide range of government agencies, nongovernmental organizations, with an interest in broad issues such as environmental sustainability, urban and peri-urban food production, health and nutrition, welfare and social justice. While there are inevitable tensions, the membership sees this cross-sectoral approach as essential to effectively address the complexities of the current food system. But if the Alliance is a food movement, whose interest(s) does it represent?

Any organization claiming to represent a multitude of interests with a single voice runs the risk of being seen to, or actually, privileging the needs of one sector over another (Winson 2010). This is a challenge for the Alliance in seeking to represent such a diverse range of stakeholders. Some are more likely than others to be marginalized in organizations of this nature. Farmers, either through a sheer inability to leave their farm to attend meetings in the city; from a suspicion of activist groups, or the fact that many are from non-English speaking backgrounds, are less likely than other stakeholders to have a voice.

The Alliance has two principal stated objectives: "working towards food security and sustainable food systems" and "shaping food policies that are fair and sustainable". This requires seeking meaningful and effective engagement with the political system at local, state, and federal government level. As the British food policy expert Tim Lang writes: "Food systems are the outcome of policy and political choices. Food is contested territory. There are conflicts of analysis and interest between diverse groups and sectors" (Lang 1999 p. 169). The Alliance aims to achieve "a mix of urban food strategies that try to do more than just 'feed the city' [Sydney]" (Sonnino 2009 p. 426). It strives to build capacity among smaller food producers and retailers; to foster the health benefits of a good diet, and to help make urban and peri-urban spaces more than the classical urban sprawl by retaining the productive agricultural land on the city's fringes and promoting more food growing in the city.

Starting from the premise that the Alliance is a distinctive food movement in that it positions itself as an "umbrella" organization representing a wide range of stakeholders in the food system, this chapter reflects on the values, achievements, issues of concern, strengths and weaknesses, and future of the Sydney Food Fairness Alliance. The information in this chapter is based on the meetings and events of the Alliance; on qualitative data collected by email survey responses to specific questions posed by the authors using email to all members of the Alliance's list server, and on one-to-one interviews with key participants in the formation of the Alliance.

## 8.2 Food Security, Food Sovereignty, or Food Democracy?

Divergent interpretations of the contested term "food security" exist, and therein lies the danger of using the term in a generic sense without some definition. The Alliance's definition of food security is: "When all people, at all times, have the ability to access and prepare sufficient, nutritious and affordable food necessary for an active and healthy life" (Sydney Food Fairness Alliance website). Food sovereignty is a more recent concept than food security, and similarly is a contested term. The term food sovereignty arose from the global agricultural peasant resistance movement, La Via Campesina. This movement, which focuses on "the social and economic conditions under which food ends up on the table" (Patel 2007 p. 90), was formed in 1993 to counter the hegemony of the global conventional food system and return power and control to the food producers and consumers. Food sovereignty, in this context, is conceptualized as a "bottom-up" process.

The Canadian food activist Wayne Roberts argues that food security lies within the concept of food sovereignty: "When food is of, by and for the people then food security lies in food sovereignty" (Roberts 2008 p. 52). Roberts is arguing that food sovereignty lies in action, autonomy and control, with food security being just one outcome of that process. Others, such as Hassanein (2003), use "food democracy", the key distinguishing characteristic being that "participation is a key feature of democracy" (Hassanein 2003 p. 79). He concurs with Tim Lang, Professor of Food Policy at City University London, whom he credits with conceptualizing and popularizing the term, that food democracy is more of a bottom-up process, involving full social engagement.

## 8.3 The Sydney Food Fairness Alliance: Beginnings and Evolution

Like many NSMs, the Alliance began with a simple conversation. In 2004, Gabriela Martinez from the Sydney South West Area Health Service's (SSWAHS) "Running on Empty" food security program for low-income families in Villawood, western Sydney, contacted Jill Finnane of the social justice nongovernmental organization, the Edmund Rice Centre. They began exploring ways of working together on food security by linking social justice and environmental concerns, which were seen as "two sides of the coin" (Martinez 2011 pers. comm.).

Links were then established between the Edmund Rice Centre, SSWAHS's Running on Empty program (2001–2004), and the Penrith Food Project, a multi-pronged strategy established in 1991 by Penrith City Council to improve food access in Penrith, in outer western Sydney (Reay and Webb 1998). The Penrith Food Project, in turn, led to the establishment of the Hawkesbury Food Program and Sydney's Fresh Food Bowl Network, two local government initiatives. In addition to addressing the themes of food security and environmental sustainability and justice, links were established with farmers in the Sydney Basin by Sheryl Jarecki (Parker 2007). She arranged for participants in the Villawood Food Project to visit farms in the adjacent peri-urban areas, which "really opened our eyes to another perspective" (Martinez 2011 pers. comm.).

In May 2005, a Food Fairness Forum was held in Liverpool, an outer suburb of Sydney, attended by about 90 participants. This forum identified many issues, including the need to push for state food policies. The forum's network included Liverpool City Council's South Creek Agricultural Education Partnership Project, the Australian City Farms & Community Gardens Network, the Council of Social Service of New South Wales, and Uniting Care Burnside. However, at this early stage most links were being forged between individuals (often working for relevant organizations) rather than between organizations per se.

The range of questions for discussion at the forum highlighted the strong social justice component of the embryonic Sydney Food Fairness Alliance:

How can food feed jobs and the local economy?
How can we regain culture and community through food action?
Why is agriculture and land preservation in the Sydney Basin important?
How are poverty and food security related?

The forum brought into sharp focus one of the principal criticisms that food movements comprise elitist, white, middle-class people who can afford all the good food they could possibly wish to eat (Guthman 2008; Johnston 2008). As one Alliance member notes:

> [The] term food security has been hijacked/reinterpreted by those who see only one half of the food system – production – and overlook the right of access to health-enhancing food so that we are developing a two-tier food system; expensive organics and farmers' markets for the wealthy and educated, and cheap, less-nutritious food for those on low incomes who then get blamed for being obese.

This view is countered by Donald and Blay-Palmer's research into small- and medium-sized food manufacturers in Canada when they found that "contrary to a widely held view, the creative-food industry is not just about promoting exclusive foods for the pleasure of [an] urban elite. Rather, it offers an opportunity for a more socially inclusive and sustainable urban development model" (Donald and Blay-Palmer 2006 p. 1901). These divergent views highlight the very strong beliefs and emotions held about food. At a follow-up meeting four months later a decision was made to form the Sydney Food Fairness Alliance. Working subgroups were established: education and research; communication and networks; local council and planning; and advocacy. Each had nominated "champions" who volunteered to take action in those broad areas.

## 8.4 Formal Launch, Governance, and Activities

The Alliance was formally launched in NSW Parliament House in October 2006, during Anti-Poverty Week. The venue highlighted the value of establishing political contacts and the importance of lobbying. Frances Parker as a speaker at the launch of the SFFA provided a range of views, ranging from social justice (with speakers such as Aunty Beryl Van-Oploo, who runs an Aboriginal café and catering traineeship project, and the former president of the International Council on Social Welfare, Professor Julian Disney, who initiated Anti-Poverty Week) to the loss of agricultural land due to urbanization, with its effect on local food production, and the livelihoods of farmers from culturally and linguistically diverse backgrounds.

Incorporation as a non-profit in (the same year) led to the establishment of an elected formal management committee that has since varied in size from seven to 10 members. Most of the Alliance's work has been by volunteers but since August

2010 a part-time worker has been employed one day per week. An immediate task was to prepare a comprehensive submission to the consultation process for the Metropolitan Strategy for Sydney, specifically to highlight that effective planning for sustainable food systems must be considered, including the planning of both urban areas and agricultural lands on the city's fringe.

Outreach activities included establishing a website and list server as an essential component of the communication strategy, and publication of the first six discussion sheets: What is the Sydney Food Fairness Alliance?; Understanding food miles; Options for an alternative food system; What are community gardens?; Understanding food insecurity; and People gather around food: celebrating food and culture. (Other topics have been added since: Why do we need a food policy?; Sydney Basin Agriculture: local food, local economy; Food and climate change; Where has all our food gone? influences on the global food supply; Overweight and obesity: the hidden role of food insecurity.) (SFFA 2009).

Over the next two years a strategic plan was developed; members participated in, and gave presentations to, a range of seminars and organizations; submissions were made to a range of inquiries, and links were established with international organizations also striving for fair food systems, such as Sustain in Britain. The Alliance supported the retention of an inner-city, heritage-listed market garden operated by Chinese market gardeners that was under threat from the expansion of Botany cemetery; and the retention of agricultural land at Hurlstone Agricultural High School in Western Sydney.

One outcome of lobbying efforts was invited membership of the Agricultural Reference Group, tasked with reviewing agriculture in greater Sydney under the Metropolitan Strategy process. However, membership of such bodies is not necessarily an indicator of success in influencing policy. It raises questions about "how food movements construct policy from positions in civil society and outside the state and the contradictions of working with and through the state to implement food security policies" (Wekerle 2004 p. 378). The Alliance made a submission to the Federal Government's National Food Plan in 2011, urging the Commonwealth to establish a national food security agency or ministry, to work in tandem with state and local authorities on a major overhaul of the country's food system.

## 8.5 Food Summit: Hungry for Change

The Alliance decided that holding a public food summit would be the best way to bring together people and organizations concerned about the future of food in NSW, to debate these issues, and to urge the government to take action. The initial idea was to hold a single event but it soon expanded to encompass six lead-up events in different parts of Sydney city and adjacent regions. "It just kept on growing and getting larger," an organizing committee member said. This "regionalization" would shape the resulting food policy declaration in ways that could not have been imagined when a single event was being planned. A presummit launch at NSW Parliament House in May 2009, attended by some MPs, the Lord Mayor of Sydney, academics, Sydney Basin farmers and members of the public, was reported in print and broadcast media, generating publicity for the summit.

The October 2009 food summit, Hungry for Change, and its associated events attracted more than 860 participants in total. The two-day summit included guest speakers, such as Jeanette Longfield of the British food and advocacy NGO Sustain, and workshops on the themes of food security and access; planning for future food; sustainable food production; food safety and health; actions; and visits to local farms and community gardens. Delegates debated proposals from the regional lead-up events, and other contributions, into a formal Declaration of Food Future that was presented to a cross-party group of politicians at NSW Parliament House at the summit's conclusion. The full declaration is as follows:

**Declaration on Future Food**

Developed at Hungry for Change Food Summit 2009

The Sydney Food Fairness Alliance (SFFA) calls for the formation of an independent Food Policy Council with state-wide responsibility to develop and ensure the security of the state's food supply.

The Council would adopt an integrated approach inclusive of:

- Protection in perpetuity of prime agricultural land and the agricultural water supply.
- Compliance of agricultural production and distribution with the principles of ecologically sustainable development.
- Access to affordable and adequate fresh food irrespective of income.
- Investigation of innovative measures such as tax reforms and subsidies to promote access to healthy foods and reduce the burden of chronic disease.
- A cautionary approach to approving new food production and processing technologies to ensure food safety.
- Adequate funding for agricultural research and development that complies with principles of ecologically sustainable development and especially the growing organic industry.
- Ensuring fair economic returns to farmers.
- Support for the development of community-based and regional food systems which support regional economies and improve food access.
- Ensuring people have access to information so as to make informed food choices.

## *Facts Support the Declaration Proposals*

These proposals were developed during the SFFA 2009 Food Summit, Hungry for Change (SFFA 2009). The Summit and its lead-up events across Greater Sydney attracted over 850 participants including primary producers, local

(continued)

(continued)

government, welfare, social justice and religious organizations, academics, citizens, environmentalists, and others.

Supporting this Declaration on Food is a number of accepted facts:

- Diet-related diseases are rising so fast, health costs will overtake state budgets by 2030.
- More than a million Australians including 500,000 children cannot afford nutritious food.
- 27% drop in agricultural production by 2080 is predicted if climate change is unchecked; urban development is taking over 50% of current farmland in Sydney Basin; Australia has shortfall of 1,200 agriculture graduates p.a; the peaking of global oil extraction will raise food prices through increased transport and fertilizer costs.
- Projected population growth in Australia and the Sydney region (to seven million) will need more food;
- Lack of inter-sectoral planning to meet future food needs.

### *Time for Action*

The SFFA asserts that access to adequate food is a human right. The security of the food supply is now firmly on the public agenda. Organizations in other cities, states, and countries are working with their governments to develop future food strategies. It is time for NSW to do likewise. The Sydney Food Fairness Alliance is ready to work constructively with government in developing the proposal for a Food Security Council.

(Source: SFFA 2009)

## 8.6 Developing a Food Policy

Worldwide, there is growing concern about the fault lines appearing in the food system and the lack of planning for future food security. Western food policies are not a new phenomenon: they evolved in the first half of the twentieth century in response to the Depression and World War II. The oil crisis in the 1970s refocused attention on the need for food policies, and the twenty-first century threats from climate change and depleting energy sources have lent new urgency to policy-making. Lang et al. (2009 p. 7) developed what could be regarded as a generic, theoretical food policy, which can be described as an "off-the-shelf" sustainable food policy that could be applicable just about anywhere in the world, at any geographical scale (Fig. 8.1). It shows the highly complex nature of a modern food policy, and the competing forces at play.

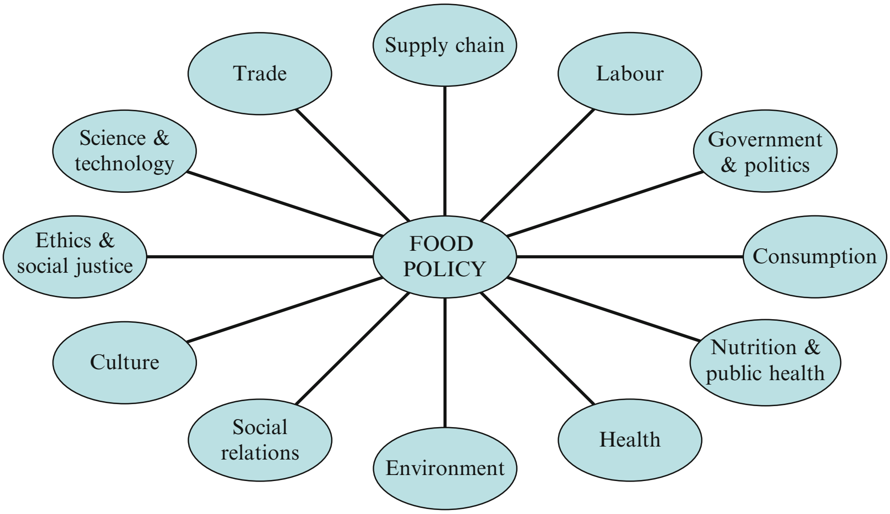



**Fig. 8.1** Food policy as an intersection point of competing issues

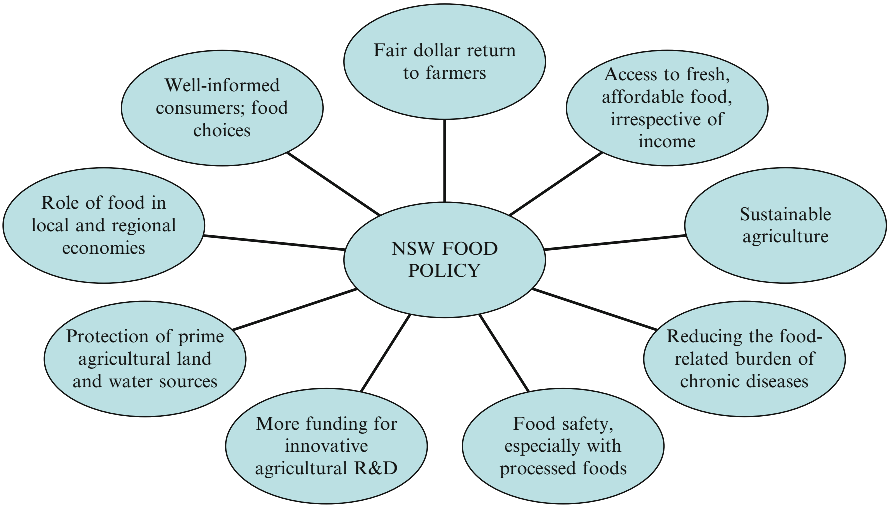



**Fig. 8.2** The essential elements of an NSW food policy

The Alliance believes that developing a food policy requires a bottom-up approach, consistent with the participatory approaches used throughout the organization. A food policy needs to reflect the specific issues and concerns of the communities involved in the consultation process. The summit's framework for an NSW food policy is depicted in Fig. 8.2.

Both the generic and place-specific models highlight the centrality of the concept of food democracy in policy-making, namely that the process is fully inclusive and stakeholder-driven (Lang et al. 2009). The same authors highlight the extreme complexity of devising food policies, asking: "How could food policy-makers and institutions address this awesome array of problems [in a holistic food system]? It will require considerable change, intelligence and effort" (Lang et al. 2009 p. 45). However, "few politicians or others in power situations seem to have an understanding that the food system needs to be viewed and managed holistically" (Alliance member).

Attempting to change a country/state/city's food system and devising a food policy can exact a heavy toll on food movements' predominantly volunteer core. The Canadian food activist and author Wayne Roberts, also manager of the Toronto Food Policy Council, says "food policy councils which take the policy in their middle name literally do burn brightly at first. But then they burn out, for the simple reason that there is no-one in government who has a real job with a serious operational responsibility who has the time or mandate to hear, deal with, champion or implement a comprehensive and sustainable food policy" (Roberts 2010 p. 175). There are many challenges in devising a workable, integrated food policy particularly when "policy integration is not only required horizontally across policy sectors, but also vertically through different levels of governance" (Barling et al. 2002 p. 557). This problem is compounded in Australia by the federated system of government. The Alliance has recognized the need to advocate for state-wide food policies as well as a national food policy that might emerge from the federal government.

## 8.7 Strengths, Weaknesses, and Achievements

The Alliance has provided a forum to increase community and political attention to the food system, thereby providing "legitimacy" to many of the issues previously marginalized in the public discourse and receiving limited attention, such as land use. As noted by one Alliance member: "There is now a groundswell of interest." The widespread interest shown in the Food Summit in 2009 and its lead-up events showed a wide range of people care, and are concerned about, the food system, and its future. For example, according to one Alliance member:

> On my own, or even working through my organization, it would have been impossible to achieve any of these things. Working together my individual efforts and efforts of my organization have been magnified. I have learnt huge amounts from the events but also from the other people involved.

Some members, especially those who have been working on the issues for many years, however, have grown frustrated that little progress appears to have been made, in that the same issues are still being discussed as were raised many years ago. Others, however, have noted the "amazing success of the SFFA when they do not even own a cupboard".

## 8.8 Diversity of Memberships and Participants

The diversity of the Alliance's membership is a major strength. The organization draws on a vast pool of expertise, and their extensive networks and contacts. Many members have worked in their specialized fields, in comparative isolation, for decades. They joined the Alliance to meet like-minded people to bring about the change they see as essential. For example, one member who works in health said:

> I was frustrated with the system's inability to provide adequate nutrition for the frail elderly without relying on artificial supplements. Determined that I could achieve more outside the system that in it, I joined SFFA.

Another member said the Alliance had "brought together many players and concerns; (with) mutual listening; developing a shared vision; everyone seems to be generous and support one another". This diversity has had a synergistic effect. Those previously focused on environmental sustainability and food production, for example, may not have considered the impact of poverty and urban planning on the accessibility of food.

## 8.9 Volunteers/Leadership/Management/Governance

The volunteer base is a strength as these individuals bring extraordinary passion and energy as well as important contacts, giving the Alliance access to networks and contacts that may not be otherwise available. Progress, however, can be slow in a volunteer organization that has a highly participatory philosophy and decision-making procedures. As one Alliance member said:

> The Alliance has adopted a very democratic style of management, affording the management committee and other members the opportunity to debate and vote on a range of organizational and issue-based matters. Whilst this is very welcome, when coupled with the reliance upon volunteers it has sometimes meant a delay in action.

Governance and the management and organizational structure have evolved as the Alliance has grown. The desire to be participatory is seen as a major strength although it is sometimes frustrating for some participants as it may lead to an apparent delay in action. There have been three presidents since the Alliance was incorporated. This is a difficult role requiring commitment, considerable patience, and an ability to work with people with diverse viewpoints and ways of working. There is a remarkable sense of goodwill among participants, and a willingness to consider alternative viewpoints. Moreover, as attendances at meetings varies, there is often a need to extend discussion of a particular issue to ensure that as many people as possible have an opportunity to contribute to the debate and decision-making.

A key leader of the Alliance noted that there are:

> Relatively small numbers involved actively, but a very large number interested and supportive. Time is needed to develop and maintain the infrastructure. Sometimes there is a tension

> between a looser knit or tighter organizational structure. This is evident in the "quality control" required for [formal SFFA] submissions, publications, presentations and papers. Some resent this and believe we should trust everyone; others believe that we need to maintain the credibility we have developed and check each other's work, but sometimes this is not possible given the need to meet deadlines, and the fact that most work is voluntary. In principle it is an excellent process to have work checked by as many people as possible, since others may provide different perspectives on the work, but often there is insufficient time to do this. There is also a different perspective in that some believe we should focus on community solutions and action, believing that governments will rarely act, whereas others believe that we should focus on achieving appropriate government policy and action. The reality is that we probably need both, and it is useful to have these different perspectives in the one organization.

## 8.10 Lack of Funding

Running the Alliance on a shoestring was the key barrier to growth and effectiveness that was identified by participants, specifically that full-time staff could not be employed. This may lead to an unsustainable workload in organizing large public events such as the Food Summit, and an inability to follow through after such events. As one respondent noted:

> Reliance upon a band of dedicated volunteers, some of whom have been here from the beginning while others have come and gone, has gotten the Alliance a long way, but given the raft of issues that confront our food system, a lack of human and other resources has meant the SFFA has yet to reach its potential.

The Alliance received sponsorship from range of organizations for the Hungry for Change summit. Sponsors included local authorities, NGOs and state and semi-state bodies, contributing both monetary and "in-kind" or goodwill sponsorship. One Alliance member commented: "It is a real Catch 22 situation: public support for an organization like the Alliance has to be shown before funding is likely to be obtained; getting the message out there is difficult without money."

## 8.11 Advocacy/Networking/Communication/Education

Advocacy is at the heart of the Alliance's work. It draws on political contacts, and uses both reactive advocacy (responding to issues as they arise, such as through writing submissions and making presentations) and proactive advocacy (such as lobbying for the formulation of an NSW food policy). Clearly, important issues will only be effectively addressed if the power of the community is harnessed to drive ideas and actions. Advocacy has been achieved through the interrelated activities of networking (bringing diverse individuals and groups together), through communication (the list server and production of discussion sheets), and education (organizing high-profile public events as well as local action).

Communicating the activities and discourses of the Alliance is a substantial part of the day-to-day work of the organization. The Alliance has maintained a website since its inception, where all its policy documents, submissions, and discussion sheets can be found, as well as forging links with other food-related organizations and publications. Social media offers a potentially wider dissemination of the Alliance's message, and in 2010 it began regular postings on Facebook and Twitter, especially targeting a young demographic. In their analysis of the concept of food citizenship, through a case study of the Toronto Food Policy Council, Welsh and MacRae (1998 p. 239) say: "The central lessons from our experiences … are … that food advocacy must be framed more broadly than traditional social justice conceptions and must embody the concepts of food citizenship, health and sustainability." This is the multifaceted message the Alliance attempts to convey.

## 8.12 The Future: The Changing Context

The context of food security has changed markedly since the Alliance was formed, and particularly since many of its members began working on food-related concerns. Many aspects of the food system are now firmly in the public realm, one indication of which is the issues paper for a proposed National Food Plan released by the Federal Government in 2011 (DAFF 2011). Two areas that the Alliance has, to date, not given a great deal of attention to are the food manufacturing industry in Australia, and food marketing, although the duopoly of the country's two principal supermarket chains Coles and Woolworths, and the issue of "junk-food" advertising on children's television, have been hotly debated at some Alliance public forums.

The Alliance was formed when there was relatively little public attention to food security, other than isolated individual projects, or broader issues such as the loss of agricultural land. There was a consensus among survey respondents that after five years the Alliance had made significant achievements but as one member remarked:

> It is time now to stop and more carefully assess what we do and how, how to make best use of the resources we have, how to best link with other groups, how to refine and focus our advocacy, how to have most impact. In other words, the Alliance needs to be strategic.

As other new groups in the broad food system area emerge, the Alliance needs to continually assess what formal partnerships will advance its aim of food policies at all levels of government and improving the food system.

## 8.13 Conclusions

This chapter has explored the history and activism of the Sydney Food Fairness Alliance, an NSM that advocates fair and sustainable food policies in Australia; that has a specific target of helping bring about food policies for the state of New South Wales, and assist in shaping a national food policy. It undertakes this task in full recognition of the challenge; of how every aspect of the food system is highly political and that "true reform of our food system requires that we muck ourselves up in the imperfection of political contestation over food" (Goodman et al. 2012 p. 32). It is an organization driven by social justice principles, and takes as its philosophical starting point that food security is a basic human right, not a privilege.

It is arguably an atypical food movement within Australia in that it attempts to connect stakeholders from all sections of the food system in one organization, rather than being a single-issue activist group. Its diverse membership base is one of its great strengths but its predominantly volunteer core means its most active members may be vulnerable to burnout. Clearly the Alliance "needs to develop strategies to continually refresh the organization" (key member of management committee). Despite limited funding, the Alliance has grown considerably in size since its inception and has, through its activities and advocacy work, gained a public profile that has led to invitations to sit at the table on food-related committees and panels.

The determination of the success, or otherwise, of any social movement is a complex and contested task (Giugni 1998). Thus a crucial question for the Alliance is how well it can judge its efficacy and performance. Is it measured by column inches in the press, seats on consultative bodies, attendance at public events, or by policy shifts or behavior change? And should it be concerned with outcomes (a common measure of success) or processes? These are difficult questions, but it is clear that the Alliance has grown, in a little more than five years, from small beginnings (a meeting of two individuals) to a broad membership of several hundred, and a portfolio of strong advocacy work on food security. Its whole-of-food-system approach has provided a forum for stakeholders across the food system to debate the future of food systems. All the members interviewed for this chapter said they thought the Alliance had been a success by establishing a united voice for the disparate, but linked, concerns about the contemporary food system in NSW and Australia.

Australians are now talking very seriously about domestic food security. Currently the main topics of this debate are the federal government's setting of a carbon tax, and disputes over water, especially in the Murray-Darling Basin, a major food-producing area in this arid continent. The Sydney Food Fairness Alliance sees itself as having an important role to play in improving the food system, equitably and sustainably, with its diverse membership representing many aspects of the food system, while attempting to break the "silo" mentality on food policy (Dixon 2011) and helping bring about systemic and sustainable change in food security in Australia. As noted by a key member of the SFFA:

> We have come up with an idea whose time has come [but] we now need to move beyond the rhetoric to implementation, not only on a local scale as demonstrated by individual small projects, but at a broader level by effectively addressing issues such as urban planning.

Such change requires long-term social and civil action. As Lang et al. (2009 p. 297) write: "Food policy has again become a high-profile 'hot' topic … the entire terrain is characterized by vibrant debate." The food policy challenge is firmly on the table, and the Sydney Food Fairness Alliance is a significant player in stimulating public and community interest to bring about change.

## References

Barling, D., Lang, T., & Caraher, M. (2002). Joined-up food policy? The trials of governance, public policy and the food system. *Social Policy & Administration, 36*(6), 556–574.

Coveney, J. (2000). Food security and sustainability: Are we selling ourselves short? *Asia Pacific Journal of Clinical Nutrition, 9*(S1), S97–S100.

DAFF. (2011). *National Food Plan: issues paper to inform development of a national food plan*. Canberra: Department of Agriculture, Fisheries and Forestry. Retrieved March 26, 2012, from http://www.daff.gov.au/__data/assets/pdf_file/0009/1926315/nfp_-_final.pdf

Dixon, J. (2011). *Food security: We need different experts in charge*. Brisbane Institute website. Retrieved November 25, 2011, from http://www.brisinst.org.au/past-issues/june-2011-issue/4

Dixon, J., Beilin, R., Isaacs, B., Rose, N., Santhanam-Martin, M., & Young, M. (2011). *Food security for the short or long term? Australia and New Zealand Agri-Food Research Network*. Retrieved July 5, 2011, from http://australian.foodsovereigntyalliance.org/food-security-for-the-short-or-long-term-the-following-is-a-piece-from-the-agri-food-research-network-on-food-security-and-the-governments-new-national-food-policy-working-group

Donald, B., & Blay-Palmer, A. (2006). The urban creative-food economy: Producing food for the urban elite or social inclusion opportunity? *Environment and Planning A, 38*(10), 1901–1920.

Edwards, F., & Mercer, D. (2010). Meals in Metropolis: Mapping the urban foodscape in Melbourne, Australia. *Local Environment, 15*(2), 153–168.

Friel, S. (2010). Climate change, food insecurity and chronic diseases: Sustainable and healthy policy opportunities for Australia. *New South Wales Public Health Bulletin, 21*(6), 129–133.

Giugni, M. G. (1998). Was It Worth the Effort? The outcomes and consequences of social movements. *Annual Review of Sociology, 24*, 371–393.

Goodman, D., DuPuis, M., & Goodman, M. K. (2012). *Alternative Food Networks: Knowledge, practice, and politics*. Abingdon, Oxford, UK: Routledge.

Guthman, J. (2008). Bringing good food to others: Investigating the subjects of alternative food practice. *Cultural Geographies, 15*(4), 431–447.

Hassanein, N. (2003). Practicing food democracy: A pragmatic politics of transformation. *Journal of Rural Studies, 19*(1), 77–86.

Ingram, J., Ericksen, P., & Liverman, D. (2010). *Food security and global environmental change*. London, Washington DC: Earthscan.

Johnston, J. (2008). Counterhegemony or bourgeois piggery? Food politics and the case of FoodShare. In W. Wright & G. Middendorf (Eds.), *The fight over food: Producers, consumers, and activists challenge the global food system*. University Park, PA: Pennsylvania State University Press.

Lang, T. (1999). The complexities of globalization: The UK as a case study of tensions within the food system and the challenge to food policy. *Agriculture and Human Values, 16*(2), 169–185.

Lang, T., Barling, D., & Caraher, M. (2009). *Food Policy: Integrating health, environment and society*. Oxford, New York: Oxford University Press.

Larana, E., Johnston, H., & Gusfield, J. R. (Eds.). (1994). *New social movements from ideology to identity*. Philadelphia: Temple University Press.

Lockie, S., Lyons, K., Lawrence, G., & Mummery, K. (2002). Eating 'Green': Motivations behind organic food consumption in Australia. *Sociologia Ruralis, 42*(1), 23–40.

Mason, D., & Knowd, I. (2010). The emergence of urban agriculture: Sydney, Australia. *International Journal of Agricultural Sustainability, 8*(1–2), 62–71.

Merson, J., Attwater, R., Ampt, P., Wildman, H., & Chapple, R. (2010). The challenges to urban agriculture in the Sydney basin and lower Blue Mountains region of Australia. *International Journal of Agricultural Sustainability, 8*(1–2), 72–85.

Nolan, M., Rikard-Bell, G., Mohsin, M., & Williams, M. (2006). Food insecurity in three socially disadvantaged localities in Sydney, Australia. *Health Promotion Journal of Australia, 17*(3), 247–254.

Parker, F. (2007). Making periurban farmers on the fringe matter. *State of Australian Cities Conference, Adelaide, November, 28–30*, 2007.

Patel, R. (2007). Transgressing rights: La Via Campesina's call for food sovereignty. *Feminist Economics, 13*(1), 87–116.

Reay, L., & Webb, K., (1998). *Penrith Food Project, Triennial Report (1994–1997)*, Penrith, NSW, Australia: Penrith City Council. Retrieved 26 October, 2011 from http://www.penrithcity.nsw.gov.au/index.asp?id=760

Roberts, W. (2008). *The no-nonsense guide to world food*. Oxford: New Internationalist.

Roberts, W. (2010). Food policy encounters of a third kind. In A. Blay-Palmer (Ed.), *Imagining sustainable food Systems: Theory and practice* (pp. 173–200). Farnham, Surrey: Ashgate.

SFFA. (2009). *Declaration on Future Food*. Source: SFFA 2009. Retrieved October 26, 2011, from http://sydneyfoodfairness.org.au/wp-content/uploads/2010/08/SFFA_Food_Declaration_-July_2010.pdf

SFFA. (2009). Sydney Food Fairness Alliance discussion papers. Retrieved October 26, 2001, from http://sydneyfoodfairness.org.au/category/resources/discussion_papers/

Sonnino, R. (2009). Feeding the City: Towards a new research and planning agenda. *International Planning Studies, 14*(4), 425–435.

Wekerle, G. R. (2004). Food justice movements: Policy, planning, and networks. *Journal of Planning Education and Research, 23*(4), 378–386.

Welsh, J., & MacRae, R. (1998). Food citizenship and community food security: Lessons from Toronto, Canada. *Canadian Journal of Development Studies, 19*(4), 237–255.

Winson, A. (2010). The demand for healthy eating: Supporting a transformative food "movement". *Rural Sociology, 75*(4), 584–600.

Wright, W., & Middendorf, G. (Eds.). (2007). *The fight over food: Producers, consumers, and activists challenge the global food system*. Pennsylvania: Penn State University Press.

# Chapter 9
# Community Supported Agriculture and Agri-Food Networks: Growing Food, Community and Sustainability?

**Robin Krabbe**

## 9.1 Introduction

Doubts are increasingly being expressed about the capacity of current sociopolitical arrangements to sustain humans and ecosystems, to deal with increasing dissatisfaction with political systems (Brodie 2003), and ultimately to overcome the crises inherent in the capitalist system of production. In short, world capitalism has been exposed as a flawed system of governance in terms of this failure to provide for basic human needs and preserve the ecosystems on which we depend (Brodie 2003).

The development of world capitalism in fact owes much of its success to agriculture and the production of 'cheap food' (Moore 2010; Wood 2000). From the sixteenth century, technological development within agriculture resulted in ever-increasing yields and food surpluses (Moore 2010). For the first time however, agriculture across the globe is failing to generate increases in yields, therefore it cannot generate the conditions for a 'new systemic cycle of accumulation' (McMichael 2003; Moore 2010), despite the hopes invested in new agricultural innovations, such as biotechnology (Moore 2010). It is argued that capitalism has now reached the limit of its capacity for generating the conditions needed for human prosperity, based in part on the prediction of the end of cheap food and cheap oil (Weis 2010), and environmental problems and social issues, including the deepening financial crises around the world (Speth 2008).

The creation of sustainable agri-food systems is vital for the sustainability of wider socio-ecological systems (Risku-Norjaa 2007). This is in accordance with the belief that sustainability resides in the large overlaps between social systems and ecosystems (Graymore et al. 2010), and that 'growing and eating food is our most

R. Krabbe (✉)
University of Tasmania, Tasmania, Australia
e-mail: rkrabbe@westnet.com.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_9,

direct and vital link' to the ecosystems on which we depend (DeLind and Ferguson 1999: p 191). When considering the need for sustainable agri-food systems, Koc and Dahlberg (1999) note that one of the reasons why the structure of capitalist agriculture is so problematic is that it tends to decrease the integrity of local and traditional systems that in the past provided efficient and accessible food production and distribution. In doing so, future options for food provision are reduced. Both 'developing' and 'developed' countries are affected by the spread of capitalist agriculture not only by a reduction in cultural and biological diversity, but also by increased dependence on large external institutions (Koc and Dahlberg 1999). As Geels (2010: p 495) notes, these large agri-food systems become entrenched by lock-in mechanisms relating to 'sunk investments, behavioural patterns, vested interests, infrastructure, favourable subsidies and regulations'.

Part of the problem is that agri-food systems suffer, as do most other sectors of society, from strategies of depoliticization. That control of agri-food systems is increasingly in the hands of corporate players (Windfuhr and Jonsén 2005) is one important example of how the dominating logic of neoliberalism can override the right of people to have a say in processes that affect them, such as the food system.

The motivation by the state to engage in depoliticization strategies relates to the desire to reduce conflict, speed up decision-making, enhance accumulation and in general, increase the effectiveness of the delivery of policy (Blühdorn 2006). These strategies purportedly tend to reduce complexity and increase the efficiency of societal systems and processes by decreasing the number of people involved in their governance (Blühdorn 2006). However one result is that people tend to become disconnected from socio-ecological systems, perpetuating degradation of socio-ecological life support systems. For instance when the interests of capital rather than the broader population are paramount in how natural resources are treated, these resources may be overconsumed.

Significant forms of action are nevertheless emerging in response to depoliticization and which more generally attempt to improve the condition of socio-ecological systems. This chapter focuses on one element of this new paradigm emerging in particular from social science, socio-ecological theories and complexity theory, and based on the idea that food security and food sovereignty provide an important opportunity to build sustainable agri-food systems. It aims to investigate the potential of community supported agriculture (CSA) combined with agri-food networks to contribute to this vision. The main hypothesis is that CSA can offer an opportunity for re-politicization, in terms of re-engaging people in negotiating the fundamental question of how we can live together in a sustainable way. The evidence that CSA is beginning to link with broader agri-food networks that attempt to engage at the policy level adds significantly to the further hypothesis that agri-food is an area with huge potential to work towards socio-ecological change.

This chapter is structured as follows. First the concepts of food security, food sovereignty and community food security will be discussed. CSA will then be analysed—the most fundamental benefit of CSA being its potential to progress towards food security at the community level. Two Australian examples of CSA will be mentioned, the significance of which are their links to broader food security and food sovereignty networks. Some aspects of socio-ecological theory will then be discussed, and the emerging concept of networks. Finally the Australian Food Sovereignty Alliance (AFSA) will be highlighted as a vehicle for re-politicization which builds on the principles of local food and CSA.

## 9.2 Community Food Sovereignty and Sustainable Agri-Food Systems

For any agri-food system to be sustainable, it must first produce food in a manner that contributes to food security. The term food security has evolved from a focus on adequate supplies of food to 'economic and physical access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective, and low-cost food and agricultural systems that are compatible with sustainable use and management of natural resources' (Pinstrup-Andersen and Pandya-Lorch 1998: p 1). Critics (e.g., see Windfuhr and Jonsén 2005; Patel 2009) however, note that this definition makes no reference to who controls agri-food systems, and point to possible detrimental effects to the extent that this control resides with commercial larger-scale entities. Instead they advocate the concept of food sovereignty, which puts access to and control over land, water and genetic resources as priorities (Windfuhr and Jonsén 2005), in addition to the use of environmentally sustainable approaches to production. A related concept is community food security, which Anderson and Cook (1999) maintain involves food systems that are decentralized, environmentally sustainable, progress towards collective rather than only individual needs, are concerned with equitable food access, and are based on democratic decision-making. The concept of community food sovereignty is introduced in this chapter as encapsulating all these concerns relating to food security, food sovereignty and community food security.

A sustainable agri-food system is therefore defined as a system that progresses towards community food sovereignty while contributing to the ultimate goal of preserving socio-ecological life support systems. A fundamental requirement of sustainable agri-food systems appears to be closer feedback mechanisms between food production and ecosystems structures and functions, and between food production and social structures and functions (O'Hara 1995). The focus on reconnecting producers and consumers inherent in CSA not only facilitates this feedback, but more generally generates sociality in terms of associative, cooperative relationships deemed as important for sustainability.

## 9.3 Community Supported Agriculture

At the operational level, CSA is a produce box scheme which is provided directly from one or more farmers to a group of consumers (with vegetables being most commonly provided: fruit, eggs, dairy products, flowers, grains and meat are also part of some schemes). Boxes are generally provided weekly, and although some schemes offer more choice than others, generally the vegetable contents of the box are determined by whatever the farmer harvests each week. Consumers become 'shareholders' by committing for the whole season to receive the boxes, ideally in return for payment in advance. By selling directly to shareholders, and by shareholders providing working capital to the farmer in advance, farmers receive increased prices for their produce, gain some financial security, and can concentrate more on growing quality produce rather than spend time on marketing (Bougherara et al. 2009). The broader aim of CSA is for farmers to share the responsibilities and rewards of farming with nonproducers, based primarily on the extra support shareholders give to farmers above the conventional exchange relationship.

The idea of CSA seems to have originated in the mid-1960s in both Japan and Germany. From its conception in 1986 in the USA, the CSA concept has diversified into a wide range of social and legal forms, with the philosophically committed and ideologically driven (in this chapter these are referred to as 'purist') forms at one end of the spectrum, with more commercially oriented 'subscription' farms at the other (referred to as less purist), with a wide variety of forms between the two (Reynolds 2000). This diversity is a valuable aspect of CSA, as it can attract consumers with varying levels of commitment to sustainability principles to participate, from the 'sustainability activist' to the 'less reflective' food consumer (Reynolds 2000). The growth in the number of CSA farms indicates the concept is appealing to ever-increasing numbers of people: estimates of the number of CSA farms in the USA are between 2,000 and 2,500, with, for example, 120 new CSA farms starting up during 2007 (Batz 2007).

This diversity of the CSA concept can be seen in two examples that currently operate in Australia. Although the CSA concept has not yet been adopted at the levels being experienced in the USA, it is starting to grow in a variety of forms. The first example is Food Connect, which originally started in Brisbane where currently produce from about 80 farmers is pooled to supply over 1,500 boxes per week. It is now in the process of being replicated in Adelaide, Sydney and Melbourne. At the other end of the scale is a recently commenced project, Local Food for Local People (LFLP) near Hobart in Tasmania, where eight 'backyard' growers are currently supplying 28 vegetable boxes. These two projects have different advantages and disadvantages with regards to progressing towards sustainability. For instance Food Connect reaches a larger amount of people than LFLP, however the opportunities for social learning may be less due to a greater distance between farmers and consumers.

Both examples however involve what (Fieldhouse 1996) sees as the three important dimensions of CSA, namely community building, sustainable agriculture and food security, with 'sharing' as the central concept. Participants share the real costs of food production through fair prices for the farmer and by assuming part of the risk of poor harvests. In agreeing to share the risks of farming, if weather conditions, pests or diseases reduce the amount of food produced, shareholders in theory receive less produce. The CSA model can therefore be seen to involve shareholders not paying for food as such, but providing support for the farmer (Bloom 2009) to grow healthy food and preserve ecological health.

According to O'Hara and Stagl (2001: p 546), CSAs are 'complex institutions of communication and interaction between producers and consumers who seek to communicate their individual interests as well as the overall interests and objectives of the CSA'. The interaction and communication mentioned by O'Hara and Stagl generates associative processes which are at the heart of CSA. Associative economics, which involves both parties engaging in economic transactions explicitly taking account of the other parties' needs and points of view, was one of the foundational principles of CSA. As Groh and McFadden (1997: p 35) state, an associative perspective involves the belief that 'taking the needs of our partners as motivation for our economic actions will lead to the greatest welfare of all involved'. This is a fundamental concept of collaboration, of social learning, and of building collective values. Likewise for Bloom (2009), associative economics or associative pricing involves transparency, social engagement, long-term relationships and generally collaborative rather than competitive processes.

The calculation of prices that shareholders pay to participate in a CSA in particular illustrates the concept of associative economics. Less purist CSA farms tend to adopt pricing structures based on conventional prices in the marketplace (Ostrom 1997). In the more purist farms, prices are calculated based on a budget which includes the actual costs of production, including a living wage for the farmer. All these costs are added up before the start of the season, then the members pledge the amount they each wish to contribute to ensure the total costs are covered (Bloom 2009). Those with more financial resources can in this way subsidize those with less financial resources. Payments also tend to be made in advance in more purist CSAs, in recognition of the philosophy of a commitment by members to the farm. These are all radical concepts for consumers, and require a level of foregoing individualistic concerns for collective values.

This glimpse of a CSA in practice appears to indicate that CSA is capable of creating the kind of relationships and networks likely to be needed for sustainability. However, a problem with CSA in practice, similar to many alternative food networks, is that they frequently remain characterized by values based on conventional notions of efficiency and cost-benefit analysis, rather than constructing new, positive, alternative arenas of action (Kloppenburg 2010).

Kloppenburg (2010) for example, states that accepting the principle of privatization instead of the principle of sharing compromises efforts to progress substantially towards food sovereignty. Other authors convey the frustration of farmers in failing to achieve the community they initially envisioned (e.g., see Kane and Lohr 1998). Motivations for involvement in CSA tend to be based on self-orientation, being related to individual health, and the safety and taste of the produce (Moore 2006), rather than a desire to participate in community building and progressing towards sustainable agri-food systems. As CSAs generally function, there is an assumption that changing how we purchase our food is sufficient for sustainability (DeLind 2010). Finally, and significantly, CSA, along with other alternative food networks, has been criticized for failing to contribute to food security for low-income groups (Moore 2006). Although there is no wholesaler to take some of the price paid by consumers, CSA farmers still have to charge a price approximating retail conventional produce (for organically grown food). Low-income groups are frequently unable to afford the prices CSA's charge, especially where payment is requested in advance.

With the likelihood of acute increases in the price of food in the near future (Weis 2010), access to healthy food for low socio-economic groups will become even more important. It appears overall, therefore, that many CSAs fail to achieve new understandings relating in the first instance to the life of a farmer, to how food is produced, to the particularities of food production that relate to sustainability, and more generally to working collectively towards sustainability (DeLind 2010).

On the other hand, issues of equity cannot be resolved without broad community and/or government action. Ostrom (1997) contends that this issue can begin to be addressed by CSAs forming strong linkages with other institutions, such as food policy councils and food security initiatives. This is in agreement with the view that community-based initiatives need to also engage with multiple levels of governance and deal with external drivers of change (Berkes 2006). This need to engage with other levels is indicated by socio-ecological theory, which will now be briefly discussed.

## 9.4 Socio-Ecological Theory

Wheatley and Frieze (2006) identify emergence (where new characteristics evolve that cannot be predicted from the existing constitutive components) as the basic scientific explanation of how local changes can connect together and affect global systems. They trace the lifecycle of emergence as living systems beginning as local innovations, developing into networks, evolving into communities of practice, and then providing options to deal with socio-ecological problems, often attaining scale in the process (Wheatley and Frieze 2006). This process describes the mechanisms by which interactions between people at the local scale, for example who are involved on local food projects, can contribute to a much larger movement of transformative collective action. Social learning is one of the important mechanisms for this action to occur.

Social learning is emerging as an important facet of socio-ecological systems thinking, which provides individuals with the opportunity to practice holistic or integrative thinking, build shared understandings and learn how to handle conflict, and develop capacities for joint action at different levels (Garmendia and Stagl 2010). It is based on the need for competent decisions involving informed citizens, and on the idea that a 'good decision' depends on the quantity and type of learning that both occurs before and after the decision (Hommels et al. 2007). A fundamental thesis of social learning is that learning to manage together requires changes in attitudes, beliefs, skills, capacities and actions (Garmendia and Stagl 2010). It is a similar concept to second order, double loop, or coevolutionary learning which all involve questioning basic assumptions (Hommels et al. 2007), doing things differently, rather than just better (Röling 2003), and learning about learning itself (Merry 1995). Social learning identifies that in addition to reinforcement experienced directly, individuals learn by observing the behaviours of others (Garmendia and Stagl 2010). A final point about social learning is that it can act to shift 'dominant ideas and belief systems that drive policy making' (Garmendia and Stagl 2010: p 1713).

CSA can be seen to provide opportunities for social learning relating to the everyday practicalities of producing and distributing food staples. CSA provides a micro level opportunity to negotiate trade-offs as a vital component of sustainability. In particular, trade-offs between material well-being and conserving natural ecosystems often conflict with each other (Sachs 1999; Lehtonen 2004). In CSA this can be seen with regards to the issue of the box contents mainly where vegetables are concerned. The more choice shareholders request in the contents of the boxes, the more effort farmers have to put into producing the variety required. For Food Connect however it may be easier to supply a greater variety of produce, due to the larger amount of farmers supplying produce. On the other hand smaller initiatives such as LFLP may find it easier having much lower numbers of shareholders in terms of logistics to tailor the boxes for individual likes and dislikes of particular vegetables, although this can add to the workload of already overcommitted volunteers who help keep these initiatives functioning.

Other trade-offs involve the distribution of the boxes: shareholders travelling to the farm (or in the case of LFLP to a central point where growers are encouraged to attend) to pick up their boxes provides an excellent opportunity for interaction between the farmer and shareholders, and for shareholders to more generally gain an increased understanding of the issues involved in growing food sustainably. Food Connect delivers the boxes via "City Cousins" who deliver to points close to shareholders; in their case this is a much more efficient in terms of saving shareholders time and energy in extra travel. CSA can also engage in questions of equity—should there be subsidies for consumers with minimal financial resources? Social interaction in a CSA context can promote conversations about these and other issues, involving negotiation about multiple values and trade-offs. In this process, at the least it can promote associativeness, which will now be discussed.

> Associate – to join as a friend, business partner or supporter, … to connect in the mind, to combine or unite with others, to come together as friends, business partners or supporters.
>
> Association – an organisation with a common aim (Websters 2008: p 22).

The concept of association inherent in CSA is a key process in the progression towards more sustainable systems in general. A major thesis of this chapter is that there is increasing recognition of our common interests, that is, in terms of sustaining our currently threatened socio-ecological life support systems. Furthermore this emerging understanding may be beginning to increase processes of association, and in multiple ways.

The concepts of networks and social learning are central to the notion of association. The more commonalities individuals develop via their interactions, the more the likelihood that they will in turn foster further interaction over time, and hence increase their involvement in networks. Networks enhanced by social learning are proposed as an important mechanism for generating sustainable agri-food systems. In fact some contend that networks, based on the synergies of cooperative relationships, could indicate the new global organizing phenomenon (Capra 1982; Merry 1995) through which sustainable socio-ecological systems can be generated.

This contention is in part based on the idea from Hendriks (2008: p 109) that networks offer a "collaborative advantage over hierarchical or state-centred modes of governing".

A network is defined as any collection of actors who engage in repeated, long-term exchange relations with one another without a centralized authority to arbitrate and resolve disputes (Podolny and Page 1998). Networks are based on reciprocity, where members feel a sense of obligation to other members, and where increasingly it is recognized that one's own well-being depends on the well-being of others. Shirky (2008) notes that cooperation and support have always increased the chance of survival for groups of humans. However as traditional societies gradually increased in size, coordination became more difficult (Gerbe 2007). With the advent of information and communication technologies, groups can form into networks to again coordinate collective action to fulfil human needs (Shirky 2008). The significance of networks in terms of transformative collective change is indicated by Ernstson (2011) who notes that when networks of individuals and organizations engage in repeated collaborations and information exchange, they can over time build a momentum for change. By learning what does and does not work, and creating a common vision, existing institutions, and ways of thinking and doing can be challenged. According to Castells (1996), many of the elements of the network society stem, at least in part, from the development of information and communication technologies. Alternative food networks are likely to increasingly adopt these technologies in the future to aid interaction and communication.

Networks facilitated by technology can assist in dealing with the effects of the level of interdependencies, or highly connected systems that have now developed. The issue of food security highlights the concern that highly connected systems have in actual fact potentially catastrophic consequences by allowing shocks to affect more and more parts of the system. Reliance on imported food for example, means that if a disturbance such as an extreme weather event occurs which affects food production and hence quantities of produce that can be exported, all those areas that rely on the imported food will be affected. This possibility highlights the importance of the retention of a degree of modularity, or independence within systems. This is manifest in the self-reliance of communities and/or practices which add to institutional diversity and retain possible pathways that are adaptive to emergent as yet unknown socio-ecological conditions. The retention of some independence or modularity means that the parts of a system can more effectively self-organize in the event of a shock (Hopkins 2008). Individuals, whether people, communities or countries, are able to draw on support and resources from others, but they are also self-sufficient enough to provide their essential needs, important particularly in times of emergencies (Hopkins 2008). Local systems can be strengthened by engaging with the wider environment through networking and information sharing rather than mutual dependence (Hopkins 2008). Modular networks consisting of several cohesive subgroups with strong ties and many weak ties may provide the strongest environment to foster the learning necessary for sustainability (Newig et al. 2010).

The importance of weak ties to larger systems in the case of food security can be seen in light of the suggestion that sustainable systems must attempt simultaneous development at differing levels (van Eijnatten 2004). This follows in part from the recognition that there are limits to the capacity of local production to satisfy local needs, especially when considering the permeable boundaries that exist between local, national and global systems (O'Hara and Stagl 2001). Another limit to focusing on local production can be depoliticization, which will now be discussed.

The gap between CSA in practice and its foundational ideals indicates a need for efforts towards re-politicization. Politics is fundamental to sustainability in general and to sustainable agri-food systems, whereby the problems, solutions and rules relating to the socio-ecological nature of our existence are negotiated, crucially involving the interaction of diverse views and interests (Voß and Bornemann 2011). Politics addresses the definition and provision of the common good (Pearce 2007) and thus is of relevance to all members of society. As Maffesoli (in Chesters and Welsh 2005) argues, the public is largely disengaged from formal politics and instead is exploring forms of sociality that may better satisfy their needs. In relation to CSA, the hope is that by engaging in action that is not technically perceived as within the realm of politics, nevertheless progress towards associativeness and negotiation can occur. In the terminology of social movements, CSA however, must improve in terms of efforts to 'incorporate the movements collective identity into their self-identification', claimed by Kiecolt (2000) as an aim of social movements. One such emerging movement in Australia relating to agri-food networks will now be discussed.

## 9.5 Emerging Networks in Australia

The AFSA is an example of a wide range of interests coalescing around the issue of sustainable agri-food systems. They define themselves as "a collaboration of organizations and individuals working together towards a food system in which people have the opportunity to choose, create and manage their food supply from paddock to plate" (AFSA 2011).

The connections between AFSA and CSA can be seen in that Food Connect, a hybrid CSA as mentioned above, is one of the founding members of AFSA, and the coordinator of LFLP is the AFSA contact for Tasmania. That the aim of AFSA includes political change is indicated by their attempts for representation on the National Food Policy Advisory Working Group. AFSA maintains that organizations representing over 500,000 Australians have supported their submission for this representation. This includes a diversity of groups ranging from farmers' groups such as Biodynamic Agriculture Australia and the Carbon Coalition, the Australian Farmers' Markets Association, community networks such as the Australian City Farms and Community Gardens Networks, the Australian Fair Trade and Investment Network and environmental organizations including Friends of the Earth and the Queensland Conservation Council. As an alliance of diverse groups, there is significant opportunity for social learning and associativeness, as representatives of these different groups negotiate together a vision of what a sustainable agri-food system looks like, and the most promising strategy to try and achieve it. In particular the mix of individuals and organizations working at different levels, some on ground such as via CSA and others more at the policy level facilitates connections to aid increased understanding of each others points of view. These connections, for example, were initially forged between small food businesses, community groups, farmers, academics, and advocates concerned with the future of food and farming in Australia collaborating towards the initial project of developing a submission for AFSA to participate in the Australian Government's National Food Policy Advisory Working Group. This, and a subsequent submission in response to the National Food Plan Issues Paper has been one of the main outputs of AFSA and was the catalyst for the groups formation in 2010. Although AFSA is still very early in its formation, according to the AFSA coordinator, Nick Rose (personal communication 2011):

> What we have managed to do in the past year is introduce into the food debate in this country, albeit in a limited way … the concept of food sovereignty; and make representations to the Federal Government on the basis of Food Sovereignty principles, with the support of numerous farmer, environmental, health and consumer organisations. This has not been done before. We believe, with good reason in my view, that Food Sovereignty principles speak to large and growing numbers of Australians; and that these principles can provide a basis around which to unite the diverse expressions of the food movement in this country, in order to convert it into a more potent political (and economic) force. As yet this has not been achieved, but I think the 'vectors of expansion' can be seen. How they are developed is up to us all.

The concept of "vectors of expansion" that Rose alludes to is used by Starr (2010), who notes that it is more important to look for "trajectories and vectors of expansion", that is, what might a movement or movements become, rather than at the individual achievements of social movements such as CSAs at a point in time.

As Pearce (2007) states, there is a deep commitment to horizontal rather than vertical relationships among recent movements and networks, reflecting a new kind of participation, as shown by AFSA. And rather than a focus on ideology, the focus of movements such as AFSA is on citizens localized needs, and on pragmatic solutions such as localized food (Hawken 2007). The goal is 'a reimagination of public governance emerging from place, culture and people' (Hawken 2007, p 18). Although the groups in AFSA are autonomous, the coming together of different organizations to address the issues pertaining to sustainable agri-food systems can effectively become a systemic approach. The potential of AFSA is in a 'linking up the margins', facilitating the discovery of shared concerns, for uniting around those concerns and hence building capacity for collective action.

By engaging a broad range of interests in a concern for both human and environmental health, AFSA has the potential to re-politicize, that is, to facilitate the taking back of control from "social elites and the dominating logic of the purportedly 'free' marketplace and the neoliberal state" (Geoghegan and Powell 2009).

It is contended these broader networks can build on the associativeness and social learning promoted by local food initiatives such as CSA. CSA has not yet reached its full potential in Australia to engender changed social relationships. Yet, the emerging links to food security and food sovereignty groups such as AFSA are an encouraging sign of how capacity for collective action towards influencing policy is starting to build, thereby contributing to sustainable agri-food systems.

## 9.6 Conclusion

Achieving food security at the community level in terms of local provisioning helps ensure access to food when supplies from other localities and other larger scales are problematic. In particular, food security at the community level is more likely to ensure food security for those on low incomes, and provides opportunities to build capacity for collective action. CSA has the potential to increase food security at the community level, particularly in terms of regaining control of regenerative food production systems to ensure both health and well-being of human populations, and of ecosystems. This capacity exists because CSA can engender social learning in relation to developing a food production system that is ecologically and socially sustainable. The main weakness to date of CSA has been the failure to include marginalized groups, to link adequately to other systems, and overall to sufficiently engender changed socio-ecological relationships. In Australia however, action is occurring that links small scale initiatives such as CSA to broader processes, as evidenced by the AFSA. Both CSA and agri-food networks provide opportunities to engage in deliberation and negotiation in relation to trade-offs regarding what food is produced, how it is produced and how it is distributed. Functioning as a network, AFSA is an example of a movement, which combined with trends in information and communications technology, may have significant potential to generate learning and contribute to the big picture of preserving socio-ecological life support systems via transformative collective action.

## References

AFSA. (2011). *Australian food sovereignty alliance*. Retrieved September 14, 2011, from http://australian.foodsovereigntyalliance.org/

Anderson, M. D., & Cook, J. T. (1999). Community food security: Practice in need of theory? *Agriculture and Human Values, 16*, 141–150.

Batz, B. J. (2007). *Community Supported Agriculture brings the farm to your front door*. Pittsburgh Post-Gazette [WWW document]. URL, Retrieved January 21, 2011, from http://www.post-gazette.com/pg/07060/765794-34.stm

Berkes, F. (2006). From community-based resource management to complex systems. *Ecology and Society, 11*(1), 45.

Bloom, J. (2009). *Getting the price right: The transformative value of associative economics*. [WWW document]. URL, Retrieved June 24, 2011, from http://transformingmoney.blogspot.com/2010/01/getting-price-right.html

Blühdorn, I. (2006). *The third transformation of democracy: On the efficient management of late-modern complexity*. Economic Efficiency—Democratic Empowerment. Contested Modernisation in Britain and Germany. I. Blühdorn and U. Jun. Maryland, Lanham.

Bougherara, D., Grolleau, G., & Mzoughi, N. (2009). Buy local, pollute less: What drives households to join a community supported farm? *Ecological Economics, 68*, 1488–1495.

Brodie, J. (2003). Globalization, in/security, and the paradoxes of the social. In I. Bakker & S. Gill (Eds.), *Power, production and social reproduction: Human in/security in the global political economy* (pp. 47–65). Toronto: Palgrave Macmillan.

Capra, F. (1982). *The hidden connections: A science for sustainable living*. New York: Simon and Schuster.

Castells, M. (1996). *The rise of the network society*. USA: Blackwell Publishers.
Chesters, G., & Welsh, I. (2005). Complexity and social movement: Process and emergence in planetary action systems. *Theory, Culture and Society, 22*(5), 187–211.
DeLind, L. B. (2010). Are local food and the local food movement taking us where we want to go? Or are we hitching our wagons to the wrong stars? *Agriculture and Human Values? 28*(2), 1–11.
DeLind, L. B., & Ferguson, A. E. (1999). Is this a women's movement? The relationship of gender to community-supported agriculture in Michigan. *Human Organization, 58*(2), 190–201.
Ernstson, H. (2011). Transformative collective action: A network approach to transformative change in ecosystem-based management. In Ö. Bodin & C. Prell (Eds.), *Social networks and natural resource management: Uncovering the social fabric of environmental governance*. Cambridge: Cambridge University Press.
Fieldhouse, P. (1996). Community supported agriculture. *Agriculture and Human Values, 13*(3), 43–47.
Garmendia, E., & Stagl, S. (2010). Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. *Ecological Economics, 69*, 1712–1722.
Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy, 39*, 495–510.
Geoghegan, M., & Powell, F. (2009). Community development and the contested politics of the late modern agora: Of, alongside or against neoliberalism? *Community Development Journal, 44*(4), 430–447.
Gerbe, K. (2007). *Key features of network sociality and critical assessment of the notion of a 'networked society'*. [WWW document]. URL, Retrieved June 6, 2011, from http://www.grin.com/en/e-book/75179/key-features-of-network-sociality-and-critical-assessment-of-the-notion
Graymore, M. L. M., Sipe, N. G., & Rickson, R. E. (2010). Sustaining human carrying capacity: A tool for regional sustainability assessment. *Ecological Economics, 69*, 459–468.
Groh, T., & McFadden, S. (1997). *Farms of tomorrow revisited: Community supported farms—farm supported communities*. Pennsylvania: Biodynamic Farming and Gardening Association.
Hawken, P. (2007). *Blessed Unrest: How the Largest Movement in the World Came Into Being and Why No One Saw It Coming*. New York: Viking Penguin.
Hendriks, C. M. (2008). On inclusion and network governance: The Democratic disconnect of Dutch energy Transitions. *Public Administration, 86*(4), 1009–1031.
Hommels, A., Peters, P., & Bijker, W. E. (2007). Techno therapy or nurtured niches? Technology studies and the evaluation of radical innovations. *Research Policy, 36*, 1088–1099.
Hopkins, R. (2008). *The Transition Handbook: Creating local sustainable communities beyond oil dependency*. London: Finch Publishing.
Kane, D., & Lohr, L. (1998). The dangers of space turnips and blind dates: Bridging the gap between CSA shareholders' expectations and reality. In S. Gilman (Ed.), *CSA farm network Vol II*. New York: Northeast Organic Farming Assoc.
Kiecolt, K. J. (2000). Self-change in social movements. In S. Stryker, T. Owens, & R. White (Eds.), *Self, identity, and social movements*. Minneapolis: University of Minnesota Press.
Kloppenburg, J. (2010). Impeding dispossession, enabling repossession: Biological open source and the recovery of seed sovereignty. *Journal of Agrarian Change, 10*(3), 367–388.
Koc, M., & Dahlberg, K. A. (1999). The restructuring of food systems: Trends, research, and policy issues. *Agriculture and Human Values, 16*, 109–116.
Lehtonen, M. (2004). The environmental–social interface of sustainable development: Capabilities, social capital, institutions. *Ecological Economics, 49*, 199–214.
McMichael, P. (2003). Food security and social reproduction: Issues and contradictions. In I. Bakker & S. Gill (Eds.), *Power, production and social reproduction: Human in/security in the global political economy* (pp. 169–189). Toronto: Palgrave Macmillan.
Merry, U. (1995). *Coping with uncertainty: Insights from the new sciences of chaos, self-organization, and complexity*. London: Praeger Publishers.
Moore, O. (2006). Understanding postorganic fresh fruit and vegetable consumers at participatory farmers' markets in Ireland: Reflexivity, trust and social movements. *International Journal of Consumer Studies, 30*(5), 416–426.

Moore, J. (2010). The end of the road? Agricultural revolutions in the capitalist world-ecology, 1450–2010. *Journal of Agrarian Change, 10*(3), 389–413.

Newig, J., Günther, D., & Pahl-Wostl, C. (2010). Synapses in the network: learning in governance networks in the context of environmental management. *Ecology and Society 15*(4), 24. http://www.ecologyandsociety.org/vol15/iss4/art24/

O'Hara, S. U. (1995). Sustainability: Social and ecological dimensions. *Review of Social Economy, 103*(4), 530–551.

O'Hara, S. U., & Stagl, S. (2001). Global food markets and their local alternatives: A socio-ecological economic perspective. *Population and Environment, 22*(6), 533–554.

Ostrom, M. R. (1997). *Toward a Community Supported Agriculture: A Case Study of Resistance and Change in the Modern Food System*. PhD thesis at the University of Wisconsin-Madison, Michigan.

Patel, R. (2009). Food sovereignty. *Journal of Peasant Studies, 36*(3), 663–706.

Pearce, J. (2007). Toward a post-representational politics?: Participation in the 21st century. *World Futures, 63*(5), 464–478.

Pinstrup-Andersen, P., & Pandya-Lorch, R. (1998). Food security and sustainable use of natural resources: A 2020 Vision. *Ecological Economics, 26*(1), 1–10.

Podolny, J. M., & Page, K. L. (1998). Network forms of organisation. *Annual Review of Sociology, 24*, 57–76.

Reynolds, P. C. (2000). *Community supported agriculture—the way forward*. [WWW document]. URL, Retrieved June 6, 2011, from http://www.organicconsumers.org/Organic/csaforward.cfm

Risku-Norjaa, H. (2007). MFA model to assess economic and environmental consequences of food production and consumption. *Ecological Economics, 60*, 700–711.

Röling, N. (2003). From causes to reasons: The human dimension of agricultural sustainability. *International Journal of Agricultural Sustainability, 1*(1), 73–88.

Sachs, I. (1999). Social sustainability and whole development: Exploring the dimensions of sustainable development. In J. Becker & T. Jahn (Eds.), *Sustainability and the social sciences: A cross-disciplinary approach to integrating environmental considerations into theoretical reorientation*. London: Zed Books.

Shirky, C. (2008). *Here comes everybody: How change happens when people come together*. London: Penguin.

Speth, J. G. (2008). *The bridge at the end of the world: Capitalism, the environment, and crossing from crisis to sustainability*. Pennsylvania: Yale University Press.

Starr, A. (2010). Local food: A social movement? *Cultural Studies <=> Critical Methodologies, 10*(6), 479–490.

van Eijnatten, F. M. (2004). Chaordic systems thinking: Some suggestions for a complexity framework to inform a learning organization. *The Learning Organization, 11*(6), 430.

Voß, J., & Bornemann, B. (2011). The politics of reflexive governance: Challenges for designing adaptive management and transition management. *Ecology and Society, 16*(2).

Websters. (2008). *Concise edition English Dictionary*. New Lanark, Scotland: Geddes & Grosset.

Weis, T. (2010). The accelerating biophysical contradictions of industrial capitalist agriculture. *Journal of Agrarian Change, 10*(3), 315–341.

Wheatley, M., & Frieze, D. (2006). *Using emergence to take social innovation to scale*. The Berkana Institute, United States of America: [WWW document]. URL, Retrieved September 16, 2010, from http://www.berkana.org/articles/lifecycle.html

Windfuhr, M., & Jonsén, J. (2005). *Food sovereignty: Towards democracy in localized food systems*. Warwickshire: ITDG Publishing.

Wood, E. (2000). The Agrarian origins of capitalism. In F. Madoff, J. B. Foster, & F. H. Buttel (Eds.), *Hungry for profit: The agribusiness threat to farmers, food and the environment*. New York: Monthly Review Press.

# Chapter 10
# The Emergency Relief Sector in Victoria, Australia

**Ric Benjamin and Quentin Farmar-Bowers**

## 10.1 Background

There is waste in the food supply chain between the producer and retailer. Traditionally the food industry dumped the waste into landfill or sold it to retail liquidator outlets. In 1967, John van Hengel, a volunteer with St Vincent de Paul in Phoenix, Arizona, became aware that the local grocery stores had food that was being thrown away. He began a campaign to persuade store owners to donate the edible but unsalable food to St. Vincent de Paul, thereby starting the first large scale Foodbank (St Mary's 2011). It was not until the 1990s that the foodbank concept came to Australia. The Foodbanks of Australia supply food and material aid products at zero or little cost to the Emergency Relief (ER) sector. There is a Foodbank in each state that collectively distributed 21 million kilograms of food in 2010/2011[1] to approximately 2,500 welfare agencies nation-wide.

The Foodbanks of Australia are the major supplier of food to the Emergency Relief (ER) sector. The other organisations that provide foodbank operations tend to specialise in particular regions and foods. Oz Harvest operates in New South Wales and the Australian Capital Territory working primarily with excess fresh food and meals which are collected and distributed with minimal warehousing. SecondBite operates in Victoria and Tasmania working primarily with fresh fruit and vegetables which are collected and distributed with minimal warehousing. FareShare operates in Victoria and specialise in the production of ready-to-eat meals.[2] All foodbank

[1] Foodbank Australia webpage: http://www.foodbank.com.au/.

[2] Information about the work OzHarvest, SecondBite and FareShare sourced from their websites: http://www.ozharvest.org; http://www.secondbite.org.au; http://www.fareshare.org.au.

Ric Benjamin (✉)
VicRelief Foodbank, Yarraville, Victoria, Australia
e-mail: ricb@vrfb.com.au

Quentin Farmar-Bowers
Deakin University, Geelong, Victoria, Australia

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_10,

organisations, including Foodbank, utilise volunteers to collect, sort, cook or distribute the food to welfare agencies. Foodbank Victoria is the largest single food relief agency in Victoria, distributing in excess 3.5 million kilograms of food and material aid in the financial year 2010/2011 to more than 500 ER agencies across the State.

## 10.2 The Meaning of Poverty and Emergency Relief in Australia

The United Nations World Summit for Social Development noted that: *Absolute poverty is a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social services* (UN 1995 p. 41). This contrasts with the notion of *relative poverty* that is typically used when referring to poverty in advanced countries such as Australia, it refers to: *relative deprivation in terms of commodities, resources and incomes* (Sen 1983 p. 153). Poverty in Australia is relative poverty and not absolute poverty present in other countries. The phrase *Emergency Relief* has been used internationally for over 100 years for assistance after single catastrophic events.[3] In Australia, a mixture of terms was used up until the 1970s, when the phrase Emergency Relief gained currency in reference to specific work that provided cash or in-kind assistance to families and individuals in need.

In the 1980s the Victorian Council of Social Services (VCOSS) argued that a growing number of Victorian households were in a chronic state of poverty and any crisis could prolong the need for support. They argued that Emergency Relief should refer to the provision of one-off assistance and also ongoing assistance to people experiencing continual and recurring crises (VCOSS 1982). By the 1990s, the Australian Council of Social Services (ACOSS) had defined Emergency Relief as the provision of aid to meet an immediate need and links with specialist community services to address the cause of their need. *Emergency Relief (ER) is the provision of assistance to people in need. It consists of the provision of financial and material aid to meet an immediate need, and a referral service to link people with specialist community services* (ACOSS 2003 p. iii).

Over the past decade successive Australian governments have refined this position to have a more financial crisis focus. The Federal Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA 2011 p. 5) indicated

[3] The term *Emergency Relief* is often associated with International Red Cross, founded in 1864, although direct references to it only occurred in reports in the early 1900s such as one in 1912 entitled: *Emergency relief after the Washington Place fire, New York, March 25, 1911.; Report of The Red Cross Emergency Relief Committee of The Charity Organization Society of The City of New York 1912*. Available from: http://ia700504.us.archive.org/8/items/emergencyreliefa00charrich/emergencyreliefa00charrich.pdf.

that: Emergency Relief services provide support to address immediate needs in time of crisis. *Assistance often includes food and clothing parcels or vouchers, transport, chemist vouchers, help with accommodation, payment of bills, budgeting assistance and sometimes cash. Importantly, Emergency Relief agencies provide appropriate referrals to other services that help to address the underlying causes of financial crisis and social and financial exclusion.* Engels (2006) provides additional information about the development of the meaning of emergency relief in Australia. Government policy has evolved around the notion that chronic disadvantage is best solved within a financial support framework. However, the ACOSS definition reflects the reality of Australian ER service providers; linking of assistance to meet an immediate need with the provision of specialist services to address underlying causes.

## 10.3 Why Emergency Relief Agencies Provide Food

In a crisis situation very often the first thing people require is shelter, food and water to meet their physiological needs. Once these are resolved they can look beyond their immediate circumstances. For many ER agencies, it is their ability to offer food that is a significant reason for people seeking their service (Watts 2011). This creates trust that enables other support services to be offered and accepted. Whether someone is afflicted with mental illness, struggling with an addiction (gambling, alcohol, etc.), an asylum seeker with no welfare support, a single teenage parent, unemployed, or is simply unable to make ends meet, they may *need* support and counselling, but they *come* for the food.

## 10.4 The Role of Organisations

Agencies providing ER services focus on meeting basic short-term needs of clients, as well as beginning the process of economic and social inclusion, although not all of them are equipped to address the underlying causes of poverty (Anglicare 2010). Engels et al. (2009) noted that social security payment reform could change the nature of poverty and disadvantage in Australia. However, whatever policy reforms may eventuate, there will always be a need for ER services and food will always form a substantive part of that service. Although food is the primary reason for people seeking assistance from ER organisations, the delivery model of ER in Victoria has evolved in the last few years beyond a basic safety net of providing food and material aid to one of becoming the primary entry point for support for people living in poverty. *But increasingly ER has become a service which needs to be able to offer more remedial assistance. To not only offer a 'hand-out' or even a 'hand-up', but also provide a clear and coherent pathway to social inclusion and a better quality of life* (Watts 2011 p 16).

## 10.5 How Do ER Agencies Use Food?

Three case studies below, illustrate how food provides a basic need and helps develop social engagement which builds trust and teaches life skills.

Brophy Family and Youth Services is a key service provider to young people and their families in Southwest Victoria. The organisation assists more than 150 young people each week. Support for young parents, indigenous community members and people suffering mental illness are the three main areas of increased demand. Approximately 50% of clients receive food from Brophy. There is no funding for food so Brophy relies on daily donated food from sources including Foodbank Victoria. Food is used by Brophy to:

1. Build rapport with clients. The food store allows Brophy to ensure regular contact with clients and offer other services that the client may need.
2. Allows clients to use the food as *rent in kind*. They are able to stay at the same house for a few nights because they have contributed to the household with food.
3. To teach young clients how to cook healthy, cheap meals.

Wesley Footscray Outreach (WFO) provides services predominantly to people living in the City of Maribyrnong (a north-west suburb of Melbourne). By providing food, the WFO can take the opportunity to encourage people to accept assistance to address other factors in their lives that may be contributing to their position of disadvantage. In the last financial year, WFO saw over 1,500 people who received over 18,000 episodes of assistance. An episode may be participating in the morning tea, having a shower, or seeing a support worker for an assessment. Approximately 85% of episodes of assistance involve receiving food in some form. Since the 2005/2006 financial year, there has been a 168% increase in episodes of assistance. Food is used by WFO to:

1. Reestablish a sense of dignity for their clients. WFO clients are able to fill their shopping basket from a ‘shopping room’ with groceries and basic personal and household items, and access a twice weekly free fruit and vegetables market.
2. Build trust with their clients. As the client contact is maintained through the regular shopping visits, it becomes possible to introduce options for advice and support to clients.

Since its inception in 2001, the Asylum Seeker Resource Centre has grown to become Australia’s largest asylum seeker organisation assisting over 7,000 people seeking asylum. The Centre works with approximately 1,300 individuals per annum. The Centre provides food through community meals and a minimart where points are used instead of money. The minimart is the only source of groceries for three quarters of the people who shop there. Once within the centre clients become familiar with the other services provided by the centre. These include English tutoring, case management, employment services, legal representation and medical services.

## 10.6 Food Insecurity in Victoria

There is a shortage of reliable information on the food insecurity in Victoria, although it seems that the demand for ER is increasing. Watts (2011) in a 2009 survey noted that there may be around 800 ER providers in Victoria and that some had suggested that the number of clients was increasing.

The prevalence of food insecurity is unevenly distributed across the State. A 2008 survey in Victoria that showed 53 out of 79 Victorian local government areas (LGA) reported that 5% of their residents ran out of food in the previous 12 months and could not afford to buy more (Vic Health 2008). One rural council reported that 12.5% of families in their LGA were food insecure (Rural and Regional Committee 2010).

Reasons for food insecurity in Australia vary, however a 2005 study by Anglicare of their Emergency Relief clients in Wollongong (New South Wales) showed that 95% were food insecure. *The main reasons*,[*for lack of food*] *after*, *not enough money for food* (*89%*) *related to the cost of transport in going to buy food* (*44%*), *the cost of food in respondent's area* (*43%*) *and that there was no one with whom they could share the cost of food* (*40%*). *Furthermore*, *when asked about the expenses incurred that left little money for food*, *the main ones cited related to basic living costs such as gas and electricity* (*59%*), *phone* (*27%*) *and housing* (*19%*). (Babbington and Donato-Hunt 2007 p. 5).

The Victorian Health Departments annual heath survey indicated that: *There was a significant increase in the proportion of females and all persons*, *but not males*, *who ran out of food at least once in the previous 12 months and could not afford to buy more* (Department of Health 2011 p. 7). The survey figures for all people went from 4.6% in 2005 to 5.4% in 2009; the figures for males went from 4.3% in 2005 to 4.6% in 2009 and females went from 4.8% in 2005 to 6.2% in 2009. People who said they ran out of food at least once in the previous 12 months were asked how frequently this had occurred; 8.8% reported running out once a week or more, 14.7% once every 2 weeks, and 20.8% ran out of food once a month and 54.2% reported running out of food less than once a month (Department of Health 2011).

Cost, quality, variety, access to transport and nonculturally appropriate food are all symptoms of disadvantage. Whatever the issues, the role of ER agencies is to create a safe environment in dealing with entrenched hunger which allows the causes of food insecurity to be addressed.

## 10.7 The Source of Food for the ER Agencies

The ER sector relies heavily on donated food to provide a service to their clients. This reliance is due ER agencies' small budgets and the lack of infrastructure to store and produce commercial quantities of food. For instance, Watts (2011) in a survey of ER in Victoria estimated that about 60% of ER agencies had a cash budget of less than $40,000.

Just over a 100 ER agencies in Victoria were surveyed in 2011 (FareShare, SecondBite, Foodbank Victoria 2011). The survey indicated that ER agencies are able to provide about two thirds of the food needed for relief within their communities, and two thirds of the food they distribute is donated from Foodbank Victoria, FareShare and SecondBite and local business. The ER agencies purchase the rest of the food they distribute. The percentage of donated foods is 70% fruit and vegetables, 50% meat, and 36% for eggs. Three quarters of the ER agencies provided food parcels while the remainder prepared meals from community kitchens. To overcome the short fall between donations and need, FareShare, SecondBite, and Foodbank are working to secure additional regular supplies of foods and advertising campaigns to raise funds for equipment and to meet increasing costs.

Foodbank has found that the reasons additional products may become available from producers, wholesalers, and retailers include the following:
Fresh Produce

1. Primary producers with surplus stock due to a 'bumper crop', cancelled orders or product that is out of specification for manufacturers, wholesalers or supermarkets (too small, too large, wrong shape or colour).
2. Wholesalers with surplus stock due to over ordering, poor product selection, changes in weather conditions changing buyer preferences or ageing produce.
3. Retailers also with surplus stock due to over ordering, poor product selection, changes in weather conditions changing buyer preferences or ageing produce.

Nonperishable Produce

1. Manufacturers with surplus stock due to poor sales forecasting, manufacturing of trial products, cancelled orders, production error that creates out of specification product or packaging, damaged goods or product line changes due to marketing initiatives or as a result of a merger/acquisition, product that has passed wholesaler/retailer acceptance dates.
2. Wholesalers with surplus stock due to over ordering, poor product selection, changes in weather conditions changing buyer preferences or ageing produce making distribution too close to Best Before Date.
3. Retailers also with surplus stock due to over ordering, poor product selection, changes in weather conditions changing buyer preferences or ageing produce making distribution too close to Best Before Date.

Several recent innovations around the notion of donation have been introduced which may go a long way to making Australia's food relief supply more secure and sustainable.

The first low cost innovation is around sourcing excess fruit and vegetable produce from urban agriculture such as Community Gardens, School Gardens, and residential plots. One example is known as *Street Harvest*. Street Harvest is aimed at simultaneously accessing quality fresh fruit and vegetables, while also engaging the community to volunteer and break down social barriers. Piloted in Wodonga, a town in northern Victoria, since June 2009, the Street Harvest program utilises residents with excess produce as suppliers, and volunteers from the local community to collect and distribute the produce direct to ER agencies or to a central storage location.

**Table 10.1** Collaborative supply program commitments

| Product | Supplier | Quantity (kilograms) | Project funding | Est retail value[4] |
|---|---|---|---|---|
| Breakfast cereal | Nestle | 43,200 | $10,000 | $561,600 |
| Pasta | Rinoldi | 800,000 | $303,540 | $3,440,000 |
| Pasta sauce | Simplot | 68,000 | $45,000 | $482,800 |
| Canned fruit | SPC | 142,000 | $100,000 | $727,040 |
| Canned baked beans/spaghetti | SPC | 145,000 | $100,000 | $609,000 |
| Total | | 1,198,200 | $558,540 | $5,820,440 |

So far 8,000 kg of excess produce from residential backyard plots and community gardens has been donated and used in local school breakfast projects, healthy eating programs, community meal programs, made into preserves to use in food parcels and given directly to people requiring fresh nutritious produce (Jess 2011; FoodMatters Newsletter 2011).

The second low cost innovation is called the Collaborative Supply Program. This is a Foodbank Australia initiative in which a network of suppliers is organised to produce a product. A manufacturer is engaged to produce a product and Foodbank supplies all the required inputs principally through donations for other firms. In some instances, not all items will be donated, so Foodbank Australia will work with government and other corporate donors to secure the necessary funds to ensure the project is completed successfully. The program enables precise amounts of required staple products to be identified and produced at a fraction of the retail cost (Foodbank 2010; AFN 2010). Table 10.1 outlines products produced through the collaborative supply scheme and their estimated retail value.

## 10.8 Conclusion

Supplying donated food to the ER agencies has tactical, strategic and holistic challenges for foodbank operators. Tactically, ER agencies need to be able to respond to the level of need at any one time. The challenge is to increase the quantity and kinds of food needed by the ER agencies so they can meet the demand. Strategically, the challenge is to provide a constant source of food products that are fresh and culturally appropriate for the clients. This requires developing ongoing relationships with a wide range of suppliers as well as constantly seeking new opportunities to obtain donated foods and financial donations to run the Foodbanks and relief organisations. Programs such as Collaborative Supply have enabled Foodbank to become proactively involved in the constant supply of staple food products. There is also a need to maintain and increase where necessary the level of volunteerism as this provides ongoing labour and expertise.

[4] http://www.colesonline.com.au, accessed Nov 1, 2010.

Holistically, the challenge is to link the supply of food to more substantive community engagement to address the causes of food insecurity in the clients of the ER agencies. It also involves considering the broader concerns of food security such as sustainability. Programs such as Street Harvest are providing opportunities to involve local communities. The food relief and ER organisations are seen by the food industry as trusted partners in putting what would become waste in the food supply chain to good use. They fill an important gap in food system by providing food for ER agencies allowing them to be more effective in providing emergency and ongoing aid when and where it is needed. While this is an important role in society, it is an emergency issue and should not be seen as increasing equity in society. Lack of equity in society is a pressing problem that requires structural and policy changes, so while food relief organisations have a distinct role to play in making sure nobody is left destitute, they should not be seen as part of the solution for social inequity.

## References

ACOSS. (2003). *The Emergency Relief Handbook, guide for emergency relief workers* (3rd ed.). Australian Council of Social Service Inc. 2003 (ACOSS), Strawberry Hills NSW 2012. Retrieved November 24, 2011, from http://www.acoss.org.au/images/uploads/363__ER_handbook.pdf.

AFN. (2010). Foodbank reinvents food donations: Collaborative supply, August 24, 2010. *Australian Food News*. Retrieved November 18, 2011, from http://www.ausfoodnews.com.au/2010/08/24/foodbank-reinvents-food-donations-collaborative-supply.html.

Anglicare. (2010). *Reaching the limits: A profile of Emergency Relief provision across Anglicare Australia agencies*. Sydney: Anglicare. Retrieved November 23, 2011, from http://www.anglicare.asn.au/documents/Reaching_Limits_November2010.pdf.

Babbington, S., & Donato-Hunt, C. (2007). *When there isn't enough to eat: The food insecurity of ANGLICARE Sydney's Emergency Relief Clients in Wollongong: Full report of the pilot study*. Parramatta, NSW: Policy Unit of ANGLICARE, Dioceses of Sydney. Retrieved November 30, 2011, from http://www.anglicare.org.au/files/pdf/WhenThereIsntEnoughToEat.pdf.

Department of Health. (2011). *Victorian population health survey 2009*. Melbourne: State Government of Victoria.

Engels, B. (2006). *The provision of emergency relief and contemporary pressures for change in Metropolitan Melbourne***.** Melbourne, Victoria: RMIT University and Emergency Relief Victoria. Retrieved November 23, 2011, from http://www.vcoss.org.au/documents/VCOSS%20docs/Emergency%20Relief/The%20Provision%20of%20ER%20and%20Contemporary%20Pressures%20for%20Change%20in%20Metropolitan%20Melbourne.pdf.

Engels, B., Nissim, R., & Landvogt, K. (2009). *Under Pressure, Costs of living, financial hardship and emergency relief in Victoria*. Melbourne, Victoria: Victorian Council of Social Service and ER Victoria. Retrieved November 23, 2011, from http://www.vcoss.org.au/documents/VCOSS_docs/Emergency%20Relief/ER%20report-Final_withCover.pdf.

FaHCSIA. (2011). *Financial management program guidelines, effective from 1 July 2009 (Version 1.5—Updated 20 June 2011).* Canberra, ACT: Department of Families, Housing, Community Services and Indigenous Affairs. Retrieved November 24, 2011, from http://www.facs.gov.au/sa/communities/pubs/Documents/FinancialManagement/FMPG_Vers1_3.pdf.

FareShare, SecondBite, Foodbank Victoria. (2011). *Community Food Programs in Victoria, A report on the food needed and the infrastructure required***.** Retrieved November 23, 2011, from http://www.secondbite.org/resources/documents/2011CollaborativeSurvey-CommunityFoodPrograms-areportonthefoodneededandinfrastructurerequire.pdf.

Foodbank. (2010). Two million Australians to benefit from delivery of pasta and pasta sauce to welfare agencies. *Fuel, 2*. Retrieved August 24, 2011, from http://www.foodbank.com.au/files/upload/Fuel_Newsletter_2_1008.pdf.

FoodMatters Newsletter. (2011). Albury Wodonga Regional Food Security Network. Retrieved February 16, 2012, from http://www.vrfb.com.au/rural-support/uploadedFiles/1323135001742-9755.pdf.

Jess, A. (2011). *Harvesting community spirit, 22 November, 2011 4:51PM AEDT*. Goulburn Murray: Australian Broadcasting Commission. Retrieved February 18, 2012, from http://www.abc.net.au/local/videos/2011/11/22/3373398.htm.

Rural and Regional Committee. (2010). *Final report, Inquiry into the Extent and Nature of Disadvantage and Inequity in Rural and Regional Victoria, October 2010*. Victorian Parliament, Parliamentary Paper, No. 385 Session 2006–2010, East Melbourne, Victoria. Retrieved November 30, 2011, from http://www.parliament.vic.gov.au/images/stories/committees/rrc/disadvantage_and_inequality/report/20101014_for_web.pdf.

Sen, A. (1983). Poor, relatively speaking. *Oxford Economic Papers, New Series, 35*(2), 153–169.

St Mary's. (2011). *Web page, St. Mary's Food Bank Alliance, About us, History*. Retrieved November 24, 2011, from http://www.firstfoodbank.org/history.html.

UN. (1995). *World Summit for Social Development, Report of the World Summit for Social Development Annex II, Chapter II, Eradication of Poverty, Paragraph 19* (p. 41). Retrieved June 10, 2011, from: http://www.un.org/documents/ga/conf166/aconf166-9.html.

VCOSS. (1982). *Victorian emergency relief project* (2nd ed.). Melbourne, Victoria: Victorian Council of Social Service.

Vic health. (2008). *Food for All—how local government is improving access to nutritious food.* Melbourne, Victoria: VicHealth. Retrieved November 30, 2011, from http://www.vichealth.vic.gov.au/Publications/Healthy-Eating/Healthy-Eating-Programs/Food-For-All---Resources-for-Local-Governments.aspx.

Watts, R. (2011). *The challenge of sustainability: Emergency relief provision in Victoria, and the key issues confronting its long term future*. Melbourne, Victoria: Richard Watts and Associates for Emergency Relief Victoria (ERV).

# Chapter 11
# Case Studies on Food Equity and Access

**Darren Ray, Leah Galvin, Claire Palermo, Erik Eklund, Stuart Auckland, Quynh Lê, Rebecca Lindberg, and Russell Shields**

## 11.1 Putting the Local Back into Food Security

**Darren Ray and Leah Galvin**

Local governments have a governance responsibility to identify local solutions that support individual, household and community food choices that strengthen the health and wellbeing of communities. Social cooperation in communities is essential to ensure sustainability of local food supplies. Local governments are key facilitators of health and wellbeing, yet the need to build understanding and capacity around local food security barriers and opportunities is only starting to emerge.

The contribution to individual, household and community health and wellbeing, and equity and sustainability of food security 'from paddock to plate' is well understood at

D. Ray (✉)
Consultant, Melbourne, Victoria, Australia
e-mail: darrencharlesray@gmail.com

L. Galvin
Victorian Local Government Association, Melbourne, Victoria, Australia

C. Palermo (✉)
Monash University, Clayton, Victoria, Australia
e-mail: claire.palermo@med.monash.edu.au

E. Eklund (✉)
Monash University, Gippsland, Victoria, Australia
e-mail: erik.eklund@monash.edu

S. Auckland (✉) • Q. Lê
University of Tasmania, Newnham, Tasmania, Australia
e-mail: Stuart.Auckland@utas.edu.au

R. Lindberg • R. Shields (✉)
SecondBite, Melbourne, Victoria, Australia
e-mail: russell@secondbite.org

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_11,

the national and international levels. Significant research, policy and action plans have emerged. While the capacity of local community and nongovernment organizations to identify local food security barriers and opportunities has grown, there is yet to be a 'critical mass' of planning by local governments in Victoria and Australia around this issue.

The Public Health and Wellbeing Act 2008,[1] requires that Victorian local governments plan for municipal health and wellbeing, via the adoption of a Municipal Public Health Plan (MPHP). Most are already reporting their local activities to promote individual, household and community health and wellbeing. More recently, the Victorian State Government has published this state's first ever Public Health and Wellbeing Plan 2011–2015, which sets out its agenda to improve health and wellbeing in Victoria over the next 4 years. This plan explicitly prioritizes the need to engage communities in prevention; as well as the need to strengthen systems for health protection, health promotion and preventive healthcare across all sectors and all levels of government. The plan recommends support for local governments and urban planners to enhance the supply of, and access to, nutritious food in municipalities through promoting the uptake of existing municipal food security scanning tools.

A handful of local governments are now embarking on this journey, and are aiming to see that their MPHP genuinely relates to, and is informed by, two other critical local government plans—the Council Plan and the Municipal Strategic Statement. With the support of 5 years of research and piloting of municipal food security scans in local governments from 2005 to 2010, the Victorian Local Governance Association (VLGA) has developed Municipal Food Security Scanning Tools to assist local governments build workforce capacity.

Local government application of these tools is a relatively rapid process of up to 6 months. Municipal scanning is completed by the local government in partnership with other organizations, and community consultation fills in the gaps and also validates local outcomes. Engagement of local government staff and external partners during this process is invaluable and provides a springboard for increasing awareness of local food security issues and the need for local governments to integrate food security strategies into core business, in realistic and achievable ways.

A key outcome of conducting municipal food security scans is the building of an evidence base to support relevant and effective local actions. The scan is informed by the Victorian Environments for Health (E4H) Municipal Public Health Planning Framework (Victorian Department of Human Services 2001),[2] as well as the E4H Municipal Health Planning Framework for Food Security (Wood and Streker 2005),[3] which have been adapted for use in metropolitan, regional and rural communities.

---

[1] Victorian Government. Public Health and Well-being Act, 2008 (Act Number 4). Melbourne:Government of Victoria; 2008. (http://www.legislation.vic.gov.au).

[2] Victorian Department of Human Services. Environments for health. Promoting health and wellbeing through built, social, economic and natural environments. Municipal public health planning framework. Melbourne, Victorian Department of Human Services, 54 pp; 2001. (http://www.health.vic.gov.au/localgov/index.htm).

[3] Wood B and Streker P. Food security in the City of Port Phillip. Report Part V: Municipal food security. Executive Summary of dimensions, opportunities, and new ideas. Community & Health Development Team. St Kilda, Victoria: City of Port Phillip; 2005. (http://www.portphillip.vic.gov.,au/attachments/o14647.pdf).

Adapting the four dimensions of the Victorian Environments for Health (E4H)—the natural, built, economic, and social environments—the VLGA tools include a Municipal Food Security Scanning Work Book, Resource Manual and Training Manual to support projects in local communities and to guide local governments through reflection, consultation, planning and responding to the things that they can directly impact upon. Barriers and opportunities unique to individual local governments are identified, as are wider impacts of food security issues. The VLGA Scanning Work Book includes adaptable forms relevant to the natural, built, economic and social environments. The Resource Manual provides local governments with the materials they require to manage the conduct of their own municipal food security project, and for those with resource constraints, the Training Manual is an outline of a recommended Training Program and other support available to individuals as well as groups of local governments.

The processes recommended in conducting municipal food security scans are informed by the actual ways that individual local governments work and interact with their communities for positive health and wellbeing outcomes. As there is a considerable overlap of many local government issues including climate change, good governance, community engagement, housing, transport, and mental and physical well-being, the processes seek to utilize existing structures and networks, as well as new opportunities. As a result, local responses to this complex challenge are more likely to be complementary, provide cross-validation, and be strengthened by social cooperation in local communities.

Details about the Municipal Food Security Scanning Tools, as well as foundational research, can be obtained from http://www.vlga.org.au/Projects___Campaigns/Climate_Change/Food_Security4.aspx or by calling +61 3 9349 7999.

## 11.2 Measure the Cost of a Healthy Diet: A Determinant of Food Security

**Claire Palermo**

The cost of nutritious food is a key determinant of food security. Monitoring the affordability of nutritious food is important to consider in addressing food insecurity (Williams et al. 2009). Measuring trends in the cost of healthy food can assist in influencing public health nutrition policy and practice surrounding fresh food affordability (Burns and Friel 2007).

A range of different tools are available to measure the cost of a nutritious basket of foods in Australia: the Victorian Healthy Food Basket (VHFB) (Palermo and Wilson 2007); Queensland Healthy Food Access Basket (Queensland Health 2001); Illawarra Healthy Food Basket (Williams et al. 2004); Northern Territory Market Basket Survey(Department of Health and Community Services 2007); and Adelaide Healthy Food Basket (Tsang et al. 2007). The VHFB (Palermo and Wilson 2007) is the most recently developed and the only one to be based on the revised Nutrient

Reference Values (2006) and to be able to calculate the cost of a healthy basket of food for different family types.

The VHFB includes 44 items across five core food groups (Table 11.1) (breads and cereals, meats and meat alternatives, fruit, vegetables and dairy) and one noncore food group (fats, sugar and oils). Additional unhealthy items are included for cost comparison between supermarkets and are not included in the overall analysis of the basket. The tool determines the cost of the basket for four different family types:

1. A typical family consisting of two adults and two children (44-year-old male, 44-year-old female, 18-year-old female and 8-year-old male).
2. A single parent family consisting of a single mother with two children (44-year-old female, 18-year-old female and 8-year-old male).
3. A single adult male (greater than 31 years of age).
4. A single elderly pensioner (71-year-old female). This cost is then able to be compared to the family's income based on government benefits.

The VHFB has been used across Victoria (Bradley 2011; Givoni and Palermo 2010; Lade 2010; Monash University Department of Nutrition and Dietetics 2010; Outer East Communtiy Support Alliance 2009; Palermo et al. 2008) and in other states (Wong et al. 2011) to assess the cost of a nutritious diet. The data is sparse and inconsistent across areas, with only a small proportion of rural and urban areas consistently collecting data. However, the findings from these studies consistently show that those with the highest risk of food insecurity need to spend between 28 and 34% of their fortnightly income to consume a healthy diet. This is in contrast to the average Australian who spends approximately 17% of their income on food (Australian Bureau of Statistics 2005) and is important consideration when evidence suggests that those on low incomes prioritize housing, power, water, telephones, transport and clothing over food (Williams et al. 2006).

Longitudinal data collected for one local government area (LGA) in Victoria over 3 years showed that while the cost of the healthy food basket increased by 6% the percentage of a 'typical families' welfare income required to be spent on food reduced from 40 to 34% of income (2007 to 2009), reflecting an increase in government income allowances (Givoni and Palermo 2010).

Although a complete representative sample of food cost across Victoria has not been collected, a cross-sectional sample of data from eight LGAs in Victoria was recently reported (Monash University Department of Nutrition and Dietetics 2010). Cost of foods that make up the VHFB was collected from 110 stores from April to August 2010 (Table 11.2). The overall median cost of the VHFB across the eight LGAs for a Typical Family was \$417.24 (33% of income). The median cost for a Typical Family significantly differed across the eight LGAs, $\chi^2$ $(7, N=110)=19.749$, $p=0.006$. The most expensive basket for a Typical Family was Mornington Peninsula Shire (\$429.60) while the least expensive was Frankston City Council (\$400.65). There is a cost difference of almost thirty dollars (\$28.95) despite the fact that these two LGAs have adjoining geographical boarders. No relationship was found between SEIFA and cost ($p=0.318$). It was found that the basket cost and percentage of income required was significantly less at Chain stores compared to Independent stores.

**Table 11.1** Total amount of food in Victorian healthy food basket (VHFB)

| Victorian healthy food basket | | | | | |
|---|---|---|---|---|---|
| Basket item | Product size | Typical family | Single parent family | Elderly pensioner | Single adult family |
| *Breads and cereals* | | | | | |
| White bread | 650 g | 1.4 loaves | 0.7 loaves | 0.2 loaves | 0.8 loaves |
| Wholemeal bread | 650 g | 5.8 loaves | 3.6 loaves | 1.3 loaves | 2.3 loaves |
| Crumpets (rounds, 6pk) | 300 g | 3.1 packets | 2.2 packets | 0.9 packets | 0.9 packets |
| Weet-bix | 750 g | 1.4 packets | 0.9 packets | 0.2 packets | 0.5 packets |
| Instant oats | 500 g | 1.5 packets | 1.2 packets | 0.4 packets | 0.4 packets |
| Pasta | 500 g | 1.7 packets | 1.1 packets | 0.4 packets | 0.6 packets |
| White rice | 1 kg | 1.4 bags | 0.9 bags | 0.3 bags | 0.6 bags |
| Instant noodles | 85 g | 9 packets | 6 packets | 2 packets | 3 packets |
| Premium biscuits | 250 g | 1.3 packets | 0.8 packets | 0.2 packets | 0.5 packets |
| *Fruit* | | | | | |
| Apples | 1 kg | 5.8 kg | 4.3 kg | 1.8 kg | 1.4 kg |
| Oranges | 1 kg | 5.7 kg | 4.6 | 1.4 | 1.1 kg |
| Bananas | 1 kg | 4.1 kg | 2.8 kg | 0.9 kg | 1.3 kg |
| Tinned fruit salad, natural juice | 450 g | 9 tins | 4.9 tins | 1.8 tins | 3.7 tins |
| Sultanas | 375 g | 0.56 packets | 0.7 packets | 0.13 packets | 0.3 packets |
| Orange juice 100%, no added sugar | 2 L | 2.5 L | 1.5 L | 0.5 L | 0.8 L |
| *Vegetables, legumes* | | | | | |
| Tomatoes | 1 kg | 4.7 kg | 2.8 kg | 1.1 kg | 1.9 kg |
| Potatoes | 1 kg | 2.6 kg | 1.7 kg | 0.7 kg | 1 kg |
| Pumpkin | 1 kg | 2.7 kg | 1.7 kg | 0.7 kg | 1 kg |
| Cabbage | 1 kg | 3.7 kg | 2.8 kg | 0.9 kg | 0.9 kg |
| Lettuce | 1 kg | 2.8 kg | 1.8 kg | 0.8 kg | 1.1 kg |
| Carrots | 1 kg | 3.1 kg | 2.2 kg | 0.8 kg | 0.9 kg |
| Onions | 1 kg | 1.2 kg | 0.85 kg | 0.3 kg | 0.4 kg |
| Frozen peas | 1 kg | 1 kg | 0.7 kg | 0.3 kg | 0.3 kg |
| Tinned tomatoes | 400 g | 8 tins | 6 tins | 2 tins | 2 tins |
| Tinned beetroot | 450 g | 0.8 tins | 0.4 tins | 0.2 tins | 0.4 tins |
| Tinned corn kernels | 440 g | 2.1 tins | 1.6 tins | 0.6 tins | 0.6 tins |
| Tinned baked beans | 420 g | 9.5 tins | 5.7 tins | 1.9 tins | 3.8 tins |
| *Meat and alternatives* | | | | | |
| Fresh bacon, shortcut, rindless | 1 kg | 0.75 kg | 0.5 kg | 0.2 kg | 0.3 kg |
| Fresh ham | 1 kg | 0.54 kg | 0.3 kg | 0.12 kg | 0.2 kg |
| Beef mince, regular | 1 kg | 1.1 kg | 0.7 kg | 0.34 kg | 0.3 kg |
| Lamb chops, forequarter | 1 kg | 0.8 kg | 0.4 kg | 0.2 kg | 0.4 kg |
| Chicken fillets, skin off | 1 kg | 1.3 kg | 1 kg | 0.3 kg | 0.3 kg |
| Sausages | 1 kg | 0.9 kg | 0.5 kg | 0.3 kg | 0.4 kg |
| Tinned tuna (unsat. oil) | 425 g | 2.8 tins | 2.1 tins | 0.7 tins | 0.7 tins |
| Tinned salmon, pink (water) | 210 g | 2.9 tins | 2.1 tins | 0.7 tins | 0.7 tins |

(continued)

**Table 11.1** (continued)

| Victorian healthy food basket | | | | | |
|---|---|---|---|---|---|
| Basket item | Product size | Typical family | Single parent family | Elderly pensioner | Single adult family |
| Large eggs (min. 50 g, caged) | 700 g dozen | 1.6 boxes | 1.2 boxes | 0.4 boxes | 0.4 boxes |
| *Dairy* | | | | | |
| Fresh full cream milk | 1 L | 2 L | 1.5 L | 0.5 L | 0.5 L |
| Fresh reduced fat milk | 2 L | 13.8 L | 10.4 L | 3 L | 3.4 L |
| Reduced fat flavoured yoghurt | 1 kg tub | 8.4 | 6.8 kg | 2 kg | 1.6 kg |
| Full fat long life milk | 1 L | 0.6 L | 0.4 L | 0.1 L | 0.14 L |
| Cheese, block | 500 g | 2.1 blocks | 1.2 blocks | 0.5 blocks | 0.9 blocks |
| *Noncore foods* | | | | | |
| Polyunsaturated margarine | 500 g | 1.4 tubs | 0.8 tubs | 0.3 tubs | 0.5 tubs |
| White sugar | 1 kg | 0.1 kg | 0.07 kg | 0.03 kg | 0.03 kg |
| Canola oil | 750 mL | 0.4 bottles | 0.3 bottles | 0.086 bottles | 0.086 bottles |

**Table 11.2** Median cost of a VHFB for various family types across eight local government areas in Victoria (Monash University Department of Nutrition and Dietetics 2010)

| | Median cost of a VHFB per fortnight ($) | | | |
|---|---|---|---|---|
| Local government area | Typical family | Single parent family | Single adult | Elderly woman |
| Frankston City Council | 400.65 | 273.24 | 127.46 | 96.20 |
| Baw Baw Shire Council | 406.37 | 277.80 | 128.80 | 96.92 |
| Latrobe City Council | 411.03 | 281.44 | 127.03 | 97.82 |
| City of Boroondara | 411.44 | 283.63 | 128.08 | 98.80 |
| Melton Shire Council | 413.31 | 283.18 | 129.96 | 98.24 |
| Hume City Council | 418.00 | 283.12 | 133.73 | 100.34 |
| Moorabool Shire Council | 425.36 | 290.76 | 134.66 | 101.89 |
| Mornington Peninsula Shire | 429.60 | 292.97 | 137.57 | 103.38 |

The cost of core, nutritious food items in the basket appear to vary in price more than the cost of the unhealthy food items. Cross-sectional data collected across rural Victoria showed that vegetables had a significantly greater variation in price compared to cereals ($p<0.05$), noncore foods ($p<0.05$) and unhealthy foods ($p<0.001$) (Palermo et al. 2008). In addition the cost of vegetables contributed to the greatest proportion of the total cost of the basket and unhealthy foods contributing the least (Table 11.3) (Palermo et al. 2008).

There is a need for a consistent and coordinated approach to collection of appropriate samples of healthy food basket data and expert assessment of the results. Monitoring the cost of a healthy diet is the first step towards an integrated approach to strategies to improve access to nutritious food and thus improve health.

**Table 11.3** Variation in cost for a 'typical family' of food groups in the VHFB purchased across 34 Victorian stores (Palermo et al. 2008)

| Food groups | Median price ($A) (interquartile range) | Percentage price variation (%)[a] |
|---|---|---|
| Cereals (9 items) | $57.22 (5.86) | 10.2 |
| Vegetables and legumes (12 items) | $93.96 (15.83) | 16.8 |
| Fruit (6 items) | $82.97(10.03) | 12.1 |
| Meat and alternatives (9 items) | $84.81 (10.63) | 12.5 |
| Dairy (5 items) | $83.62 (10.74) | 12.8 |
| Noncore foods (3 items; fats, sugar) | $5.66 (0.53) | 9.4 |
| Unhealthy food items (2 items) | $4.34 (0.30) | 6.9 |

[a]Calculated as (interquartile range/median)*100

## 11.3 The Australian Frontier and Food Security

**Erik Eklund**

Indigenous people in Australia fiercely resisted European encroachment onto their traditional lands which provided their livelihood and with which they had intimate spiritual connections. In the last 30 years especially there has been a flowering of new scholarship on the Australian frontier from anthropologists, historians and Indigenous scholars. Before 1970, it was not so much that the Australian frontier experience had been forgotten as this knowledge was marginalized or denied by mainstream white society and scholarship.

One crucial element of the frontier experience for Indigenous people was the steady erosion of traditional food sources in the face of new patterns of land use and exploitation aggressively imposed by white settlers. Threats to Indigenous food security in turn led to attacks on the settler economy and its food resources. This was both a form of resistance and an inevitable consequence of dispossession as competition and conflict over scare resource become common place during particular frontier scenarios.

For coastal Aborigines the first impact of the new settler economy was the transient but often quite destructive impact of the whalers and sealers, who were active on the eastern and southern coasts of the continent from the 1790s (Shaw 2003, p. 3). There was a trade in Aboriginal women, sometimes negotiated and sometimes forcibly taken. Forced removal of group members was a common experience across the frontier, removing key contributors to the hunter gatherer economy. On the coast east of what later became Melbourne whalers and sealers were visiting isolated beaches and inlets from as early as 1796. Further west sealers camped on Flinders Island, or to the south on the isolated bays and islands of Van Diemen's Land. Very soon, colonies of seals and the smaller whales were depleted. Such foods were a rare treat for Indigenous people, often the result of a beached animal. Such was the extent of the exploitation, by the 1840s bay or shore whaling was no longer a viable enterprise (Lawrence 2008 pp. 15–33).

South east of the new settlement of Melbourne through the Gippsland region, frontier conflict began in earnest in the 1840s. Initial contact on the frontier did not always precipitate conflict. This was often a period of distant watchfulness or even modest engagement. It was only the assertion of control and the increasing use of resources together with the abuse of Aboriginal women that often led to more sustained conflict. In South Gippsland, in the mid-1840s, spearing cattle was a common form of Indigenous resistance. Attacking this prized animal of the new settler economy was a powerful form of symbolic and economic reprisal (Broome 2005 p. 77). Here, as elsewhere such actions, as well as the killing of a settler, led to retribution from colonial authorities and settlers, often disproportionate to the original transgression and often meted out with little regard for confirming the correct perpetrators (Broome 2005 p. 81).

It was on the pastoral frontier, particularly the open dry plains behind the coastal ranges, where food security became a more central cause of frontier conflict. There was a rapid spread of sheep and cattle, along with shepherds and station managers, on the plains of New South Wales, Van Diemen's Land (renamed Tasmania in 1853) and South Australia from the 1800s. By the 1840s, much of the best grazing land had been taken in Van Diemen's Land, large parts of the future colony of Victoria were occupied, and even the far west of NSW along the Darling River was occupied by pastoralists.

Pastoralism was a low cost economic activity that relied on the seemingly endless supply of virgin territory. This land-hungry practice had a profound impact on the environment. Natural grasses were eroded, and waterholes polluted by large mobs of unruly cattle with little if any supervision. Pastoralists often took the best positions for their own homesteads, near a reliable water source. Such areas were crucial for the supply of traditional food sources, both for the water of course but also as a natural site for game, and many gathered foods (Cole 2004 pp. 156–189 and Reynolds 1990a pp. 157–158). Areas of sparse scrub and young trees, often cared for and husbanded deliberately by Indigenous people to encourage certain animals or plants, were trampled. This had the effect of reducing traditional supplies of food forcing Indigenous people into the settler cash economy (where this was possible), or requiring Indigenous people to 'come in' and reside in fringe camps on the outskirts of new towns (Reynolds 1990a pp. 192–197).

While traditional sources of food were in short supply, the flocks of sheep and herds of cattle represented an alternative food source. In some cases, Indigenous people killed sheep and cattle, or took crops such as corn, just for survival. In other cases, spearing of cattle and sheep, or indeed other forms of attack and resistance such as spearing horses or attacking camps at night, were calculated reprisals against settler transgressions, or guerilla-style actions in an ongoing act of resistance (Cole 2004 ). This was one way to fight back against the incoming wave of pastoralism.

While violence or the threat of violence was a factor shaping all frontier relations, it was also the case that Indigenous knowledge and expertise was utilized by settlers. Aboriginal guides were on most journeys of land and sea exploration (Reynolds 1990b). Such journeys, it should be remembered, were not just about exploration for the sake of it, but were about identifying new resources and potential grazing land. Indigenous knowledge of hunting and gathering techniques was also passed on. On Kangaroo Island, off the South Australian coast, survival for the mixed community of sealers and Aboriginal women was assisted by the hunting and gathering skills of the women. Women taught the sealers how to build wallaby traps and collect eggs from mutton bird colonies (Clarke 1996).

In other ways, in particular frontiers, settler food security was dependent on Indigenous labour. The pastoral economy in remote parts of Australia such as in North Queensland and in the south west of Western Australia was heavily dependent on Aboriginal labour. Aboriginal men were highly capable horseman and also used their bush craft for the benefit of the property. Aboriginal women worked on the stations performing a range of domestic and household jobs (Crawford and Crawford 2003; May 1994; McGrath 1987) and Aboriginal men recruited to the native police in Queensland and in the Port Phillip District were a highly effective force that helped quell Indigenous resistance (Fels 1988; Reynolds 1990b).

Food security was an issue that shaped the frontier experience and the expansion of settler dominion over the land, the sea and its resources. It exercised the minds of Indigenous people and white settlers with a burning immediacy. What was at stake for Indigenous people was their survival in their traditional country, while for settlers it was the success or failure of the colonizing project. While the context has changed dramatically, the underlying issues of sustainability, reconciling competing needs and managing scarce resources remain. The nineteenth century frontier experience indicates that an aggressive assertion of control by one group over another is not a long-term solution. Many of these same issues remain for this current generation to tackle. We trust that our present-day investigation and resolution of these issues will be more humane and effective than the nineteenth century equivalents.

## 11.4 Building Collaborative Structures to Address Food Security in Tasmania: The Tasmanian Food Access Research Coalition (TFARC) Experience

**Stuart Auckland and Quynh Lê**

### *11.4.1 Context*

Tasmania is often regarded with great envy by many individuals seeking to live a more sustainable lifestyle. It has an abundance of natural resources with vast water reserves and some of the best food producing soils in the country, which produce a significant amount of products for both domestic and export markets, including 20% of Australia's aquaculture production and nearly 9% of the nations' dairy production (Isaac 2010). However, a large percentage of its population receive some form of social security payment which allows for only the most basic quality of life (Madden 2004). Due to a higher level of socioeconomic disadvantage compared to other states, food insecurity is likely to be experienced by proportionately more people in Tasmania.

In recent years, a number of reports have identified food security as a critical issue and opportunity for action. One such report was the Social Inclusion Strategy for Tasmania (Adams 2009). The report identified the need for greater promotion of nutritious eating in schools and within families and wider adoption of practical measures to enable individual and community participation in food enterprises and systems in Tasmania.

One of the key responses to this pressing need for enhanced food security state-wide was the establishment of the Tasmanian Food Security Council (TFSC). In 2010, the TFSC provided the Tasmanian Food Security Fund (TFSF) for the development of innovative and enterprising projects aimed at improving Tasmania's access to a reliable supply of safe and nutritious food. Central to the TFSF provision was the recognition of the value of a cross-sectoral approach based on the formation of collaborative structures to address the intersecting issues underpinning food security. Whilst not conditional of the funding, the TFSF administrators strongly encouraged cross-sectoral collaborations in the submission applications on the basis that effective collaborations are an effective mechanism for increasing the power and leverage of groups or individuals towards common goals.

### *11.4.2 Coalitions*

Collaborative structures have different forms and levels of formality. One such form is coalitions. Coalitions are defined as structured arrangements for cooperation and collaboration between otherwise unrelated groups or organizations, in which each group retains its identity but all agree to work together towards a common, mutually agreed goal (Minnesota Department of Health 2011). Forming coalitions to address social or environmental issues is not unique; the uniqueness in coalitions is often in how they are formed or how they operate. Coalitions are particularly effective in tackling big social issues where goals focus on system-wide changes. The issue of food security transcends the landscapes of production, environment, society and health. By its very nature, food security is closely aligned with the notions of equity, social justice, community empowerment and related social issues (Bertrand et al. 2008; Friel and Baker 2009). Therefore, it calls for an integrated approach to addressing the full breadth and depth of the whole issue. The importance of considering the social, economic and environmental dimensions of food security together with a strong recommendation by the project funding body to demonstrate cross-government and/or cross sector collaborations was the basis for the formation of the Tasmanian Food Action Research Coalition (TFARC).

### 11.4.3 The Tasmanian Food Access Research Coalition (TFARC)

TFARC is a coalition of six Tasmanian based organizations from the government, nongovernment and academic sectors that expressed a common interest in food security. In addition to the core organizational membership, there are local community based partner organizations to help strengthen the capacity of TFARC. The partnerships between coalition members and local community partners are regarded as pivotal to the community development approach. Each coalition member and local partner organization brings a distinct suite of skills and community networks critical to achieving the project outcomes.

The aim of the TFARC is to work in a community development framework to identify and improve understanding of food access in two Tasmanian municipal areas: Dorset in the North-East and Clarence in the South of Tasmania. The project uses a mixed methodology approach in gathering data relating to the physical accessibility of food outlets, and the cost, quality and availability of fresh nutritious foods. The project also aims to identify potential areas at risk of food insecurity within the two study sites and determine what interventions are needed to improve the situation (TFARC Submission for Funding 2010).

### 11.4.4 Establishing and Managing the Coalition: The TFARC Experience

A primary driver for the formation of the TFARC coalition was the implementation of an expression of interest (EoI) processed by the project sponsor (TFSC), in which interested organizations were invited to attend a project briefing. During the briefing, the project sponsor was explicit in its encouragement of interested parties to put forward their particular expertise and interest areas and thereby identify potential collaborators in the tender submission process. Formal and informal approaches were made between interested parties based on matching similar interests and complementary skills. The project sponsor offered to facilitate the matching process by introducing representatives from different organizations to one another.

A number of factors contributed to the successful formation of the TFARC coalition. Many of them such as prior history of collaboration, common interest in food security and strong networks are well-known motivators for cross-sectoral collaboration. From a community partner perspective, coalitions are seen to build trust and consensus between people and organizations that have similar responsibilities and concerns within a community (Prevention Institute 2011). In the case of the TFARC coalition, the influence of the local landscape cannot be underestimated. The local landscape is characterized by strong business and community networks, a high awareness of the social and political climate within the study area and the limited number of local organizations with sufficient capacities to respond to the terms of the food security tender.

### 11.4.5 Leadership

Strong leadership at both the project and organizational level is critical in maintaining the momentum of the coalition. At the project level, good leadership involves the ability to inspire commitment and action whilst maintaining the coalition's focus on its agreed goals (US Department of Housing and Urban Development 2009). At the organizational level, the TFARC experience was one in which leadership had the potential to be both an enabler and a barrier to the effective operation of the coalition. The coalition understood the need for strong leadership at an organizational level to advocate for the work of the coalition, to deal with the various administrative and contractual requirements between the collation and project sponsor and to potentially provide leverage for future work. Points of friction did arise between some members of the coalition and the coalition 'lead' organization. This tension rose when it was perceived by some coalition members that the 'lead' organization had exceeded its agreed responsibilities and became too domineering and controlling in the day-to-day operations of the coalition. Such situations could be avoided through the establishment of a formal agreement between coalition member organizations that place limits on a lead organization's control of process.

### 11.4.6 Establishing Ground Rules

Achieving agreement on the ways of working was the first priority for the TFARC. It was agreed at the first meeting of the coalition that any established ground rules would be on the basis of fairness and equality defined as the 'spirit of the coalition'. It was agreed that no one coalition member organization would have more power or authority than another and that the process for decision making would be based upon one organization/one vote. For administrative purposes, one coalition member organization was appointed the 'lead' organization, which would represent the coalition for all administrative and contractual requirements between the project sponsor and the coalition member organizations. Separate contractual arrangements were made between the respective coalition member organizations and the 'lead' organization. This arrangement ensured that no one organization carried the project risk should there be breaches or non-compliance of the contractual obligations with the project sponsor. Funds for the completion of project tasks were distributed to coalition member organizations in accordance with the number and cost of tasks carried out by coalition member organizations. For ease of communication and transparency, these funding arrangements together with the roles and responsibilities of each coalition member organization were included in a draft memorandum of understanding between coalition members and the 'lead' organization.

### 11.4.7 Managing Competing Expectations

A major challenge in the early stages of the project was managing the competing demands placed on coalition members by their respective employer organizations. The absence of clear and transparent communication channels between coalition members and their respective employer organizations about their specific project responsibilities had the potential to impede the long-term success of the coalition. Given that all coalition members had other work commitments, the importance of communicating the agreed goals, objectives and project tasks with employer organizations was critical. A coalition comprised of a diverse group of member organizations such as the TFARC brings with it a wide variety of viewpoints and experiences. Such viewpoints and experiences held by any one coalition member organization have the capacity, through its coalition membership, to push for a stronger emphasis on a particular aspect of the project focus. For example, a coalition member organization that has a core interest in the social determinants of health may seek to bring a stronger focus on addressing the health aspects of food security, or another member organization may have a particular interest in the social dimensions of food security. How these competing interests are managed whilst maintaining the integrity of the project in terms of its agreed goals and objectives is crucial in achieving the successful outcomes of the project.

### 11.4.8 Effective Communication Processes

The TFARC coalition operates at different levels. The first level is the relationship between coalition members and coalition member organizations, where it is important to establish effective communication processes between the coalition members. These processes are supported by the existence of a memorandum of understanding (MoU), which outlined the roles, responsibilities and financial obligations of each member organization. Importantly, the MoU provides an opportunity to build relationships between the coalition members by identifying areas of strength and expertise. This information also gives rise to opportunities for shared learning or mutual support. Communication strategies at this level include regular face-to-face meetings, video conferencing and group emails.

At another level exists the relationship between the coalition and external partner organizations such as neighbourhood houses and community centres in the target study sites. Many partner agencies are community based organizations reliant on basic resources and volunteer resources. Communication processes at this level are determined by the needs of the community partners and available resources.

At the third level is the relationship between the TFARC coalition, the project sponsors and external stakeholders. This is perhaps the most problematic level. The drafting of a TFARC Communication strategy which outlined key messages and preferred communication channels was essential in ensuring some level of control by the coalition over the flow of information from the project to external stakeholders.

A major challenge was managing information about the project to media outlets as dispatched through coalition member organizations. A number of coalition member organizations have operated their own media resources responsible for all aspects of the organization work, including the TFARC project. The risk with this approach was that the coalition had limited control over the release of information. A strategy employed by the TFARC has been to work with member coalition organizations' media offices to ensure consistency, both in terms of timing and content, between the TFARC communication strategy and that of the member organizations.

### *11.4.9 Monitoring and Evaluation*

Putting in place the ongoing project monitoring and evaluation processes was seen as vitally important in ensuring that the project remained on track. The ability to modify or change approaches in response to evaluation outcomes was crucial. During the early project design phase, a number of modifications and adjustments to the project plan were required. The adjustments were based on new information or knowledge that could potentially impact the performance of the project. Evaluation strategies were linked to particular project milestones or key tasks.

### *11.4.10 Lessons Learned to Date*

The comments contained in this paper are based on preliminary observations and experiences with the development and operation of the TFARC project. The establishment of a high level of trust between coalition members as a starting point for further agreements is crucial. Important learnings to date include the importance of clarifying the boundaries and responsibilities of any coalition member organizations through the development of formal agreements. Of particular attention is achieving a formal agreement on the role of the 'lead' organization charged with overseeing the administrative and contractual obligations of the project with the project sponsor on behalf of the coalition members. Part of this agreement should clearly state how that role manifests at the project coalition level.

The importance of communication between and within the various levels of project governance is critical for ensuring the ongoing success of the project. Of particular importance is how coalition member organizations are kept informed about coalition policy and decisions at both the employer organizational and project level. The need to maintain effective communication with community based partner organizations will help achieve 'buy in' for the project at the local level. Flexibility and informality appear to be the key approaches in communicating to local partner organizations.

The need to monitor and evaluate project progress and the ability to make the necessary changes as they arise will help keep the project on track. Part of the project evaluation should also include an evaluation of the governance processes and in particular the degree to which the coalition is adhering to agreed processes.

With the TFARC project approximately halfway through its term, there will undoubtedly be further challenges ahead. There is an overwhelming commitment by all coalition member organizations to the agreed outcomes of the project and a desire to share learnings. This commitment to the spirit of the coalition provides a solid platform for addressing future challenges.

## 11.5 A Recipe for Success. SecondBite: Food for People in Need

**Rebecca Lindberg and Russell Shields**

SecondBite is committed to making a positive difference to people by identifying sources of nutritious surplus fresh food and produce that might otherwise go to waste, and facilitating its safe and timely distribution to agencies and people in need. The not-for-profit organization started in 2005 in Melbourne, Victoria, in a very small way using volunteers and private vehicles to collect fresh food from markets and deliver to local Community Food Programs (such as pantries, kitchens and outreach services). From humble beginnings, in 2011 SecondBite collected over one million kilograms of fresh food that might otherwise have gone to waste. The majority of this was fresh fruit and vegetables. With the generous support of 510 volunteers, enough food to provide almost two million hearty meals was delivered to 307 Community Food Programs across Australia. In their metropolitan operations SecondBite have warehouse facilities, refrigerated vans and 500 volunteers to collect and distribute the donated food. They also have a second model of fresh food rescue called *SecondBite Community Connect* ™. The program enables local food donors to connect directly with local food programs in outer-metro, regional and remote settings, ensuring food rescue can occur across Australia.

SecondBite has been able to grow in response to community demand because of their innovative approach to fresh food rescue which emphasizes collaboration, community consultation, research and strong advocacy. Along with the fundamental infrastructure that ensures fresh food is not being wasted, and that community agencies are receiving the best food delivery service possible, they have a Research and Development Department. A seven member Food Security Advisory Committee with expert Academics, Advocates and practitioners help guide the Department and ensure their research projects, evaluation framework, community consultations and education programs are effective. An example of a SecondBite education program is the community workforce training program, developed with the Community Nutrition Unit at the Department of Health and Human Services, Tasmania, which commenced in 2011. It aims to provide skills and support to the staff and volunteers that operate food pantries, parcel programs, cooking classes, community meals and outreach services. The Research and Development Department also conducts research exploring the issue of food insecurity for vulnerable people, investigates new fresh food rescue models in new regions and is responsible for measuring the impact of all of SecondBite's initiatives.

SecondBite actively collaborates with other organizations in community and industry sectors to form partnerships. For example, they launched a pilot program with the Australian Red Cross with a view to training Red Cross volunteers to be local facilitators of SecondBite Community Connect. They have been active in seeking new donations of food, especially based on ongoing and regular arrangements and donations of other materials including refrigerated vans and money. Recently *Coles Community Food with SecondBite* was launched, ensuring fresh food rescue will be offered to all Coles stores around Australia (approximately 665 over 3 years), benefiting local community agencies. The retailer will make a major contribution to SecondBite's food supplies, which range from farms, markets, wholesalers, packing companies, retailers and (to a small extent) catering companies and restaurants. In 2010, they released the results of research on the social return on investment which indicated that SecondBite returns $4.42 of social value for every dollar they received in donations (SecondBite 2011 annual report). This financial figure helps to highlight what social changes occur as a consequence of their work and attracts funders and food donors alike.

SecondBite has diversified their funding strategy to secure long-term investment partners. As part of the funding arrangements, SecondBite has established a future fund with the aim of reaching an endowment of $5 million by 2015 to allow the organization to work in perpetuity. The board's nine members for the future fund have been selected to build strength in the organization as have the 12 Directors for SecondBite. SecondBite have established a team of 'ambassadors' in 2011 to raise the profile of SecondBite in local communities and at a national level to ensure the community sector has a voice on the subject of food security.

SecondBite firmly believes that fresh food redistribution is part of the solution to food insecurity and has positive social, health, environmental and economic impacts. SecondBite exists to: (a) support community agencies that are the frontline response to poor nutrition and social disadvantage in Australia; and (b) explore better ways of redistrbuting food and engaging with donors and supporters in challenging the food waste practices in Australia. SecondBite sees food as a powerful medium through which to nurture, support and include people who are experiencing disadvantage (as many as two million Australians per year). Fresh food rescue can become a part of the solution to food insecurity—the 'how to' and evidence is there—it is just the funding and resources that limit the reach of SecondBite. Even so, the future looks bright for the NGO, as an example of a sustainable food solution that ensures social justice; SecondBite has just the right recipe.

Further information about SecondBite is available from the following sources:

SecondBite web site: http://www.secondbite.org/.

SecondBite Annual Report 2011, 2010, 2009 and 2008 available at: http://www.secondbite.org/about_us/annual_reports.php.

Lindberg, R. (2011). *Food Rescue—A Fresh Approach. Report 1.* SecondBite, Kensington, Victoria. Available from: http://www.secondbite.org/resources/documents/2011SecondBiteAFreshApproachReport_1_EMAILVERSION.pdf.

SecondBite (2009). *More Hunger, More Waste, A Report on the Experiences of Emergency Food Relief Agencies in Melbourne and Hobart in 2009.* SecondBite, Kensington Victoria. Available from: http://www.secondbite.org/resources/documents/MoreHungerMoreWastereportontheexperiencesofEFRagenciesinMelbourneandHobartWebVersion.pdf.

## References


Adams, D. (2009). *A social inclusion strategy for Tasmania*. Retrieved August 16, 2011, from http://www.dpac.tas.gov.au/__data/assets/pdf_file/0005/109616/Social_Inclusion_Strategy_Report.pdf.

Australian Bureau of Statistics. (2005). *Household Expenditure Survey, 2010*. Retrieved April 7, 2011, from http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/6D5F1DDFF4729C60CA25705900755727/$File/65300_2003-04.pdf.

Broome, R. (2005). *Aboriginal Victorians: A history since 1800*. Sydney: Allen and Unwin.

Bertrand, L., Therien, F., & Cloutier, M. S. (2008). Measuring and mapping disparities in access to fresh fruits and vegetables in Montreal. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique, 99*(1), 6–11.

Bradley, V. (2011). *The cost and availability of food in Bass Coast and South Gippsland, Victoria*. Retrieved April 7, 2011, from http://www.southcoastpcp.org.au/index.php/programs-a-services/integrated-health-promotion/207-victorian-healthy-food-basket-latest-report-december-2010.

Burns, C., & Friel, S. (2007). It's time to determine the cost of a healthy diet in Australia. *Australian and New Zealand Journal of Public Health, 31*(4), 363–365.

Clarke, P. A. (1996). Early European interaction with Aboriginal hunters and gatherers on Kangaroo Island, South Australia. *Aboriginal History, 20*, 59–61.

Cole, N. (2004). Battle camp to Boralga: a local study of colonial war on Cape York Peninsula, 1873–1894. *Aboriginal History, 28*, 156–189.

Crawford, P., & Crawford, I. (2003). *Contested country: A history of Northcliffe area, Western Australia*. Crawley: University of Western Australia Press.

Department of Health and Community Services. (2007). *NT Market Basket Survey 2007*. Retrieved April 7, 2011, from http://digitallibrary.health.nt.gov.au/dspace/bitstream/10137/226/1/Market%20Basket%202007.pdf.

Fels, M. (1988). *Good men and true: The Aboriginal Police of the Port Phillip District 1837–1853*. Melbourne: Melbourne University Press.

Friel, S., & Baker, P. I. (2009). Equity, food security and health equity in the Asia Pacific region. *Asia Pacific Journal of Clinical Nutrition, 18*(4), 620–632.

Givoni, N., & Palermo, C. (2010). Monitoring the cost of healthy food. *Australian and New Zealand Journal of Public Health, 34*(4), 433–434.

Isaac, J. (2010). *The Apple Isle's bid to feed Australia*. ECOS, CSIRO Publishing, published December 20, 2010.Retrieved August 2, 2012, from http://www.ecosmagazine.com/?paper=EC10043

Lade, R. (2010). *The Cost and Availability of Healthy Food in Wellington—May 2010*. Retrieved April 7, 2011, from http://www.wellingtonpcp.com.au/wp-content/uploads/2009/06/The-Cost-and-Availability-of-Healthy-Food-in-Wellington-May-2010.pdf.

Lawrence, S. (2008). A maritime empire: archaeological evidence for Van Diemen's Land whaling in the Southern oceans. *Tasmanian Historical Studies, 13*, 15–33.

Madden, K. (2004). *Bread and Board: When the basics break the budget*. Hobart: Social Action and Research Centre, Anglicare Tasmania.

May, D. (1994). *Aboriginal labour and the cattle industry: Queensland from white settlement to the present*. Melbourne: Cambridge University Press.

McGrath, A. (1987). *Born in the cattle: Aborigines in cattle country*. Sydney: Allen and Unwin.

Minnesota Department of Health. (2011). *What is a coalition?* Retrieved August 24, 2011, from http://www.health.state.mn.us/divs/hpcd/chp/hpkit/text/team_what.html.

Monash University Department of Nutrition and Dietetics. (2010). *Summary of 2010 Healthy Food Basket data across various Local Government Areas in Victoria*. Retrieved April 7, 2011, from http://www.med.monash.edu.au/nutrition-dietetics/documents/2010-vhrb-report.pdf.

Outer East Communtiy Support Alliance. (2009). *Outer East Community Food Access Research Project: Food security assessment and plans for a way forward*. Retrieved April 7, 2011, from http://www.oehcsa.infoxchange.net.au/library/public/items/2009/06/284025-upload-00001.pdf.

Palermo, C., Walker, K., Hill, P., & McDonald, J. (2008). The cost of healthy food in rural Victoria. *Rural and Remote Health, 8*, 1074 [online].Retrieved August 2, 2012, from http://www.rrh.org.au/publishedarticles/article_print_1074.pdf.

Retrieved August 2, 2012, from http://www.rrh.org.au/publishedarticles/article_print_1074 pdf.Palermo, C., & Wilson, A. (2007). Development of a healthy food basket for Victoria. *Australian and New Zealand Journal of Public Health, 31*, 360–363.

Prevention Institute. (2011). *Developing effective coalitions: An eight step guide*. Retrieved September 6, 2011, from http://www.eatwellmovemore.org/pdf/eightstep.pdf.

Queensland Health. (2001). *The 2000 Healthy Food Access basket (HFAB) survey: Full report.* Queensland Government: Brisbane, Queensland, Australia.

Reynolds, H. (1990a). *The other side of the frontier: Aboriginal resistance to the European Invasion of Australia*. Melbourne: Penguin.

Reynolds, H. (1990b). *With the white people*. Melbourne: Penguin.

Shaw, A.G.L. (2003). *A History of Port Phillip District: Victoria Before Separation*. Melbourne University Press..

Tasmanian Food Access Research Coalition. (2010). Food Security Fund—Stage 1: Submission for Funding. Anglicare, Hobart, Tasmania.

Tsang, A., Ndung'u, M., Coveney, J., & O'Dwyer, L. (2007). Adelaide Healthy Food Basket: A survey on food cost, availability and affordability in five local government areas in metropolitan Adelaide, South Australia. *Nutrition and Dietetics, 64*, 241–247.

U.S Department of Housing and Urban Development. (2009). *Building effective coalitions*. Retrieved August 28, 2011, from http://www.hudhre.info/documents/buildingEffectiveCoalitions.pdf

Victorian Department of Human Services, (2001). *Environments for health, promoting health and wellbeing through built, social, economic and natural environments, Municipal public health planning framework*. Melbourne, Victoria, Australia: Victorian Department of Human Services.

Williams, P., Hull, A., & Kontos, M. (2009). Trends in affordability of the Illawarra Healthy Food Basket 2000–2007. *Nutrition and Dietetics, 66*, 27–32.

Williams, P., Johnson, C., Kratzmann, M., Johnson, C., Anderson, B., & Chenhall, C. (2006). Can households earning minimum wage in Nova Scotia afford a nutritious diet? *Canadian Journal of Public Health, 97*, 430–434.

Williams, P., Reid, M., & Shaw, K. (2004). The Illawarra Healthy Food Price Index. 1. Development of the food basket. *Nutrition and Dietetics, 61*(4), 200–207.

Wong, K., Coveney, J., Ward, P., Muller, R., Carter, P., Verity, F., et al. (2011). Availability, affordability and quality of a healthy food basket in Adelaide, South Australia. *Nutrition and Dietetics, 68*, 8–14.

Wood, B., & Streker, P. (2005). *Food security in the City of Port Phillip, Report Part V: Municipal food Security, Executive Summary of dimensions, opportunities, and new ideas*, St Kilda, Victoria: Community & Health Development Team, City of Port Phillip, Victoria, Australia.

# Part II
# Food Production, Policy and Trade

# Chapter 12
# The Impacts of Climate Change on Australia's Food Production and Export

**Geoffrey Lawrence, Carol Richards, and David Burch**

## 12.1 Introduction

The global food system is in crisis. For much of the past decade more grain has been consumed by humans, livestock and the biofuels industry than farmers have been able to produce, with grain reserves having been depleted and presently remaining at their lowest level for close to half a century (Cribb 2009; United Nations 2011). In many of the world's arable lands, soils are diminishing due to desertification, acidification, salinization, chemical burden and erosion, while land availability is also shrinking due to urban encroachment. In addition, water has also become an increasingly scarce commodity. In the middle of this century cities are predicted to be consuming about half the world's available water which will reduce the amount available to agriculture by approximately one-third (Cribb 2009). Groundwater can be harnessed to supplement irrigation, but there are already signs of serious depletion of aquifers. In the marine environment, global fish stocks are expected to decline precipitously by mid-century, and more pressure will be placed on agriculture (and aquaculture) to feed the world's growing population. The food system is already under considerable stress, and when factoring in the adverse impacts of climate change on agricultural production, it is clear that food security is going to be one of the defining issues of our times. While climate change will warm some regions of the globe and stimulate food production, it is not believed that this will be sufficient to overcome production losses or to meet the growing food shortages that will be associated with world population increase and changing demand patterns of countries like China and India for diets higher in animal protein (United Nations 2011).

G. Lawrence (✉) • C. Richards • D. Burch
The University of Queensland, St Lucia, Queensland, Australia
e-mail: g.lawrence@uq.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_12,

This chapter outlines the features of the current agri-food production system as they relate to food production in Australia and identifies the climate change impacts that the nation's farmers will face. Australia is an important food-producing country both in terms of domestic and export markets. In the context of the predicted burgeoning global demand for food, and higher food prices, it would be expected that the nation's farmers will respond by producing more food for export. But is this likely?

## 12.2 Food Production and Export

During the early decades of convict settlement—dating from the arrival of the First Fleet in New South Wales in 1788—foods were sent to Australia from Britain to feed the prisoners and officers. One of the main aims of the colonization of Australia was to ease the burden on Britain of feeding its prisoners, and the various founding governors were charged with making the colonies self-sufficient in food. Within 15 years of settlement New South Wales was producing a wide variety of fruits and vegetables (Henzell 2007, p. 233), while cattle and sheep thrived on the open plains and lands cleared of trees, particularly in the colonies of New South Wales, Victoria and Tasmania (Henzell 2007). Within 40 years of white occupation of the continent, the colonies began to export food and fiber. Throughout the nineteenth and twentieth centuries, the colonies (and later after federation in 1901, the nation) relied upon the export of bulk, undifferentiated, farm products including beef, lamb, sugar, wheat and wool for export income (Campbell 1980). In the nineteenth century, much of the produce was sent to Britain while, in the twentieth century, markets were broadened to include Europe. Then, following the Second World War and up to the present time, the destination of Australian foods has been Asia and the Middle East.

In 2009–2010, farm and fish food production was valued at $36.7 billion. The two main commodity groups were meat (37% of total value) and grains and oilseeds (24% of total value). Food and beverage processing (which included the processing of meat, grains, dairy, and fruit and vegetables) was valued at $77 billion. The export value of all foods (bulk agricultural commodities such as wheat, sugar and beef, and processed foods) amounted to some $24.3 billion (DAFF 2011a, p. 2). The value of Australian food and fiber commodity exports, and export destinations, are shown below in Tables 12.1 and 12.2, respectively.

While Japan remained the single largest importer of Australian agricultural products in 2008–2009, its overall share has been declining in relation to other countries. Asian nations, in particular Singapore, China, Indonesia, Malaysia, Thailand and the Philippines have been importing increasing volumes of food from Australia. Australia imports fruits and vegetables, seafood, processed foods, soft drinks and cereals. While Australia remains a net exporter of raw commodities such as wheat, beef and sugar, recording a surplus of some $14.2 billion in 2009–2010 (DAFF 2011a, p. 7), it is important to note that Australia imports more fresh and processed

**Table 12.1** Values of the top 12 agricultural commodity exports (2008–2009)

| Commodity | Value $ million |
|---|---|
| Wheat | 5,028 |
| Beef and veal | 4,857 |
| Wine | 2,428 |
| Wool | 2,322 |
| Dairy (excluding cheese) | 1,883 |
| Sugar | 1,338 |
| Barley | 1,321 |
| Lamb | 925 |
| Horticulture | 903 |
| Cheese | 796 |
| Canola | 595 |
| Live cattle | 559 |

Source: DAFF (2010, p. 8)

**Table 12.2** Major destinations of Australia's agricultural exports (2008–2009)

| Country/region | % of value of exports |
|---|---|
| South and South-East Asia | 22.2 |
| Japan | 16.3 |
| Middle East | 11.1 |
| China | 10.0 |
| United States of America | 9.4 |
| European Union | 8.2 |
| Republic of Korea | 5.7 |
| New Zealand | 4.4 |
| Africa | 3.4 |

Source: DAFF (2010, p. 10)

food than it exports (Australian Food and Grocery Council [AFGC] 2010)—something which has alarmed the industry.

Table 12.3 provides an up-to-date overview of the Australian food industry. It indicates that food's share of GDP (the value of farm and fisheries production) has remained very low for the past 6 years (reaching only 2.8% in 2009–2010). It also indicates that the value of food exports has remained steady at around $24 billion and that food has been between 13 and 15% of total merchandise exports.

Australia exports some 60% of the volume of total farm production, representing 76% of the total gross value of all agricultural production in Australia (DAFF 2010). Australia is an important contributor to agricultural export markets. It is the sixth largest exporter of farm products, equating to about 3% of global agricultural exports (Productivity Commission 2005, p. 55). According to the Prime Minister's Science, Engineering and Innovation Council (PMSEIC), Australian agriculture is a success story, with farmers feeding 22 million Australians, and exporting sufficient quantities of food to feed an additional 40 million people abroad (PMSEIC 2010, p. 1).

**Table 12.3** Overview of the Australian food industry

| | | 2004/2005 | 2005/2006 | 2006/2007 | 2007/2008 | 2008/2009 | 2009/2010 |
|---|---|---|---|---|---|---|---|
| Value of farm and fisheries production | $b | 32.4 | 34.5 | 32.6 | 38.6 | 38.4 | 36.7 |
| Share of total GDP | % | 3.7 | 3.5 | 3.3 | 3.1 | 2.9 | 2.8 |
| Value added, food, beverage and tobacco processing | $b | 21.1 | 20.9 | 21.1 | 21.1 | 20.4 | 21.7 |
| Share of total GDP | % | 2.0 | 1.9 | 1.9 | 1.8 | 1.7 | 1.8 |
| Food and liquor retailing turnover | $b | 91.2 | 96.7 | 104.4 | 111.7 | 118.8 | 125.7 |
| Share of total retailing | % | 49.1 | 50.1 | 50.6 | 50.7 | 51.5 | 52.6 |
| Value of food exports | $b | 24.1 | 24.1 | 23.4 | 23.4 | 28.1 | 24.3 |
| Share of total merchandise exports | % | 14.4 | 14.1 | 13.2 | 12.8 | 15.2 | 12.7 |
| Minimally transformed share | % | 29.1 | 27.9 | 23.7 | 28.1 | 33.7 | 30.8 |
| Value of food imports | $b | 6.7 | 7.1 | 8.3 | 9.1 | 10.4 | 10.1 |
| Share of total merchandise exports | % | 4.5 | 4.2 | 4.6 | 4.5 | 4.7 | 5.0 |

Source: DAFF (2011a, p. 2)

This so-called success story has come at a high price for the environment. The expansion of farming and grazing has resulted in the clearing of some 90% of vegetation in eastern Australia's temperate zone, 50% of rainforests and 30% of woodlands (Aretino et al. 2001). Soil erosion and salinization have been a consequence of tree removal. Acidification, largely attributable to the heavy application of ammonium-based fertilizers on Australia's thin and nutrient-deficient farming soils, is now a multi-million dollar problem, while increasing salt concentrations in rivers and streams are leading to the poisoning and death of trees, including the iconic river red gums of inland Australia (Williams and Saunders 2005). Biodiversity losses have also been significant (Aretino et al. 2001). Water extractions for irrigation have, in some major food growing regions, compromised the ecological integrity of rivers and wetlands (Williams and Saunders 2005). Importantly—in terms of the future of farming—the amount of water available for irrigation is being progressively reduced to provide environmental flows.

It is also important to recognize that Australian agriculture is reliant upon fossil fuels to power farm machinery, for the creation of artificial fertilizers and pesticides, and to truck food to supermarkets. A typical western family of two parents and two children is estimated to "eat" 175 barrels of oil in a year—equating to the amount it takes to grow and deliver their food (Cribb 2010, p. 119). The advent of "peak oil" will mean higher prices for oil-based products as supplies decline, making it more costly for farmers to produce foods which, in turn, is likely to result in increased food prices (Cresswell 2009; Dodson et al. 2010).

## 12.3 Climate Change: Predicted Impacts on Food Production and Export

Australia has the world's most variable climate, and climate change is expected to increase that variability—including the advent of more severe dry periods, more flooding, increased frequency of cyclones, an increasing number of hot days and nights, and a decreasing number of cold days and nights (ABARE 2007; Hennessy et al. 2010; PMSEIC 2010). Climate change has already begun to impact upon Australia, with the maximum day-time temperature having increased by 0.7°C since 1910, with decreased rainfall in south-eastern and south-western Australia, and with increased falls in the north-west (Climate Commission 2011; Hennessy et al. 2010, p. 13; PMSEIC 2010, p. 12). Given the projected increases in the global release of anthropogenically created greenhouse gases, Australia will be unable to escape climate change. Some of the broader impacts will include:

- The continuing warming, and drying, of the continent (temperature could increase by between 2.2 and 5°C by 2070)
- Sea level rises that will inundate low-lying coastal areas of the nation and salinize freshwater systems
- Ocean acidification, impairing calcification which affects shell fish, coral growth and the marine food chain
- Declines in river flows in south-eastern and south-western Australia
- Reduced predictability of seasons.

The negative secondary effects of climate change in Australia are predicted to include:

- More frequent and intensive bush fires
- Changes in the incidence of pests and diseases (cattle ticks and fruit flies are likely to move further south)
- An increased rate of soil erosion and degradation (including waterlogging, acidification, salinization)
- Increased heat stress on livestock, and a reduction in the area of available pasture (with likely animal productivity declines)
- Salinization of irrigation water (with likely plant productivity declines)
- An increased distribution of exotic weeds and native woody species.

Some positive gains are expected to be:

- The warming of cooler areas of the continent leading to cropping increases in those areas
- Warmer winters and therefore reduced lamb mortality rates
- Moderate crop increases in north-eastern Australia with rainfall improvement (see ABARE 2007; CSIRO 2007; DAFF 2011b; Hennessy et al. 2010).

Despite possible positive gains, climate change is expected to reduce Australian wheat, beef, dairy and sugar production by some 9–10% from current levels by 2030, and by 13–19% from current levels by 2050 (ABARE 2007, p. 657). Depending upon the particular scenarios (best case/worst case) employed, Australian agricultural exports are expected to decline by between 11 and 63% by 2030 and by 15–79% by 2050 (ABARE 2007, p. 657). Cline (2007) has calculated the likely productivity declines in agriculture by 2080 will be in the order of 27% (in the absence of carbon fertilization) to 16% (if a carbon fertilization "bonus" is anticipated) (GRAIN 2009).[1]

Overall, Australia is expected to be one of the worst-affected regions of the world in terms of climate change impacts upon future agricultural production and food exports (ABARE 2007, p. 657). Globally, it is anticipated that wheat, beef, dairy and sugar production will decline by 2–6% to 2030 and by 5–11% by 2050, relative to current levels (ABARE 2007, p. 657). This is at a time when the world's population is expected to increase from seven billion, today, to nine billion in 2050 (ITUC 2009). Thus, during a predicted period of reduction in global food availability, Australia is expected to be less capable of responding via the production of greater volumes of food for export.

At the height of the most recent drought, there were calls for the development of northern Australia as the next "food bowl." The Federal government established the Northern Australia Land and Water Taskforce to examine how the north could be developed in a sustainable way (Northern Australia Land and Water Taskforce 2009). The findings were disappointing for those seeking a location for the next agricultural bonanza. The study confirmed that while an abundance of rain falls in the north, it falls on the coast and floodplains where there is only limited farming potential. The landscape is low-elevation and gently undulating, preventing the use of surface-water storage dams (DSEWPC 2010). The report confirmed what many scientists had been saying: sustainable development would only occur if agricultural production conformed to the biophysical limits of the climate and terrain (Wentworth Group of Concerned Scientists 2009).

[1] "Carbon fertilization" refers to the hypothesis that if $CO_2$ levels do increase in the atmosphere this might enhance the ability of crops to photosynthesise and so increase yields. The IPCC considers that this will occur in some food crops. However, counter-evidence suggests that while $CO_2$ might provide an initial boost to plants, its positive effects quickly disappear. In fact, increased $CO_2$ is believed to reduce nitrogen and protein in plant leaves by some 12%. Climate change will thereby reduce the amount of protein in staple cereals available for human consumption. The reduced nitrogen in leaves will mean that pests attacking crops will consume more leaves to obtain the nitrogen that they require—which will translate into yield reductions (GRAIN 2009 p. 4).

## 12.4 Climate Change Challenges for Australian Food Producers

There are three main challenges, associated with climate change, which Australian food producers and exporters will face over the coming decades.

### *12.4.1 Increasing Food Production*

The Australian population is expected to increase from its present level of some 22 million to approximately 35 million people by 2,050 while, during this same period, the world population is expected to grow from seven billion to nine billion people (Commonwealth of Australia 2010; The Economist 2011). It is anticipated that the world will need to produce an additional 70% more food than it does at present to feed the global population (PMSEIC 2010, p. 21). Yet, as indicated above, it is anticipated that Australia's food production will decline as a consequence of the drying of the continent and the subsequent reduction in the supply of water available for irrigation. ABARES (2011, p. 1) has noted that Australia produces much more food than it consumes and, as well, "has the income to meet all its food security needs". While it would seem reasonable to conclude that, in the face of contracting output in Australia, the food currently being exported would be re-directed to the domestic market, this might not be so. With escalating demand from Asian countries, open-market policies will ensure food goes to the highest bidder—whether national or global. Growcom (2011) has raised the issue of Australia's increasing dependence upon supplies of overseas foods (particularly vegetables) and has criticized ABARES for its "arrogance" in suggesting Australia will not have a problem in securing food. Growcom argues that costs for imported foods may become prohibitive and makes the important point that because Australia has a surplus of products such as wheat and beef, does not mean that Australians have a nutritionally balanced food supply. Foreign land purchases by sovereign wealth funds, private equity and other investment instruments might also mean that food grown on foreign-owned Australian land is sent overseas. While this would equate to Australia continuing to export its agricultural produce, this will not necessarily improve Australia's export income.

Technological innovation is viewed as an important way of increasing food supply domestically—as well as for export—with genetic modification of plants and animals being heralded as having significant potential (Nossal et al. 2008; Productivity Commission 2005). Advocates expect that a past "green revolution" will be supplanted by a "gene revolution." Part of the promise of genetically modified (GM) organisms is that they will be created to deal with specific issues that relate to climate change—crops that can respond well to hotter temperatures and to less soil moisture, animals that can resist heat and water stress, and so forth. While it is expected that there will be a place for some biotechnologies in Australia's future farming landscape (see PMSEIC 2010; DAFF 2012), there remain concerns that genetic engineering technologies will produce foods that are not acceptable to consumers and that their widespread use will compromise other, alternative, food production systems—such as organics (Hindmarsh and Lawrence 2004). This concern recently materialized with Western Australian farmer, Steve Marsh, losing his organic certification following the GM contamination of his canola crop (NAASA 2011).

At present, the "recipe" for increased food production is to continue to employ advanced technologies, and rely upon market logic, to get the best combination of efficiency and productivity outcomes. This normally means removing the least productive farmers so that their land can be purchased by larger properties to capture economies of scale in production—a process often referred to as "adjustment". According to ABARE (2007, p. 657) there is an "urgent need for policies that encourage rather than impede adjustment in vulnerable sectors in agriculture, including already marginal farming enterprises". In the 20 years to 2002–2003 the number of farms in Australia declined by some 25%—from 178,000 to 132,000—while the average size increased by 23%—from 2,720 to 3,340 ha (Productivity Commission 2005, p. 31). Farm production has become increasingly concentrated on the larger farms. For example, the top 20% of broadacre farms produce around 64% of total output (Productivity Commission 2005, p. 31). The concentration in production is associated with increased cropping intensity, the use of feedlots to produce grain-fed beef, and irrigation and pasture improvement on dairy farms (Productivity Commission 2005, p. 43). This represents a drive towards the further industrialization of agriculture, the format of agriculture that has already been shown to compromise the sustainability of the natural environment (Rosin et al. 2012).

### *12.4.2 Climate Change Adaptation and Mitigation*

Agriculture is estimated to produce 16% of the nation's carbon emissions and another 11% in emissions from land clearing—a total of over a quarter of Australia's carbon emissions. The sequestering of $CO_2$ returns carbon from the atmosphere to the land and can, if managed carefully, improve the condition of the soil, increase agricultural productivity and provide enhanced biodiversity outcomes (Department of Climate Change and Energy Efficiency 2011, p. 58). The Federal government recognizes that the agricultural sector is the largest single producer of methane and nitrous oxide (DAFF 2011c, p. 64) and that these emissions must be reduced.

It is planning to achieve this via its Carbon Farming Initiative (CFI) the legislation for which was introduced into parliament in March 2011. The CFI will attempt to achieve greenhouse gas abatement (mitigation) by providing farmers, tree-growers and other landholders with carbon credits. These credits will be provided from such activities as the capture/destruction of methane emissions from livestock manure and landfill and the removal of carbon from the atmosphere via production techniques that store carbon in soil or in trees (DAFF 2011c, p. 65). The government predicts that mitigation measures in agriculture will have the capacity to improve both farm efficiency and productivity (DAFF 2011c, p. 66) but does not detail how this might be expected to occur. In fact it recognizes that as the cost of energy increases (under a carbon tax) this will spill over into agriculture in the form of higher priced inputs (DAFF 2011c, p. 66) which will undermine profits of many producers, exacerbate cost/price pressures thereby removing small-scale farmers and encouraging the further industrialization of agriculture. If history is any guide, a more industrialized farming sector will release greater levels of carbon into the atmosphere. This will intensify currently experienced environmental problems.

In terms of abatement, the Federal government provides incentives through its Australia's Farming Future initiative. Under this blanket program, farmers are eligible for "FarmReady" funds to (re)train in farm management. Its Climate Change Adjustment Program delivers professional advice and training to farmers for the development of farm business plans that assist in adaptation to climate change. A Transitional Income Support Program assists farmers in financial difficulty by providing short-term income support to help with climate change impacts. Its Community Networks and Capacity Building activities seek to increase leadership in building community resilience to climate change. And, its Climate Change Research Program funds research projects that help primary producers to become more sustainable, and resilient, in the face of climate change (DAFF 2011c, p. 66). These are all important programs but have, at their heart, adaptation within a system of productivist farming that already impacts heavily upon the environment.

### *12.4.3 Food Production and Competition from Emerging Energy Industries*

At face value, the production of energy sources that serve as an alternative to oil seem to be a positive development that is far removed from the issue of food production. Indeed, emerging energy sources, such as biofuels and coal seam gas (CSG), are often promoted as being more environmentally benign when compared to oil. However, both of these technologies, whilst responding to concerns about declining oil supplies, also pose significant problems in relation to food production.

The replacement of fossil fuels with biofuels is claimed to reduce the amount of atmospheric carbon (Department of Climate Change and Energy Efficiency 2011, p. 60). The problem is that, at present, biofuels compete for land that is normally used for food production. For example, in the US, blending requirements (fossil fuels with biofuels) has seen the amount of corn production used for biofuel reach 40% of total corn production (United Nations 2011, p. 11). It is estimated that corn prices rose by some 75% between 2002 and 2008 as a consequence (United Nations 2011, p. 12). With flow-on (so-called substitution) effects on other grain crops, it is estimated that the diversion of US corn into biofuel raised world prices of corn, rice, wheat and soybeans by approximately 30% during the 2002–2008 period (United Nations 2011, p. 12). Second generation biofuels, such as those made available via cellulosic biofuel technologies—where the cell walls of the non-edible parts of plants like sugar cane and sorghum are broken down to create ethanol and biodiesel—have the advantage of not competing with foods, although some do compete for food-producing land. Nations like Australia might be able to harness such technologies in future decades. In the meantime, increased biofuel production must be considered carefully so that food price inflation is avoided, and sustainable production outcomes are achieved.

CSG has been similarly promoted as a "clean" technology that, according to the Australian Petroleum Production & Exploration Association (APPEA) (2011), will reduce carbon emissions by 70%. However, the production of CSG is also emerging as a major issue in future food production. Lying under three of Australia's most valuable and productive farming regions (the Darling Downs, Hunter Valley and Liverpool Plains) CSG will provide billions of dollars worth of export income. However gaining access to underground CSG is claimed to:

- Require the utilization of already scarce water resources
- Pollute waters through the use of toxic chemicals
- Take land out of production via tens of thousands of wells
- Through an extended network of pipes and roadways, have the potential to release methane (one of the most potent greenhouse gases) into the environment as a result of faulty drilling procedures (Econews 2011; Lloyd 2011).

Along with climate change, CSG is likely to reduce the amount of food Australia is able to produce for the domestic and global marketplace. Biofuels and CSG are already proving to have adverse impacts on global food production which is likely to amplify as these industries are further developed.

## 12.5 Towards a More Sustainable and Resilient Australian Food Production and Export Sector?

Australian farmers face the dilemma of needing to increase food production for a growing domestic and global population while becoming more sustainable. This means increasing productivity while, at the same time, cutting the production of greenhouse gases, reducing water consumption and improving biodiversity (Howden 2010). There are, as stated above, growing concerns about the potential for industrial farming systems to deliver benefits to the environment. In this context, it is worth considering alternative options.

In 2008, over 400 of the world's leading scientists produced a report criticizing the reliance of governments on narrow techno-science solutions to complex agricultural problems. The International Assessment of Agricultural Science and Technology Development (IAASTD, 2008, p. 16) argued that:

> Over the last century, the agricultural sector has typically simplified production systems to maximize the harvest of a single component … This has often led to degradation of environmental and natural resources (for example deforestation, introduction of invasive species, increased pollution and greenhouse gas emissions).

It also argued that technological "silver bullets" were not addressing the issues of rising food prices, global hunger and extreme poverty, noting that the application of science divorced from an appreciation of the political and socio-economic systems in which science is embedded is producing limited, and potentially flawed, options (IAASTD 2008). The IAASTD (2008) supported the development of agro-ecological farming systems—those based upon interdisciplinarity, integration and holistic thinking, and with the overall goal of achieving sustainable development. "Low input farming," "organic agriculture" and "agro-ecology"—relying upon principles of minimum tillage, the recycling of waste, improving ecological biodiversity and fostering soil creation—were identified as the best options for the production of foods within sustainable production systems. Instead of industrial agriculture's preoccupation with productivity increases, agro-ecological approaches seek a stable and resilient system of production that can survive through the vagaries of climate change and other challenges (De Schutter 2010; Pretty 2002; Tansey and Rajotte, 2008; Lawrence and McMichael 2012).

Reinforcing the IAASTD report, GRAIN (2009, p. 4) argues:

> The artificial separations and simplifications that industrial agriculture has brought upon us have to be undone, and the different elements of sustainable farming systems must be brought together again. Crops and livestock need to be reintegrated on the farm. Agricultural biodiversity has to become the cornerstone of food production again, and local seed saving and exchange systems need to be reactivated. Chemical fertilizers and pesticides must be replaced by natural ways of keeping soil healthy, and pests and diseases in check. The restructuring of the food system along these lines will help create the conditions for near-zero emissions on farms.

Likely environmental and climate change benefits notwithstanding, questions remain about the ability of low input systems to generate the production of large volumes of cheap, plentiful, foods. According to the UN's Food and Agriculture Organization, while organic farming has the potential to "feed the world," the move—in developed nations—from industrial to organic systems can lead to overall yield reductions (FAO 2011). Australian consumers have become used to the convenience of purchasing a wide variety of readily available Australian-grown and imported foods that are supplied by the large supermarket chains largely as a result of industrial farming systems and global trading which provides foods "out of season". Furthermore, the nation relies upon industrial agriculture for substantial export income. The system of "high tech," intensive, farming would appear to be entrenched—despite deepening concerns about environmental degradation, greenhouse gas emissions, "food miles," animal cruelty and corporate control (Lawrence et al. 2010; Weis 2007).

To date, there are few signals from government that there needs to be a radical re-assessment of Australia's food production system. In fact, adaptation and mitigation are viewed as providing necessary but incremental changes to farming systems, allowing them to become more efficient and contribute to an expansion in food production for domestic and export markets (Burke 2009). This is business-as-usual not a critical examination of the sustainability of food production in Australia in the face of climate change.

## 12.6 Conclusion

Australia's food production and food exports are expected to decline under the impact of future climate change. Despite this, it is anticipated that the nation will continue to export bulk agricultural commodities such as wheat, beef, sugar and wool. These products will be in strong demand by a rapidly increasing global population. Emerging economies such as China and India are expected to have the wealth to purchase more protein in the form of meat and it is likely that Australian producers will seek to expand beef production despite evidence that animal production vastly contributes to greenhouse gas emissions.

To understand the future of food production in Australia it is necessary to place climate change impacts alongside past actions that are now combining to limit production and export growth. In the past, tree clearing for farming and grazing has resulted in salinization, soil erosion, acidification and desertification. Soil acidification and water pollution has been caused by injudicious applications of artificial fertilizers. Hundreds of thousands of hectares of once-productive farming and grazing regions have been rendered unusable. The damage is continuing. Alongside this, the increased use of lands for biofuel production, the expansion of the CSG industry into some of Australia's best farming lands have the potential further to reduce food output and export.

To address climate change, Australian governments are endorsing actions that aim to both mitigate greenhouse gas emissions, and assist farmers to adapt to climate change impacts. However, at this stage little is understood about the capacity to reduce Australia's farm-related greenhouse gas emissions. It is likely—given the conflicting commitment to sustainability and to greater efficiencies through industrialized farming methods as demand for food grows—that the resource base will continue to diminish and major gains in climate change mitigation may be difficult to attain.

## References

ABARE. (2007). Climate change: Impacts on Australian agriculture. *Australian Commodities, 14*(4), 657–676.

ABARES. (2011). *Global food security: Facts, issues and implications. Science and Economic Insights, Issue 1*. Canberra: ABARES.

Aretino, B., Holland, P., Peterson, D., & Schuele, M. (2001). *Creating markets for biodiversity: A case study of earth sanctuaries Ltd. Productivity Commission Staff Research Paper*. Canberra: AusInfo.

Australian Food and Grocery Council (AFGC). (2010). *State of the industry 2010*. Canberra: AFGC.

Australian Petroleum Production & Exploration Association (APPEA). (2011). *We Want CSG*. Retrieved October 5, 2011, from http://www.wewantcsg.com.au/

Burke, T. (2009). Australia to have a key role in addressing the global food crisis. *Farm Policy Journal, 6*(1), 31–35.

Campbell, K. (1980). *Australian agriculture: Reconciling change and tradition*. Melbourne: Longman Cheshire.

Climate Commission. (2011). *The critical decade: Climate science, risks and responses*. Canberra: Department of Climate Change and Energy Efficiency.

Cline, W. (2007). *Global warming and agriculture: Impact estimates by country*. Washington: Centre for Global Development and Peterson Institute for International Economics.

Commonwealth of Australia. (2010). *Australia to 2050: Future challenges*. Canberra: Commonwealth of Australia.

Cresswell, A. (2009). Soaring food prices, global warming and natural disasters have experts worried that the world is facing a food crunch. *The Australian.* Retrieved February 19, 2009, from http://www.theaustralian.news.com.au/story/0,25197,25041144-28737,00.html

Cribb, J. (2009). Tackling the global food crisis. *Farm Policy Journal, 6*(3), 47–56.

Cribb, J. (2010). *The coming famine: The global food crisis and what we can do to avoid it*. Berkeley: University of California Press.

CSIRO. (2007). *Climate change in Australia—technical report*. Canberra: CSIRO.

De Schutter, O. (2010). *Agroecology and the right to food.* Report submitted to the Human Rights Council, Sixteenth Session, United Nations General Assembly. Geneva: United Nations. Retrieved July 6, 2011, from http://www.srfood.org/images/stories/pdf/officialreports/20110308_a-hrc-16-49_agroecology_en.pdf

Department of Agriculture, Fisheries and Forestry (DAFF). (2010). *Australia's agriculture, fisheries and forestry at a glance*. Canberra: DAFF.

Department of Agriculture, Fisheries and Forestry (DAFF). (2011a). *Australian food statistics 2009–10*. Canberra: DAFF.

Department of Agriculture, Fisheries and Forestry (DAFF). (2011b). *Issues paper to inform development of a national food plan—summary*. Canberra: DAFF. Accessed June 30, 2011, from http://www.daff.gov.au/__data/assets/pdf_file/0009/1926315/nfp-27june.pdf

Department of Agriculture, Fisheries and Forestry (DAFF). (2011c). *Issues paper to inform development of a national food plan*. Canberra: DAFF.

Department of Climate Change and Energy Efficiency. (2011). *The critical decade: Climate science, risks and responses*. Canberra: Commonwealth of Australia.

Department of Agriculture, Fisheries and Forestry (DAFF). (2012). *National food plan: Green paper* 2012. Canberra: DAFF.

Department of Sustainability, Environment, Water, Population and Communities. (DSEWPC). (2010). *Moving water long distances: Grand schemes or pipe dreams?* Canberra: Commonwealth of Australia.

Dodson, J., Sipe, N., Rickson, R., & Sloan, S. (2010). Energy security, agriculture and food. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food security, nutrition and sustainability* (pp. 97–111). London: Earthscan.

Econews. (2011). *The facts on coal seam gas, Econews*. Retrieved June 13, 2011, from http://econews.org.au/2011/04/the-facts-on-coal-seam-gas/

FAO. (2011). *Organic agriculture*. Retrieved July 7, 2011, from http://www.fao.org/organicag/oa-faq/oa-faq7/en/

GRAIN. (2009). *The international food system and the climate crisis*. Retrieved June 28, 2011, from http://www.grain.org/seedling/?id=642

Growcom. (2011). *Growcom calls for federal government to join the dots in food security and health debate. Growcom media release, 20 May 2011*. Brisbane: Growcom.

Hennessy, K., Whetton, P., & Preston, B. (2010). Climate projections. In C. Stokes & M. Howden (Eds.), *Adapting agriculture to climate change: Preparing Australian agriculture, forestry and fisheries for the future* (pp. 13–20). Melbourne: CSIRO Publishing.

Henzell, T. (2007). *Australian agriculture: Its history and challenges*. Victoria: CSIRO Publishing.

Hindmarsh, R., & Lawrence, G. (Eds.). (2004). *Recoding nature: Critical perspectives on genetic engineering*. Sydney: University of NSW Press.

Howden, M. (2010). *Interview with Mark Howden in Climate change 'threatening agriculture', World News Australia*. Retrieved March 27, 2010, from http://www.sbs.com.au/news/print/Article/1214802

IAASTD. (2008). International assessment of agricultural knowledge, science and technology for development. *Global Summary for Decision Makers.* Retrieved July 22, 2011, from http://www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Global%20Summary%20for%20Decision%20Makers%20(English).pdf

ITUC. (2009). *A recipe for hunger: How the world is failing on food*. Brussels: International Trade Union Confederation.

Lawrence, G., & McMichael, P. (2012). The question of food security. *International Journal of Sociology of Agriculture and Food, 19*(2), 135–142.

Lawrence, G., Lyons, K., & Wallington, T. (2010). *Food security, nutrition and sustainability*. London: Earthscan.

Lloyd, G. (2011). Gates shut in the gas lands. *The Australian*. Retrieved June 14, 2011, from http://www.theaustralian.com.au/national-affairs/gates-shut-in-the-gas-lands/story-fn59niix-1226064000756

NAASA. (2011). *Press Release: NASAA Response to WA GM Contamination, 3 January 2011*. Retrieved July 7, 2011, from http://www.nasaa.com.au/data/media/NASAA%20Press%20Release_140F06.pdf

Northern Australia Land and Water Taskforce. (2009). *Sustainable development of northern Australia. A report to government from the Northern Australia Land and Water Taskforce*. Canberra: Department of Infrastructure, Transport, Regional Development and Local Government.

Nossal, K., Abdalla, A., Curtotti, R., Tran, Q., & Brown, A. (2008). *GM crops in emerging economies: Impacts on Australian agriculture*. Canberra: ABARE.

PMSEIC. (2010). *Australia and food security in a changing world*. Canberra: The Prime Minister's Science, Engineering and Innovation Council.

Pretty, J. (2002). *Agriculture: Reconnecting people, land and nature*. London: Earthscan.

Productivity Commission. (2005). *Trends in Australian agriculture*. Canberra: Commonwealth of Australia.

Tansey, G., & Rajotte, T. (2008). *The future control of food: A guide to international negotiations and rules on international property, biodiversity and food security*. London: Earthscan.

The Economist. (2011). *The 9 billion-people question. The Economist 26 February*. Retrieved July 5, 2011, from http://www.economist.com/node/18200618

United Nations. (2011). *Price formation in financialised commodity markets: The role of information*. New York: United Nations.

Weis, T. (2007). *The global food economy: The battle for the future of farming*. London: Zed Books.

Wentworth Group of Concerned Scientists. (2009). *Blueprint for a national water plan.* Retrieved July 4, 2011, from http://www.wentworthgroup.org/blueprints/blueprint-for-a-national-water-plan

Williams, J., & Saunders, D. (2005). Land use and ecosystems. In J. Goldie, B. Douglas, & B. Furnass (Eds.), *In search of sustainability* (pp. 61–78). Victoria: CSIRO Publishing.

# Chapter 13
# Increasing Food Production Sustainably in a Changing Climate: Understanding the Pressures and Potential

**Beverley Henry, Richard Conant, John Carter, Veronique Droulez, and Peter Grace**

## 13.1 Introduction

Australia is a net exporter of food, producing annually enough to feed an estimated 40 million people in addition to the domestic population (DAFF 2009). While Australia accounts for only around 2% of global trade in food, the contribution to some commodities is more significant, notably as the second largest global exporter of beef and of sheep meat.

Approximately 93% of food for domestic consumption is currently produced within Australia (DAFF 2009), and despite the future climate and resource challenges and the projections of continued domestic population growth to around 36 million by 2050 assuming current trends continue (ABS 2008), Australia is not expected to suffer food shortages. Nevertheless, there are domestic issues that need urgent attention, including improving the long-term sustainability of food production for economic as well as ethical performance of the food industry.

Australia's food production is largely characterized by low input systems which, in many areas, have been adapted to cope with low rainfall, nutrient poor soils and the highest climate variability of the inhabited continents. In addition to these natural

B. Henry (✉) • R. Conant
Institute for Future Environments, Queensland University of Technology,
Brisbane, Queensland, Australia
e-mail: beverley.henry@qut.edu.au

J. Carter
Department of Science, Information Technology, Innovation and the Arts, Queensland, Australia

V. Droulez
Meat and Livestock Australia Sydney, Australia

P. Grace
Institute for Future Environments at Queenlsand University of Technology,
Brisbane, Queensland, Australia

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_13,

geographic and climatic features, Australia's food producing regions are predicted to be amongst the most adversely affected in the world by anthropogenic climate change.

Amongst governments and the community there is broad recognition that food security is a global issue, and one in which Australia can, and should, play a part. This will be through:

– Continued export of high quality, safe, nutritious food products, especially to the rapidly expanding regional markets such as China and Korea.
– Transfer of technology, tools and knowledge, thus sharing the benefits of Australia's strong history in agricultural research and development (R&D), and its growing expertise in climate change research with some of the 80% of global population who are 'farmers' (ILRI 2009).

Increasing global food production will be partly achieved through closing the yield gap between regions and countries. For example, the yield of cereals ranges from 8.1 tonnes per hectare in the Netherlands to 1.8 tonnes per hectare in the least developed countries (FAO 2008). Although Australia is a minor player in global food trade there is potential to make a significant contribution through technological and research sharing. Koning et al. (2008) estimate that by closing the gap between actual and theoretical maximum yield of food crops and reducing waste an additional 16–24 billion people could be fed in 2050. However, in analysing the role of agricultural productivity in food security it is not sufficient to look simply at the volume or energy produced. It is also necessary to consider the quality and nutrient density of food, since the concept of food security encompasses the concept of reliable access to affordable and safe food choices with the nutritional quality necessary to support an active, healthy and dignified life rather than people simply having sufficient to eat to avoid feeling hungry.

Through a focus on on-farm production, this chapter explores some of the challenges and prospects for increasing agricultural productivity in an increasingly resource and carbon-constrained environment. We use a simple case study of alternative food production in a mixed grain and livestock farming region of New South Wales (NSW), Australia, to examine the relationship between productivity shift and environmental impact using the single impact category of greenhouse gas emissions. Importantly, we use this case study analysis to highlight the dangers of basing assessment of potential productivity gains on a narrow analysis that does not consider the complex interactions between ecosystem capacity for agricultural production, broad environmental impacts and human nutrition needs and note the need for further research to provide scientifically robust policy and investment decisions.

## 13.2 Potential for Increasing Food Production

### *13.2.1 Global Context*

Since the growth in global agricultural productivity starting in the 'Green Revolution' of the 1960s, rates of increase have recently declined, particularly in developed countries (ABARE 2009). Globally, of the total ice-free land surface of 13.4 billion hectares, approximately 3.5 billion ha (27%) are permanent pastures and 1.5 billion ha (12%) are under cultivation. It has been estimated that while an additional 2.8 billion ha is potentially arable, taking natural restraints into account a more realistic estimate is around 1.5 billion ha (Bruinsma 2009). Even to realize a doubling of the area currently under cultivation would require a marked acceleration in investment in capital and infrastructure, construction and possibly reclamation. In fact, FAO data show that the net increase in arable land has increased by only five million ha per year over the past two decades and the likely further increase is more likely to be about 5% rather than 50% by 2050 (FAO 2009). The potential for increase in arable land is even more restricted in the developed countries and will likely decline.

Productivity growth must, therefore, be achieved by increasing yields on existing agricultural land, through improving plant and animal breeds, greater efficiency and technological innovations. Further, unlike past productivity gains, yield increases will likely need to be achieved without proportionate increase in inputs. Inputs will be limited by availability in the case of water and some nutrients (e.g. phosphorus), and/or cost for those that rely heavily on energy for their manufacture or application (e.g. nitrogenous fertilizers). The emphasis must be on optimizing energy and nutrition production across the global range of geographical and climatic regions available for agriculture.

Vast areas of the world's land surface are not suitable for cultivation because of water and nutrient limitations, and on arid and semi-arid rangelands ruminant livestock that can thrive on natural grasses and browse offer the only means of food production. Locally, livestock frequently also provide valuable co-products, including clothing, draught and organic fertilizer, and, particularly for poor rural communities, offer a degree of 'food buffer' for poor seasons and 'wealth banking' in good seasons. Currently livestock provide food for an estimated 830 million food-insecure people with livestock products contributing 17% of global energy intake and 33% of protein (FAO 2008).

Optimizing productivity across the farm sector requires an integrated approach to national land use and land management. Competing demands on prime agricultural land for food production, urban expansion, biofuels, commercial and carbon forestry, and for ecosystems services are likely to increase in future (GHD Hassall 2010), and climate change and policies that put pressure on arable land for non-food production uses will exacerbate the challenge of producing enough food for the projected 2050 population of over nine billion, of whom 70% will be living in cities. These challenges are discussed later in this chapter.

### *13.2.2 Productivity Growth in Australia: Opportunities and Barriers*

Productivity may be increased through either expansion of the area of production or through intensification of the existing area. The opportunities for these options

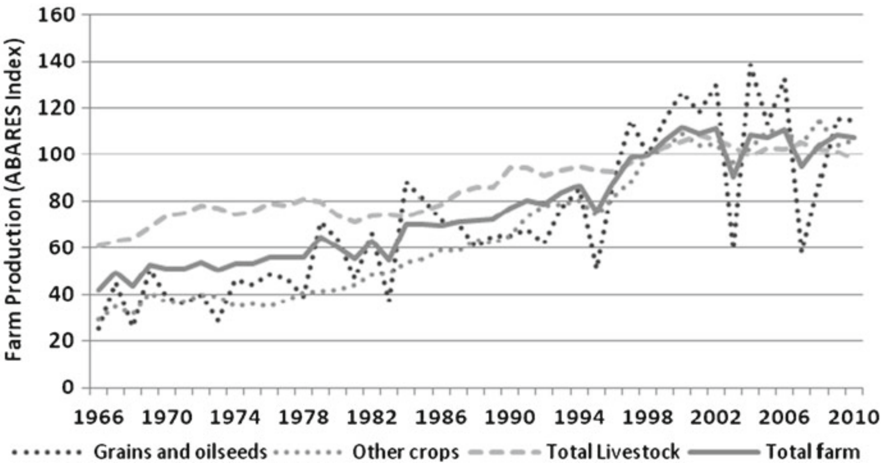
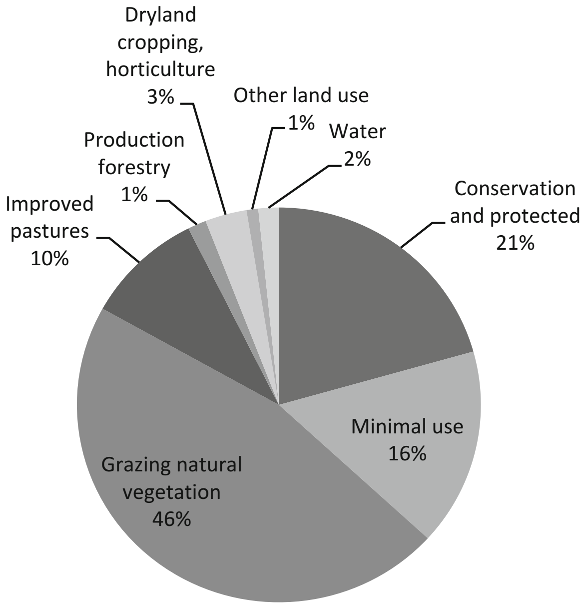



**Fig. 13.1** Trends in volume of Australian farm production of major food commodities (*source of data:* ABARE (2009) http://www.abare.gov.au)

in Australia can be considered in the light of potential risks to the long-term sustainability of agro-ecosystems and support for R&D to achieve the gains in production. In Australia agricultural productivity has increased at about 2% per year since the 1980s, significantly higher than the global average (Sheales and Gunning-Trant 2009) and higher than for many other Australian sectors. However, statistics show that the rate of increase in broadacre productivity is declining (Fig. 13.1); a decline linked to lower investment in R&D (e.g. Sheales and Gunning-Trant 2009; Sheng et al. 2011) and there is little doubt that increased public and private funding for R&D will be needed if the rates of production required to meet increased global demand over the next four decades are to be achieved.

Intensification of production has been promoted as a way of meeting future food demands but continued increase in yields depends on acceleration of genetic and technological advances, and improved rates of adoption of better management practices. Increasing inputs will likely be needed in many systems for intensification, but input costs are likely to rise as a result of climate change policies in Australia (DCCEE 2011). These costs will affect farm terms of trade and productivity (Calford et al. 2010) and in turn, cause a decline in already eroded farm income imposing pressures for further intensification or expansion of production into increasingly marginal land types that are more vulnerable to degradation. It will be challenging to ensure that high climate variability and climate change in combination with practices aimed at increasing production do not result in longer-term resource degradation and loss of future productive capacity. Indicators of degradation in agricultural lands include biodiversity loss, increased need for chemical herbicides and pesticides, depletion of water reservoirs, declining water quality and loss of soil health and structure.

**Fig. 13.2** Major land uses in Australia based on the 2005–2006 dataset. The total land area is 7,687,147 km² (*source of data (2005–06 dataset):* BRS (2010))




In addition to renewed investment in R&D, improved extension and education for farmers and additional regional socio-economic support, sustainable long-term productivity growth will require new approaches to address an ageing rural population and agricultural labour shortages.

Of the total land area of Australia (7.687 million km²) only 7% is arable (FAO 2008). In contrast approximately 46% of Australia's land area is used for grazing livestock, mainly on native or naturalized pastures (Fig. 13.2).

Land use mapping (BRS 2010) shows that in the 5-year period from 1996/1997 to 2001/2002, the area of land with natural vegetation used for production fell by 12.7 million ha, predominantly due to a decline in grazing land of 11.6 million ha due to approximate equal areas of conversion to cropping and to conservation areas, trends that appear set to continue at least in the short term.

Australian land use data confirm that the increase in production of major cereals during the second half of the twentieth century (Fig. 13.1) has been due to both an increase in area and higher yields per hectare. For beef, total production, carcass weight and the ratio of total beef production to area grazed have all increased over the same period at a lower but more consistent rate. The high inter-annual variability in wheat yield compared to beef reflects greater impact of variations in seasons (Fig. 13.3).

The extent to which grain production can expand into new areas in future is naturally limited by availability of suitable arable land in rainfall zones providing sufficient water to support dryland farming or in areas with access to irrigation

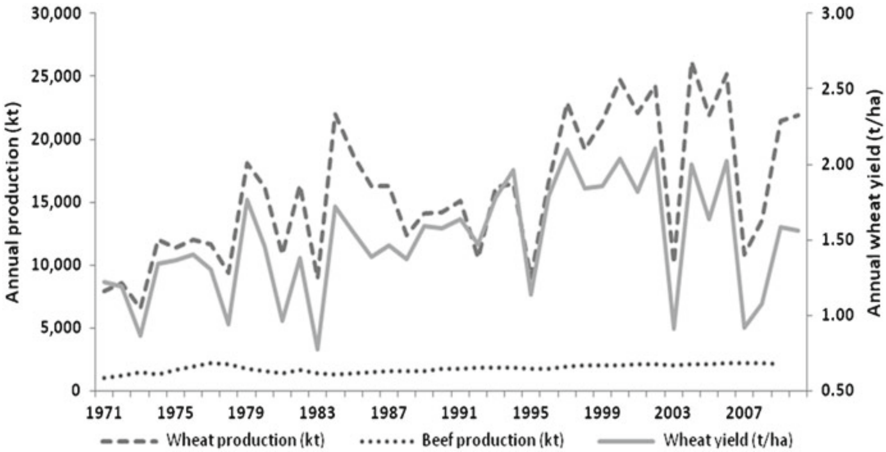



**Fig. 13.3** Trends in total production and yield per hectare of wheat in Australia showing declining rate of growth and variability due to seasonal conditions. In contrast production of beef has increased steadily at about 1.5% per year with lower inter-annual variability (*source of data:* ABARE (2009))

water. Ongoing demand for Australia's limited prime arable land for urban use, biofuel and forestry industries (GHD Hassall 2010) also limits expansion. On more marginal lands, grain yields are lower and more variable and often rely on additional nutrient and water inputs. In these areas economic food production may lean towards coarse grains for feed or to mixed farming with livestock providing the major food production. The impacts of climate change may extend conditions beyond local farmer experience, increasing the value of investment in R&D and agricultural extension.

Intensification of production, i.e. producing more from the same or less land, is already occurring through plant and animal breeding programmes. In the livestock industries, there has been a trend towards larger 'industrial' pig and poultry production systems, and an increase in finishing beef cattle and meat sheep in feedlots. Feeding grain gives higher growth rates which brings animals to slaughter sooner and heavier. The intensification of pig and poultry production in Australia is linked to increasing consumer demand for these meats over the past 30 years (Fig. 13.4).

Increase in monogastric production and lot feeding of cattle globally requires more feed grain production with the potential that there may be a real or perceived competition for grain between animal feed and human food. In Australia feed for stock is generally sourced from grain not of a quality fit for human consumption. There are also some concerns that intensification, with increasing trends towards confined animal feeding, may result in changes in the nutritional quality of meat. For example, Ponnampalam et al. (2006) measured a change in fatty acid composition with increasing days on grain for beef.

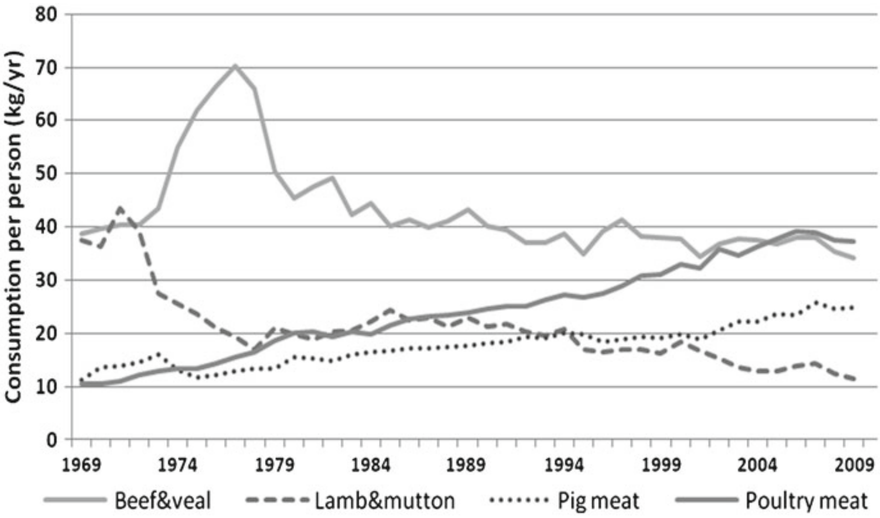



**Fig. 13.4** Trends in apparent consumption of meat products over the past 40 years (*source of data:* ABARE (2009))

## 13.3 Climate Change Policies and Food Production

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) set legally binding greenhouse gas emissions targets for developing country parties for the commitment period of 2008–2012. At the 16th UNFCCC Conference of Parties (CoP 16) in Cancun, Mexico in 2010, both developed and developing countries committed to take urgent action to reduce emissions to achieve a global target of no more than 2 °C warming above pre-industrial levels. Under the Cancun agreement, Australia has committed to reducing greenhouse gas emissions by a minimum of 5% below 2000 levels by 2020. In December 2011 at CoP 17 in Durban, all approximately 190 countries agreed to begin negotiations towards a new legally binding agreement to reduce greenhouse gas emissions to take effect by 2020.

Direct emissions from agriculture account for 8 to 11% of global anthropogenic emissions (O'Mara 2011) and 15% of Australia's total reported national emissions (DCCEE 2010b). As a significant proportion of total anthropogenic emissions, agriculture is expected to contribute to climate change mitigation efforts.

In November 2011, the Australian Government passed the *Securing a Clean Energy Future Plan* (DCCEE 2011), aimed at reducing greenhouse gas emissions, by putting a price on carbon (greenhouse gas emissions) from July 2012, supporting greater uptake of renewable energy and improved energy efficiency and providing opportunities for mitigation through the land sector. Direct emissions from agriculture, such as emissions of nitrous oxide from fertilizer use and methane from ruminant livestock, are excluded from coverage but all sectors of the economy will be affected by higher costs for energy and energy-dependent goods and services. A key component of the legislation, the *Carbon Farming Initiative* (CFI), enables trade in offsets generated from emissions reduction and carbon sequestration activities in the land sector (DCCEE 2010a). This legislation introduces potential opportunities for income from carbon credits. Agricultural greenhouse gas emissions depend on natural resource availability, climatic conditions including seasonal variability, geographical factors and response of individual farmers and national governments to technology and markets. This variability will have consequences for policies to effectively balance objectives for climate change mitigation and the need to achieve food security into the future. The UK Government's Foresight Programme on the Future of Food and Farming (Foresight 2011) demonstrated the importance of involving agriculture in climate change discussions and the potential impacts of climate change and mitigation policies on food security. Inappropriate application of mitigation policies to food production systems could have a negative impact on domestic food availability and trade to food-insecure countries through direct costs of a price on emissions, indirect impacts of higher input costs eroding already vulnerable farmer terms of trade or through market distortions. Moreover, focus on climate change policies without consideration of the broader environmental, economic and social context of food production risks serious perverse outcomes for the health and well-being of communities and long-term food security (Gill et al. 2010). In the case study below we note the challenge of interpreting an analysis focused on the single environmental impact category of greenhouse gas emissions for policies on agricultural development and food production.

## 13.4 The Challenge of Optimizing Land Use: A Case Study

The challenges for sustainable increase in food production will grow as the impacts of higher temperatures, changes in amount, seasonality and intensity of rainfall and greater variability in weather affect yields and as the impacts of constraints and costs due to introduction of climate change mitigation policies are felt. There is a growing recognition of the need for agricultural productivity programmes that incorporate climate change adaptation and mitigation measures, that are nutrition-sensitive, and that are integrated with socio-economic development strategies and implementation (UNSCN 2010). However, there are currently gaps in underpinning science needed to support these programmes. In particular, the availability of detailed spatial biophysical and climatic data to assess the ecological functionality of landscapes and potential for food production is limited. These data and information on supporting services such as transport, labour and access to markets would allow national analyses of optimal land use for agriculture and alternative land uses under current conditions and future climate and development scenarios. Using available data and understanding of the diversity of farm systems and management practices, combined with projected future trends in climate and economic drivers, some broad national analysis has been conducted for Australia (e.g. PMSEIC 2010).

To identify likely methodological issues for future more detailed studies into the potential to sustainably increase food production we present a preliminary exploration of impacts of alternative enterprise scenarios on a hypothetical farm with capacity for both livestock and crop production. We emphasize that this case study does not fully account for limitations on production and in particular looks at a single year so does not allow for impacts on natural resources in the longer term.

### *13.4.1 An Enterprise-Scale Case Study: Description and Scenarios*

The case study agricultural system is a 1,500 ha mixed farming property in the central agro-ecological zone of the Australian state of NSW. In this zone approximately half (52%) of broadacre farms are mixed grain and livestock enterprises (Hooper and Levantis 2011) and the remainder are specialist grain farms, occupying similar climatic regions. The average annual rainfall was 340 and 335 mm, respectively, for the period from 2006–2007 to 2008–2009. The central agro-ecological zone of NSW was selected as a representative Australian broadacre farming region, but a more complete study would require assessment of whether food production in an alternative region would result in higher or lower productivity overall and whether it was more or less sustainable.

Realistic production and economic returns for a hypothetical mixed broadacre farm and future scenarios modelled were based on Gross Margin data published by the NSW Department of Innovation and Investment. The base-case farm was based on that developed as an example study by the Australian Farm Institute to demonstrate the FarmGAS Calculator (AFI 2009). To meet the requirements for a nutritionally adequate diet for the Australian population, a variety of foods are needed (Commonwealth Department of Health and Ageing 1998). Therefore, stopping production of an essential food product on an individual farm or in a region would normally require an alternative source, either from domestic production or imports. Clearing of new lands for agriculture is now restricted by State legislation in Australia, and in general moving to less productive and more arid lands can be expected to either require higher inputs, such as fertilizer, irrigation water or labour, or have lower land use intensity (e.g. lower stocking rate). For example, in the NSW central zone, average yields of wheat are 25% lower in the mixed enterprise grain farms compared to specialist farms, and sheep equivalents per ha are 36% lower on average (Hooper and Levantis 2011). Therefore, caution should be exercised in extending the livestock and crop mix options used to explore the impacts on food production in this case study to broader regions with different climatic conditions and soil quality.

The effect of changing enterprise mix was assessed using three indicators:

1. Economic impact was assessed as the sum of the gross margins estimated for each enterprise making up the farm. A 'gross margin' is the gross income from an enterprise less the variable costs incurred in achieving it. Fixed or overhead costs such as depreciation, interest payments, rates or permanent labour are not included. However, within these limitations, gross margin budgets are useful for providing an estimate of the relative profitability of agricultural enterprises and as an indication of management operations involved in different enterprises. It was assumed that the base-case mixed broadacre farm possessed all machinery and infrastructure for alternative enterprises.

   For this study it was also assumed that irrigation was not used in production. It should be noted that compensating change in production on the case study farm with changes in agricultural production in another region could involve significant irrigation costs or may not be possible due to restricted water allocations. In the central west zone of NSW, sheep are raised for both wool and meat. Farm financial performance calculations included income and variable costs associated with both products from the Merino wether flock.
2. Food productivity was measured from production of grain or meat for each species taken from published regional gross margin data (NSW I&I 2005–10). In the case of sheep meat and beef, Hot Standard Carcass Weight (HSCW) was used as the indicative unit of food product. This unit of measurement represents the meat leaving the processor (before chilling) ready for entering the human nutrition cycle. Typically HSCW accounts for approximately 55% of the live weight (MLA 2002).
3. A single environmental impact was calculated as the carbon dioxide equivalent ($CO_2$-e) emissions for each production type. These emissions are those accounted for in national inventories for the agriculture sector and include methane from enteric fermentation in sheep and cattle, methane and nitrous oxide from animal waste and nitrous oxide from fertilizer applications. Where agro-forestry was carried out on part of the property and involved reforestation or afforestation eligible under Kyoto Protocol accounting, the on-farm greenhouse gas impact was the net of emissions and $CO_2$ sequestration in the year of assessment. While the focus of this paper is food production, it should be noted that the estimate of emissions from sheep enterprises are for the entire Merino wether enterprise and no allocation was made between wool and meat products. Similarly, beef cattle emissions are unallocated.

The calculation of greenhouse gas emissions did not extend to the impact of a carbon price or emissions trading, due to uncertainty in specific impacts of new policies in Australia. Further, the greenhouse gas emissions do not represent a product 'carbon footprint'. Using a Life Cycle Assessment approach emissions from electricity and fuel use on-farm and up-stream embedded emissions in inputs such as fertilizers and chemicals would be included. Rather, this study counted only non-$CO_2$ agricultural sector emissions and $CO_2$ sequestered in agro-forestry. Thus, we implicitly assume that for comparison purposes fossil fuel emissions were equivalent in each

**Table 13.1** Features of farm scenarios as simulated in the case study

| | Mixed farm 1 | Mixed farm 2 | Mixed farm 3 | Livestock 1 | Livestock 2 | Grain 1 |
|---|---|---|---|---|---|---|
| | Area (ha) or stock (head cows or wethers) | | | | | |
| *Total area of crop* | *600* | *300* | *300* | *0* | *0* | *1,200* |
| Wheat | 280 | 140 | 140 | 0 | 0 | 560 |
| Sorghum | 100 | 50 | 50 | 0 | 0 | 200 |
| Canola | 220 | 110 | 110 | 0 | 0 | 440 |
| *Total area of pasture* | *500* | *600* | *700* | *1,200* | *1,200* | *0* |
| Improved pasture | 250 | 300 | 350 | 600 | 600 | 0 |
| Fertilized pasture | 100 | 100 | 150 | 200 | 200 | 0 |
| Beef breeding | 200 | 300 | 400 | 300 | 600 | 0 |
| Sheep (merino) | 2,000 | 2,500 | 0 | 2,500 | 0 | 0 |
| *Agro-forestry (planted 2006)* | *0* | *0* | *100* | *100* | *100* | *0* |

The enterprise data were derived from gross margin information for the central agro-ecological zone of New South Wales. Total Farm area in each case was 1,500 ha

scenario. Whilst climate change has high media and public interest at present, it should not be assumed that greenhouse gas emissions can be used as a proxy for the relative environmental impact of products or as an indicator of sustainability of food production. Other impact categories such as water use, water quality, biodiversity and scarce resource use (e.g. phosphorus, energy) must be considered in a comprehensive assessment of environmental impact.

The Australian Farm Institute FarmGAS calculator was used to provide comparative outputs of farm financial performance and greenhouse gas emissions as described above. Livestock emissions from enteric fermentation and waste management were calculated in the FarmGAS calculator assuming emissions factors reflecting Australia's national inventory system. Similarly, fertilizer applications were specified for each crop and for pastures and N fertilizers used to estimate $N_2O$ emissions from soil following national accounts methodologies. The calculator approach has significant limitations but provides a simplified framework for an initial evaluation of different enterprise options. A more complete analysis on a regional or national scale using an approach based on life cycle assessment methods is recommended when detailed resource and social data on a regional basis are available through targeted research. Therefore, the results of the enterprise case study must be interpreted with caution.

To illustrate differences in productivity, financial performance and greenhouse gas emissions, variations in enterprise mix on the case study farm were tested as summarized in Table 13.1.

The base-case farm (Mixed Farm 1) was assumed to have 1,200 ha under production in total, consisting of 500 ha pasture, 600 ha cropped and 100 ha fallow. Mixed Farms 2 and 3 increased the proportion of productive area in livestock and halved the area cultivated, with Mixed Farm 3 also including 100 ha tree planting. Two scenarios looked at moving from cultivation to specialist livestock production,

**Table 13.2** Estimated (a) production and financial performance and (b) greenhouse gas emissions for mixed farm 1 case study with enterprise characteristics described in Table 13.1

| | Production (kg HSCW; kg grain) | | Financial performance | | |
|---|---|---|---|---|---|
| | (kg/year) | (kg/ha/year) | Variable costs | Income | Gross margin |
| (a) Production and financial performance | | | | | |
| Beef cattle | 35,312 | 70.6 | $59.399 | $118,399 | $59,127 |
| Sheep | 4,180 | 11.0 | $57,804 | $78,550 | $20,746 |
| Wheat | 840,000 | 3,000.0 | $106,120 | $168,000 | $61,880 |
| Sorghum | 450,000 | 4,500.0 | $65,850 | $108,000 | $42,150 |
| Canola | 396,000 | 1,800.0 | $127,380 | $198,000 | $70,620 |
| Total crop | 1,686,000 | 9,300.0 | $299,350 | $474,000 | $174,650 |

| | Enterprise GHG emissions (t $CO_2$-e/year) | | | | GHG intensity of production | | |
|---|---|---|---|---|---|---|---|
| | Enteric $CH_4$ | Waste $CH_4$ | $N_2O$ | Total GHG | t $CO_2$-e per ha | t $CO_2$-e per $'000 GM) | t $CO_2$-e per t product |
| (b) Greenhouse gas emissions for mixed farm | | | | | | | |
| Beef cattle | 446.5 | 0.1 | 28.3 | 474.9 | 0.95 | 0.48 | 13.45 |
| Sheep | 370.7 | 0.1 | 50.8 | 421.6 | 0.84 | 2.45 | NA[a] |
| Pasture | | | 5.2 | 5.2 | 0.05 | | |
| Wheat | | | 45.0 | 45.0 | 0.16 | 0.73 | 0.05 |
| Sorghum | | | 24.5 | 24.5 | 0.25 | 0.58 | 0.10 |
| Canola | | | 39.9 | 39.9 | 0.18 | 0.59 | 0.10 |
| Total crop | | | 109.4 | 109.4 | 0.18 | 0.63 | 0.02 |

The right-hand column in Table 13.2 (b)expresses the greenhouse gas emissions per kg of HSCW or per kg grain produced as given in Table 13.2(a)

[a]Note: the GHG intensity of sheep meat was not calculated as a realistic allocation could not be made to the major commodity, wool

either Merino wethers and beef weaner production (Livestock 1) or all beef production (Livestock 2). The final scenario moved to a specialist grain production maintaining three crops. All scenarios were calculated to be economically viable according to Gross Margin estimates, within the assumptions described above, but differed in their greenhouse gas emissions and their food outputs. The analysis did not consider changes in soil carbon resulting from land conversion scenarios, because of uncertainty in their magnitude (and even direction) but it is recognized that they may be significant and should be included in future studies when accepted methodology is available. For example, in the higher rainfall Liverpool Plains region of NSW, conversion of cultivated lands to pastures has been estimated to have the potential to store 0.350 tC/ha/year until equilibrium, while soil carbon losses on conversion of pasture to cultivation might result in annual average losses of 1.4–1.9 t/ha/year over a 22-year period (Young et al. 2009).

Taking Mixed Farm 1 as the example, Table 13.2 illustrates summary outputs for production and gross margin (a) and greenhouse gas emissions (b) for each enterprise unit. In the single season illustrated, kilograms of food product per ha are markedly greater for grain than for meat. However, it is important to note that inter-annual variability in yield is much higher for broadacre crops than for livestock production (Fig. 13.1), and in poor years this relationship could be reversed.

This simple calculation does not take into account differences in nutrient density or dietary requirements. Based on the Australian Guide to Healthy Eating recommendations, Larsen et al. (2011) estimated that, for a nutritionally adequate food supply, the average Australian requires 0.04 kg meat/person/day and 0.39–0.54 kg/person/day from the cereal group of foods. A simple calculation assuming the three crop types are nutritionally equivalent would indicate that each hectare of cultivated land on the case study farm produces the cereal requirements for about 63 people for a year and that each hectare used for grazing produces the meat requirements for five to six people. However, micronutrient deficiencies which can have major adverse health consequences, particularly deficiencies in iron, zinc, vitamin A and iodine, have been linked with poor dietary quality arising from diets that are predominantly plant-based and contain very small amounts of animal-source foods (Gibson 2010).

It would be an over-simplification to conclude that to meet requirements of increasing food demand, moving from livestock to crop production would alone provide the solution even in this mixed farming scenario. Putting this case study farm into real-world context serves to illustrate why such a conclusion cannot be drawn and why claims that this approach is logical are misleading.

In Australia's climate and soil conditions, dryland crop production is not only seasonably variable but depends on rotation with pasture and fallow systems to maintain productivity levels. A typical rotation in the NSW central agro-ecological zone for this farm area may include 100 ha fallow rotating with pasture every 5–6 years so that each year about 100 ha of pasture is placed under crop and 100 ha crop area returned to pasture with legumes (lucerne/clover mix) sown to allow soil renewal (e.g. AFI 2009). Rather than increasing productivity, some intensification scenarios would result in highly variable production and long-term resource degradation. In more arid regions where rainfall is insufficient or too unreliable for crop production, and where irrigation is not possible or practical, ruminant livestock frequently offer the only option for food production.

Table 13.2 shows that the greenhouse gas emissions are higher for the livestock enterprises than for the crop production expressed on either a land area or productivity basis. The main source from crop production is $N_2O$ from applied nitrogenous fertilizer. For livestock, $CH_4$ emitted during digestion by ruminant animals (Eckard et al. 2010; Henry and Eckard 2009) can make up as much as 80–90% of total emissions.

The enterprise management scenarios evaluated in this case study and summarized in Table 13.3 were not assumed to represent practical on-farm management options but simplified scenarios used to explore the impacts on food production. Gross Margins for the six scenarios ranged from approximately \$202 k to \$349 k, so that each was assessed to be financially viable. Agricultural sector greenhouse gas emissions for the farm ranged from about 219 t $CO_2$-e for crop-only production to 1,299 t $CO_2$-e for a mixed farming enterprise with 300 ha crop production and 600 ha pasture supporting sheep and beef cattle enterprises (Mixed Farm 3).

**Table 13.3** Summary of financial and greenhouse gas emissions estimates for the six case study farm scenarios

| | Production (kg LW or grain) | Production (kg/ha) | GHG (t $CO_2$-e) | GHG (t $CO_2$-e/ha) |
|---|---|---|---|---|
| *Mixed farm 1: gross margin = $254,523; total GHG emissions = 1,011 t $CO_2$-e/year* | | | | |
| Beef breeding (500 ha) | 64,204 | 71 | 474.9 | 0.95 |
| Sheep (500 ha) | 7,600 | 11 | 421.6 | 0.84 |
| Fertilized pasture (100 ha) | | | 5.2 | 0.05 |
| Wheat (280 ha) | 840,000 | 3,000 | 45.0 | 0.16 |
| Sorghum (100 ha) | 450,000 | 4,500 | 24.5 | 0.25 |
| Canola (220 ha) | 396,000 | 1,800 | 39.9 | 0.18 |
| *Mixed farm 2: gross margin = $217,963; total GHG emissions = 1,299 t $CO_2$-e/year* | | | | |
| Beef breeding (600 ha) | 96,266 | 88 | 712.1 | 1.19 |
| Sheep (600 ha) | 9,600 | 9 | 526.7 | 0.88 |
| Fertilized pasture (100 ha) | | | 5.2 | 0.05 |
| Wheat (140 ha) | 420,000 | 3,000 | 22.5 | 0.08 |
| Sorghum (50 ha) | 225,000 | 4,500 | 12.3 | 0.12 |
| Canola (110 ha) | 198,000 | 1,800 | 20.0 | 0.09 |
| *Mixed farm 3: gross margin = $201,846; total GHG emissions = 762 t $CO_2$-e/year* | | | | |
| Beef breeding (700 ha) | 128,408 | 101 | 949.8 | 1.36 |
| Fertilized pasture (150 ha) | | | 7.8 | 0.08 |
| Wheat (140 ha) | 420,000 | 3,000 | 22.5 | 0.08 |
| Sorghum (50 ha) | 225,000 | 4,500 | 12.3 | 0.12 |
| Canola (110 ha) | 198,000 | 1,800 | 20.0 | 0.09 |
| Farm forestry (100 ha) | | | −286.3 | −0.73 |
| *Livestock farm 1: gross margin = $263,505; total GHG emissions = 920 t $CO_2$-e/year* | | | | |
| Beef breeding (600 ha) | 96,266 | 88 | 632.6 | 1.27 |
| Sheep (600 ha) | 7,600 | 11 | 561.1 | 1.12 |
| Fertilized pasture (200 ha) | | | 12.2 | 0.12 |
| Farm forestry (100 ha) | | | −286.3 | −0.73 |
| *Livestock farm 2: gross margin = $210,159; total GHG emissions = 992 t $CO_2$-e/year* | | | | |
| Beef breeding (1,200 ha) | 192,532 | 176 | 1266.0 | 2.53 |
| Fertilized pasture (200 ha) | | | 12.2 | 0.12 |
| Farm forestry (100 ha) | | | −286.3 | −0.73 |
| *Grain farm 1: gross margin = $349,300; total GHG emissions = 219 t $CO_2$-e/year* | | | | |
| Wheat (560 ha) | 1,680,000 | 3,000 | 89.9 | 0.32 |
| Sorghum (200 ha) | 900,000 | 4,500 | 49.0 | 0.49 |
| Canola (440 ha) | 792,000 | 1,800 | 79.8 | 0.36 |

Where specialist grain production is possible more food energy at lower GHG intensity and higher profitability can be achieved, but as noted only 7% of Australia's land area is arable and even in these areas continuous cropping is often not possible due to soil moisture and nutrient limitations.

On the 1,500 ha case study farm it was assumed that a proportion of the farm area was allocated to buildings, including the farm residence, and that only about 1,200 ha was under production. 100 ha was assumed to have been considered suitable for reforestation without negative impact on production. The two specialist livestock scenarios and Mixed Farm 3 estimated the impacts of farm forestry by assuming that 100 ha had been planted to trees in 2006. Annual carbon sequestration in the 5-year old 100 ha plantation in this climate was estimated to be 286 t $CO_2$-e. This is a significant offset for the agricultural activities but insufficient to balance the emissions.

## 13.5 Conclusions

Success in long-term sustainability of food production will depend on the development of a capacity for land managers to match management practices to the natural capacity of agro-ecosystems. Overly simple solutions to the challenge of increasing food production for a growing population such as a broad shift from livestock to crop products will not meet nutrition needs as specified by dietary recommendations and will not effectively decrease environmental impacts. Improved understanding of the ecological functionality of landscapes and analysis of likely response to future changes in climate will require increased investment in research targeting environmental and agricultural science and nutrition value of food products for human health. To minimize the risk of unexpected perverse outcomes, it is critical that R&D takes a comprehensive approach to understanding food production systems. Understanding of the interactions of farm practices, agro-ecosystem functionality, climate change and environmental factors such as water use and biodiversity as well as greenhouse gas emissions, is needed to inform strategies for long-term environmental and economic sustainability.

Rapidly emerging domestic and international policies for reductions in greenhouse gas emissions will require targeted research identifying practical regionally based strategies with the potential to achieve greater efficiency of food production as well as mitigation (e.g. Grace et al. 2010; Henry et al. 2011). Policies are needed that are sensitive not only to the threat of climate change but also to the finite nature of resources for agriculture and the socio-economic needs of rural communities. Particular challenges will come from competing demands for prime agricultural lands and in efforts to optimize land use for different needs and for different production systems.

We used a simplified case study analysis to begin to examine the potential to increase productivity in a hypothetical mixed grain and livestock farming region of Australia through change in land allocation to production, and to illustrate the risks of not adequately considering the agro-ecological system. While cropping was shown to theoretically produce more food with lower greenhouse gas emissions than livestock from the same area much of the area used for livestock production in Australia is non-arable. The case study gives an indication that it is possible to intensify production in some regions suitable for cultivation by changing enterprise mix. However, with knowledge of limitations due to climate variability, water availability, soil quality and nutrient deficiencies, it is clear that a cautionary approach should be taken in extrapolating the case study results. The impacts of climate change—warmer conditions with changes in rainfall patterns and amount, and probable increases in the incidence and severity of extreme weather events—further exacerbate the complexities of recommending changes for future productivity growth and financial returns.

Interpretation of the results should also consider dietary recommendations for both animal and plant nutrition, and availability and sources of alternative sources of essential nutrients. Overall the case study highlighted that while there is potential to increase production through changes in farm systems management, extreme caution is required in interpreting a simplified analysis which ignores important environmental and nutrition aspects. The case study reinforced the need for investment in research and development. Practical technologies for productivity linked to climate risk management and understanding of nutrition between regions and countries will likely provide the greatest opportunities to develop strategies to increase productivity in a changing climate. Investment in R&D has the potential to contribute to global food security through export of knowledge and technologies for farm systems in developing countries particularly those sharing similar regional or climatic conditions.

## References


ABARE (Australian Bureau of Agriculture and Resource Economics). (2009). *Australian commodity statistics 2009*. Canberra.

ABS (Australian Bureau of Statistics). (2008). *Population Projections, Australia, 2006–2101*. Canberra. Retrieved January , 2010, from http://www.abs.gov.au/Ausstats/abs@.nsf/mf/3222.0

AFI (Australian Farm Institute). (2009). *FarmGAS Calculator: Final Report and Case Studies.* Research Report, Australian Farm Institute, Surry Hills, Australia. http://farmgas.farminstitute.org.au/.

BRS (Bureau of Rural Sciences). (2010). *Workplan of the Australian Collaborative Land Use and Management Program Retrieved January, 2010, from.* http://www.brs.gov.au/landuse. Retrieved January 2010

Bruinsma, J. (2009). *The resource outlook to 2050: By how much do land, water and crop yields need to increase by 2050?* Paper presented at the FAO Expert Meeting, How to Feed the World in 2050, 24–26 June 2009, Rome.

Calford, E. M., Gurney A., Heyhoe, E., & Ahammad, H. (2010). *The effects of an emissions offsets scheme on Australian agriculture.* ABARE Issues Insights 10.2, Canberra. http://www.abare.gov.au

Commonwealth Department of Health and Ageing. (1998). *Australian Guide to Healthy Eating*. Retrieved March, 2011, from http://www.health.gov.au/internet/healthyactive/publishing.nsf/content/eating

DAFF (Department of Agriculture, Fisheries and Forestry). (2009). *Australian Food Statistics 2008.* Canberra.

DCCEE. (2010a). *Design of the carbon farming initiative.* Consultation paper. Canberra: Department of Climate Change and Energy Efficiency.

DCCEE. (2010b). *Australian National Greenhouse Accounts, National Greenhouse Gas Inventory, accounting for the Kyoto Target*. Canberra: Department of Climate Change and Energy Efficiency.

DCCEE. (2011). *Securing a clean energy future: The Australian Government's Clean Energy Plan*. Retrieved November 6, 2011, from http://www.cleanenergyfuture.gov.au/wp-content/uploads/2011/07/Consolidated-Final.pdf. (Source: Licensed from the Commonwealth of

Australia under a Creative Commons Attribution 3.0 Australia Licence; The Commonwealth of Australia does not necessarily endorse the content of this publication.)

Eckard, R. J., Grainger, C. J., & de Klein, C. A. M. (2010). Options for the abatement of methane and nitrous oxide from ruminant production—a review. *Livestock Science, 130*, 47–56.

FAO (Food and Agriculture Organization of the United Nations). (2008). *FAOSTAT*. Retrieved December, 2010, from http://faostat.fao.org/

FAO (Food and Agriculture Organization of the United Nations). (2009). *How to Feed the World in 2050*. Report of Expert Meeting, 24–26 June 2009, Rome Italy.

Foresight. (2011). *The future of food and farming*. Final Project Report. London: The Government Office for Science.

GHD Hassall. (2010). *The Implications of Greenhouse Mitigation Policies on the Demand for Agricultural Land.* Research Report. Surry Hills, Australia: Australian Farm Institute.

Gibson, R. S. (2010). Strategies for preventing multi-micronutrient deficiencies: A review of experience with food-based approaches in developing countries. In B. Thomson & L. Amorosos (Eds.), *Combating micronutrient deficiencies: Food-based approaches* (pp. 7–27). FAO. http://www.cobi.org

Gill, M., Smith, P., & Wilkinson, J. M. (2010). Mitigating climate change: The role of domestic livestock. *Animal, 4*, 323–333.

Grace, P. R., Antle, J., Ogle, S., Paustian, K., & Basso, B. (2010). Soil carbon sequestration rates and associated economic costs for farming systems of south-eastern Australia. *Australian Journal of Soil Research, 48*, 1–10.

Henry, B., Charmley, E., Eckard, R., Gaughan, J., & Hegarty, R. (2012). Livestock production in a changing climate. *Crop and Pasture Science*, *63*, 191–202

Henry, B., & Eckard, R. (2009). Greenhouse gas emissions in livestock production systems. *Tropical Grasslands, 43*, 232–238.

Hooper, S., & Levantis, C. (2011). *Physical and financial performance benchmarks for grain producing farms, New South Wales central agroecological zone*. ABARES report prepared for the Grains Research and Development Corporation, February 2011, Canberra.

ILRI (International Livestock Research Institute). (2009). *Global livestock trends—the past may not always predict the future*. Presentation by John McDermott, Deputy Director General—Research, to United States National Academy of Sciences, Board of Agriculture and Natural Resources Meeting, May 12, 2010. http://www.ilri.org

Koning, N. B. J., van Ittersum, M. K., Becx, G. A., Van Boekel, M. A. S. J. S., Brandenburg, W. A., Van den Broek, J. A., et al. (2008). Long-term global availability of food: Continued abundance or new scarcity? *NJAS Wageningen Journal of Life Sciences, 53*, 229–292.

Larsen, K., Turner, G., Ryan, C., & Lawrence, M. (2011). *Victorian Food Supply Scenarios: Impacts on availability of a nutritious diet.* Victorian Eco-Innovation Lab (University of Melbourne). Melbourne: CSIRO and Deakin University.

MLA. (2002). *Eco-efficiency manual for meat processing*. Sydney: Meat and Livestock Australia Ltd.

NSW I&I. (2005–10). *Gross margin budgets.* NSW Department of Industry and Investment. Retrieved November, 2010, from http://www.dpi.nsw.gov.au

O'Mara, F. P. (2011). The significance of livestock as a contributor to global greenhouse gas emissions today and in the near future. *Animal Feed Science and Technology, 166–167*, 7–15.

PMSEIC. (2010). *Australia and food security in a changing world*. Canberra: The Prime Minister's Science, Engineering and Innovation Council.

Ponnampalam, E., Mann, N., & Sinclair, A. (2006). Effect of feeding systems on Omega 3 fatty acids, conjugated linoleic acid and trans fatty acids in Australian beef cuts: Potential impact on human health. *Asia Pacific Journal of Clinical Nutrition, 15*, 21–29.

Sheales, T., & Gunning-Trant, C. (2009). *Global food security and Australia.* ABARE Issues Insights report 09.8, Canberra.

Sheng, Y., Gray, E. M., & Mullen, J. D. (2011). *Public investment in R&D and extension and productivity in Australian broadacre agriculture.* ABARES Paper 11.08, Canberra.

UNSCN (United Nations System Standing Committee on Nutrition). (2010). *Climate Change and Nutrition Security*. Message to UNFCCC negotiators to COP 16, Cancun. http://www.unscn.org

Young, R. R., Wilson, B., Harden, C. S., & Bernardi, A. (2009). Accumulation of soil carbon under zero tillage cropping and perennial vegetation on the Liverpool Plains, eastern Australia. *Australian Journal of Soil Research, 47*, 273–285.

# Chapter 14
# Enhancing Food Security in Australia by Supporting Transformative Change

**Sarah Park, Steven Crimp, Simon Attwood, Nadine Marshall, and Mark Howden**

## 14.1 Introduction

The latest report commissioned by Australia's Commonwealth, State and Territory Governments on the impacts of climate change on the Australian economy highlights the important role that Australian agricultural producers must play in maintaining the nation's food security status into the future (Garnaut 2011). Research and development (R&D) has an important role to play in informing the decisions that farmers must make in effectively managing change. Today, over AUD 1.6 billion per annum is spent on R&D aimed at supporting the growth of primary industries (agriculture, forestry and fishing) in Australia (DAFF 2011). However, this investment is focused predominantly on improving the productivity of the present crop and animal production systems, generally through the intensification of management practices and increased inputs at the farm scale. This scale of change is generally referred to as incremental (Stokes and Howden 2010).

The unabated pace of climate change (Stafford Smith et al. 2011), the presence of environmental thresholds and an increasingly understood relationship between agricultural intensification and reduced sustainability, suggests increasing numbers of agricultural enterprises, production chains, communities, regions and industries

S. Park (✉) • S. Crimp • M. Howden
Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra, ACT, Australia
e-mail: sarah.park@csiro.au

S. Attwood
Fenner School of Environment and Society, Australian National University, Canberra, ACT, Australia

N. Marshall
Commonwealth Scientific and Industrial Research Organisation (CSIRO), Townsville, Queensland, Australia

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_14,

will need to undertake larger and more fundamental changes if they are to remain productive into the future.

Unlike incremental change, transformation requires fundamental (but not necessarily irreversible) changes in the biophysical, social or economic components of a system (Park et al. 2011). The outcome from such actions may include in situ land-use change, translocation of the production unit, or the diversification of income streams (Howden et al. 2010). Attempts at such change can already be seen in the Australian livestock grazing, wine, peanut and rice industries. This chapter details our attempt to understand how agricultural stakeholders frame the issue of adaptation and undertake pro-active and re-active strategies to manage change. We consider how this insight can enhance the delivery of research and policies aimed at supporting more informed decision-making within the agricultural sector and improve the effectiveness of attempts by primary producers to transform their enterprises in response to drivers and change, and consequently maintain the current net food security status of the nation.

## 14.2 Historical Development of Agricultural Production in Australia

The history of agricultural development in Australia is characterized by extended periods of relative stasis and incremental changes that have been abruptly altered by massive transformative activities. Arguably the most notable of changes in the scale and pace of agricultural development followed the colonization of the Australian continent by the first Europeans in the late eighteenth century. Until that time Aboriginal land management practices, such as 'fire stick farming', and innovations in hunting, such as improved stone tools, had incrementally developed over several thousand years and enabled ecological systems to remain relatively stable (Bowman 1998;ww Dodson and Mooney 2002).

From the first days of settlement, the majority of new residents of Australia faced a continuous struggle to maintain a year-round supply of sufficient quantities of food of appropriate quality, and often depended upon imports from Europe. The first 5 years of European settlement were characterized as particularly 'lean' (Davey et al. 1947). It was not until the late 1890s that States like New South Wales and Victoria were able to satisfy their own domestic demand (Henzell 2007). Initial attempts to produce food and fibre often faltered, reflecting the lack of farming knowledge existing amongst the earliest settlers. It has been widely claimed that it was a mistake not to have sent more people with farming experience on the First Fleet (Collins 1975). However, by the early to mid-nineteenth century the importation of technical knowledge, expertise and resources, as well as the introduction of rail transport and mechanized milling processes, brought about the widespread use of European-style farming practices and agricultural systems, as well as the expansion of agricultural land use.

Continuous incremental changes in agronomic technologies and practices, particularly in machinery (e.g., for sowing, harvesting and threshing), and in irrigation technology, enabled farming of crops like wheat to expand over vast areas and into many lower rainfall regions across the continent. Contemporary wheat production is

~24 million metric tonnes annually, from an area of on average 12 million hectares (ABARE 2008). Approximately 53% of the crop is exported, representing 13–15% of the global wheat export market (Sheng et al. 2011).

Fundamental to this expansion to present day production levels and contemporary influence on world markets, was a reassessment and modification of the assumption that European-style agronomic practices would suit the vastly different biophysical and climatic conditions existing in Australia. This rethinking of food production systems generated context-specific knowledge and the governance systems required to support agricultural production planning and practice in Australia's unique biophysical and socio-economic environment. This new knowledge resulted from what is now termed 'double-loop learning', whereby decision-makers reflect upon the outcomes of their efforts and modify their assumptions and future strategies and actions accordingly (Argyris and Schön 1978; van de Kerkhof and Wieczorek 2005).

It may be argued, however, that there were many cases where lessons were not learnt (e.g., early incursion north of where Goyder's Line was later established in South Australia (Meinig 1962)). In some cases the cycling of iterative learning also resulted in changes to the governance of a system itself (Biggs and Rogers 2003; Stafford Smith et al. 2009). Examples from the late nineteenth century (e.g., the rapid transition from capstan milling to roller milling) were precipitated by extreme variability in rainfall resulting in few reliable streams in NSW, the development and dissemination of the new technologies, and government incentives to take up the technology (Farrer 1980). This alignment of new technologies and policy are also related to periods of rapid expansion and innovation resulting from the increasing recognition that declining soil fertility and pasture conditions were associated with droughts and the over-grazing by excessive densities of stock (Anon 1901; Condon 2002).

The technology drives that followed World Wars I and II advanced agricultural mechanization, irrigation, cultivar development and agro-chemical use in Australian food production systems. These in turn have increased crop yields and profits, as well as encouraging and enabling the expansion of agriculture into areas that were previously considered marginal. Eco-efficiency gains increased production per unit area based on more intensive use of economic and ecological resources (Gregory et al. 2002) have, however, also contributed to ongoing environmental degradation, loss of ecosystem function and biodiversity loss (Ford et al. 2001; McAlpine et al. 2002; Maron and Fitzsimons 2007).

## 14.3 Present Day Agriculture, Using Grains as an Example

Innovation, a focus on increased efficiency of resource use and effective partnerships between industry, government and the research community have resulted in Australian farms increasing multifactor productivity growth of 1.4% p.a. from 1977–1978 to 2007–2008 (DAFF 2011). One such crop credited with such productivity gains is the grains industry. These gains have been attributed to continued investment in R&D, as well as improvements in the efficiency of institutional arrangements (Henzell 2007). However, this positive view is actually more complex; the first 20 years of this period

(1977–1978 to 1997–1998) had annual growth averaging 1.8% p.a., but this reversed over the following 10 years with shrinkage of 1.3% p.a. This reduction may be related to reductions in R&D investment (Nossal and Gooday 2009).

Today Australia is a significant net agricultural exporter, with around two-thirds of total domestic production exported to international markets (ABS 2010). Wheat alone has earned Australia an average of AUD 3.1 billion per annum since 1990 (ABARE 2009). However, there is a long-term trend downwards in the proportion of production exported due to patterns of increasing domestic consumption. It has been estimated that climate change will interact with increasing domestic wheat consumption to significantly reduce wheat surplus for export (Howden et al. 2010). In the event of a worst-case climate change scenario, Australia could become a net importer of wheat as soon as 2,050. It is further projected (under this worst-case scenario) that by 2,070, there is a 26% chance of Australia needing to import wheat to meet domestic demand, with around 15 million tonnes/year of wheat required. This is approximately the same amount of wheat as Australia currently exports. In that particular study (i.e., Howden et al. 2010) only a limited range of adaptations were assessed and more substantial changes in technologies, production practices and land use may result in different outcomes in terms of domestic food security and Australia's status as a net food exporter.

## 14.4 Agricultural Intensification, Biodiversity and Sustainable Production

In Australia, both the expansion and intensification of agriculture (e.g., through increased grazing pressures, irrigation of pastures and crops) have been associated with biodiversity loss (Ford et al. 2001; McAlpine et al. 2002; Maron and Fitzsimons 2007). In Queensland, the recent expansion of the beef industry has seen both land clearing and exotic pasture establishment on an enormous scale, with associated habitat loss, fragmentation and degradation, and associated loss of both faunal and floral diversity and abundance (Fairfax and Fensham 2000; McAlpine et al. 2009).

Whilst the impact of agriculture on biodiversity is increasingly well documented (Sala et al. 2000; Attwood et al. 2009), there is growing concern over environmental degradation having potential negative impacts on Australia's agricultural production and system resilience in the long-term. For instance, clearing of indigenous woody vegetation in Queensland may be contributing to warmer and drier conditions (McAlpine et al. 2007), whilst loss of native woodland and grassland systems have been linked to considerable reductions in soil carbon, that in turn have implications for long-term land productivity (Collard and Zammit 2006). Such concerns, coupled with the productive advantages that may be accrued through management of natural and semi-natural habitats for services such as pest control (Fiedler et al. 2008), provide a strong case for primary producers to consider environmental and social factors in their production goals and practices (sensu Garnaut 2011; De Schutter 2010).

The decision-making processes of primary producers need to simultaneously aim at maintaining long-term productivity, as well as minimizing external negative impacts. Importantly, these aims need to be realized in an environment where increases in the global interconnectedness of economic and trade systems have resulted in the food production systems in Australia increasingly being influenced by global, as well as regional drivers (McAlpine et al. 2009). Contemporary drivers of change include a range of socio-economic factors e.g., human food consumption patterns, *per capita* consumption, population, financial imperatives—particularly resulting from the global financial crisis and global demand for energy—and environmental factors (e.g., changes in land use, and concentrations of atmospheric $CO_2$ and associated climate change). Decisions and changes that previously operated at local scales are increasingly determined by a wide range of global markets, information, capital and policy processes (Yi et al. 2008).

## 14.5 Climate Change as a Key Driver of Food Production in Australia

One of the most significant factors determining the quality and quantity of food produced in Australia is the highly variable and changing climate. As a result of living in one of the world's most variable climates, many Australian primary producers have developed highly effective skills and tools to manage daily, seasonal and annual variations in precipitation and temperature (Agtrans Research 2008). Management of climate variation has more recently broadened to include consideration of the longer-term trends for a changing climate. The vast majority of adaptation responses developed to date, that are aimed at managing climate change, have justifiably drawn on the rich seam of experience and tools developed to respond to short-term variations in climate. R&D investments can also clearly be seen to have largely focused on tactical, short-term decisions and producing incremental changes in production systems (Stokes and Howden 2010).

Given the potential scale and severity of projected climate changes (CSIRO 2011) it is unlikely that the present suite of incremental adaptation actions alone will be sufficient to sustain Australia's food production systems into the long-term (Howden et al. 2010). In some cases, more transformative responses will be needed to maintain the country's food security status and net food exports. Unlike incremental change, transformation requires fundamental (but not necessarily irreversible) changes in the biophysical, social or economic components of a system (Park et al. 2011). Transformation of primary production enterprises, production chains, communities, regions and industries are evident across Australia today. These are occurring either as a pre-emptive longer-term response to perceived or actual changes in climate (e.g., the purchase of a cool climate vineyard in Tasmania by a traditionally Victorian-based wine company—see The Age (2010)). They are also occurring with the intention of overcoming short-term extreme climate events (e.g., the importation of rice to maintain processing output in the face of reduced domestic yields as a result of low levels of rainfall—see ABC News (2010)). This latter strategy was considered by the rice processing company to be a short-term response to an insufficient domestic supply. As such, it may be considered to be more of a

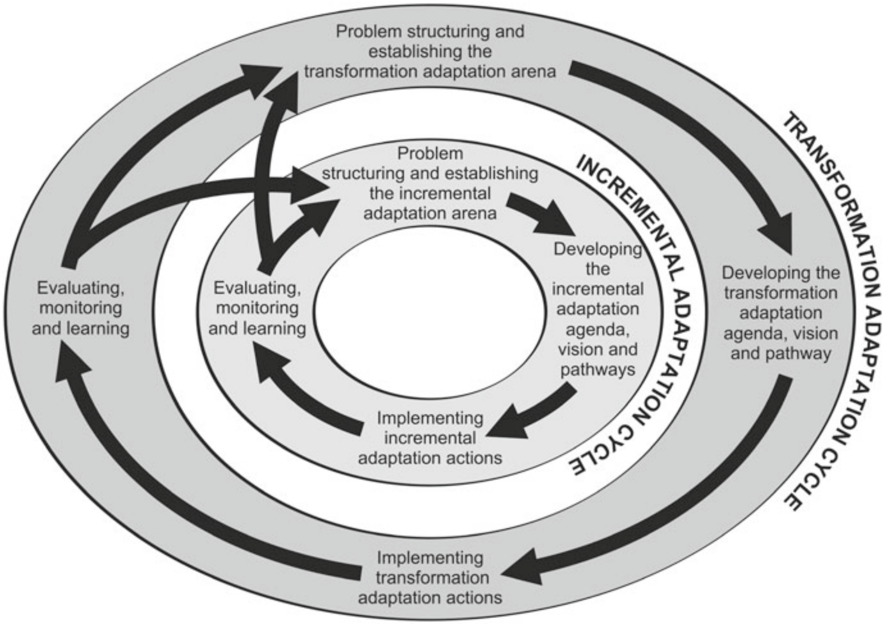



**Fig. 14.1** Adaptation action cycles (Park et al. 2011)

risk management strategy than a longer-term fundamental change that is more characteristic of transformation. Conceptually, the extent of this adaptive response lies somewhere between incremental and transformative change, and is referred to as systemic change by Howden et al. (2010). Clearly, the definitional boundaries between the three scales of adaptation (i.e., incremental, systemic and transformational) can become somewhat blurred in reality, and depend to varying degrees upon their intended duration, extent and timing.

Regardless of the rationale or drivers of transformation, the decisions and actions taken to realize fundamental change are likely to be more costly, risky and complex than those associated with incremental change management (Howden et al. 2010). It is therefore more important than ever that decision-making and risk management be innovative, informed by science-based knowledge and technologies, and be supported by policies that facilitate effective change (Garnaut 2011; Meinke et al. 2001).

Increasing the likelihood that adaptation process will reach an end point desired by the decision-maker and the broader community (Olsson et al. 2006; Olsson et al. 2008), offers the potential to reduce the transaction costs of adaptation. The lack of understanding of the conditions prevailing at the time of transformational change, the options available and the associated decision-making processes undertaken, highlights a knowledge gap in both international and national literature on the information needs and policy support required by actors at all scales (Nelson et al. 2007; Sarewitz and Pielke 2007; Smithers and Smit 1997). Efforts to address this knowledge gap in the Australian context have largely been absent from the agendas of key R&D agencies until very recently.

The adaptation action cycles diagram (Fig. 14.1) has been developed as a conceptual framework for describing and guiding assessment of the decision-making processes undertaken by Australian primary industry stakeholders considering incremental and transformative change (Park et al. 2011). Importantly, the adaptation action cycles does not assume that the decision-making processes, drivers of change, factors facilitating or hindering actions, types and sources of information consulted, and visions of success are the same for both incremental and transformative change.

This conceptual framework is presently being utilized in collaboration with stakeholders in longitudinal studies focusing on decision-making processes associated with adaptation actions taken in the wine, livestock grazing and peanut, industries of Australia. Early indications are that the R&D needs of those undertaking transformative change in these industries differs from that required to undertake incremental change as predicted from theory (Howden et al. 2010; Park et al. 2011). Further, aspects of the social, political and economic environment may need to be modified if those transforming are to realize fundamental changes in primary food production. Once confirmed, using these findings to inform R&D and policy and institutional developments aimed at socially, environmentally and economically sustainable production systems will be particularly important if we are to avoid many of the past mistakes documented in the history of agricultural development in Australia.

Using the above action learning cycles concept in participation with a sample of agricultural producers enables an assessment of the extent of single and double-loop learning in operation. As such it is possible to observe stakeholders seeking to address questions such as 'are we doing things right, and are we doing the right things?' (Flood and Romm 1996). It also offers the potential to observe instances where a more fundamental questioning of the 'rightness' of an action is in evidence. This is considered a third loop of learning (Flood and Romm 1996). Triple-loop learners are credited with operating more intelligently and responsibly than those at the single and double levels. It may be argued that the greater costs, risks and complexity associated with transformative, compared with incremental, change management (Howden et al. 2010), may require this enhanced level of intelligence and responsibility.

## 14.6 Factors that Hinder and Facilitate Successful Change Management

There are many factors that act to either hinder or facilitate change. While the nature and causation of these may be diverse and operate at different scales, they can all be thought of in terms of their impact on the action learning cycle. A small number of factors are discussed below in terms of their influence on the ease and effectiveness of change management. These include foreign sovereignty, the extent of an individual's dependency and knowledge of the local natural resource base, their level of attachment to occupation (identity) and place, and the extent of their social network and use of technology. An important insight from this exposition is that individual factors can act to both hinder and facilitate change depending on the particular context at any one time. Clearly, the importance of knowing how each factor plays out in particular circumstances is vital to informing the effective alignment of science and policy delivery to primary industry needs.

While the implications of foreign sovereignty of food production systems in Australia is more fully discussed in other chapters of this book, it is relevant here to specifically consider its possible impacts on the capability of primary producers, communities, regions and industries to effectively manage change. A failure in cooperation and collective action is considered to typically result from an increasing influence of global drivers and reduced local sovereignty (Walker et al. 2009). The consequences of this for the responsive and iterative management of effective food production systems in Australia, is as yet unclear. However, by reflecting on events occurring over the past 200 years of agricultural development in Australia, it can be argued that a decoupling of decision-making from local context and constraints may result in unintended perverse environmental, social or economic outcomes. It can further be envisaged that a growing disconnect between the process of problem structuring and other activities on the action learning cycle, may reduce the capability of individuals to employ double and triple loop learning outcomes within adaptive management.

This disconnect in the action learning cycle can further be complicated by the nature and levels of dependency on the natural resources that exist between different agents in the production chain (Marshall 2011; Park et al. 2011). A decision to pursue a strategy of incremental change management taken by an overseas-based global corporation may require local Australian supplies of primary produce to radically transform if they are to maintain supply contracts. For example, this may include relocation and the necessity to consider the biophysical and technological determinants required for successful re-establishment of an enterprise in a climatically more suitable region.

Less obvious, but clearly important, are the additional factors at the individual level that influence capacity to transform (Marshall et al. in review). Barriers and facilitators may exist where transformative adaptation requires a farmer to change the focus of their enterprise. For example, the gradual policy shift towards a more multifunctional rural landscape (Cocklin et al. 2006; Phillips and Lowe 2005) has focused attention on the role that landholders may play in conserving on-farm biodiversity (Attwood 2010). Whilst this shift in emphasis from production to conservation management may appear subtle, it requires a reassessment of what it means to be a farmer, and this may act to be a formidable barrier to transformation. It is additionally seen that a strong attachment to occupation may also drive some primary industry stakeholders to relocate their enterprise in the hope of maintaining their current profession. In this sense, attachment to occupation may also act as a facilitator of transformative change, albeit using a different strategy.

Attachment to place may also have a significant influence on the outcomes from attempts to undertake structural or functional change (Devine-Wright and Clayton 2010). The extent to which primary producers are networked, both informally (with colleagues within the industry), and formally (with government representatives and researchers), also influences their capacity to adapt to climate risk (Park et al. 2011). The hypothesis here is that primary producers that are well networked are more likely to be aware of the need to change (either incrementally or transformatively), and are more aware of their options and the strategies that are most likely to succeed.

Similarly, local environmental knowledge as well as environmental awareness can influence the inclusion of climate information in decision-making (Marshall et al. 2007). In such instances, primary producers that are looking for, and responding to, environmental indicators of landscape health are possibly more aware that degradation processes are occurring and that behavioural change is necessary. Similarly, whether individuals access or effectively utilize available technology in deriving information about their future has also been linked to the capacity to affect change (Marshall et al. 2010). Primary producers who are interested in using climate technology to assist them in their business tend to have a higher capacity to assess risk, as well as skills for planning and preparing for the future (Marshall et al. 2007). This proactive vision is helping to shift the discourse around transformation from one of failure, to a more positive management response.

## 14.7 Governance

This chapter has touched lightly on the influence of formal and informal institutions and governance systems in hindering and facilitating effective transformative adaptation in the primary industries of Australia. These factors clearly play an important role in determining the capability of an individual to realize change. The important role of policy, e.g., in driving and shaping both successful and unsuccessful outcomes from transformation, has been highlighted in the dairy industry (Edwards 2003). Here deregulation of the industry in 2000 saw the introduction of a structural adjustment package offering exit payments to incentivize farmers to leave the industry. It is important to note the role that R&D, and more specifically knowledge of the decision-making processes undertaken by those within primary industries, can have in informing the development of effective social, environmental and economic institutions and governance systems (Nelson et al. 2008). Clearly R&D has no role in prescribing policy, but offers the potential for developing evidence-based and informed incentives and regulations to be aligned to the promotion of both environmental and production outcomes.

## 14.8 Concluding Remarks

By reflecting on the historic development of agriculture in Australia over the past two centuries, it is clear that transformative change has been a key strategy in enabling primary producers to maintain outputs at levels that have resulted in the favourable food security and net export status enjoyed by the nation today. Nevertheless, climate, human population growth, recent commodity price fluctuations, world market volatility, loss of productive land to non-food production and the degradation of natural resources and concomitant impairment of ecosystem services are likely to intensify the challenge of food security into the future (Alcamo et al. 2005; FAO 2008; Koning et al. 2008; MEA 2005; Schmidhuber and Tubiello 2007). It is likely that transformative change, more than ever, will be called upon by Australian agricultural producers to deliver the sustainable, stable and sufficient quantities and quality of food required by future generations. We have argued that effective transformational change requires both appropriate information and technologies, in addition to well-aligned social, environmental and economic governance systems to help realize change. However the need to adapt to change appears to be growing and future production levels will require that R&D and governance and institutional reforms reflect and support the evolving decision-making processes used by those producing food in Australia's soils and oceans.

## References


ABARE (Australian Bureau of Agricultural and Resource Economics). (2008). *Australian Commodity Statistics: Summary of Australian statistics for wheat*. Retrieved April 20, 2011, from http://www.abareconomics.com

ABARE (Australian Bureau of Agricultural and Resource Economics). (2009). *Australian Commodity Statistics: Summary of Australian statistics for wheat*. Retrieved April 20, 2011, from http://www.abareconomics.com

ABC News. (2010). *Rice shortage to force temporary industry restructure.* Retrieved August 17, 2010, from http://www.abc.net.au/news/stories/2007/11/05/2081913.htm

ABS. (2010). 7111.0—*Principal Agricultural Commodities, Australia, Preliminary, 2009–10*. Australian Bureau of Statistics. Retrieved April 20, 2011, from http://www.abs.gov.au/ausstats/abs@.nsf/mf/7111.0

Alcamo, J., van Vuuren, D., Ringler, C., Cramer, W., Masui, T., Alder, J., et al. (2005). Changes in nature's balance sheet: Model-based estimates of future worldwide ecosystem services. *Ecology and Society, 10*(2), 19.

Anon. (1901). *Royal commission to inquire into the condition of the crown tenants, Western Divisions of New South Wales*. Sydney: Government Printer.

Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.

Attwood, S. J. (2010). *The impacts of agricultural intensification on arthropod assemblages at global and local scales*. PhD thesis, University of Southern Queensland, Australia.

Attwood, S. J., Park, S. E., Maron, M., Collard, S. J., Robinson, D., Reardon-Smith, K. M., et al. (2009). Declining birds in Australian agricultural landscapes may benefit from aspects of the European agri-environment model. *Biological Conservation, 142*, 1981–1991.

Biggs, H. C., & Rogers, K. H. (2003). An adaptive system to link science, monitoring, and management in practice. In J. T. du Toit, K. H. Rogers, & H. C. Gibbs (Eds.), *The Kruger experience: Ecology and management of savanna heterogeneity* (pp. 59–80). Washington, DC: Island Press.

Bowman, D. M. J. S. (1998). Tansley review no. 101: The impact of Aboriginal landscape burning on the Australian biota. *New Phytologist, 140*, 395–410.

Cocklin, C., Dibden, J., & Mautner, N. (2006). From market to multifunctionality? Land stewardship in Australia. *The Geographical Journal, 172*, 197–205.
Collard, S. J., & Zammit, C. (2006). Effects of land-use intensification on soil carbon and ecosystem services in Brigalow (Acacia harpophylla) landscapes in the southeast Queensland, Australia. *Agriculture, Ecosystems and Environment, 117*, 185–194.
Collins, D. (1975). *An account of the English Colony in New South Wales: With Remarks on the Dispositions, Customs, Manners etc. of the Native Inhabitants of That Country, original 1798/ ed.* By B.H. Fletcher. Sydney, A.H. &A.W Reed in association with the Royal Australian Historical Society.
Condon, R. W. (2002). *Out of the West: Historical perspectives on the Western Division of New South Wales. Lower Murray Darling and Western Management Catchment Management Committees* (p. 444). Yowie Bay: Rangeland Management Action Plan.
Cleugh, H., Stafford Smith, H., Battaglia, M., Graham, P. (2011). Climate Change: Science and Solutions for Australia. CSIRO PUBLISHING, 168 pp. http://www.csiro.au/Outcomes/Climate/Climate-Change-Book.aspx
DAFF. (2011). *Australian Government, Department of Agriculture, Fisheries and Forestry. Research and Innovation*. Retrieved April 20, 2011, from http://www.daff.gov.au/agriculture-food/innovation
Davey, L., Macpherson, M., & Clements, F. W. (1947). The hungry years: 1788–1792. *Historical Studies Australia and New Zealand, 3*(11), 187–208.
De Schutter, O. (2010). *Report submitted by the Special Rapporteur on the right to food. United Nations General Assembly, Human Rights Council. Sixteenth session, Agenda item 3: Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development*. Retrieved April 20, 2011, from http://www.reliefweb.int/rw/RWFiles2011.nsf/FilesByRWDocUnidFilename/SNAA-8EBLUA-full_report.pdf/$File/full_report.pdf
Devine-Wright, P., & Clayton, S. (2010). Introduction to the special issue: Place, identity and environmental behaviour. *Journal of Environmental Psychology, 30*, 267–270.
Dodson, J. R., & Mooney, S. D. (2002). An assessment of historic human impact on south-eastern Australian environmental systems, using late Holocene rates of environmental change. *Australian Journal of Botany, 50*, 455–464.
Edwards, G. (2003). The story of deregulation in the dairy industry. *The Australian Journal of Agricultural and Resource Economics, 47*, 75–98.
Fairfax, R. J., & Fensham, R. J. (2000). The effect of exotic pasture development on floristic diversity in central Queensland, Australia. *Biological Conservation, 94*, 11–21.
FAO. (2008). *The State of Food Insecurity in the World 2008*. Rome: Food and Agriculture Organization of the United Nations.
Farrer, K. T. H. (1980). *A settlement amply supplied: Food technology in nineteenth century Australia*. Carlton, VIC: Melbourne University Press.
Fiedler, A. K., Landis, D. A., & Wratten, S. D. (2008). Maximizing ecosystem services from conservation biological control: The role of habitat management. *Biological Control, 45*, 254–271.
Flood, R. L., & Romm, N. R. A. (1996). Contours of diversity management and triple loop learning. *Kybernetes: The International Journal of Systems and Cybernetics, 25*, 154–163.
Ford, H. A., Barret, G. W., Saunders, D. A., & Recher, H. F. (2001). Why have birds in the woodlands of Southern Australia declined? *Biological Conservation, 97*, 71–88.
Garnaut, R. (2011). *Garnaut Climate Change Review—Update 2011.* Update Paper four: Transforming rural land use. Retrieved April 20, 2011, from http://www.garnautreview.org.au
Gregory, P. J., Ingram, J. S. I., Andersson, R., Betts, R. A., Brovkin, V., Chase, T. N., et al. (2002). Environmental consequences of alternative practices for intensifying crop production. *Agriculture, Ecosystems and Environment, 88*, 279–290.
Henzell, T. (2007). *Australian agriculture: Its history and challenges* (p. 320). Collingwood: CSIRO Publishing.
Howden, S. M., Crimp, S. J., & Nelson, R. N. (2010). Australian agriculture in a climate of change. In I. Jubb, P. Holper, & W. Cai (Eds.), *Managing climate change: Papers from the GREENHOUSE 2009 conference* (pp. 101–111). Melbourne: CSIRO Publishing.

Koning, N. B. J., Van Ittersum, M. K., Bec, G. A., Van Boeke, M. A. J. S., Brandenburg, W. A., Van Den Broek, J. A., et al. (2008). Long-term global availability of food: Continued abundance or new scarcity? *Wageningen Journal of Life Sciences, 55*, 229–292.

Maron, M., & Fitzsimons, J. A. (2007). Agricultural intensification and loss of matrix habitat over 23 years in the West Wimmera, South-Eastern Australia. *Biological Conservation, 135*, 587–593.

Marshall, N. A. (2011). Assessing resource dependence on the rangelands. *Society and Natural Resources, 24*(10), 1105–1115.

Marshall, N. A., Park, S. E., Adger, N., Brown, K., & Howden, S. M. (in press). Transformational capacity and the influence of place and identity. Environ. Res. Lett.

Marshall, N. A., Fenton, D. M., et al. (2007). How resource-dependency can influence social resilience within a primary resource industry. *Rural Sociology, 72*, 359–390.

Marshall, N. A., Gordon, I. J., et al. (2010). The reluctance of resource-users to adopt seasonal climate forecasts that can enhance their resilience to climate variability. *Climatic Change*. doi:10.1007/s10584-010-9962-y.

McAlpine, C. A., Etter, A., Fearnside, P. M., Seabrook, L., & Laurance, W. F. (2009). Increasing world consumption of beef as a driver of regional and global change: A call for policy action based on evidence from Queensland (Australia), Colombia and Brazil. *Global Environmental Change, 19*, 21–33.

McAlpine, C. A., Fensham, R. J., & Temple-Smith, D. E. (2002). Biodiversity conservation and vegetation clearing in Queensland: Principles and thresholds. *Rangeland Journal, 24*, 36–55.

McAlpine, C. A., Syktus, J., Deo, R. C., Lawrence, P. J., McGowan, H. A., Watterson, I. G., et al. (2007). Modeling the impact of historical land cover change on Australia's regional climate. *Geophysical Research Letters, 34*, L22711.

Meinig, D. W. (1962). *On the margins of the good earth. The South Australian wheat frontier 1869–1884* (p. 231). Chicago: The monograph series of the Association of American Geographers, Rand McNally.

Meinke, H., Baethgen, W. E., Carberry, P. S., Donatelli, M., Hammer, G. L., Selvaraju, R., et al. (2001). Increasing profits and reducing risks in crop production using participatory systems simulation approaches. *Agricultural Systems, 70*, 493–513.

Millennium Ecosystem Assessment (MEA). (2005). *Ecosystems and human well-being: Current state and trends. Findings of the Condition and Trends Working Group* (p. 948). Washington, DC: Island Press.

Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: Contributions of a resilience framework. *Annual Review of Environment and Resources, 32*, 395–419.

Nelson, R., Howden, S. M., & Stafford, S. M. (2008). Using adaptive governance to rethink the way science supports Australian drought policy. *Environmental Science and Policy, 11*, 588–601.

Nossal, K., & Gooday, P. (2009). *Raising productivity growth in Australian agriculture, Issues Insights, 9.7*. Canberra: ABARE. doi:http://www.abare.gov.au/insights.

Olsson, P., Folke, C., & Hughes, T. P. (2008). Navigating the transition to ecosystem-based management of the Great Barrier Reef, Australia. *Proceedings of the National Academy of Sciences, 105*, 9489–9494.

Olsson, P., Gunderson, L. H., et al. (2006). Shooting the rapids: Navigating transitions to adaptive governance of social-ecological systems. *Ecology and Society, 11*, 18.

Park, S. E., Marshall, N., Jakku, E., Dowd, A. M., Howden, S. M., & Mendham, E. (2011). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*. doi:10.1016/j.gloenvcha.2011.10.003. Retrieved December 9, 2011.

Phillips, A., & Lowe, K. (2005). Prioritising integrated landscape change through rural land stewardship for ecosystem services. *Australian Journal of Environmental Management, 12*, 39–46.

Research, A. (2008). *An economic analysis of GRDC's investment climate research (2002–2007). Impact Assessment report Series*. Canberra: GRDC.

Sala, O. E., Chapin, F. S., Armesto, J. J., Berlow, E., Bloomfield, J., Dirzo, R., et al. (2000). Global biodiversity scenarios for the year 2100. *Science, 287*, 1770–1774.

Sarewitz, D., & Pielke, R. A., Jr. (2007). The neglected heart of science policy: Reconciling supply of and demand for science. *Environmental Science and Policy, 10*, 5–16.

Schmidhuber, J., & Tubiello, F. N. (2007). Global food security under climate change. *Proceedings of the National Academy of Sciences, 104*, 19703–19708.

Sheng, Y, Mullen, JD and Zhao, S (2011). *A turning point in agricultural productivity: consideration of the causes*, ABARES research report 11.4 for the Grains Research and Research and Development Corporation, Canberra, May. http://adl.brs.gov.au/data/warehouse/pe_abares99010542/RR11_4AgricProductivity_LowResREPORT.pdf.

Smithers, J., & Smit, B. (1997). Human adaptation to climatic variability and change. *Global Environmental Change, 7*, 129–146.

Stafford Smith, M., Abel, N., Walker, B., & Chapin, F. S., III. (2009). Drylands: Coping with uncertainty, thresholds, and changes in states. In F. S. Chapin III, G. P. Kofinas, & C. Folke (Eds.), *Principles of ecosystem stewardship* (pp. 171–195). New York: Springer.

Stafford Smith, M., Horrocks, L., Harvey, A., & Hamilton, C. (2011). Rethinking adaptation for a 4°C world. *Philosophical Transactions of the Royal Society A, 369*, 196–216.

Stokes, C. J., & Howden, S. M. (2010). *Adapting agriculture to climate change: Preparing Australian agriculture forestry and fisheries for the future*. Melbourne: CSIRO Publishing.

The Age. (2010). *Climate drives big wine deal.* Retrieved August 17, 2010, from http://www.theage.com.au/business/climate-drives-big-wine-deal-20100816-1272s.html

van de Kerkhof, M., & Wieczorek, A. (2005). Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations. *Technological Forecasting and Social Change, 72*, 733–747.

Walker, B., Barrett, S., Polasky, S., Galaz, V., Folke, C., Engström, G., et al. (2009). Looming global-scale failures and missing institutions. *Science, 325*, 1345–1346.

Yi, S., Ning, W., Peng, L., Qian, W., FuSun, S., QiaoYing, Z., et al. (2008). Agricultural heritage in disintegration: Trends of agropastoral transhumance on the southeast Tibetan Plateau. *International Journal of Sustainable Development and World Ecology, 15*, 273–283.

# Chapter 15
# Framing the Research Needs for Food Security in Australia

**Quentin Farmar-Bowers**

## 15.1 Introduction

Not all Australians maintain good health and, for many people, this failure is related to diet. Diet makes a vital contribution to the balance we need in our lives to help us achieve mental and physical health. We select what we eat from what is available in the market (supermarket, restaurant, garden, grocery store, etc.) and what we can afford, what we know about diets, and what we prefer. What food gets to the market depends on the operation of a complex, interacting set of businesses referred to as the food chain. What sells in the market is the starting point for the money that flows through the food chain providing businesses with profit and an incentive for most food related research.

The food chain is big business and is supported by various forms of research mainly aimed at enhancing the success of the businesses involved. Business will continue to undertake food related research that leads to increased profits, from genetics to marketing. Governments' involvement in food research is out of concern for the public interest. What is considered to be in the 'public interest' is swayed by the interactions between two competing streams of ideas; one focused on business and the other on the current concerns of society. Consequently, the topics that constitute the public interest change over time.

Food security is one of these public interest topics and it is likely to become a major topic in Australia for a number of reasons. These include; increasing public concern about Australia's vulnerability to climate change, disquiet about population growth, food sovereignty, peak oil, social inequities, food waste, diet related health problems, fertiliser prices and availability, land degradation, irrigation water use, biodiversity loss, declining growth in agricultural productivity, ageing population,

Q. Farmar-Bowers (✉)
Deakin University, Geelong, Victoria, Australia
e-mail: quentin.farmarbowers@deakin.edu.au; q.farmarbowers@gmail.com

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_15,

urbanisation, globalisation with increasing dependence on international markets and early deaths in Indigenous Australians. Currently these concerns are usually treated as separate items and consequently there is a tendency to research each concern separately.

However, the knowledge being generated leads to the appreciation that food is linked, in a variety of ways, to each concern. Food security is a catchall term that covers a number of distinct issues (such as, obesity, hunger, food safety) but it also brings the outcomes or potential outcomes of changes (such as global warming and increasing prices of fertilisers) closer to the interests of the public. As the importance of food security increases more funding for food security research is likely to be made available. The question this chapter attempts to answer is; should this research money be added to the money already being spent on researching the separate topics listed above with the addition of 'food security' in the title, or is there a way of framing food security research that makes it a distinctive new area.

Many of the separate areas are highly specialised and employ professional practitioners and researchers with skills developed over a lifetime of work and experience. These separate areas are not static nor are they isolated from what is occurring in other fields and in the world generally. They are and will continue to be influenced by the same drivers that are creating the concern about food security so it is quite appropriate that they respond to food security concerns. It is certain that additional research dollars will go to 'dual titled' projects such as 'population and food security' and 'land use and food security'. This chapter addresses the idea that the framing for food security research ought to create a distinctive new area that deals with food security issues concomitantly with dealing with other social objectives.

## 15.2 Joining Two Ideas to Frame Food Security Research Needs

The topics that push food security into the public arena (many of which are listed in the introduction to this chapter) are those that food security research should deal with. The food system is a major element in each of these topics and forms part of larger social-ecological systems that concern people's interactions with the world's ecosystems and physical processes. Research into food security should therefore be undertaken within the frame of social-ecological systems. Given that people do not want the food system to 'fail', resilience may be a useful approach for food security research. This is a systems approach and the notion in resilience is that system failure might be avoided by purposely transforming the system, or parts of it, to keep the benefits coming and the failure point somewhere over the horizon.

The second idea concerns the other objectives people have in addition to the objective of food security. Food is not the only thing people want to 'secure' now and for the future well-being and welfare of humanity. Food security is one of a number of 'securities' people need from the operation of social-ecological systems. Food security should be framed as one security among other securities, with the idea that people should act in ways to ensure that the full range of securities are maintained. The current framing of food security is established through the definitions used. The definitions guide what actions including research are undertaken under the food security banner.

## 15.3 Food Security Definitions

The international community through the United Nations has been involved in developing definitions of food security since the inception of the term in the mid 1970s for the good reason that the definition governs the consequent policy and actions taken (FAO 2003). The FAO (2009, p. 1) defines the concept of food security as: *Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilisation and stability*. The definition stresses the individual's point of view: *Food security is not simply a function of production or supply, but of availability, accessibility, stability of supply, affordability and the quality and safety of food* (UNEP 2009, p. 77). The Australian Government, in its issues paper for a national food plan, use this definition (DAFF 2011b).

Roetter and Van Keulen's (2008, p. 27) widen the definition from the individual living a healthy life to suggest that food security is a spring board for economic development and world standing: *The ultimate aim… [of] …food security is to arrive at a healthy and well-nourished population that can take on, to the maximum of its capacities, the development of its own community, area or country*. The two definitions imply that research into food security needs to elucidate the issues listed in the definition at the level of the individual as well as at community and national levels.

If food was the only thing people required then these definitions would suffice. But people need other 'securities' to live a full life. Food security has to be achieved in the context of these other securities so that in obtaining a satisfactory diet we are not denying ourselves or future generations the ability to fulfil all of our needs. Perhaps this implies that we require a practical definition of food security using a systems approach that puts food security needs into the context of securing the full range of people's needs. But what 'needs' do people actually have?

## 15.4 Human Needs, Food Security and the Other 'Securities'

Max-Neef (1991) lists nine fundamental human needs as: subsistence, protection, affection, understanding, participation, leisure, creation, identity, and freedom. Perhaps we should add the 'need to act ethically' as a tenth fundamental human need as many people feel the need to protect the interests of current and future people and food security fits this need. Max-Neef's notion is that people or society are ‘poor’ when one or more of these needs are not met. ‘Security’ is about ensuring each of these needs will always be fulfilled in the future.

Although most of the nine fundamental human needs are psychological, achieving them requires the use of materials as well as the establishment of social arrangements and processes. For example, leisure requires places for recreation as well as the social acceptance of free time. Understanding requires biodiversity to study as well as arrangements to facilitate learning and the social acceptance of learning about biodiversity (in this case).

The needs-approach alters how choices are viewed. For example, growing food in a way that leads to biodiversity loss is not ‘food versus biodiversity’ but rather a choice between two human needs (subsistence and understanding). Instead of trade-off between needs, the needs-approach asks us to seek synergies so that one action can secure as many human needs as possible. The objective is to deliver all human needs and not substitute one need for any of the others. Food, for example, can be produced in many different ways; some ways provide more opportunities to satisfy human needs than other ways.

It seems very likely that people in the future will have the same needs as people do today so it is important to secure these needs. In identifying the resources and arrangements that are critical for these securities, it is important to avoid confusing ‘wants’ with ‘needs’. For example, petroleum is a critical resource for specific technologies but not for any fundamental human need; in fact, its use damages critical entities and processes that are required in the provision of human needs such as air quality and biodiversity (Farmar-Bowers 2008).

There are other approaches to understanding people’s needs including the concept of ‘ecosystem services’; the services, or needs, people obtain from nature. These are grouped into provisions services (e.g. food), regulating services (e.g. erosion control) cultural services (e.g. outdoor recreation) and supporting services (e.g. soil formation) (MEA 2005). Another economic concept; ‘critical natural capital’, defined as that part of the natural environment that performs important and irreplaceable functions, established food as only one of the services people require from nature (Ekins et al. 2003). Chiesura and de Groot (2003) suggest a more complete accounting of the functions of natural capital that touches on some of people’s psychological needs, such as recreation and education. Maslow’s hierarchy of needs (Maslow et al. 1998) may be less useful for food security research as it suggests satisfying needs in a hierarchical order. Thus food, as a physiological need, would have to be satisfied first before moving on to ‘higher’ needs such as understanding (education and learning) even though ‘understanding’ is required for food security.

The notion being proposed in this chapter is that people have a range of needs and all of these have to be secured for the future; food security cannot be dealt within isolation of these other securities without jeopardising the aim of maintaining healthy societies, physically and socially, into the future. An essential step in food security research in Australia is to understand what these other securities are. This is likely to be a complex long-term task requiring the clarification of the full range of people’s fundamental needs and how they can be secured into the future. This will require information on the relationships between these ‘other securities’ and food security in terms of the physical entities and the social arrangements.

## 15.5 A Systems/Resilience Approach to Food Security

Food security is part of the relationships between people and the environment referred to as social-ecological systems (Ericksen 2008) that can be studied from global down to a single person scales. The entire group of social-ecological systems is referred to as a Panarchy (Chapin et al. 2009). Social-ecological systems are controlled by feedbacks from activities. Some feedbacks stabilise the system (negative feedbacks) while amplifying feedbacks inexorably move the system in a constant direction (positive feedback) allowing the system to cross thresholds and tipping it into another state that has different functions (Walker and Salt 2006).

How people are manipulating the existing social-ecological systems in Australia is changing the nature of the securities that the social-ecological systems provide. The changes are not always positive as testified by the increase in the number of overweight and obese Australians and the increase of land degradation and decline in biodiversity.

Resilience is a systems-based approach and useful for considering food security because it implies the objective of survival (i.e. an active and healthy life). This is achieved by purposeful incremental or transformative actions to adapt the social-ecological systems to changing conditions. Too much adaptation to current conditions makes the system vulnerable when conditions change. Resilience assessment helps researchers identify areas of 'too much adaptation' and associated feedbacks and thresholds (Resilience Alliance 2010). There are two desirable outcomes; one is to allow the social-ecological system to adapt to external changes and continue to provide the securities people require in life (including food security). The second is to purposely transform the social-ecological systems that are not providing the securities people require in order to improve the outcomes in terms of securities. Perhaps the task is to study the social-ecological systems in a range of communities using resilience assessments to identify critical points (thresholds) where flexibility or change is required to maintain or improve the securities people need, including food security. This is work that can be done on a regional basis by people living in the region. It would lead to the identification of changes that are occurring in the region and their origins, indicating what regional people can do themselves and where they require external assistance and change.

## 15.6 Why Is Food Security Research Using a Systems Approach Important in Australia?

A systems approach can help identify aspects of food insecurity that have causes outside the food system and where the operation of the food system is leading to decline in securities. Although Australia exports agricultural products (DFAT 2010), about 5% of Australians are food insecure (Temple 2008) although it could be more (Radermacher et al. 2010) and many have health problems related to poor diet, including those related to obesity (ABS 2008). Superficially, it would seem that exports ought to provide a buffer for food security because exports could be redirected to domestic consumption. This is unlikely to be effective because food insecurity is an emergent property of social-ecological systems and not just a consequence of the food system. The production of agricultural products for export uses resources that may be required for the provision of other needs and their relevant securities within Australia. Perhaps understanding food insecurity and diet related health problems in different communities in terms of the relevant regional social-ecological systems would help establish the status of their other securities and the relationships between these securities and how food security is being addressed.

Income inequity is increasing in Australia and it varies among different communities and regions (ABS 2011a) and the proportion of income spent of food tends to be lower for higher incomes (ABS 2011b). Food prices are likely to rise in future because of climate change and many other changes that are occurring outside the food system. This will increase the number of food insecure Australians. Welfare payments may provide relief but when used as a permanent solution such payments prevent the recipients from satisfying important psychological needs; welfare and charity can swop 'food poverty' for 'participation poverty'.

Physical access to food shops (food deserts) may be a problem when stores are not located in the vicinity or because of transportation problems, such as in remote communities in Australia (COAG 2009). Food deserts are less of a problem in cities (Turrell et al. 2004). Personal factors such as education and income are important influences on what people purchase and how they utilise food. There is also inequity of information about foods between suppliers and consumers partly because of the lack of useful information at the point of sale. Having a more 'food literate' public would encourage suppliers to provide better information and better information would help achieve a more food literate public.

## 15.7 Drivers of Change in the Social-Ecological System

Social-ecological systems are always changing in response to people's current and previous activities. The main external drivers in Australia that have an impact on food security and most other securities as well are; climate change, population, resources, globalisation and social values. These drivers need to be included in the framing for food security research by developing an appreciation of how they are changing the opportunities to deliver all securities. These drivers are outlined below with an example of how they relate to human needs and security.

### *15.7.1 Climate Change*

The forcing from greenhouse gases is leading to rapidly warming winters and more rapid increases in overnight minimum temperatures compared to daytime maximum temperatures (Climate Commission 2011). Rainfall is highly variable and there is considerable uncertainty in the projections of changes in run off (AAS 2010). *Climate change could, in fact, lead to more extremes in general—both in drought and in rainfall* (Climate Commission 2011, p. 38).

Generally climate change will not benefit agricultural production despite a fertilising effect on plants. Lobell and Asner (2003) found that crop yields are adversely affected by average temperature increases and periods of extremes may lead to marked fluctuation in production (Howden et al. 2009; Howden and Stokes 2010; Poole 2009; Trewin and Watkins 2010). Battisti and Naylor (2009) noted the severe heat in Europe in 2003, that resulted in record drops in crop yields (maize yields dropped 36% in Italy and 30% in France), may represent the temperature norms towards the end of the twenty first century.

In Australia, agriculture contributes about 15% of greenhouse gases and land use change contributes about 9% (DCC&EE 2011). These levels may eventually stimulate the development of mitigation policy to reduce the contribution. Carbon sequestration in soil and vegetation offers a quick if temporary way of reducing atmospheric carbon (Climate Commission 2011).

Climate change is likely to increase food insecurity because of food price increases caused by production losses and by producers switching to more profitable products such as carbon sequestration and biofuels. However, there is scope on a local or regional scale to adapt food production and take up some mitigation opportunities in ways that will satisfy a range of needs (and associated securities) such as participation and understanding.

### *15.7.2 Globalisation*

There are many benefits associated with globalisation. For example, about two-thirds of Australia's agricultural production is exported (worth about $24 billion) and Australia imported about $10 billion worth of food in 2009/2010 (DAFF 2011a). Australia also imports resources such as oil and fertiliser used in agriculture (Moir and Morris 2011). World trade allows shortfalls in domestic food supplies and resources to be met through imports. However, globalisation increases the competition for global resources and commodities, the risk of pests and diseases importation and the danger of financial volatility. Foreign ownership of resources and businesses in Australia can reduce the participation, innovation, knowledge development and business decision-making skills of Australians, as does the overseas patent on seeds and products (Tansey and Rajotte 2008).

### *15.7.3 Resource Availability*

There is a general trend towards increasing demand for most resources (local and imported) which may lead to increasing prices throughout the food supply chain. Farmers will adapt to increasing prices by altering the mix of resources used in production, the products they produce and markets they serve. This will provide opportunities for participation and innovations. For instance, the increasing cost of phosphate and nitrogen fertilisers provides an opportunity for devising ways of reducing fertiliser wastage, recycling and reducing the level of environmental pollution (Cooper et al. 2011; Elser and Bennett 2011; USEPA 2011). The shortage of agricultural graduates (ACDA 2008) provides an opportunity for new careers. The biofuels industry is in its infancy (Stucley 2010), but second generation technology offers scope for fuel production with less impact on food production (Karp et al. 2010). Resource challenges can provide opportunities for Australians to satisfy a range of needs such as participation, protection and creativity and their associated securities.

### *15.7.4 Population Growth*

The United Nations 2010 Revision projects world population to pass 9.3 billion people by 2050 (UN 2011). The growing population and affluence may double the demand for food in the coming 40–50 years (Southgate 2009) but this is in dispute (Soil Association 2010). By 2050 Australia's population is expected to reach 34 million (PRB 2009). Other projections suggest the population could reach 40 million in 2051 (ABS 2010). Australia has an urbanised population and the growth of urban centres has a mixed impact on food security. The aim of Australia's population strategy is to ensure *that future changes in Australia's population are compatible with the sustainability of our economy, communities and the environment* (DSEWPC 2011, p. 11). Growth in population and affluence increases demand for food and increases competition for resources for non-food uses. Increasing domestic demand and resource pressures are likely to increase food insecurity but provide opportunities for new business arrangements that could meet demand in a way that maintains a full range of securities.

### *15.7.5 Social Values*

Changing social values and public debate have been very effective, politically leading to the major environmental statutes (Purdy 2010). The situation is complex but there seems to be an indication that people's acceptance of human rights is increasing and that there is greater appreciation of the value of the environment of the planet, not just anthropocentrically but for intrinsic values (Inglehart 1995). Changing values have an impact on food production methods such as an increasing sensitivity to cruelty in animal production. Changes in how people view inequities in society and their concerns for the future are very important for food security.

### *15.7.6 The Opportunity*

The five external drivers identified above are already partly factored into many aspects of life and business. Generally it seems that these external drivers will maintain their current directions for some decades to come; population is increasing, availability of resources is declining, globalisation is increasing and climate change is progressing. This certainty provides an opportunity to develop new arrangements to improve the full range of securities including food security domestically. An important part of these arrangements is the maintenance of ecological integrity as the environment is the physical basis for all securities (Bosselman 2008). The opportunity to use ongoing changes as a catalyst for improving a range of securities depends on clarifying what these securities are and what arrangements and physical entities they require. Undertaking this work in a collaborative way would seem to be the best way of developing robust information and at the same time bringing in enough people to take up the opportunities these changes present.

## 15.8 Innovation Trajectories

How people respond to the impacts of the external drivers and the opportunities they present depend to a large extent on the innovation trajectories they are already pursuing. The three trajectories are suggested: (1) commercial (2) social/civil society (3) public interest/government.

Australian families acquire virtually all their food through commercial transactions and this constitutes a significant part of the Australian economy. The commercial trajectory is motivated by profit; consequently businesses move resources into any expanding and profitable market. The processes business use such as branding and patent protection, marketing and mass production are well accepted by society making the commercial trajectory very robust.

Incremental change is usual but step changes have allowed commerce to advance rapidly in the direction it was already heading. For instance, the desire to store and transport food was given a step advance in the nineteenth century through the development of mechanical refrigeration (Goodwin et al. 2002), and the desire to increased crop production was given a step advance through the green revolution beginning in the 1960s (Evenson and Gollin 2003). Research and innovation in the commercial trajectory is deemed successful when firms satisfy demand profitably. However, the commercial trajectory is not always in the public interest. For instance, the shift in diets towards more meat and dairy products and more processed food with more fats and sugars is unlikely to increase health (Pretty et al. 2010; Friel 2010). The increase in resources used in food production is controversial when it reduces the physical aspects of other securities such as healthy rivers and native biodiversity.

The motivations in the social innovation trajectory include a mix of cultural preferences, attitudes and traditions about foods and its production. The social trajectory represents the counter to the commercial trajectory and success occurs when social innovations (such as concerns about equity, sustainability and health) become recognised as being in the public interest and taken up by governments and adopted by industry. The process of getting to that point may take decades of debate. The public interest trajectory lies somewhere between the commercial and social trajectories and is influenced by both. Governments can make public policy as a consequence of requests from business or as a result of advocacy from civil society. Public policy is limited to that which can be implemented through agency hierarchies. Political perception of these trajectories can change and lead to changing policy. For example, the reduction in the agricultural research and extension funded by governments (Fresco 2009) may be due to the view that the benefits are captured by commercial interests and so commercial organisations should conduct the research themselves.

Food security is viewed differently in the three innovation trajectories. Current level of food insecurity may be viewed as a market failure in commercial terms. Social concerns about food security may focus on sustainable resource use, biodiversity loss, farmer welfare, public health, animal welfare and food sovereignty (the control of production). The public interest trajectory may view food insecurity in terms of welfare payments and charity. Food research is principally in the commercial innovation trajectory, while food security research, at least for now, is mainly a concern in the social/civil society innovation trajectory. To be effective, food security research has to make a positive contribution to each of these trajectories. It has to generate programs governments can implement, it has to provide some profit to industry and satisfy some of the social and environmental concerns of civil society.

## 15.9 Public Policy

The level of food insecurity that governments consider is politically acceptable will influence how governments will act. It seems the Australian government views the current food security level in remote communities as unacceptable (COAG 2009). Changing the political framing of food from *welfare* which is a solution hierarchies, such as governments, can administer to food security as one among other securities will allow the participation of commercial and civil society sectors. This expanded frame may help in finding synergistic solutions in which food security can be enhanced concomitantly with other securities. The welfare approach, apart from the psychological negative, will be difficult to finance in the coming decades as food prices rise and more and more people become insecure.

The national security agenda provides some insight into the political position. Australia's National Security Statement (Rudd 2008, p. 12550), sets out five national security objectives. They concern; border integrity, political sovereignty, protecting

Australia's national interests and promoting global stability in Australia's interests. But one, the third objective, is *preserving a cohesive and resilient society and strong economy*.

As a flow on, the Australian Government has developed a Critical Infrastructure Resilience Strategy which identifies seven critical sectors within the Australian economy that must not fail if this third national security objective is to be met (AGD 2010). Food chain is one of the seven critical infrastructures that must be maintained. *The aim of this Strategy is the continued operation of critical infrastructure in the face of all hazards, as this critical infrastructure supports Australia's national defence and national security, and underpins our economic prosperity and social wellbeing. More resilient critical infrastructure will also help to achieve the continued provision of essential services to the community* (AGD 2010, p. 8). The other sectors that must be maintained are; energy, water, communications, transport, health and banking.

Although the food chain is only one of the seven critical infrastructures, it is easy to see that the others, energy, water, communication and transports are essential for maintaining food chains, and in turn food is essential for health. The food security expert-working-group of the Prime Minister' Science, Engineering and Innovation Council (PMSEIC 2010) recommended the establishment a National Food Security Agency that would develop a national food security strategy and a national land use planning framework in collaboration with the states. Such an agency would improve collaboration among government agencies but it would make food security a responsibility of a hierarchy and not, as this chapter suggests, as one security among others that ought to be maintained collaboratively.

## 15.10 National Food Plan

A government issues-paper released in 2011 noted that the proposed Australian food plan, due in 2012, will provide an overarching policy framework to maintain Australia's food security status and supporting health outcomes. It would do this by integrating food policy along the whole food chain from 'paddock to plate'. It identifies the challenges to food supply as climate change, competition for land and water, natural disasters and slowing rate of agricultural productivity growth (a shorter list than presented in this chapter). The issue paper directs submission by asking 48 questions. Virtually all the questions are directed at the immediate concerns about the internal working of the food system. Only Question 1 and 46 may stimulate thinking outside the food system. "What is the most important thing you think a national food plan should try and achieve?" and "What regional-specific issues should be taken into account in a national food plan?" (DAFF, 2011b, pp. 74–78). It seems likely from the orientation of the issues-paper that the national food plan will not consider the relationships between food security and other securities.

## 15.11 Conclusion

A systems approach for food security research provides a way of studying social-ecological systems so that changes can be made to reduce food insecurity in ways that maintains the full range of securities that people need for a healthy and productive life. The current modest level of food insecurity in Australia provides an opportunity to experiment, at minimal social and economic cost, to find new ways of improving food security in preparation for future problems.

## References

AAS. (2010). *The science of climate change: Questions and answers*. Canberra, Australia: Australian Academy of Science. Retrieved March 26, 2012, from http://www.science.org.au/reports/climatechange2010.pdf

ABS. (2008). *Catalogue 4719.0—overweight and obesity in adults, Australia, 2004–05*. Canberra: Australian Bureau of Statistics.

ABS. (2010). *Australian Social Trends 4102.0 June 2010, Population growth: Past, present and future*. Canberra: Australian Bureau of Statistics. Retrieved March 26, 2012, from http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/LookupAttach/4102.0Publication30.06.102/$File/41020_PopulationGrowth.pdf

ABS. (2011a). *Catalogue 6523.0—household income and income distribution, Australia, 2009–10*. Canberra: Australian Bureau of Statistics.

ABS. (2011b). *Catalogue 6530.0—household expenditure survey, Australia: Summary of results, 2009–10*. Canberra: Australian Bureau of Statistics.

ACDA, Australian Council of Deans of Agriculture. (2008). *Australian Agriculture at risk from shortage of Uni graduates, Communiqué*. Retrieved March 26, 2012, from http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/232844/australian-agriculture-graduate-shortage.pdf

AGD. (2010). *Critical Infrastructure Resilience Strategy*. Attorney General's department, Barton, ACT Commonwealth of Australia. Retrieved March 26, 2012, from http://www.ag.gov.au/Documents/Australian%20Government%20s%20Critical%20Infrastructure%20Resilience%20Strategy.PDF

Battisti, D. S., & Naylor, R. L. (2009). Historical warnings of future food insecurity with unprecedented seasonal heat. *Science, 323*, 240–244.

Bosselman, K. (2008). *The principle of sustainability: Transforming law and governance*. Farnham, UK: Ashgate Publishing.

Chapin, F. S., III, Folke, C., & Kofinas, G. P. (2009). A framework for understanding change. In F. S. Chapin III, C. Folke, & G. P. Kofinas (Eds.), *Principles of ecosystem stewardship, resilience-based natural resource management in a changing world* (pp. 3–28). New York: Springer Science.

Chiesura, A., & De Groot, R. (2003). Critical natural capital: A socio-cultural perspective. *Ecological Economics, 44*, 219–231.

Climate Commission. (2011). *The critical decade, climate science, risks and responses*. Canberra, ACT: Climate Commission Secretariat, Department of Climate Science and Energy Efficiency.

COAG. (2009). *National Strategy for food security in remote and indigenous communities*. Council of Australian Governments. Retrieved March 26, 2012, from http://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/docs/nat_strat_food_security.pdf

Cooper, J., Lombardi, R., Boardman, D., & Carliell-Marquet, C. (2011). The future distribution and production of global phosphate rock reserves. *Resources, Conservation and Recycling, 57*, 78–86.

DAFF. (2011a). *Australian food statistics 2009–10*. Canberra, ACT: Department of Agriculture, Fisheries and Forestry.
DAFF. (2011b). *Issues paper to inform development of a national food plan*. Canberra, ACT: Department of Agriculture, Fisheries and Forestry.
DCC&EE. (2011). *Australia's national greenhouse gas accounts, State and Territory Greenhouse Gas Inventories 2009*. Canberra, ACT: Department of Climate Change and Energy Efficiency, Commonwealth of Australia.
DFAT. (2010). *Value of Australia's top agricultural exports—2009* (*calendar year*) *and Australia's major exports of agriculture by destination—2009* (*calendar year*), *Agriculture and the WTO*. Department of Foreign Affairs and Trade, Australian Government. Retrieved March 26, 2012, from http://www.dfat.gov.au/trade/negotiations/trade_in_agriculture.html
DSEWPC. (2011). *Sustainable Australia—sustainable communities, a sustainable population strategy for Australia*. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities.
Ekins, P., Simon, S., Deutsch, L., Folke, C., & De Groot, R. (2003). A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics, 44*, 165–185.
Elser, J., & Bennett, E. (2011). A broken biogeochemical cycle. *Nature, 478*, 29–31.
Ericksen, P. J. (2008). What is the vulnerability of a food system to global environmental change? *Ecology and Society, 13*(2), 14.
Evenson, R. E., & Gollin, D. (2003). Assessing the impact of the Green Revolution 1960–2000. *Science, 300*, 758–762.
FAO. (2003). *Trade reforms and food security: Conceptualizing the linkages*. Rome: Food and Agriculture Organisation of the United Nations. Retrieved March 26, 2012, from ftp://ftp.fao.org/docrep/fao/005/y4671e/y4671e00.pdf
FAO. (2009). *Declaration of the World Summit on Food Security*. Rome: World Summit on Food Security, 16–18 November 2009. Food and Agriculture Organisation of the United Nations, Rome. Retrieved March 26, 2012, from http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf
Farmar-Bowers, Q., (2008). *Making Sustainable Development Ideas Operational: A General Technique for Policy Development*. Saarbrücken, Germany: VDM Verlag Dr. Müller.
Fresco, L. (2009). Challenges for food system adaptation today and tomorrow. *Environmental Science and Policy, 12*, 378–385.
Friel, S. (2010). Climate change, food insecurity and chronic diseases: Sustainable and healthy policy opportunities for Australia. *New South Wales Public Health Bulletin, 21*(6), 129–133.
Goodwin, B. K., Grennes, T. J., & Craig, L. A. (2002). Mechanical refrigeration and the integration of perishable commodity markets. *Explorations in Economic History, 39*, 154–182.
Howden, M., Crimp, S., Laing, A., Nidumolu, U., Nelson, R., Stafford, M., et al. (2009). Can climate change make food-rich countries like Australia food-poor? In *Proceedings of the International Scientific Congress on Climate Change: Global Risks, Challenges and Decisions*, March 10–12, 2009, Copenhagen. IOP Conf. Series: Earth and Environmental Science 6. Retrieved March 26, 2012, from http://iopscience.iop.org/1755-1315/6/37/372019/pdf/1755-1315_6_37_372019.pdf
Howden, S. M., & Stokes, C. J. (2010). Introduction. In C. Stokes & M. Howden (Eds.), *Adapting agriculture to climate change preparing Australian Agriculture, forestry and fisheries for the future* (pp. 1–11). Collingwood, Victoria, Australia: CSIRO Publishing.
Inglehart, R. (1995). Public support for environmental protection: objective problems and subjective values in 43 societies. *Political Science and Politics, 28*(1), 57–72.
Karp, A., Haughton, A. J., Bohan, D. A., Lovett, A. A., Bond, A. J., Dockerty, T., Sünnenberg, G., Finch, J. W., Sage, R. B., Appleton, K. J., Riche, A. B., Mallott, M. D., Mallott, V. E., Cunningham, M. D., Clark, S. E., & Turner, M. M. (2010). Perennial energy crops: Implications and potential. In M. Winter & M. Lobley (Eds.), *What is Land for? The food fuel and climate change debate* (pp. 47–72). London, Washington, DC: Earthscan.
Lobell, D. B., & Asner, G. P. (2003). Climate and management contributions to recent trends in US agricultural yields. *Science, 299*, 1032.

Maslow, A., Stephens, D. C., & Heil, G. (1998). *Maslow on management*. New York: Wiley.
Max-Neef, M. (1991). *Human scale development conception, application and further reflections*. New York, London: The Apex Press.
MEA. (2005). *Living beyond our means, natural assets and human well-being, statement from the board*. New York, NY: Millennium Ecosystem Assessment, United Nations. Retrieved March 26, 2012, from http://www.maweb.org/documents/document.429.aspx.pdf
Moir, B., & Morris, P. (2011). *Agriculture and food, Science and Economics Insights*. Canberra: Australian Bureau of Agriculture and Resource Economics and Sciences.
Pretty, J., Sutherland, W. J., Ashby, J., Auburn, J., Baulcombe, D., Bell, M., et al. (2010). The top 100 questions of importance to the future of global agriculture. *International Journal of Agricultural Sustainability, 8*(4), 219–236.
PMSEIC. (2010). *Australia and food security in a changing world*. Canberra, Australia: The Prime Minister' Science, Engineering and Innovation Council. Retrieved March 26, 2012, from http://www.innovation.gov.au/Science/PMSEIC/Documents/AustraliaandFoodSecurityinaChangingWorld.pdf
Poole, L. (2009). *Heatwave destroys $30 million of crop potential*. Victoria: ABC Rural. Retrieved March 26, 2012, from http://www.abc.net.au/rural/vic/content/2009/11/s2742143.htm
PRB. (2009). *2009 World population data sheet.* Washington, DC: Population Reference Bureau. Retrieved August 26, 2012, from http://www.prb.org/pdf09/09wpds_eng.pdf
Purdy, J., (2010). The politics of nature: climate change, environmental law, and democracy. *Yale Law Journal*, 119.6, 1122–1209.
Radermacher, H., Feldman, S., & Bird, S. (2010). Food security in older Australians from different cultural backgrounds. *Journal of Nutrition Education and Behavior, 42*(5), 328–336.
Resilience Alliance. (2010). *Assessing resilience in social-ecological systems: Workbook for practitioners, Version 2.0.* Retrieved March 26, 2012, from http://www.resalliance.org/3871.php
Rudd, K., (2008). *House of Representatives National Security Speech, Thursday, 4 December 2008*. Parliamentary debates, Australian Parliament, Hansard, 12549–12557. Retrieved March 26, 2012, from http://parlinfo.aph.gov.au/parlInfo/genpdf/chamber/hansardr/2008-12-04/0045/hansard_frag.pdf;fileType=application%2Fpdf
Roetter, R. P., & Van Keulen, H. (2008). Chapter 3, food security. In R. P. Roetter, H. Van Keulen, J. Verhagan, M. Kuiper, J. Verhagen, & H. H. Van Laar (Eds.), *Science for agriculture and rural development in low-income countries* (pp. 27–56). Dordrecht, The Netherlands: Springer Science + Business Media B. V. 2008, Springer.
Soil Association. (2010). *Telling porkies, the big fat lie about doubling food production*. Bristol, United Kingdom: Soil Association. Retrieved March 26, 2012, from http://www.soilassociation.org/LinkClick.aspx?fileticket=qbavgJQPY%2fc%3d&tabid=680
Southgate, D., (2009). Population Growth, Increases in Agricultural Production and Trends in Food Prices. *The Electronic Journal of Sustainable Development, 1*(3), 29–35.
Stucley, C. (2010). *Overview of bioenergy in Australia*. Canberra: Publication Number 10/078, Bioenergy Australia and Rural Industries Research and Development Corporation. Retrieved March 26, 2012, from http://rirdc.infoservices.com.au/items/10-078
Tansey, G., & Rajotte, T. (2008). *The future control of food*. London: Earthscan.
Temple, J. B. (2008). Severe and moderate forms of food insecurity in Australia: Are they distinguishable? *Australian Journal of Social Issues, 43*(4), 649–668.
Trewin, B. C., & Watkins, A. B. (2010). Oceania, (1) Australia, [in State of the Climate in 2009]. In D. S. Arndt, M. O. Baringer, & M. R. Johnson (Eds). *Bulletin of the American Meteorological Society*, *91*(6), S180–S184. Retrieved March 26, 2012, from http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/climate-assessment-2009-hi-rez.pdf
Turrell, G., Blakely, T., Patterson, C., & Oldenburg, B. (2004). A multilevel analysis of socioeconomic (small area) differences in household food purchasing behaviour. *Journal of Epidemiology and Community Health, 58*, 208–215.
UN. (2011). *World Population Prospects, the 2010 Revision, Highlights*. New York: Department of Economic and Social Affairs, Population Division, United Nations. Retrieved March 26, 2012, from http://esa.un.org/peps/Documentation/Press_Release_WPP2010.pdf

UNEP. (2009). *The environmental food crisis: The environment's role in averting future food crises. A UNEP rapid response assessment*. Geneva: United Nations Environment Program.

USEPA. (2011). *Reactive Nitrogen in the United States: An analysis of inputs, flows, consequences, and management options—a report of the EPA science Advisory Board*. Washington: United States Environmental Protection Agency. Retrieved March 26, 2012, from http://yosemite.epa.gov/sab/sabproduct.nsf/WebBOARD/INCFullReport/$File/Final%20INC%20Report_8_19_11%28without%20signatures%29.pdf

Walker, B., & Salt, D. (2006). *Resilience thinking, sustaining ecosystems and people in a changing world*. Washington, DC: Island Press.

# Chapter 16
# Water Sovereignty and Food Security

**Francine Rochford**

## 16.1 Introduction

Whereas food security is a matter of growing concern internationally (O'Grady 2011), and commentary relating to food security has a significant sovereignty aspect (Boland 2000; Menezes 2001), the concept of freshwater sovereignty has received comparatively little attention (e.g. Postel 1996). Food security, however, is driving increasing international acquisition of fresh water in countries in which water is a tradeable commodity (as a commercial good, an investment opportunity and as a service): (Girouard 2003; Shrybman 2000), and corresponding attempts to protect sovereignty over water (Girouard 2003).

This chapter aims to consider the current Australian policy and legislative position with regard to purchase of water and agricultural land by foreign entities. Whereas restrictions apply to the acquisition of property, commercial property and corporate assets (Foreign Acquisitions and Takeovers Act 1975 (Cth)), and foreign land ownership has generated significant concerns (Kelly 2011), the acquisition of water assets by foreign owners has not yet generated the same level of concern—possibly because many people are not aware that water can now be owned independently of land. However, water acquisition by foreign interests has been occurring by degrees, without triggering the oversight of the Foreign Investments Review Board (Clifford 2010; Vasek 2010).

F. Rochford (✉)
La Trobe University, La Trobe Law School, PO Box 199, Bendigo 3552, Bendigo, Australia,
e-mail: F.Rochford@latrobe.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_16,

## 16.2 Food Security as a Growing Concern

Food security has been a matter of increasing policy concern over the past decades as projected climate change requires adaptation responses both in terms of production and in terms of policy and legislative change, leading to analyses of potential mass population displacement and an 'environmental refugee' crisis (McGregor 1994). In a corollary, investors in a position to capitalise on projections of massive population centres unable to support their own nutrition needs have purchased the means of production in neighbouring countries—particularly Australia (Sprague 2011).

Shaw and Clay (1998) define food security as the condition in which 'all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (Shaw and Clay 1998, cited in Wichelns 2004, p. 50; Food and Agriculture Organization 2002). There are thus four main aspects of food security: availability, stability, utilisation and access (Schmidhuber and Tubiello 2007). The dimension of food *availability* is most commonly considered, along with its subdimensions of 'the agro-climatic fundamentals of crop and pasture production and the entire range of socio-economic and cultural factors that determine where and how farmers perform in response to markets' (Schmidhuber and Tubiello 2007, p. 19703).

Whereas all four dimensions may be of concern in nations identified as having current food security problems (Lobell et al. 2008, p. 608), and Australia as a whole could not be considered a food-insecure nation, the availability and utilisation of food are of particular concern in development of a long-term agricultural food and water strategy for Australia. The capacity of individuals to utilise food resources may be affected by stability and access issues in Australia, but the focus of concerns about foreign ownership of land and water must be the capacity of Australia to assure the availability of food, and to mitigate concerns about utilisation of food due to food safety and quality issues—to ensure sanitary conditions across the food chain (Schmidhuber and Tubiello 2007, p. 19703).

Drought, flood and disease have always generated concerns about the availability of food. However, as McGregor notes:

> [t]he geographical literature on natural hazards has repeatedly stressed the role of human agency either in causing the disaster itself, or in causing populations to be more vulnerable to disasters … Groups may become more vulnerable when their coping strategies have been undermined directly or indirectly by the state, or their recovery prevented by failure to provide insurance and relief (McGregor 1994, p. 121).

Absenting military conflict, human resettlement or human-engendered environmental disturbance, however, food security is of increasing concern because of a 'convergence of global crises (financial, environmental, energy, food) in recent years (which has contributed to) a dramatic revaluation of and rush to control land, especially land located in the global South' (Borras and Franco 2010). This is potentially exacerbated by the uncertain effects of global climate change (Brown and Funk 2008). Australia's agricultural sector is acknowledged to be a 'climate change-taker' (Chisolm 1992, p. 7), and agricultural productivity in Australia is thus vulnerable to overseas consumption and production activities (Chisolm 1992, p. 7). Lobell et al. report that 'climate change is likely to reduce agricultural production, thus reducing food availability' (Lobell et al. 2008) particularly in tropical and semi-tropical regions which are most vulnerable to climatic variations.

> Identifying the impact of this reduced production will, however, be complicated by other changes. The latter include rising oil prices, the globalisation of the grain market, and a structural change in demand for key food supplies due to increasing demand for biofuels and rising per-capita consumption in India and China (Brown and Funk 2008, p. 580).

The transnational purchase of land 'to acquire, large swathes of land on which to build, maintain or extend large-scale extractive and agro-industrial enterprise' (Borras and Franco 2010) is one response to projected food shortages.

> Various estimates suggest that the total lands transacted in this context reached 20 million hectares between 2005 and mid-2009, although just how much land actually changed control remains unknown (Borras and Franco 2010, p. 4, citing (GRAIN 2008; Cotula et al. 2009; IFPRI 2009)).

The Australian experience is similar; as Sprague notes, investment is Australian farm resources is projected to gain good long-term returns, but '[i]n this so-called soft commodities boom, investors may have to work harder for a seat at the table. The foreigners have got here first. And according to investment bankers, there will be plenty more foreign stalkers of local companies to come' (Sprague 2011).

Technological sophistication is a major indicator of farm productivity and thus of resilience to climatic effects (Brown and Funk 2008). Partially as a result of Australian farmers' technological sophistication, food security in Australia is currently not of major concern and up until recently Australia remained a net exporter of food (Roberts et al. 2009). However, reports indicate that this position has changed—net trade in manufactured fresh and processed food and beverages and groceries declined over the 6-year period from 2004 to 2005 (AAP 2010). Ongoing perceptions of agricultural surfeit may influence the perception that food insecurity does not affect Australia, but the growth in imports and demand for food in other countries will be significant: 'in some countries with large populations and limited resources, substantial amounts of food will need to be imported, in perpetuity, even if all resources are committed to producing food for domestic consumption' (Löfgren and Richards 2003; cited in Wichelns 2004). This is not necessarily a major issue. Food availability can be supplemented, or even entirely constituted by, importation:

> national self-sufficiency is neither necessary nor sufficient to guarantee food security at the individual level. Note that Hong Kong and Singapore are not self-sufficient (agriculture is nonexistent) but their populations are food-secure, whereas India is self-sufficient but a large part of its population is not food-secure (Schmidhuber and Tubiello 2007, p. 19703).

Responses to climate change will also affect Australian food policy. Projected changes in agro-ecological conditions may make Australian farmland either more or less marginal, but it may also have an effect on the agricultural capacity of trading partners and trade competitors. This may provoke changes in trade policy, so that trade in food may become less liberal—as evidenced recently by export bans in India and Russia on the export of wheat to ensure sufficient supply for domestic consumption (O'Grady 2011). Climate change may also affect 'growth and distribution of incomes, and thus demand for agricultural produce' (Schmidhuber and Tubiello 2007, p. 19703), and this may occur in unexpected ways—by, for instance, increasing commodity prices to the extent that domestically grown produce may become more viable, thus making long-term infrastructure decisions to close railways or irrigation districts a maladaptive response.

As a result of Australia's relatively small population and comparatively rich natural resource base, Australia is nationally self-sufficient and therefore in a position to contribute to the food resource needs of other nations either by food export, food grants or by providing the natural resource base for other resource-poor nations. It is also relatively food-secure at an individual level, so as a nation it is difficult to generate concern about food security. Indeed, in economic terms, agriculture has declining importance *relative* to other consumption expenditure. Chisolm (1992) cites Engel's Law (Schultz 1953) in this connection. This predicts that 'as income per capita rises there will be a relative decline in food prices and consumption expenditure will shift towards manufactured goods and services relative to food' (Chisolm 1992, p. 21). As a proportion of Australia's GDP, agricultural produce is of declining importance. This is in spite of periods of higher productivity growth in agriculture compared with other sectors and compared with agricultural productivity in comparable countries (Chisolm 1992, pp. 21–2). In terms of real value, however, agricultural subsidies in other countries have had an effect on Australian farm prices. Chisolm also notes that: *[f]uture environmental controls applying to Australian agriculture and to our major trading competitors may have significant effects on Australia's long-run competitiveness in agriculture. In terms of 'willingness-to-pay', a high quality environment is more highly valued as real incomes rise* (Chisolm 1992, p. 23).

In this policy environment, foreign acquisition of rural land is not subject to notification under s. 26A of the Foreign Acquisitions and Takeovers Act 1975 (Cth); although the monetary thresholds that apply to other acquisitions of Australian companies or business assets apply to the acquisition of rural land. Residential land and most commercial property is, however, subject to approval (subject to exemptions), as is the purchase of shares. Thus, Australian agricultural policy is not informed by knowledge of the real level of acquisition of Australian rural land and water.

The capacity of many 'capital-rich, natural resource-poor nations' (Robertson and Pinstrup-Andersen 2010) to mitigate food security concerns through the acquisition of foreign farmland has not been a core concern on the Australian policy agenda. This is in contrast to the view in other countries, where the acquisition of land or water by foreign countries or companies can be seen as potentially a modern version of 'colonialism', as poorer, but land rich nations are frequently targeted (Robertson and Pinstrup-Andersen 2010, p. 271).

> Ralava Beoboarimisa spoke about how the other people from Madagascar formed an association, called the Collectif de défense des terres malgaches, after they found out, through the Financial Times, that their government had signed a deal for a long-term lease of 1.4 million hectares of land to the Korean company Daewoo Logistics, which wanted to use the land to produce maize and palm oil for export to Korea. People in Madagascar immediately saw this as a new form of colonisation of their country (Food producers speak out against the global hijack of their food production resources 2009).

The history of dispossession of agrarian lives is recent enough for it to remain in the collective memory:

> The emphasis on land grabbing builds on familiar, iconic images from the past of Northern companies and governments enclosing commons, dispossessing peasants and indigenous peoples, and ruining the environment in the South (Borras and Franco 2010, p. 2).

However, the acquisition of Australian farming land by foreign interests does not neatly express that conundrum. Unlike the secretive transactions described by Robertson and Pinstrup-Anderson, in which 'two consenting parties—the natural resource-rich but capital-poor host government and capital rich investor—jointly forge contracts for land transfer' (Robertson and Pinstrup-Andersen 2010, p. 272), land transfers in Australia are typically carried out in market conditions between private individuals; or at least corporations. Moreover, concerns about the purchase of farming land are not necessarily originating with farmer-vendors. Most are willing sellers and to restrict sales of land or water to overseas purchasers would potentially economically neutralise their greatest assets.

Nevertheless, the purchase of farming lands by overseas interests indicates a growing disparity between Australian food security policy and policy priorities in other countries. If Australian farmland is more attractive to foreign interests than to local farmers, this contributes to concerns about agricultural viability in Australia. This is apparent by the conundrum expressed in the early 1990s that, despite productivity growth in Australia's farming sector, and 'an impressive increase in the productive capacity of Australian agriculture' (Chisolm 1992, p. 4) allied with very low foregone productivity due to land degradation (Chisolm 1992, p. 4), the 'absolute and relative scarcity of farmland in Australia has decreased' (Chisolm 1992, p. 4).

Australian farmers, unlike their counterparts in poorer nations, are relatively resilient in the face of climatic extremes, have modern cropping and harvesting methods, use chemical fertilisers and, in some cases, biotechnological advances such as genetically modified seedstock (c/f Altieri and Rosset 2002). However, 'macro-economic policies that create disincentives for agricultural development, such as agricultural subsidies in the United States and Europe and poorly implemented cash transfer programs' (Brown and Funk 2008, p. 581) create an uncompetitive environment for relatively unprotected Australian producers (Hamblin 2009, p. 1199). Other factors, such as the strength of the Australian dollar allied with low commodity prices in some sectors (Chisolm 1992), the level and cost of infrastructure in rural Australia (for instance, McKenzie 1999), an ageing demographic and labour shortages (Gerritsen 2000) also, arguably, lead to increasingly difficult conditions. Where climatic extremes such as drought or floods exacerbate these factors, farmers facing low returns from farming may prefer to sell their land rather than continuing to work for a negative return. More recently, aggressive acquisition of water resources by government to address over-allocation across the Murray-Darling Basin and for environmental purposes (Department of Environment, Water, Heritage and the Arts, nd) will lead to retraction of irrigation infrastructure in some regions, and diminish farm viability (Rochford 2009).

In that environment, the purchase by overseas interests of Australian farmland may represent an opportunity for Australian farmers who wish to exit the industry or who can see farm exits threatening the ongoing viability of a farming area.

This could place them in line with some other commentators, who argue that transnational investment could result in:

> creation of farm/off farm job employment, the boosting of smallholder incomes, the transfer of needed technology, an increase in food production, the building-up of rural infrastructure, improved access to basic services, and the opening up of export opportunities (Borras and Franco 2010, p. 7).

Nevertheless, the acquisition of Australian farmland by overseas interests was aggressively attacked in 2010 by Senator Bill Heffernan (e.g. White and Dowler 2010), who expressed 'the urgent need to put agricultural land and our water resources on the radar of the Foreign Investment Review board' (Crittenden 2010). Echoing these concerns, in 2010 the Australian Broadcasting Corporation aired a three part series, with the tag line that '[f]oreign interests including state-owned companies from China and the Middle East are increasingly looking to Australia to secure their food production by purchasing key agricultural assets' (Crittenden 2010).

Risks identified by transnational land acquisition include:

> neglect of land users, short-term speculation, absence of consultation, corruption, environmental harm, violent conflict over land rights, polarisation and instability, undermining food security and loss of livelihoods, and failure to keep promises (local jobs, facilities, compensation) (Borras and Franco 2010, p. 8).

To address these concerns, the Federal Government commissioned two studies, to be completed by the Australian Bureau of Statistics, to assess the level of foreign farm ownership in Australia, using data from the agricultural census to be held in 2011 (Studies to examine foreign ownership of farms 2010). In addition, Senator Bill Heffernan is chairing an inquiry by the Senate Standing References Committee on Rural Affairs and Transport into the management of the Murray Darling Basin, the terms of reference of which will examine the implications to Australia of foreign ownership of agricultural land and water. A 2012 Green Paper into Australia's Food Security, however, has suggested that foreign investment is critical to Australia's continuing food security.

The key question is whether Australia *has* a vision for the significant proportion of land that is currently committed to agriculture. With a long-term trend of declining real income for farmers, a relative decline in the importance of agriculture for the national economy, and an increase in the costs of agriculture relative to other countries due in part to a higher valuation placed on environmental values, the current Australian sentiment may well be sanguine about the transfer of Australian land and water resources to countries that place a greater policy value on food production, and overseas investment in the means of production by companies with long-term investment strategies. However, the lack of information about the degree of foreign ownership of land and water resources means that that policy-decision is not fully informed.

## 16.3 Water Sovereignty

'Sovereignty'—with its chauvinistic overtones—used in the context of water, is more commonly cited in transboundary disputes about salt water (see for instance Brilmayer and Klein 2001), although it may also manifest itself in disputes over export of fresh water (Girouard 2003). In modern disputes, it is commonly treated as an aspect of free trade (Shrybman 2000), and restrictions placed on trade in water are potentially in breach of the General Agreement on Tariffs and Trade, the General Agreement on Trade in Services, and World Trade Organisation rules (Girouard 2003).

Concerns about fresh water sovereignty typically arise in four contexts: the purchase of rural land with significant water resources attached, the purchase of water detached from land in areas of Australia in which this is possible, the actual purchase of water for bulk export and the 'virtual export' of water through trade in commodities when water is itself a scarce commodity. However, water sovereignty also expresses the issue of loss of control of water resources through privatisation of water resources. In all cases, the concern inchoately expressed through reference to 'sovereignty' is the denial or potential denial of a scarce resource to the domestic community.

It is, in normative terms, problematic to deny to an impoverished neighbour the right to food and water, and most conventional economic analyses consider that removing barriers to trade is the most effective way of ensuring long-term amelioration of distributive disadvantage. In social justice discourse, however, trade in water is most commonly associated with the appropriation of an essential resource from communities with little economic or political power. Spronk and Crespo (2008) analyse the backlash against 'neoliberal' economic policies which have 'slowly dismantled policies that provided a degree of national, democratic control over economic policy, creating legal mechanisms that entrench the corporate 'right' to property and profit in their place' (Spronk and Crespo 2008, p. 2). The creation of a legal and policy environment which 'lock-in' neoliberal reforms, although not as pronounced and far-reaching in the Australian trade context, is demonstrable in the Competition Policy Reforms and the longstanding commitment to the creation of a market in water. The overarching trend has been identified in relation to trade and investment treaties as 'conditioning frameworks' (Grinspun and Kreklewich 1994), who note that:

> They constrict economic and social decision making at the domestic level, and exert pressures upon less powerful countries to accept (by eroding what remaining ability they might have to modify), overriding dictates of globalisation and regionalisation in the world economy. The outcome, if unchallenged, will be a narrower set of societal choices; an unprecedented entrenchment of barriers to progressive social change (Grinspun and Kreklewich 1994, p. 51).

Spronk and Crespo note that bilateral investment treaties have long-term effects on sovereignty over natural resources in 'capital-poor, heavily indebted countries', such as those in South America, because they constrain the capacity of those countries to regulate their own water resources. The contrast between the 'hard law' consequences of an investment treaty and the 'soft law' of international human rights is instructive:

> the 'system of investor protection, in terms of its scope and effectiveness, goes well beyond other international regimes that permit individualised access to international governing institutions', such as international human rights law and humanitarian law (Van Harten 2005, pp. 603–4). By contrast, soft law initiatives that aim to protect the human right to water, such as the General Comment 15 of the United Committee on Economic and Social Rights, contain no provisions for binding arbitration or damage awards (Spronk and Crespo 2008, p. 3).

Australian mechanisms enabling investment in water and water infrastructure are less vulnerable to charges of power asymmetry on a national level; however the acquisition of water can have significant and negative effects for the continued sustainability at individual and community levels. This is only partly as a result of the removal of actual water. More problematic systemic consequences follow from the infrastructure consequences of removal in a sparsely populated country with a user-pays system, and the long-term reallocation of water to 'more efficient' use. Where, as is the case, the global food market is distorted by subsidisation by many of the countries now purchasing the Australian means of agricultural production, 'efficiency' as a non-normative end will result in water infrastructure shifting away from traditional food supply regions. Investors in water separate from land do not need to be concerned with the long-term food security of a region.

## 16.4 Policy Implications

In the market-based system in which Australian farmers operate, policies which prevent or restrict acquisition of land by foreign interests risk disadvantaging farmers. Where land and water are the primary assets of a business enterprise, such policies result in the economic neutralisation of those assets. This has happened in other contexts; in Victoria, for instance, for every irrigator or irrigation community in favour of a cap on extraction of water from an irrigation district, there is likely to be a number of vendors of water who are opposed to such a cap. At a national level, opposition to foreign ownership of land or water must be balanced by the damage to land owners who wish to sell, but cannot find local buyers. The International Food Policy Research Institute suggests development of a 'code of conduct' and appropriate policies to address both risks and opportunities (von Braun and Meinzen-Dick 2009; c/f Borras and Franco 2010). Von Braun and Meinzen-Dick (2009) cite the key elements of a code of conduct for foreign land acquisition: transparency in negotiations, respect for existing land rights, including customary and common property rights, sharing of benefits, environmental sustainability and adherence to national trade policies. Whilst these elements are essential to mitigate potentially undesirable effects in countries in which farmers may have limited tenure or poor recourse to law, this does not describe the situation in an advanced western nation. Indeed, Borras and Franco argue that:

> [i]ncreasingly, the image of 'global land-grabbing' is being appropriated by those who are bent on re-casting the phenomenon itself as a golden opportunity to further extend capitalist agro-industry in the name of pro-poor and ecologically sustainable economic development. This extremely dubious agenda is now being consolidated around the dangerously seductive call for a 'code of conduct' to discipline big bad land deals and transform them into supposedly more ethical 'win-win' outcomes (Borras and Franco 2010, p. 2).

Instead, Borras and Franco suggest attention to the wider policy environment, including a range of mechanisms that are fully developed in the Australian economy, such as an established system for the identification, protection and transfer of property rights, contract security and well-developed market information systems. The areas of the policy environment that deserve further attention in Australia are 'evidence-based agricultural policies in relation to incentives, markets, technologies, and rural infrastructure', however not, perhaps, in the manner suggested by the authors. The role of subsidisation of external markets, including through the purchase by foreign governments and government-controlled companies of Australian land and water and the potential for market manipulation through such purchases must be considered. Introduction of full cost recovery of infrastructure—including water infrastructure—in Australia must be compared with subsidised or government-supplied infrastructure in other countries, and government policy which fails to correct for the resultant skewing of the international commodities market should be a matter of concern.

The underpricing of commodities as a result of agricultural policies in other countries is a major impediment to the continuing viability of Australian farms, which are subsidised at a minimal rate compared to market competitors. Australian farmers are estimated to be subsidised at 6% of farm income in 2005–2007 (DFAT 2010) compared with 26% of total farm income in other OECD countries (DFAT 2010). Japan and Switzerland protect their farmers at 56% and 68%, respectively (Hamblin 2009, p. 1199). Agricultural policies in many developed nations represent a range of interests other than economic interests—social priorities, defence, environment and amenity.

> By contrast, the plight of rural communities in decline in Australia went largely unnoticed by policy makers during the height of the economic-rationalist phase of government thinking in the 1990s, and although some moderation has since occurred, government policy remains wedded to a market-rules approach rather than one of support towards multifunctionality (Hamblin 2009, p. 1199).

## 16.5 Conclusions

Australian policy decisions in relation to agriculture are constrained by a dominant ideological preferencing of market-based rationalities in spite of an international environment placing Australian farmers in competition with protectionist countries (Chisolm 1992, p. 25). In other respects Australian farm policy is guided by the necessarily backward-looking research based on census data, and the degree of foreign ownership of the means of agricultural production is difficult to assess by that means. The conditions which appear to be generating purchase of farm assets by other countries and international interests appear to be less significant to Australian policy-makers and domestic industries, and with the increasing importance of other values, such as environmental values, to Australia, this is in line with Pareto efficiency. Thus, individuals may be better off, without others being worse off, by the purchase of Australian farm interests by offshore investors. However, Pareto efficiency is not a measure of equity or other social values–it is a minimal measure of efficiency; and in an open economy with an export-oriented agricultural sector, as Chisolm, writing in 1992 notes, 'a decline in the real net value of farm output attributable to a decline in world prices, lowers a country's economic welfare' (Chisolm 1992, p. 25).

It is important to determine *why* Australian assets are considered to be worth more in accord with foreign priorities than Australian priorities. Given the constraints of an unprotected rural sector competing for land and water against protected international interests, the answer might seem too simple—Australian investors in agricultural interests are at a competitive disadvantage because the current Australian *realpolitick* places less value on primary production and primary producers than that of competitor nations.

## References

AAP. (2010). *Australia a net importer of food*. The Sydney Morning Herald [online] October 27. Retrieved November 29, 2011, from http://news.smh.com.au/breaking-news-national/australia-a-net-importer-of-food-20101027-173kl.html

Altieri, M. A., & Rosset, P. (2002). Why biotechnology will not ensure food security, protect the environment, or reduce poverty in the developing world. In R. Sherlock & D. J. Morrey (Eds.), *Ethical issues in biotechnology* (pp. 175–182). Lanham, MD: Rowman & Littlefield.

Boland, A. (2000). Feeding fears: Competing discourses of interdependency, sovereignty, and China's food security. *Political Geography, 19*(1), 55–79.

Borras, S. M., & Franco, J. (2010). *Towards a Broader View of the Politics of Global Land Grab: Rethinking Land Issues, Reframing Resistance.* ICAS Working Paper Series No. 001 May.

Brilmayer, L., & Klein, N. (2001). Land and sea: Two sovereignty regimes in search of a common denominator. *Journal of International Law and Policy, 33*(3), 703–768.

Brown, M. E., & Funk, C. C. (2008). Food security under climate change. *Science, 319*(5863), 580–581.

Chisolm, A. H. (1992). Australian agriculture: A sustainability story. *Australian Journal of Agricultural Economics, 36*(1), 1–29.

Clifford, C. (2010). *Shenhua buys 142ML water licence outside EL7223*. ABC News [online]. Retrieved January 7, 2011, from http://www.abc.net.au/news/stories/2010/11/17/3069330.html

Cotula, L., Vermeulen, S., Leonard, R., & Keeley, J. (2009). *Land grab or development opportunity? Agricultural investments and international land deals in Africa*. London, Rome: IIED/FAO/IFAD.

Crittenden, S. (2010). *Selling the farm*. ABC News [online] November 17. Retrieved January 5, 2011, from http://www.abc.net.au/news/specials/selling-the-farm-part-1/

Department of Environment, Water, Heritage and the Arts. (nd). *Water for the future: Murray Darling Basin*. [online] at Retrieved August 12, 2010, from http://www.environment.gov.au/water/locations/murray-darling-basin/index.html

DAFF. (2012). *National Food Plan green paper 2012*. Department of Agriculture, Fisheries and Forestry, Canberra.

DFAT, Department of Foreign Affairs and Trade Australian Government. (2010). *Agriculture and the WTO*. Retrieved June 8, 2010, from http://www.dfat.gov.au/trade/negotiations/trade_in_agriculture.html

Food and Agriculture Organization. (2002). *The State of Food Insecurity in the World 2001*. Rome: Food and Agriculture Organization.

Food producers speak out against the global hijack of their food production resources. (2009). *Civil Society Organisations (CSO) Forum Parallel to World Summit on Food Security 2009 13–17 November*. Rome. Retrieved 7, 2011, from http://peoplesforum2009.foodsovereignty.org/food_producers_speak_out_against_the_global_hijack_of_their_food_production_resources

Gerritsen, R. (2000). The management of government and its consequences for service delivery in regional Australia. In B. Pritchard & P. McManus (Eds.), *Land of discontent—the dynamics of change in rural and regional. Australia* (pp. 123–139). Sydney: UNSW Press.

Girouard, R. J. (2003). Water export restrictions: A case study of WTO dispute settlement strategies and outcomes. *Georgetown International Environmental Law Review, 15*, 247–289.

GRAIN. (2008). *Seized: The 2008 land grab for food and financial security*. Barcelona, Spain: GRAIN.

Grinspun, R., & Kreklewich, R. (1994). Consolidating neoliberal reforms: "Free Trade" as a conditioning framework. *Studies in Political Economy, 43*, 33–61.

Hamblin, A. (2009). Policy directions for agricultural land use in Australia and other post-industrial economies. *Land Use Policy, 26*, 1195.

IFPRI. (2009). *Food scare sparks Third World land rush, as reported by Reuters*. Retrieved January 7, 2011, from http://uk.reuters.com/article/idUKTRE53S97420090429?pageNumber=2&virtualBrandChannel=0&sp=true

Kelly, J. (2011). Success of crackdown on foreign property buyers called into question. *The Australian*. Retrieved January 18, 2011, from http://www.theaustralian.com.au/business/property/success-of-crackdown-on-foreign-property-buyers-called-into-question/comments-e6frg9gx-1225990275190

Lobell, B., Burke, M. B., Tebaldi, C., Mastrandrea, M. D., Falcon, W. P., & Naylor, R. L. (2008). Prioritizing climate change adaptation needs for food security in 2030. *Science, 319*, 607–610.

Löfgren, H., & Richards, A. (2003). Food security, poverty, and economic policy in the Middle East and North Africa. In H. Löfgren (Ed.), *Food, agriculture, and economic policy in the Middle East and North Africa. Research in Middle East Economics* (Vol. 5, pp. 1–31). Greenwich, Conn: JAI Press.

McGregor, J. (1994). Climate change and involuntary migration: Implications for food security. *Food Policy, 19*(2), 120–132.

McKenzie, F. H. (1999). *Impact of declining rural infrastructure*. Canberra: Rural Industries Research and Development Corporation.

Menezes, F. (2001). Food sovereignty: A vital requirement for food security in the context of globalization. *Development, 44*(4), 29–33.

O'Grady, S. (2011). *The coming hunger: Record food prices put world 'in danger', says UN*. The Independent 6 January [online]. Retrieved January 6, 2011, from http://www.independent.co.uk/news/world/politics/the-coming-hunger-record-food-prices-put-world-in-danger-says-un-2177220.html

Postel, S. (1996). *Dividing the waters: Food security, ecosystem health, and the new politics of scarcity worldwatch paper #132*. Washington, DC: Worldwatch Institute.

Roberts, I., Haseltine, C., & Maliyasena, A. (2009). *Factors affecting Australian agricultural exports outlook 09.5 issues/insights*. Canberra: Australian Bureau of Agricultural and Resource Economics.

Robertson, B., & Pinstrup-Andersen, P. (2010). Global land acquisition: Neo-colonialism or development opportunity? *Food Security, 2*, 271–283.

Rochford, F. (2009). Climate change and irrigation water delivery—substantive constraints on social learning. In J. Martin, M. Rogers, & C. Winter (Eds.), *Climate change in regional Australia: Social learning and adaptation*. Ballarat: VURRN Press.

Schmidhuber, J., & Tubiello, F. N. (2007). Global food security under climate change. *Proceeding of the National Academy of Sciences, 104*(50), 19703–19708.

Schultz, T. W. (1953). *The economic organization of agriculture*. New York: McGraw Hill.

Shaw, D. J., & Clay, E. J. (1998). Global hunger and food security after the World Food Summit. *Canadian Journal of Development Studies, 19*(4), 55–76.

Shrybman, S. (2000). *The accord to prohibit bulk water removal—will it actually hold water?* BC Freshwater Workshop. Retrieved January 6, 2011, from http://www.ce.utexas.edu/prof/mckinney/ce397/Topics/WaterMarketing/WestCoastLaw.pdf

Sprague, J. (2011). Want a piece of the agricultural action? *Australian Financial Review,* 23.

Spronk, S., & Crespo, C. (2008). Water, sovereignty and social: Investment treaties and the struggles against multinational water companies in Chochabamba and El Alto, Bolivia. *Law, Social Justice and Global Development Journal*, (1). http://www.go.warwick.ac.uk/elj/lgd/2008_1/spronk_crespo

Studies to examine foreign ownership of farms. (2010). ABC News [online] Nov 23. Retrieved January 5, 2011, from http://www.abc.net.au/news/stories/2010/11/23/3073570.htm?section=justin

*Foreign Acquisitions and Takeovers Act* 1975 (Cth).

Van Harten, G. (2005). Private authority and transnational governance: The contours of the international system of investor protection. *Review of International Political Economy, 12*, 600–623.

Vasek, L. (2010). *Foreign farm buyers split Libs and Nats*. The Australian July 30 [online]. Retrieved January 7, 2011, from http://www.theaustralian.com.au/national-affairs/foreign-farm-buyers-split-libs-and-nats/story-fn59niix-1225898725758

von Braun, J. & Meinzen-Dick, R. (2009). *"Land Grabbing" by Foreign Investors in Developing Countries—Risks and Opportunities*. IFPRI, Policy Brief No. 13 April. Retrieved January 7, 2011, from http://www.ifpri.org/sites/default/files/publications/bp013all.pdf

White, L., & Dowler, K. (2010). *China accused of land grab*. Weekly Times June 23 [online]. Retrieved January 7, 2011, from http://www.weeklytimesnow.com.au/article/2010/06/23/202021_property.html

Wichelns, D. (2004). The policy relevance of virtual water can be enhanced by considering comparative advantages. *Agricultural Water Management, 66*, 49–63.

# Chapter 17
# Food Security and Soil Health

**Declan McDonald**

## 17.1 Introduction

The green revolution profoundly changed agricultural systems and greatly increased food and fibre production across the globe. The superior control of the production process provided by the tools of modern agriculture significantly raised the standard of living for billions of people. The great gains in production have, however, overshadowed negative impacts on the natural environment—particularly its soils and water. There is growing international recognition of natural resource degradation from agriculture, and of the need to transition to climate-resilient agricultural production systems (Beddington et al. 2011). This chapter frames the food security debate in the context of impacts on productive soil from agricultural practices, tensions in sustainable resource management debates, impediments to change and progress towards sustainable soil management.

## 17.2 The Global Context

The global human population is rapidly growing, along with its hunger for protein. Human activities are significantly affecting the global climate, leading to shifts in weather patterns and novel challenges to food production systems (Cribb 2011). Cribb (2011) sets out the evidence of environmental threats to production and questions how to meet the food and fibre needs of the world's population in the face of dwindling water supplies, reduction of arable land, growing scarcity (and expense) of oil and phosphorus, and declining fish stocks, with these problems further

D. McDonald (✉)
Victorian Department of Primary Industries, Victoria, Australia
e-mail: Declan.mcdonald@dpi.vic.gov.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_17,

compounded by the unknown impacts of climate variation. The Director-General of the International Water Management Institute, Dr. Colin Chartres, cautions that at current usage rates, agriculture may not have sufficient water to produce the necessary crops within 30 years, and that developments are urgently needed so that production can be maintained and increased with less water (IWMI 2011).

Sustainability, according to Kirkpatrick (2011), is the need for the productive capacity of terrestrial ecosystems to be maintained or *improved indefinitely*. Application of this principle to agroecosystems raises concerns for the on-going productive potential of agricultural soils in view of the fact that soil formation rates are a fraction of erosion rates on agricultural land (Edwards 1993). Clearly, soil should be considered a non-renewable resource, with a commitment to soil building—namely, increasing carbon, preventing erosion and improving productive capacity—central to agricultural management practices.

## 17.3 Progress Towards Sustainable Soil Management

The United States National Academy of Sciences, in their recently released report titled *Toward Sustainable Agricultural Systems in the 21st Century* (NAS 2010), defined sustainability not as any particular end state, but rather as progress towards four goals: (1) producing enough to satisfy human needs; (2) enhancing environmental quality and protecting the natural resource base; (3) being profitable and (4) increasing the quality of life for farmers, farm workers and society as a whole. In recommending the acceleration of effort towards agricultural sustainability, the authors proposed two parallel and overlapping approaches to the improvement of farms.

The first promotes incremental progress towards the expansion and enhancement of current efforts to improve sustainability.

The second, overlapping, approach is termed ‘transformative’. This approach seeks to re-design farming systems in the context of the abovementioned four goals. Re-designing agricultural systems requires:

- New thinking about practices and their impact on the natural environment
- New multidisciplinary research to develop a new knowledge base
- Use of that knowledge base to, in turn, inform future policies and practices

Also highlighted are possibilities that might arise from a survey of diverse farming systems and how selection of the best elements of each could support transformative thinking (NAS 2010).

In promoting awareness of the National Academy of Sciences’ report, the chair of the committee that prepared the report, Dr. Julia Kornegay (Head of the Department of Horticultural Sciences, North Carolina State University), stated that ‘Agricultural research is too focused on food production and needs to do better at considering consequences such as water and air pollution’. Dr. Gary Schnitkey (a farm management specialist in the Department of Agricultural and Consumer

Economics, University of Illinois) responded: ‘I think there’s too little research on agricultural productivity. We’ve got to keep increasing output from these acres’ (Mercer 2010). This exchange highlights the tensions that exist in academia and policy circles; these will be discussed further below.

## 17.4 Re-designing Agroecosystems

The case for re-designing agroecosystems becomes clear when reviewing the issues relevant to sustainable soil management. Scientific evidence is showing that human activities, including agriculture, are negatively impacting the ecosystem services involved in maintaining environments necessary to support our modern way of life. As a consequence, trends in soil degradation, both nationally and globally, suggest that major change is required (Banwart 2011).

Professor Stuart Hill, Foundation Chair of Social Ecology, University of Western Sydney developed a framework for working with change, termed ‘ESR’—efficiency, substitution, re-design. In this conception, efficiency involves reduction of waste, substitution involves the replacement of inputs or practices with less disruptive or impacting alternatives, and re-design seeks to address underlying causes so that the problems associated with the poor design or practice do not arise (Hill 1998, 2009).

The components of ESR describe a continuum along which learnings from the previous level will inform, and encourage progression to, the next level, with some overlap being inevitable. Modern agriculture thoroughly embraced and greatly benefited from the efficiency model through significant increases in production (Sheng et al. 2011). Substitution, as a response to improved knowledge, economic opportunity and regulation, is contributing to improved natural resource outcomes. However, re-designing agriculture for sustainability requires a systems understanding of the inter-relatedness of the elements that constitute agroecological health (Hill 2009).

Re-design has not yet received serious attention in agriculture. Permaculture and agroecology are the most comprehensive re-design models currently available, but neither is seriously regarded—arguably due to the dominance of productivist thinking—in spite of the contributions both offer to sustainable agriculture. Cocklin et al. (2006) state that, ‘policy settings [in Australia] remain firmly locked onto a productivist trajectory’. The same is true for the majority of agricultural and soil science university curricula. While productivity will, of necessity, remain central to Australian agriculture due to projected demand for food and fibre, of concern is the rate of progress in balancing productivity with sustainability.

Without some large external driver, it is not reasonable to expect Australian farmers to significantly progress along the efficiency-substitution-re-design continuum. However, indications are that awareness of environmental threats (climate change, water availability) and resource constraints (peak oil, peak P and associated price rises) is resulting in a growing numbers of Australian farmers looking beyond traditional sources of information in their search for adaptation strategies to mitigate identified risks through improving soil health.

Critics of industrial agriculture, such as Reeve (1992), claim that modernization has shifted landholder education from a former intimate knowledge of the land, where farmers responded to a range of signals such as phenological cues, to education of farmers by governments and agribusiness using production formulae based on per hectare application rates. A common theme among farmers working with the author to improve soil health is the need to regain control of soil, crop and animal fertility through better understanding of soil processes. This is a challenging time of change; engaged farmers are both nervous about departing from known practices, and excited by the prospect of regaining control of the fundamental driver of productivity—soil fertility. If they are successful in regaining knowledge and control, the door to advancement to Hill's third stage—re-designing agricultural systems—will begin to open.

In recent years, soil health has emerged as a new driver of farmer understanding of management practices on soil. As a result, a growing number of farmers, including a number of conventional high-input dairy farmers in south-eastern Australia, are moving to the substitution phase through exercising greater discrimination when selecting and formulating inputs. The results are providing important feedback on soil and animal health, and are contributing to increased farmer knowledge essential for consideration of re-design possibilities. However, attention to impediments to more rapid adoption of sustainable practices is required so that institutions, industry and consumers can support the necessary changes.

## 17.5 Impediments to Sustainable Soil Management

Impediments to sustainable soil management in Australia must be addressed if agricultural sustainability is to become a reality. Four principal impediments are discussed below and include exploitative soil management practices, short-term thinking, expediency over-riding considerations of system health and limitations in the use of scientific methodology. Options to deal with these impediments are considered.

1. In Australia, major research investment has gone into understanding and responding to short-term crop requirements rather than long-term soil ecosystem requirements. The consequence of this approach is found in the common consensus that improving soils beyond a basic level of condition, sufficient only to produce a crop, is a luxury few farmers can afford. The refusal to spend a dollar without getting an immediate dollar-plus back has resulted in soils being 'mined' of their carbon and nutrients. This has led to, for example, near-hydroponic production systems on the West Australian sands (Kirkpatrick 2011).
2. This short-term view of return-on-investment has also characterized decision-making in relation to the persistent problem of soil acidification in the Western Australian wheat-belt (Fisher in Gazey and Andrew 2010). Gazey and Andrew (2010) identified that reluctance to adopt strategies to prevent soil acidification

did not properly consider production losses from acidification, or benefits from addressing this constraint. The authors identified multiple benefits to the farming system and the environment from managing soil acidity. Few of these benefits were considered in an economic analysis because too much attention was directed towards 'what will be the short-term return-on-investment?' without consideration of investment in soil-based solutions.

3. An example of the potential for a soil health-based approach to problem-solving is provided from the Queensland banana industry. Yellow Sigatoka is an endemic problem, with control of the disease traditionally relying on the expedient use of protective and systemic fungicides applied on a 14-day schedule. Researchers sought an improved management option through better understanding of the relationship between calcium, boron and disease resistance. The researchers found that the pH and calcium required for optimal plant health in bananas *was higher than that required for optimum yield*, but resulted in significant reduction in Sigatoka pressure and the need for fungicide applications (Fitzgerald et al. 2003). This approach to plant health demonstrates fundamentally different thinking to conventional control of pests and diseases and presents the opportunity for multiple benefits to the soil. For example, increasing soil calcium promotes improved soil structure and biological function (Chan and Heenan 1999) and the elimination of scheduled 14-day fungicide applications removed what amounts to a regular biocidal impact (Bunemann et al. 2006) on the soil, thereby freeing the enterprise from a fungicidal dependence that routinely diminished soil ecosystem health, and continually cloaked the potential for system benefits arising from improved soil health. This exemplifies a re-design approach to pest and disease management that aims to improve plant vigour, increase plant defences and improve soil biodiversity.
4. A challenge to scientific methodology is necessary for the development of tools and approaches that better serve complex problem-solving. Stocking (2007) identified limitations with the reductionist approach to soil science because it narrowly aims to unlock the complexities of soil and soil processes by analyzing their constituent parts and seeking to solve one problem. Professor Daniel Hillel, in his opening address to the 2008 Australian and New Zealand Soil Science Societies' Conference, identified a need for a broader, more interdisciplinary approach to unlocking the complexities of soil. Scholz et al. in Eksvärd (2010) report that '…trans-disciplinarity sets science on its head because its practice demands researchers move from the screening of a problem within a narrow theoretical perspective to identifying where in a messy situation their competence might contribute'.

In Australia, leaders in the soil science community also recognize the need for change. McBratney and Koch (2011) state that 'in the university sector, we can't simply follow our noses in research. We need to engage in and raise public debate in key areas that relate to our scholarship'. As witnessed by the growing public debate over food security, it is appropriate that the soil science community engages more strongly with McBratney and Koch's (2011) issue of 'soil security'. The authors acknowledge that meeting the needs of growing populations has been 'hard on our soils'; but as the issue of food security has begun to permeate public consciousness, more fundamental, they argue, is the issue of 'soil security'.

The need for 'soil security' requires a strategy that improves soil health *while* increasing production. Notwithstanding the best advances in agricultural technologies, there is as yet no agreement on a production model that will reliably deliver this outcome, and no technology that can replace '… the complexity and processing ability of soils and ecosystems' (McBratney and Koch 2011). However, the intention of sustainable soil management implies such an outcome and the attainment of sustainable soil management requires it.

## 17.6 A Hybrid Possibility

A production model that meets the needs of current and future populations must be supported by robust natural systems that can sustain the required level of output. A hybrid approach is proposed that combines the production strengths of modern agriculture and the soil building practices of alternative agriculture. Soil building needs to address the chemical, physical and biological properties of soils through a range of activities appropriate to soil type including ripping and drainage as well as additions of phosphorus, manures, calcium, composts and trace elements. Improvement in soil chemical and physical properties has been a strong priority of modern agriculture. Attention to soil biological properties has lagged behind, although awareness of the significant contribution effective management of biology can make to sustainable agricultural production is rapidly growing.

Soil improvement practices common to all forms of alternative agriculture align with the principle of 'feeding the soil', a concept that has sustained agriculture for millennia (King 1911). In a modern context, 'feeding the soil' aims to conserve and enhance soil biological, chemical and physical functions through a range of recognized best management practices including maintaining year-round groundcover, use of green and brown manures, use of composts, holistic grazing management and improved management of chemical inputs.

The suggestion to take the best from conventional and organic systems was put forward by M. S. Swaminathan, a leader of the green revolution in India, when he called for 'organic and chemical' agriculture to work together and seek synergies from their respective inputs (Swaminathan 2006). This recommendation is compatible with that of the National Academy of Sciences (2010) mentioned earlier. More recently the suggestion emerged in Britain where in recognition of the need for new beginnings, leaders in agriculture Jules Pretty and Jim Paice (British Minister for Agriculture) called for alternative and conventional agriculture to set aside past enmity to work together and learn from each other. Pretty (Pro-Vice Chancellor, University of Essex), at the launch of the UK Government-backed *Foresight Report on Food and Farming Futures*, urged the organic and conventional farming lobbies to 'put their differences behind them and stop bickering over which system is best to meet the global food challenge'. The report acknowledged that existing knowledge and innovations currently being used in both organic and conventional agriculture had a role to play (Davies 2011). Jim Paice stated in a conference address that mainstream agriculture can learn lessons from the organic sector, and that this would help the industry produce more from less (Gleeson 2011). Hails (2002) acknowledged the ideological boundaries that are often set up between different agricultural systems (organic and conventional), but argued that if these can be set aside, the objectivity of ecological science can be used to pick the best elements of all systems.

Underpinning agricultural sustainability will be promotion of robustness in natural systems to sustain production. Therefore, the issue of environmental risk from agricultural management practices must be considered. The suite of environmentally sensitive practices characterized by organic agriculture is regarded as having low environmental risk, and the potential to contribute to improved environmental outcomes (Eksvärd 2010), unlike modern agriculture, which has a poor environmental record stemming from practices brought to public attention by Rachel Carson's seminal *Silent Spring* (1962), and that continue with the annual Gulf of Mexico 'dead zone' reports (Texas A&M University 2011). However, whilst the organic system promises improved environmental outcomes, it can also be argued that a transformed hybrid model of conventional agriculture that incorporates the best of alternative practices, could significantly improve its environmental record. In practice, the best outcome for sustainable agriculture is a hybrid system that would support high production and allow inputs, such as are available to conventional agriculture, to be used in conjunction with soil improvement practices. Although this approach is likely to support improved environmental outcomes, further regulation or incentives to prevent off-site impacts may be required.

If a hybrid system that improves soil health and increases production—potentially with less water and fewer nutrients—is to be developed, indications are that greater attention to soil biology and soil biodiversity will be required (Sandhu et al. 2010). 'If agriculture does move to embrace an ecologically sympathetic approach, the great scientific challenge for the coming years will be to understand more fully the life in our soils and how it may be better managed for food production and environmental renewal' (Cribb 2006). Improving understanding of soil life will require better knowledge of the impact of agricultural inputs on soil ecosystem function. Lavelle et al. (2006) assert that treating the soil as an ecological system will result in management practices that conserve and enhance ecosystem services in ways that reduce negative trade-offs, and that provide positive synergies with other ecosystem services.

New research is constantly revealing the complexity of biological systems and the profound influence they can exert on their surroundings. Such work has shown the potential of plants to physically change local environments (Sawkins et al. 2011), actively recruit microorganisms in defense of plant roots (Rasmann and Agrawal 2008), and facilitate transformation of hostile sodic subsoils into friable, fertile soils (Gill et al. 2009). Recent work by scientists from universities across North America and Europe has shown the importance of biodiversity for maintaining multiple ecosystem services (McGill University 2011). Considerable resources are currently being directed to improve understanding of soil ecosystems.

Recent progress in the molecular characterization of soil biodiversity is rapidly advancing our understanding of complexity and function (European Community 2011; Nelson and Mele 2006). EcoFINDERS is an initiative of the European Community that aims to ensure the sustainable use of soils by characterizing soil biodiversity and determining links with soil function and ecosystem services (European Community 2011). There is clearly scope for improved understanding of above- and below-ground biology to contribute much more positively to sustainable soil management and sustainable agriculture.

In the past, the expediency and control provided by high analysis inputs (fertilizers and biocides) negated the need for research on soil biology and soil health for productivity. Although some work has been done to examine the impacts of agricultural inputs on soil organisms (Bunemann et al. 2006; Sarathchandra et al. 1993), such research is in its infancy, with benefits anticipated from improved understanding of soil biological processes and harmonization of agricultural practice to those processes (Hill 1986). New research is showing that a reliance on biocides, borne out of expediency and commercial pressure, can disrupt soil ecosystem function (Yamada et al. 2009), promote resistance in disease organisms (Chapman et al. 2011) and mask the potential of biological processes to positively contribute to production (Zaborski and Stinner, in Holland 2004). Therefore, if a hybrid system is to benefit from a range of conventional inputs (fertilizers, pesticides, herbicides, fungicides etc.), the primary criterion needs to be selection of benign inputs and elimination of those that are toxic to soil biological function (Zimmer 2000). Alternatively, it may be possible to use inputs in ways that avoid or minimize negative impacts on the soil ecosystem (Anderson 1992).

These examples serve to show the potential for a critical re-appraisal of current practices, development of a hybrid production system, and the compatibility of a soil health-led approach to more sustainable practices to support progress towards re-design of agricultural systems and more sustainable agriculture. Fitzgerald et al.'s (2003) work illustrates the type of change necessary to bring about the transformation called for by the US National Academy of Sciences (2010). The use of calcium and boron to reduce infection rates in plants was not a new discovery (Edgington and Walker 1958; Keane and Sackston 1970) but the control and convenience allowed by fungicides on farms now using the calcium/boron-led approach to disease management, was for many years critical to the success of these enterprises. The imperative for this kind of adaptation is growing with every new report of induced resistance to agricultural chemicals (Chapman et al. 2011; Johnson et al. 2009).

## 17.7 Moving Forward

Substitution of inputs and improved management strategies can significantly improve sustainable soil management. The examples provided show that substitution does not necessarily mean that a lot needs to change. This is significant when promoting change to a traditionally risk-averse community such as farming.

Successful substitution will build confidence to move to more fully engage with re-design options. This process will be greatly aided by targeted scientific research, public policy, and improved use of public funds to maintain and improve, rather than simply repair, natural resource degradation.

As discussed above, Reeve (1992) suggested that production formulae relieved farmers of the need for detailed understanding of cause/effect relationships, and replaced that need with easy-to-use chemicals to treat symptoms. Although this assertion does not do justice to a large number of farmers, the examples provided above indicate that narrow production formulae, including effective pest and disease control, have reduced the capacity for more lateral solution-finding, as opposed to problem-solving, approaches. For example, pest/disease management within a sustainability framework requires endogenous solutions such as promotion of suppressive soils, Integrated Pest Management and improved plant nutrition for vigour and pest and disease resistance. The value to sustainable agriculture of 'within-system' approaches to soil and plant health, and the attendant knowledge required for successful implementation must be weighed against the expedient, but unsustainable, back-and-forth practice of chemical use, resistance, and pursuit of novel chemical development to control co-evolving pests and diseases.

Practices that do not reflect a 'systems' approach or recognize the soil as an ecosystem are less likely to be sustainable. There is growing appreciation of the soil as a medium that may be possessed of 'health' or 'ill-health', and promotion of the soil as a complex ecosystem is central to a number of undergraduate and post-graduate agricultural science courses that have developed over the past 20 years (CSU 2011). The need for change is supported by a growing number of academics including Daniel Hillel who, in his address to the 2008 Australian and New Zealand Soil Science Conference, acknowledged the tensions in agricultural science when he identified conventional research efforts as resulting in '… knowing more and more about less and less'. This point was not made to disparage higher learning or traditional research, but rather to provoke discussion on the necessary advancement of inter- and multidisciplinary research in support of sustainable solutions to unsustainable problems (Hillel 2008).

It must be emphasized that ultimately, for agriculture to become sustainable, practices need to change *on farm*. Farmers will respond to financial and environmental cues (Ecker et al. 2011) but the latter are often not fully recognized, possibly because of the often slow change in soil condition over time. Conacher and Conacher (1995) identified that most farmers are poor at recognizing the relationship between land management practices on-farm and their contribution to local and regional land degradation. It therefore becomes the role of government to context the need for transformative change; conversely, the lack of incentives for private providers to fulfil this role should be recognized as a significant 'market-failure' risk to sustainability.

Although forward-looking farmers, academics and policy-makers may recognize the need for major change, this will only occur when alignment of a range of support structures is complete. Any change first requires a change of thinking, and this must become manifest across policy and research institutions. This will require clear articulation at the policy level of soil improvement as a necessary outcome, together with commitment at the research level to take an interdisciplinary approach to designing soil improvement into modern production systems. More sophisticated development and extension activities will follow to ensure new research findings are communicated and adopted.

Although it is acknowledged that policy and research bodies are engaging with these questions, as discussed above, they continue to do so primarily within the productivity paradigm. The necessary change requires engagement with these issues within a *sustainable* productivity paradigm. Incremental change regulates the familiar whereas transformational change, to use Eksvärd's (2010) phrase, will set science on 'its head' and will challenge the discipline in new and more complex ways.

Multidisciplinary and trans-disciplinary thinking is necessary to support development of a hybrid system that will feed the soil, promote soil ecosystem function, reduce reliance on environmentally and economically unsustainable inputs and, most importantly, meet the long-term production needs of humans. The first stage of this change process is acceptance of the need to build soil improvement into every aspect of the production process. Such a commitment will fundamentally alter the way research, demonstration and extension activities will be carried out, and will strongly support progress towards agricultural sustainability.

## References


Anderson, A. B. (1992). *Science in agriculture*. Austin, TX: Acres USA.

Banwart, S. (2011). *The state of our soils*. Retrieved August 28, 2011, from http://eusoils.jrc.ec.europa.eu/projects/Soiltrec/Documents/SoilTrEC_ResearchMedia_Low.pdf

Beddington, J., Asaduzzaman, M., Fernandez, A., Clark, M., Guillou, M., Jahn, M., et al. (2011). *Achieving food security in the face of climate change: Summary for policy makers from the commission on sustainable agriculture and climate change*. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Retrieved November 15, 2011, from http://ccafs.cgiar.org/sites/default/files/assets/docs/climate_food_commission-spm-nov2011.pdf

Bunemann, E. K., Schwenke, G. D., & Van Zwieten, L. (2006). Impact of agricultural inputs on soil organisms—a review. *Australian Journal of Soil Research, 44*, 379–406.

Carson, R. (1962). *Silent spring*. Boston, MA: Houghton Mifflin.

Chan, K. Y., & Heenan, D. P. (1999). Lime-induced loss of soil organic carbon and effect on aggregate stability. *Soil Science Society of America Journal, 63*, 1841–1844.

Chapman, K. S., Sundin, G. W., & Beckerman, J. L. (2011). *Identification of resistance to multiple fungicides in field populations of Venturia Inaequalis.* Retrieved August 1, 2011, from http://www.purdue.edu/newsroom/research/2011/110712BeckermanScab.html

Cocklin, C., Dibden, J., & Mautner, N. (2006). From market to multifunctionality? Land stewardship in Australia. *The Geographical Journal, 172*(3), 197–205.

Conacher, A., & Conacher, J. (1995). *Rural degradation in Australia*. Melbourne, VIC: Oxford University Press.

Cribb, J. (2006). *Can Australian soil science save the world*? Keynote address at the ASSSI-ASPAC-ACMS National soils conference, Adelaide, SA.

Cribb, J. (2011). *The Coming Famine, Presentation to the 2nd annual North central CMA soils forum*, Bendigo.

CSU. (2011). *Bachelor of ecological agricultural systems*, Charles Sturt University. Retrieved August 8, 2011, from http://www.csu.edu.au/courses/undergraduate/ecological_agriculture/course-overview

Davies, J. (2011). *Organic vs. conventional row must stop*. *Farmers guardian*. Retrieved July 15, 2011, from http://www.farmersguardian.com/home/livestock/livestock-news/organic-vs-conventional-row-must-stop/36729.article

Ecker, S., Kancans, R., & Thompson, L. (2011). Drivers of practice change in land management in Australian agriculture: Preliminary national survey results. *Science and Economic Insights, Land Use*. Issue 2.1. Canberra, ACT: Australian Bureau of Agricultural and Resource Economics and Sciences.

Edgington, L. V., & Walker, J. C. (1958). Influence of calcium and boron nutrition on development of fusarium wilt of tomato. *Phytopathology, 48*, 324–326.

Edwards, K. (1993). Soil formation and erosion rates. In P. E. V. Charman & B. W. Murphy (Eds.), *Soils: Their properties and management* (pp. 36–47). Sydney, NSW: Sydney University Press.

Eksvärd, K. (2010). Is conventional agricultural research fit for the purpose of supporting ecological agriculture? A case study of an attempted transition in Sweden. *Renewable Agriculture and Food Systems, 25*, 55–68.

European Community. (2011). *EcoFINDERS: Ecological function and biodiversity indicators in European soils*. Retrieved July 27, 2011, from http://eusoils.jrc.ec.europa.eu/projects/ecofinders/

Fitzgerald, S. M., White, S. D., Dickinson, A. A., & Goldman, B. (2003). A survey of Sigatoka leaf disease (*Mycosphaerella musicola* Leach) of banana and soil calcium levels in North Queensland. *Australian Journal of Experimental Agriculture*, *43*, 1157–1161. Canberra, ACT: CSIRO Publishing.

Gazey, C., & Andrew, J. (2010). Getting the soil pH profile right helps with weed control and sustainability. In *Proceedings of the 19th World Congress of soil science, soil solutions for a changing world*, Brisbane, QLD, August 1–6, 2010.

Gill, J. S., Sale, P. W. G., Peries, R. R., & Tang, C. (2009). Changes in soil physical properties and crop root growth in dense sodic subsoil following incorporation of organic amendments. *Field Crops Research, 114*, 137–146.

Gleeson, C. (2011). *Farmers urged to learn from organic sector*. *Farmers guardian*. Retrieved July 15, 2011, from http://www.farmersguardian.com/shows-and-sales/events/farmers-urged-to-learn-from-organic-sector/37139.article

Hails, R. S. (2002). Assessing the risks associated with new agricultural practices. *Nature, 418*, 685–688.

Hill, S. (1986). Soil fauna and agriculture: Past findings and future priorities. *Quaestiones Entomologicae, 21*(4), 637–644.

Hill, S. (1998). Redesigning agroecosystems for environmental sustainability: A deep systems approach. *Systems Research and Behavioral Science, 15*, 391–402.

Hill, S. (2009). From shallow to deep organics: Redesigning our agroecosystems for sustainability and wellbeing. *Ag Impetus*, 7–8. Hamilton, VIC: Sustainable Rural Development.

Hillel, D. (2008). Homo et Humus. In *Proceedings of the 2008 Australian and New Zealand soil science societies conference*, Palmerston North, New Zealand.

Holland, J. M. (2004). The environmental consequences of adopting conservation tillage in Europe: Reviewing the evidence. *Agriculture Ecosystems and Environment, 103*, 1–25.

IWMI. (2011). *Colin's STRAIGHTtalk on global water issues*. International Water Management Institute. Retrieved August 13, 2011, from http://www.iwmi.cgiar.org/ColinsSTRAIGHTtalk/

Johnson, W. G., Davis, V. M., Kruger, G. R., & Weller, S. C. (2009). Influence of glyphosate-resistant cropping systems on weed species shifts and glyphosate-resistant weed populations. *European Journal of Agronomy, 31*, 162–172.

Keane, E. M., & Sackston, W. E. (1970). Effects of boron and calcium nutrition of flax on Fusarium wilt. *Canadian Journal of Plant Science, 50*, 415–422.

King, F. H. (1911). *Farmers of forty centuries*. Emmaus, PA: Rodale Press.

Kirkpatrick, J. B. (2011). The political ecology of soil and species conservation in a 'Big Australia'. *Geographical Research, 49*, 276–285. doi:10.1111/j.1745-5871.2011.00696.x.

Lavelle, P., Decaens, T., Aubert, M., Barot, S., Blouin, M., Bureau, F., et al. (2006). Soil invertebrates and ecosystem services. *European Journal of Soil Biology, 42*(1), S3–S15.

McBratney, A., & Koch, A. (2011). *Soil: It's what keeps us clothed and fed*. Retrieved May 30, 2011, from http://theconversation.edu.au/soil-its-what-keeps-us-clothed-and-fed-146

McGill University. (2011). Biodiversity critical for maintaining multiple 'ecosystem services'. *ScienceDaily*. Retrieved August 23, 2011, from http://www.sciencedaily.com/releases/2011/08/110819155422.htm

Mercer, D. (2010). *Ag research too focused on food production*. Associated Press. Retrieved August 29, 2011, from http://m.nctimes.com/mobile/article_6808d9db-851b-5aad-828b-0599633b33a0.html

NAS. (2010). *Toward sustainable agricultural systems in the 21st Century*. US National Research Council of the National Academies, National Academy of Sciences. Retrieved June 20, 2011, from http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/Systems-Ag-Report-Brief.pdf

Nelson, D. R., & Mele, P. M. (2006). The impact of crop residue amendments and lime on microbial community structure and nitrogen-fixing bacteria in the wheat rhizosphere. *Australian Journal of Soil Research, 44*, 319–329.

Rasmann, S., & Agrawal, A. A. (2008). In defense of roots: A research agenda for studying plant resistance to belowground herbivory. *Plant Physiology, 146*(3), 875–880. doi:10.1104/pp.107.112045.

Reeve, I. (1992). Sustainable agriculture: Problems, prospects and policies. In G. Lawrence, F. Vanclay, & B. Furze (Eds.), *Agriculture, environment and society: Contemporary issues for Australia* (pp. 208–223). Melbourne, VIC: Macmillan.

Sandhu, H. S., Gupta, V. V. S. R., & Wratten, S. D. (2010). Evaluating the economic and social impact of soil microbes. In G. R. Dixon & E. L. Tilston (Eds.), *Soil microbiology and sustainable crop production*. New York, NY: Springer.

Sarathchandra, S. U., Lee, A., Perrott, K. W., Rajan, S. S. S., Oliver, E. H. A., & Gravett, I. M. (1993). Effects of phosphate fertilizer applications on microorganisms in pastoral soil. *Australian Journal of Soil Research, 31*, 299–309.

Sawkins, D., Verboom, W., & Pate, J. (2011). *Native vegetation in Western Australia is actively involved in soil formation*. West Australia Department of Agriculture. Retrieved July 31, 2011, from http://www.agric.wa.gov.au/objtwr/imported_assets/content/lwe/vegt/vegsoil_booklet.pdf

Sheng, Y., Zhao, S., & Nossal, K. (2011). *Productivity and farm size in Australian agriculture: Reinvestigating the returns to scale. AARES conference paper 11.06*. Canberra, ACT: Australian Agricultural and Resource Economics Society.

Stocking, M. (2007). A global systems approach for healthy soils. In *Proceedings of the international forum celebrating the centenary of conservation and restoration of soil and vegetation in Iceland*. Selfoss, Iceland, 31 August to 4 September 2007.

Swaminathan, M. S. (2006). Preface. In N. Uphoff, A. S. Ball, E. Fernandes, H. Herren, O. Husson, M. Laing, C. Palm, J. Pretty, P. Sanchez, N. Sanginga, & J. Thies (Eds.), *Biological approaches to sustainable soil systems*. Boca Raton, FL: Taylor & Francis Group.

Texas A&M University. (2011). 2011 Gulf of Mexico 'dead zone' could be biggest ever. *ScienceDaily*. Retrieved July 20, 2011, from http://www.sciencedaily.com/releases/2011/07/110718141618.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Ftop_news%2Ftop_science+%28ScienceDaily%3A+Top+News+−−+Top+Science%29

Yamada, T., Kremer, R. J., de Camargo e Castro, P. R., & Wood, B. W. (2009). Glyphosate interactions with physiology, nutrition, and diseases of plants: Threat to agricultural sustainability? *European Journal of Agronomy, 31*, 111–113.

Zimmer, G. F. (2000). *The biological farmer*. Austin, TX: Acres USA.

# Chapter 18
# Australian Food Security Dilemmas: Comparing Nutritious Production Scenarios and Their Environmental, Resource and Economic Tensions

**Graham M. Turner, Kirsten A. Larsen, Chris Ryan, and Mark Lawrence**

## 18.1 Introduction

Food security is the 'canary in a cage' for a host of resource and environmental issues playing out at national and global scales. Contemporary events such as riots in several nations and even the 'Arab Spring' point to the importance and sensitivity of food security on a range of global environmental and resource issues, namely climate change, peak oil and fertilizer availability. A common perception is that Australia is immune to any such challenges to our food security. This view is at least partly based on the understanding that Australian agriculture has provided far in excess of domestic demand. This ignores some critical aspects. Firstly, the large excess production has not covered all food types needed for a nutritious diet, but has centred on grains and meat. Consequently, other critical food types may be in question and exposed to the uncertainties of international trade. Secondly, the implications of growth in Australia's population are not fully considered. Thirdly, it is not well understood how dependent past food production and distribution has been on key inputs such as water, fertilizers and oil, and a relatively stable climate.

Therefore, it is a misplaced view to simply extrapolate from the past and judge that Australia's future food supply will be secure. This is not guaranteed if increasing concerns about the future climate, and availability of oil, fertilizer and water come

G.M. Turner (✉)
CSIRO Ecosystem Sciences, Canberra City, ACT, Australia
e-mail: graham.turner@csiro.au

K.A. Larsen
Victorian Eco-Innovation Lab, University of Melbourne, Melbourne, Australia

C. Ryan
Victorian Eco-Innovation Lab, University of Melbourne, Melbourne, Australia

M. Lawrence
Deakin University, Burwood, VIC, Australia

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_18,

to pass. The typical response to such issues is to assume that both technological progress in agricultural production and international trade in foods will overcome any domestic deficits. These are valid countering forces, but there is no guarantee that they will be sufficient to ensure domestic food security.

Consequently, the research we undertook in scenario simulations of the Australian agricultural system, economy, resources and environment investigated a range of these competing factors in detailed accounts of Australia's food security for a nutritious diet. While the research was originally formulated with a focus on Victoria for VicHealth (Larsen et al. 2011), the simulations were implemented across Australia. This chapter describes the national outcomes, highlighting the trade-offs between food security, the economy and the environment.

Food availability is necessary, but not in itself sufficient, to ensure that a household or population is food secure. This analysis does not discount the critical importance of other aspects of access to food that affect security, e.g. price, consumer preferences, advertising, food safety and so on, but they are outside the scope of the research. Our analysis focuses mostly on a supply-side focus of food production, while embodying demand-side factors by way of diet and population. In order to cover a wide range of supply-side factors and the associated uncertainty in future trajectories of these factors, we first developed qualitative scenarios through a participatory stakeholder process. These descriptive scenarios were then simulated in a CSIRO model of the physical processes of the Australian economy to identify quantitative benefits and tensions.

This chapter is mainly focused on the scenarios created and their outcomes. The following section describes the food supply scenarios: first, how these were qualitatively created using a participatory stakeholder process, and then the modelling process. We then discuss the simulation results for each scenario, examining in turn the outcomes regarding: food availability; environmental and resource impacts; and economic implications. We finish with a summary overview comparing the scenarios and main findings.

## 18.2 Defining the Scenarios

In this section we describe the stakeholder workshop process that was used to develop alternative scenario descriptions, and then outline the quantitative interpretation of these.

### *18.2.1 Participatory Stakeholder Process*

To ensure that a wide range of views were captured in the scenarios we explored, two workshops were held with stakeholders drawn from academic researchers, government departments, industry bodies and non-government organization interest groups related to the food system. Prior to the first workshop, participants supplied their views of the 'top ten' dynamics that could impact on food provision for the Victorian community. Additionally, a review of many other scenario-based reports, not necessarily restricted to food security, helped to identify strategic drivers of change. The inputs generated were grouped to identify key drivers and dynamics of change, which were then summarized for use in the second workshop. The second stakeholder workshop also provided a sense-check of the key scenario settings, revealing additional constraints, possibilities and interactions. Together, the two workshops were designed to answer the question: 'What dynamics, or combinations of dynamics, could affect secure and sustainable provision of a nutritious diet to the Victorian community?'

The scenarios describe a 25-year horizon, for both practical and strategic reasons. This timeframe is sufficiently removed from the present day that most workshop participants and readers were able to suspend intellectual or business commitments to 'what will happen.' Twenty-five years is also a sufficiently long period that real structural change can take place (the results of the modelling are shown to 2060 so that longer-term implications of the settings can also be considered). The 'exploratory' scenarios developed by the workshop process have plausible and internally consistent storylines reflecting different social, cultural, political and economic regimes. Clearly, none are predictive. From our review and workshop process we were able to: (a) synthesize a number of common features of each scenario, and (b) coalesce responses that differed substantially among participants into three qualitatively different scenarios.

### *18.2.2 Common Features: Global and National Context*

In addition to the focus on providing a nutritious diet, there are five overarching drivers that provide the context for the challenges we face in securing food availability:

- Population growth
- Climate change impacts
- Greenhouse gas mitigation
- Oil availability
- Fertilizer availability

A summary of the assumptions made about these drivers is given in Table 18.1. While these issues may not be fully in our control, it is the divergent strategies of possible responses that shape the alternative future scenarios.

**Table 18.1** Common features of the scenarios

| Driver | High-level assumptions | Key settings |
|---|---|---|
| Population growth | Efforts to stabilize Australia's population are not implemented, while very high growth rates are also avoided | Medium population trajectory (series B) of ABS projections (ABS 2008), resulting in 36 million by 2050 |
| Climate change impacts | Further climate change will be inevitable due to the effect of cumulative emissions and the inherent inertia of the climate system | A1FI climate from the IPCC (SRES) scenarios (CSIRO-BOM 2010)<br>Impacts were limited to water resources in this modelling |
| Greenhouse gas mitigation | Domestic and international efforts to reduce GHG emissions will grow as climate change impacts escalate | Targets and strategies for emission reduction vary according to the scenario |
| Oil availability | Global production of conventional oil peaked in 2006 (IEA 2010) | Production and further discovery of oil resources in Australia based on Geoscience Australia projections (GA 2009) |
| Fertilizer availability | Increasing constraints on the supply of phosphorus will occur as high grade resources (mostly international) are depleted (Cordell et al. 2009) | Domestic production of phosphate rock assumed to increase 2–3-fold over the scenario period |

### *18.2.3 Distinguishing Features of the Three Scenarios*

In response to the global and national drivers identified above, the scenarios were differentiated along three axes (see Fig. 18.1) by grouping the reactions of workshop participants into common themes:

- Speed and effectiveness of greenhouse gas emissions reductions
- Extent to which governments intervene to manage food and energy security concerns
- Scale of solutions: global, national or local/regional solutions

High level summaries of the three scenarios follow:

'Adjustment'—Global markets drive economic and agricultural systems. Production of food is focused on getting the highest return, with land preservation a low priority. Food is more likely to be exported for top dollar than reserved for the domestic market. If not enough is produced domestically, food is imported from wherever in the world it can be efficiently and cheaply produced. Uncoordinated efforts to mitigate GHG emissions result in moderate reductions. Technological progress is generally high without there being quantum shifts to alternative systems.

'Control'—Coordinated action is implemented by governments, on a large scale. Allocation of land and resources is nationally monitored and carefully managed to seek food and energy security from domestic supplies. Large, centralized projects are implemented, such as a transition to rail freight away from road, and creating

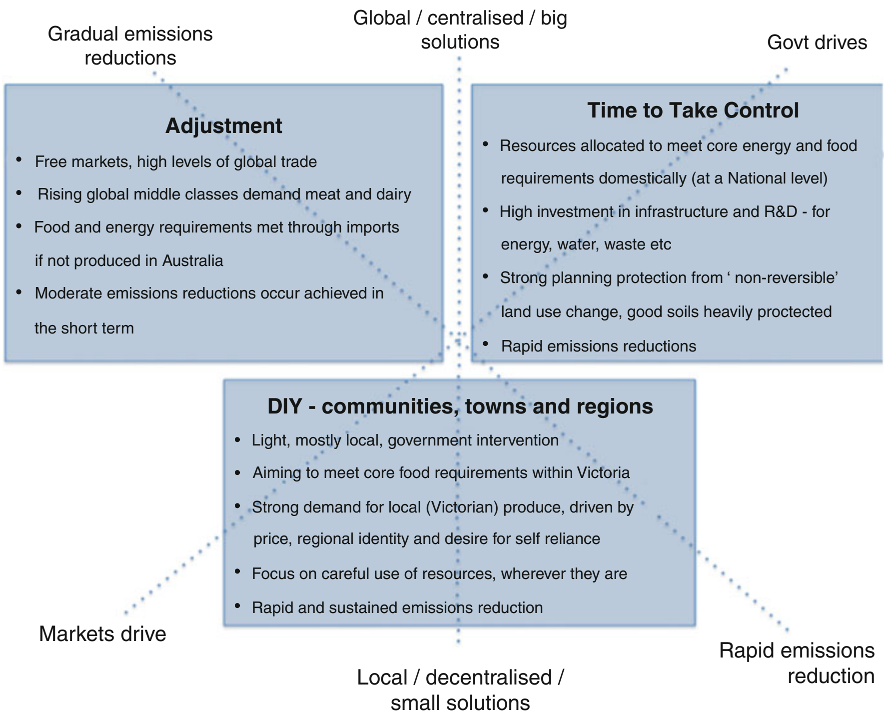



**Fig. 18.1** The three scenarios (adjustment, time to take control and DIY) that were developed from the participatory stakeholder process were differentiated along three axes associated with: effort to reduce GHG emissions; extent of government intervention in food security; and, geographical scale at which changes are attempted

an electric-powered vehicle fleet. Substantial targets for reduced GHG emissions are established.

‘DIY’—Local food and energy production dominates. Revival of regional communities occurs at the expense of cities. Innovation and experimentation are encouraged, drawing on networks of community learning. Shifts to alternative transport and energy systems are attempted, but constrained to less high-tech options. Wide-spread environmental awareness underlies efforts to reduce waste, improve land and water health, and rapidly reduced GHG emissions.

### *18.2.4 Turning the Descriptive Scenarios into Model Simulations*

To quantify the various benefits and tensions that might be associated with each of the qualitative scenarios, we employed a CSIRO model of the physical activity of Australia’s economy, including food production and environmental resources.

This model, the Australian Stocks and Flows Framework (ASFF) (Turner et al. 2011), is a process-based simulation that covers the physically significant elements of each sector of the Australian economy. Natural resources (land, water, air, biomass and mineral resources) are also represented explicitly. Throughout the ASFF, physical accounting relationships based on irrefutable mass and energy balance represent the key processes, such as converting the requirement for transport of goods into the size of the freight transport fleet and the fuel requirement.

Essentially, population and consumption rates are set, along with the activity of primary industries and various technological parameters. The framework calculates the necessary physical activity, including the labour required, throughout the economy to provide for the population, infrastructure and underlying economic activity. Ultimately this may require imports of goods and commodities, or allow for exports if there is excess production. Additionally, emissions and wastes (allowing for recycling) are produced, and environmental resources are harvested.

Modelling with the ASFF typically does not involve economic signals such as prices, instead taking an *exploratory* or learning approach (akin to airplane pilots in a flight simulator). This also avoids the vexed issue of predicting (potentially volatile) prices and complex human/societal behaviour many decades into the future. Recent applications of the ASFF investigate agriculture (Dunlop and Turner 2003), fisheries (Lowe et al. 2003), resource use (Schandl et al. 2008), dematerializing the economy (Schandl and Turner 2009) and consumption/lifestyle (Turner 2011).

#### 18.2.4.1 Background Scenario Settings

Since it is necessary to simulate the entire economy, each scenario is 'seeded' from a common background scenario. This background scenario assumes wide-spread increases in productivity (1% p/a), and ensures stable levels of unemployment and trade balance. To establish it, both production (primary and secondary industry output) and final demand consumption are adjusted to simultaneously maintain a target unemployment rate (about 5%) and a target net foreign surplus/debt relative to GDP (about 50%). Consequently, economic growth in the background scenario is an outcome of the modelling rather than an assumption imposed on the simulation.

#### 18.2.4.2 Food Requirements of a Nutritious Diet

In terms of food consumed, we simulated a nutritious diet rather than a projection of an unhealthy contemporary diet. In addition to the interests of VicHealth, simulating a nutritious diet is commensurate with the aim of exploring what is required for a sustainable future. Defining the nutritious diet as an input to the ASFF modelling was based on the National Health and Medical Research Council's Australian Guide to Healthy Eating (AGTHE), with three adjustments. First, because not every 'core' and 'extra' food was in the modelling, representative foods were selected for each of the five food groups recommended in the AGTHE, along with extras (sugar and oil) to allow for minor additional energy inputs. Second, a midpoint serve-size

**Table 18.2** Per capita diet proportions for the nutritious diet

| | | Grams/person/day | | | |
|---|---|---|---|---|---|
| Food group | Representative food | Children | Adolescents | Adult males | Adult females |
| Bread, cereal, rice, pasta, noodles | Bread | 420 | 450 | 540 | 390 |
| Vegetables, legumes | Cooked vegetables | 188 | 300 | 375 | 375 |
| Fruit | Fruits | 150 | 450 | 300 | 300 |
| Milk, yoghurt, cheese | Milk | 500 | 750 | 500 | 500 |
| Meat, fish, poultry, eggs, nuts, legumes | Beef, lamb, pigmeat | 40 | 40 | 40 | 40 |
| | Poultry | 22 | 22 | 22 | 22 |
| | Eggs | 8 | 8 | 8 | 8 |
| | Fish, crustaceans, molluscs | 13 | 13 | 13 | 13 |
| | Nuts | 2 | 2 | 2 | 2 |
| Extra foods | Sugar | 35 | 35 | 35 | 35 |
| | Oil | 20 | 20 | 20 | 20 |

was selected from the AGTHE diet that has more plant-based foods. These serve-sizes were broadly gender and age related. Third, the number and weight of these serve-sizes were combined with the age and gender profile of the population (modelled in the ASFF), to arrive at the per capita food consumption (Table 18.2). This hypothetical nutritious diet is substantially different to the typical contemporary diet profile. This work focused on nine land-based food types, and had to omit analysis of fisheries and intense farm production such as piggeries due to project resource constraints.

#### 18.2.4.3 Specific Settings for Scenario Responses

In addition to developing scenario storylines, the workshop and review process determined anticipated degrees of change. Table 18.3 summarizes the key settings of the three scenarios, where the scenarios incorporated different responses. The main scenario elements were:

- Land moved from food production to urban uses, forests for sequestration and energy
  - Productive land area reduces in all scenarios, due to varying combinations and rates of diversion to forests (for carbon sequestration and bioenergy) and urban land expansion. The change of land use from irrigated to dry-land production also has an impact.
- Increased proportion of dry-land agriculture
  - Reduced availability and reliability of irrigation water reflects climate change impacts on water resources and varying degrees of environmental management of river ecosystems.

- Agricultural production efficiencies in water and fertilizer use
  – Long-term technological advances in agricultural science promote a second Green Revolution. This may arise from genetic technology or a better understanding of complex organic soil–biota interactions. The benefits of the advances are reaped in varying combinations of increased yield or decreased inputs.
- Energy efficiency, changes to energy mix and demand reduction
  – Efficiency of energy use and how electricity is generated changes in response to GHG mitigation targets. Ambitious targets also require household or personal consumption rates to be reduced.
- Fuel efficiency, fuel substitution, change of transport mode and demand reduction
  – Increasing difficulty of extracting oil resources means that costs will rise significantly. This drives substantial transformation of the transport sector, with implications for the food system. Biofuels are based on First-Generation technologies, i.e. those that have been developed and can be implemented immediately (but consequently compete with food production).

## 18.3 Comparative Outcomes of the Three Scenario Simulations

The scenario storylines and associated settings for the ASFF model resulted in three very different outcomes in the simulations. We begin by examining the outcomes for food availability, then present the environmental and resource implications, followed by the high-level economic indicators.

### *18.3.1 Food Availability Outcomes*

We use an indicator of national 'net food availability' showing how much of each food group is produced compared to that required by Australians (i.e. domestic production less requirements (in Fig. 18.2)). We assumed that it is possible to import food (and other critical resources) if required when net availability is negative, though this will have an effect on the trade balance (see later) and does not ensure domestic food security.

Although the detailed surpluses and deficits vary among the scenarios, some general outcomes are evident. Importantly, *Control* is the only scenario to achieve food surplus to about 2030. However, no scenario ensures complete food availability nationally throughout the scenario period to 2060. Nevertheless, early in the simulation in all scenarios, cereals, sugar, dairy, oil crops and red meats exhibit significant surplus availability. This is similar to past and contemporary conditions. However, the future situation in the scenarios is more complex than the simple view

**Table 18.3** High level summary of key scenario settings

| | Adjustment | Control | DIY |
|---|---|---|---|
| *Net food availability* | | | |
| Food required (waste and losses) | 50% of food produced is wasted/lost | 44% of food is wasted/lost | 33% of food is wasted/lost |
| Food available | Any deficits met through imports | Reallocate resources to produce nutritious diet in Australia | Reallocate resource to produce nutritious diet in each State |
| *Agricultural production* | | | |
| Energy efficiency | 40% as per overall | 40% as per overall | 50% as per overall |
| Water efficiency (% change pa): | | | |
| intensity of application (reduces) | 0.5% | 0.5% | 1% |
| yield (increases) | 0.5% | 0% | 0% |
| Fertilizer efficiency (% change pa): | | | |
| intensity of application (reduces) | 0.2% | 1% | 0.5% |
| yield (increases) | 1% | 1% | 0.5% |
| Labour productivity | As per background | As per background | −2% per annum, agriculture only |
| *Land and water use* | | | |
| Reduction in productive (food) land by 2035 | −20% to forests for bioenergy | −20% to forests for bioenergy and sequestration | −15% to forests for sequestration only |
| Urban land use (all changes in urban land use are exchanged with land use of 'grazing') | Roll-out of increasing population at current dynamics for household formation, density, etc. | Stop conversion of productive land to residential, increasing high-rise density | Contracting urban area, more people per dwelling, larger households, renovation/adaptation |
| Reduction in proportion of cropland irrigated by 2035 | 40% | 60% | 75% |
| *Energy* | | | |
| Energy efficiency (across economy) | 40% | 40% | 50% |
| Energy production | 30% renewable by 2030, increased gas, CCS from 2025 | Conversion to gas and renewable | Conversion to renewable |

(continued)

**Table 18.3** (continued)

| | Adjustment | Control | DIY |
|---|---|---|---|
| *Transport* | | | |
| Efficiency/demand reduction | Fuel efficiency | Fuel efficiency | Fuel efficiency, demand and distance reduction |
| Mode change | | 90% freight on rail | 50% freight on rail |
| Fuel substitution (where not stated, changes are applied out to 2035) | 15% electric vehicles for new passenger vehicles from 2011 | 100% electric for new passenger vehicles from 2011 | 10% p.a. increase in crop diversion for biofuel |
| | 10% to compressed gas 1% p.a. increase in crop diversion to biofuel | Switch to gas for remaining road freight | |
| *Greenhouse emissions.* | 15–20% by 2030 | 60% by 2030 | 60% by 2030 |
| Target values—reduction on 1990 levels) | 45% by 2060 | 80% by 2060 | 90% by 2060 |

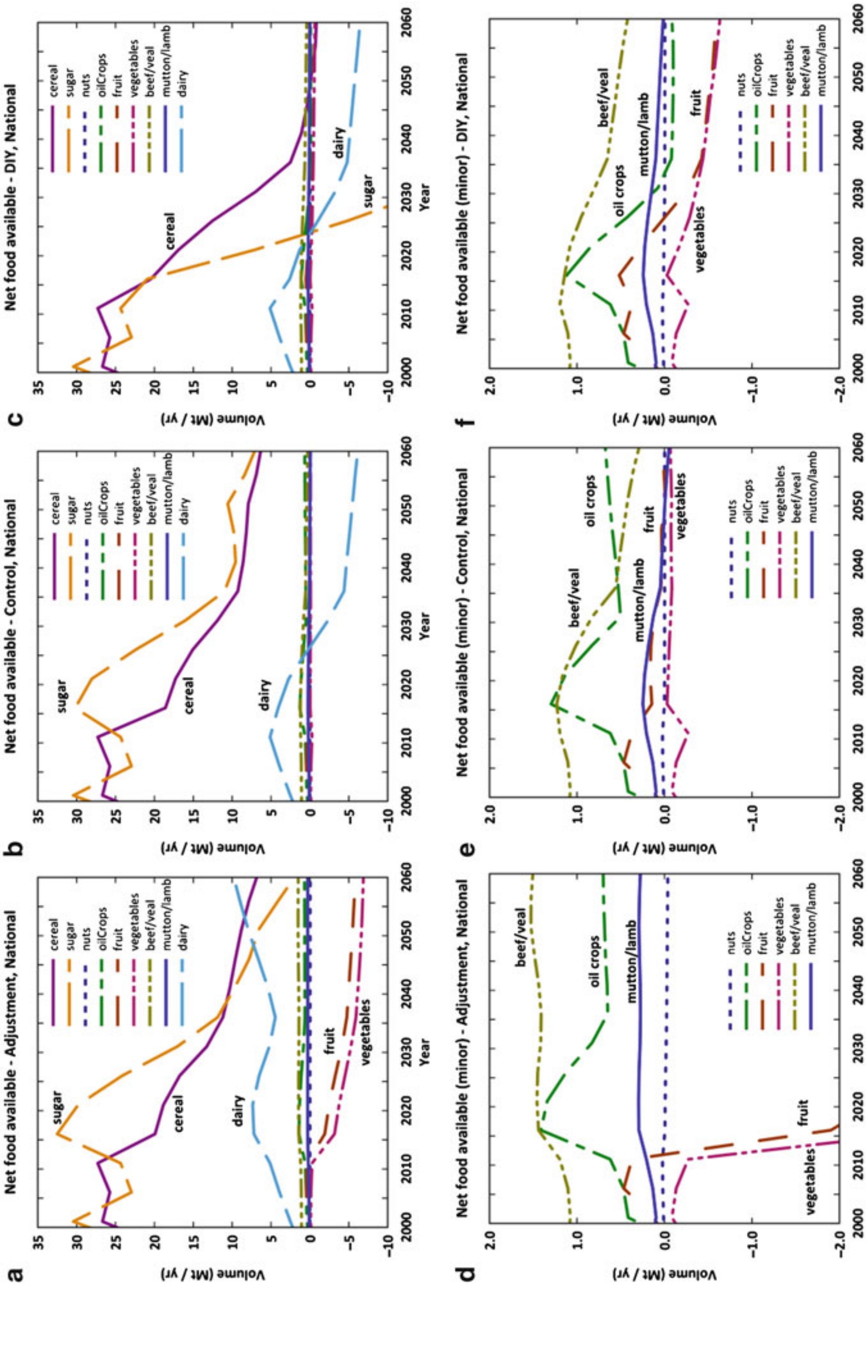



**Fig. 18.2** National net food availability. *Upper graphs* show all food types on the same scale; *lower graphs* expand the scale for the smaller volume food types. **(a)** and **(d)** Adjustment; **(b)** and **(e)** Control; **(c)** and **(f)** DIY

that past trends will prevail into the future. When viewed as a gross total across all food types, there is a fall in the aggregate surplus. This means the overall resilience of the food system to shocks such as disease or climate-related extreme events is reduced, as is any trading position.

Importantly, domestic security of some other nutritionally important foods—fruit and vegetables—is threatened or borderline even early in the scenarios. This is particularly an issue for the *Adjustment* scenario, where there is a substantial deficit. This highlights that a gross surplus of 'food products' is not the same as production of a nutritionally adequate food supply. Security for some other food types vanishes particularly after about 2030, including for some large volume food types such as dairy and cereals. This is an issue for the *Control* and *DIY* scenarios. Even in the *Adjustment* scenario, the mid-century surplus is a fraction of contemporary levels.

These outcomes reflect the series of changes embodied in the scenarios, some of which have competing effects. Some of the reduction in production is associated with land retirement and competition with urban expansion—slightly higher loss of land in *Adjustment* and *Control*, and lowest in *DIY*. Decreasing irrigation partly explains the deficits that occur in fruit and vegetables (*Adjustment*) and dairy (*Control* and *DIY*)—however, in *Adjustment*, gross land loss and ongoing competition with more profitable grazing drive the fruit and vegetable deficit. These effects are partially offset by annually compounding increases in yield associated with water use and fertilizer application—highest in *Adjustment* and lowest in *DIY*. Additionally, alternative land use affects food production, where first-generation bio-fuels divert some cereal, oil and sugar crops from food to fuel—highest in *DIY*, low in *Adjustment* and none in *Control*—or where grazing land (beef, lamb and dairy) is reallocated to fruit and vegetable—highest in *Control*. Finally, the net food availability reflects increasing population size across all scenarios, combined with the nutritious diet consumed and food wastage—highest in *Adjustment* and lowest in *DIY*.

### *18.3.2 Environmental and Resource Outcomes*

To examine environmental and resource outcomes, four overarching indicators have been selected from the ASFF simulations, namely:

- GHG emissions
- Net imports of oil
- Net imports of phosphates (these three indicators in Fig. 18.3)
- Average flow for the Murray River (at river-mouth) in Fig. 18.4

The latter was chosen to illustrate impacts on the Murray-Darling Basin as the major food production basin and an iconic environmental asset. The GHG emissions are estimated from the major sources and sinks across the Australian economy of three key gases ($CO_2$, $CH_4$ and $N_2O$) in terms of equivalent $CO_2$ volumes. As the following shows, none of the scenarios achieve comprehensive environmental and resource outcomes across all four of the indicators.

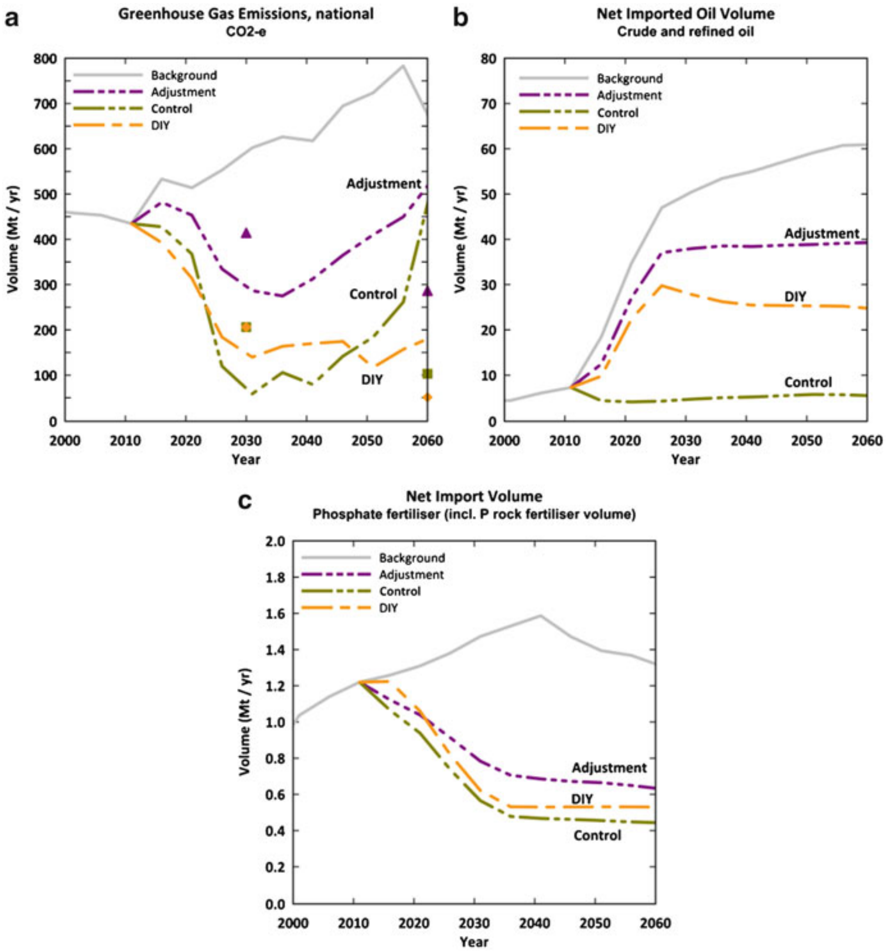



**Fig. 18.3** Scenario comparison of (**a**) GHG emissions and reliance on (**b**) overseas oil and (**c**) phosphates. In addition to the three alternative food security scenarios, the background scenario is also shown to provide a benchmark. The GHG emission targets are also shown as points at 2030 and 2060 (Adjustment—*triangle*, Control—*square*, DIY—*diamond*)

#### 18.3.2.1 Climate Security: GHG Emissions

All scenarios demonstrate significantly reduced GHG emissions compared with the background scenario. However, in the long-term none of the scenarios achieve their respective GHG targets, though the *DIY* scenario produces the best outcomes. It exceeds IPCC requirements by 2020 and its own 60% reduction target at a national level in 2030. *DIY* is also the only scenario that is able to sustain emissions reductions beyond 2040 (though not quite meeting the 90% reduction target). The sustained

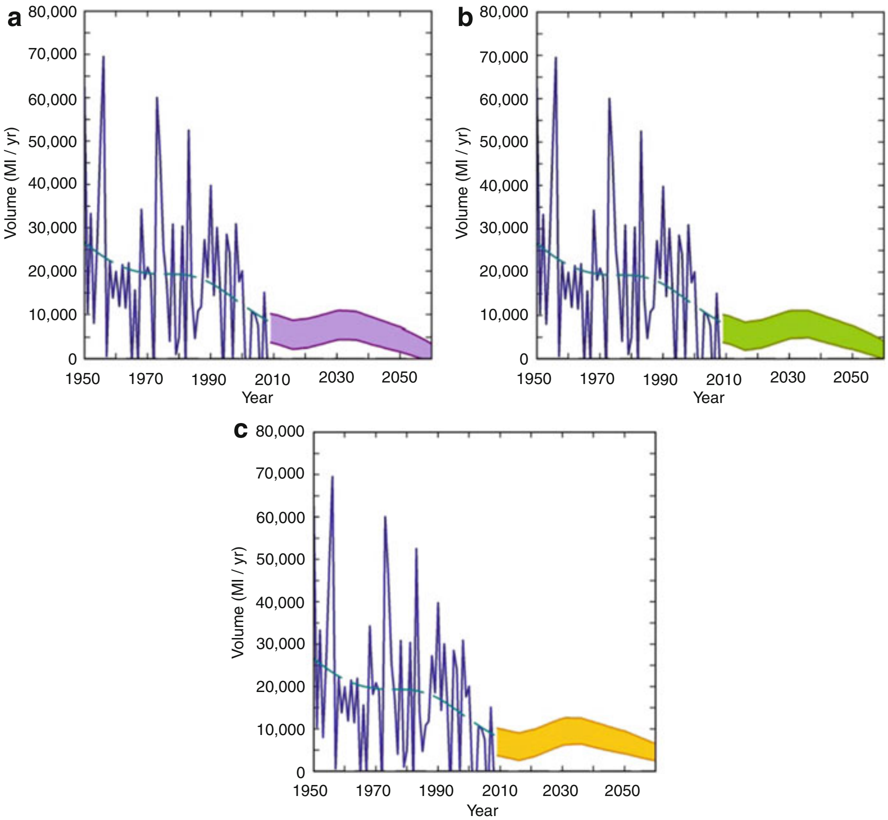



**Fig. 18.4** Water flow at the mouth of the Murray river for the alternative scenarios: (**a**) Adjustment, (**b**) Control, (**c**) DIY

reduction is largely due to a reduced per capita consumption of goods and services (and correspondingly energy use) across the economy. This has relatively negative implications for GDP per capita and unemployment. In the other two scenarios, the economic indicators remain 'healthy' but greenhouse gas emissions start rising again from 2040. This is due to increasing energy demand outpacing efficiency gains and carbon sequestration in forests declining as land availability reduces.

#### 18.3.2.2 Fuel Security

In terms of fuel security, all scenarios reduce reliance on imported oil compared with the background scenario, but only the *Control* scenario manages to reduce net imports below contemporary levels. This is achieved through an immediate shift to electric vehicles (all new passenger vehicles from 2011) and rapid scale-up of gas for electricity and transport fuel. This leads to electric vehicles using more electricity than buildings by 2030 (with some GHG impost) and sees conventional gas resources under severe strain by 2060. By contrast, the substantial diversion of crops for First-Generation bio-fuels in *Adjustment* and *DIY* has relatively marginal impact on oil demand, compared to the decline in Australian oil production, but results in a large diversion of food production.

#### 18.3.2.3 Fertilizer Security

All scenarios reduce reliance on imported phosphorus, but retain a large requirement equal to about half contemporary levels. The significant reductions in imported phosphorus are largely due to demand-side measures: change of diet and reducing waste. Agricultural efficiencies that reduce demand for phosphorus (relative to the amount of food produced) were also included. The requirement for a nutritional diet modelled in this project has a significantly lower requirement for meat products than the Australian average, and therefore lower phosphorus requirement. Additionally, the *Control* and *DIY* scenarios reduce the proportion of meat and dairy products being produced.

#### 18.3.2.4 Water Security

Only the *DIY* scenario is able to provide some degree of security in water supply (in the Murray-Darling Basin) throughout the scenario timeframe (Fig. 18.4). The graphs of river flow at the mouth of the Murray River show about six decades of the simulated reproduction of historical flows, highlighting the large variation typical of Australian river systems as well as the overall recent reduction in average flows largely associated with climatic changes. The scenario trajectories depict a band of outcomes for average flows based on two alternative historical reference periods used in the climate impact calculations (of the same A1FI climate scenario).

Even with substantial reductions in water extraction for irrigation and compounding improvements of water use efficiency, both the *Adjustment* and *Control* scenarios fail to overcome the growing effects of climate change so that average river flow disappears by about 2055–2065. Although loss occurs through water transpired by additional forests grown for carbon sequestration, this has a relatively small impact. Additionally, river-flow variability will place pressure on irrigated food production well ahead of 2050, which was not factored into the net food availability presented above, hence may not be achieved.

The *DIY* scenario employs both substantial reduction (75%) in irrigated land area and reduction in water intensity through high growth in efficiency (1% pa), to maintain environmental flows throughout the scenario period, albeit declining after 2030. The change in area induces the net food deficits in fruit and vegetables noted above.

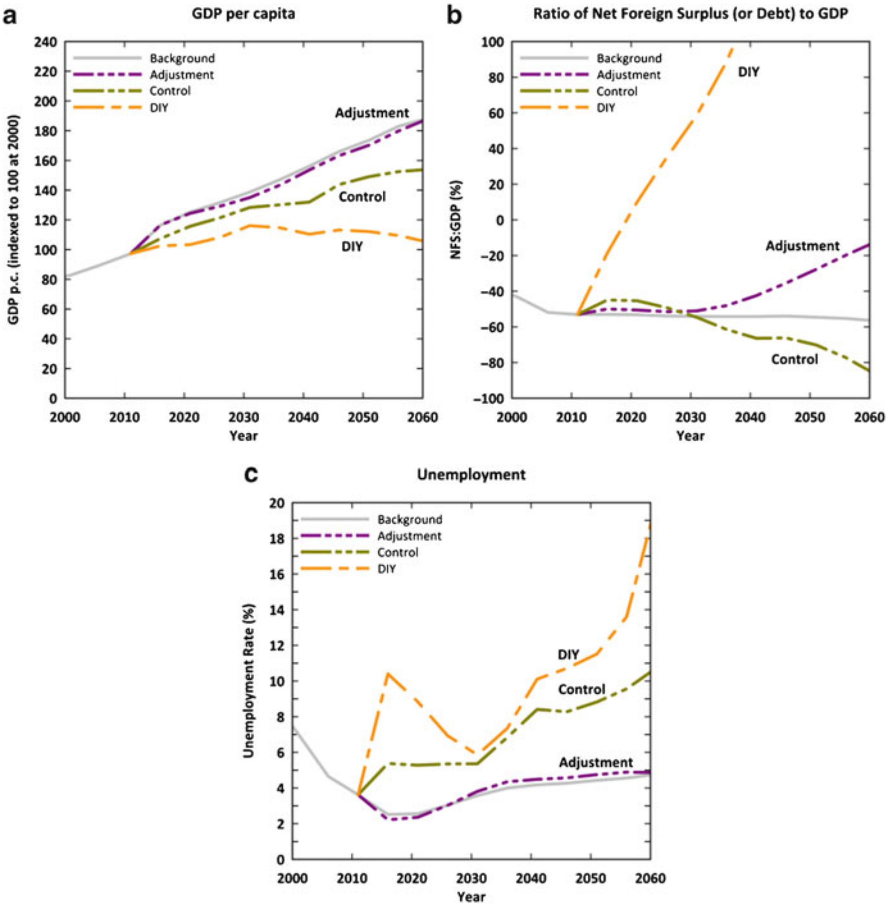



**Fig. 18.5** Economic outcomes of the three scenarios (with the background scenario for reference): (**a**) GDP per capita, (**b**) net foreign surplus:GDP, (**c**) unemployment level

### *18.3.3 Economic Outcomes*

Three macro-economic indicators—GDP per capita, net foreign debt (NFD, relative to GDP) and unemployment level—simulated in the ASFF display markedly divergent pathways in the three alternative scenarios (Fig. 18.5).

The settings and assumptions in *Adjustment* are the least disruptive to attaining the 'ideal' background settings for economic stability. This is very much in keeping with the general intent of this scenario, where change is gradual—'adjusted'—rather than transformational. Along with the highest growth in per capita GDP, they also allow a reduction in net foreign debt. However, this reduction in NFD does not account for potential but highly uncertain price variations in imports of strategic resources such as oil or food. High reliance on imported oil and food in *Adjustment* means that volatile prices for these resources will have the largest impacts on the trade situation. Possibly these might be countered by large exports of energy and food products.

In contrast, *DIY* sees significant structural changes across the economy, reflected in the largest divergence from background ‘ideal’ settings. Marginal growth in GDP per capita is maintained to around 2030, when it plateaus and returns to contemporary levels. This is mostly driven by the reduction in personal consumption that is applied across the economy. While this stabilized economic activity (reduced per capita) would be very challenging, it is this reduction in consumption that allows the large and sustained reduction in energy use, which in turn enables greenhouse gas emissions to be stabilized at a much lower level than in the other two scenarios.

Interestingly, *DIY* also results in a large surplus of the net foreign account balance. The substantial growth in the surplus relative to GDP mostly reflects the reductions in imports due to lower consumption of goods. This extreme surplus is not likely to be sustainable due to anticipated foreign exchange pressures in such a trading position. However, the situation of a foreign trade surplus could provide the financial environment in which to acquire food and other strategic resources where these are lacking domestically.

Due to reduced economic activity a significant rise in traditional unemployment occurs in *DIY*. This is partially offset by higher intensity of agricultural labour in *DIY*, to support local food production. In a similar fashion, fewer jobs in the formal economy present an opportunity for lifestyle changes consistent with the intent of the *DIY* scenario—reduced costs to householders of a lower consumption lifestyle may well enable many to voluntarily reduce their paid working week and increase time spent (and value created) in the ‘informal’ local economy.

The economic performance of *Control* is intermediate between *Adjustment* and *DIY*. Per capita wealth grows, but at a slower pace than in *Adjustment*. Similarly, unemployment grows at a lower rate than in *DIY*. In contrast with the other scenarios, the net foreign account diverges toward greater debt, though the level has not exceeded GDP within the scenario timeframe. The *Control* scenario is the most effective in reducing long-term oil reliance, successfully decoupling growth in the economy from a reliance on imported oil. However, early success in reducing emissions is not sustained, as the overall growth in demand and activity outpaces the large efficiencies achieved through technology and practice change.

## 18.4 Discussion of Challenges and Prospects for Sustainable and Resilient Food Security

### *18.4.1 Summary of Scenario Outcomes*

No single strategy provides an ideal win–win outcome, as the spider diagrams in Fig. 18.6 illustrate for the range of indicators. Indeed, comprehensive food security is not achieved in any scenario, particularly when the potential impacts of constraints

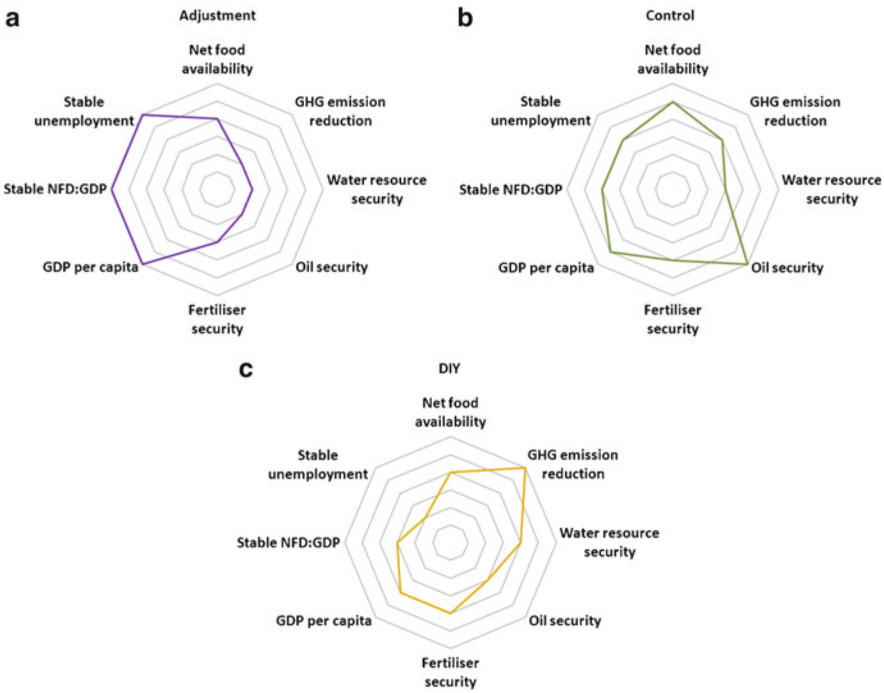



**Fig. 18.6** Relative scenario outcomes using subjective measures on a 'spider diagram.' Better outcomes are toward the perimeter; worse are toward the centre. (**a**) adjustment, (**b**) control, (**c**) DIY

in other critical resources are considered. Overall, *Adjustment* is skewed toward economic benefits, *DIY* towards environmental resilience and *Control* is more evenly balanced though by no means ideal.

In *Adjustment*, a significant deficit of fruits, nuts and vegetables exists by 2030 that worsens by 2060. There is a large surplus of milk and plenty of beef and lamb, enabling ongoing exports. There will be more than enough dairy and meat for the population, even taking into account crop losses from extreme weather events. Energy and water insecurity accelerate, and in the long-term greenhouse gas emissions grow. Disregarding these issues, economic conditions are bright and growing.

In *Control*, up to 2030, there is sufficient or surplus in all food groups—including fruit and vegetables. But by 2060, the reallocation of grazing land for fresh produce leads to a shortage of milk, with constraints in lamb. Australia retains a grain surplus. Energy security is high, but early reductions in greenhouse gas emissions are not maintained. Water security is not maintained. Growth in economic wealth continues, though with some stresses.

In *DIY*, there is adequate supply of all foods in 2030, except cereal grains which are being diverted to bio-fuels at great rates. In 2060, fruit and vegetables are still sufficient but the gradual decline in milk and lamb production means there is less than needed. By 2060, there is not even enough oil crop to cope with both bio-fuel and food demand. While energy security remains problematic, greenhouse gas emissions are reduced and stabilized; and water security is provided. Individual economic wealth plateaus, with modifications in lifestyle implied.

### *18.4.2 Other Issues*

Although the scenarios modelled here represent sophisticated accounts of the food, environment and economic systems, there are several aspects which this preliminary work did not incorporate. We have presented net food availability as a simple indicator of domestic food security. Complete food security, however, depends ultimately on more complex interactions of resource availability, and economic and environmental conditions, both domestically and globally. As an important example, global competition for fossil fuels and fertilizers could impose constraints on Australia's access through international trade to these critical resources. If these constraints were more severe than the net import volumes simulated in the scenarios, then any simulated net food surplus would be in question. In this case, the *Control* scenario is the least exposed, though this scenario implies high sensitivity to long-term water and climate security.

Other interactions also require further scrutiny, such as food production constraints imposed by water supply issues (more significant in *Adjustment* and *Control*), or by wider climate change impacts (potentially more significant in *Adjustment* and *Control*, if global pathways reflect the Australian situation).

There will also be a range of alternative actions to avert food insecurity and other issues that have not been simulated. For instance, it appears that some mix of *Control* and *DIY* may lead to the most comprehensive realization of food security. A rapid and highly coordinated programme to transition vehicles to electrical power in *DIY*, rather than a decentralized bio-fuels pathway, might alleviate oil insecurity, provide employment prospects and resolve food deficits. However, until modelled, it is not clear that such a mixed scenario is internally consistent, and whether it would actually produce the desired outcome. All of the possibilities for fuel substitution that are not quantitatively included in the scenarios would have other costs elsewhere, e.g. increased greenhouse gas emissions (coal-to-gas and coal-to-liquids) or environmental damage (and additional loss of agricultural land or water resources) from accessing non-conventional gas resources.

Finally, we recognize that the vulnerability and resilience of the food system to shocks or rapid systemic change has not been analyzed. This is a critical test of the viability of the food system that will become increasingly significant as the impacts of climate change and peak oil impinge on global and local markets.

### *18.4.3 Challenges and Prospects*

As they stand, the scenarios above depict with numerical clarity the considerable challenges to comprehensive food security that Australia is likely to face in coming decades. In addition to reliance on international imports of some food types in each of the scenarios, the modelling highlighted substantial challenges in security of transport fuels, fertilizers, water resources, land condition and climate stability (indicated by GHG emissions). The multiplicity of such challenges has recently been identified as threats to food security in the Asia-Pacific (Butler 2009), and others identify the need for comprehensive exploratory scenario studies (ESF/COST 2008), such as this work. The challenges not only have the potential to jeopardize domestic and international food supply, but also to seriously impact or disrupt economies and societies, as demonstrated by international food-related riots. Many (if not all) of the issues are gaining awareness in Australian government institutions, but typically there is a reliance on technology-based proposals (PMSEIC 2010; Moir and Morris 2011). Our simulations show that this is unlikely to be sufficient. In order to address the suite of challenges, it is necessary to implement multiple substantial and rapid changes simultaneously across many different areas of the economy (agriculture, transport, energy, consumption and lifestyle). This would appear to require broad community support or action, and considerable institutional change and governance. Given the magnitude and multitude of physical and social transitions involved, the probabilistic prospect of a successful outcome is arguably low.

## 18.5 Summary

Our simulated scenarios confirm that food availability is complex—it is closely linked with resource and land use, trade, employment and energy and water usage. Assessing or managing food availability requires a coherent assessment of the interactions of all of these factors.

We have developed and tested three scenarios to explore food availability and to investigate its interaction with population, resource use and the economy. One scenario, labelled *Adjustment*, assumes free markets and high levels of international trade; *Control*, as the second scenario, assumes strong policy and regulatory intervention in the market to ensure the domestic supply of core foods; the third, *DIY*, envisages a more decentralized future with light, mostly local, government intervention.

The scenarios reflect different strategic approaches to the issue of food availability and create divergent sets of factors for modelling: energy demand, efficiency and sources; allocation of land and water resources; levels of waste and losses; levels of water and fertilizer efficiency in agricultural production; and transport patterns and modes.

The simulations show that under the expected future conditions (climate change, increasing population and diminishing availability of oil), the domestic production of a surplus of required foods cannot be guaranteed. Comprehensive food security is not achieved in any scenario, particularly when the potential impacts of constraints in other critical resources are considered.

## References


ABS. (2008). *Population Projections: Australia, 2006 to 2101*. Australian Bureau of Statistics. Number 3222.0, Australian Government Publishing Service, Canberra

Butler, C. D. (2009). Food security in the Asia-Pacific: Climate change, phosphorus, ozone and other environmental challenges. *Asia Pacific Journal of Clinical Nutrition, 18*(4), 590–597.

Cordell, D., Drangert, J.-O., & White, S. (2009). The story of phosphorus: Global food security and food for thought. *Global Environmental Change, 19*(2), 292–305. doi:10.1016/j.gloenvcha.2008.10.009.

CSIRO-BOM. (2010). *State of the climate*. Canberra: CSIRO; Bureau of Meteorology.

Dunlop, M., & Turner, G. (2003). *Future sustainability of the Australian grains industry; report for the grains council of Australia*. Canberra: CSIRO Sustainable Ecosystems, Resource Futures Program, National Futures.

ESF/COST. (2008). *ESF/COST forward look on European food systems in a changing world*. Strasbourg Cedex, France: European Science Foundation and European Cooperation in Science and Technology.

GA. (2009). *Oil and gas resources of Australia 2006*. Canberra: Geoscience Australia.

IEA. (2010). *World energy outlook*: *Presentation to the press*, International Energy Agency, OECD, http://www.worldenergyoutlook.org/.

Larsen, K., Turner, G., Ryan, C., & Lawrence, M. (2011). *Victorian food supply scenarios: Impacts on availability of a nutritious diet* (p. 121). Melbourne: Victorian Eco-Innovation Lab (University of Melbourne), CSIRO and Deakin University for the Victorian Health Promotion Agency (VicHealth).

Lowe, D., Poldy, F., Kearney, B., Foran, B., & Turner, G. (2003). *Australian fish futures: 2020 and beyond.* Report to the Fisheries Research and Development Corporation. Canberra: CSIRO Sustainable Ecosystems, Resource Futures Program, National Futures.

Moir, B., & Morris, P. (2011). *Global food security: Facts, issues and implications*. Canberra: ABARES.

PMSEIC. (2010). *Australia and food security in a changing world*. Canberra, Australia: Prime Minister's Science, Engineering and Innovation Council.

Schandl, H., Poldy, F., Turner, G. M., Measham, T. G., Walker, D., & Eisenmenger, N. (2008). Australia's resource use trajectories. *Journal of Industrial Ecology*, *12*(5; Special Issue on Material Use across World Regions: Inevitable Pasts and Possible Futures), 669–685.

Schandl, H., & Turner, G. M. (2009). The dematerialization potential of the Australian economy. *Journal of Industrial Ecology, 13*(6), 863–880.

Turner, G. M. (2011). *Consumption and the environment: Impacts from a system perspective*. In P. Newton (Ed.), Urban consumption. Collingwood: CSIRO Publishing.

Turner, G. M., Hoffman, R., McInnis, B. C., Poldy, F., & Foran, B. (2011). A tool for strategic biophysical assessment of a national economy—the Australian stocks and flows framework. *Environmental Modelling and Software, 26*(9), 1134–1149. doi:10.1016/j.envsoft.2011.03.007.

# Chapter 19
# 'Sustainable Standards'? How Organic Standards in the EU and Australia Affect Local and Global Agrifood Production and Value Chains

**Amelie Bernzen**

## 19.1 Introduction

A consequence of the global division of labour is the increase not only of the total number of value chain players participating in product production processes, but also an increase in the geographical distances between them (Gereffi, Humphrey, & Sturgeon, 2005). Standards may be an appropriate tool to govern product and process characteristics of economic activities while making them more transparent and thus ensuring quality and safety in these areas. In recent years, a large array of standards has been developed which differ not only with regard to their geographical diffusion, but also in terms of their respective goals and the key drivers involved (Nadvi & Wältring, 2002).

The role of standards has also received much attention within the field of social sciences, including economic geography over the past few years (e.g. Braun, 2005; Dannenberg, 2008; Higgins, Dibden, & Cocklin, 2010; Mutersbaugh, Klooster, Renard, & Taylor, 2005; Nadvi, 2008; Ouma, 2010). Here, the discussion takes place particularly in the context of theoretical concepts dealing with international trade and governance processes along global value chains (Gereffi et al., 2005) and production networks (Henderson, Dicken, Hess, Coe, & Yeung, 2002). Generally speaking, a value- or production chain can be understood as the connection from raw material(s) via production and manufacturing processes to the final product's point of sale (Kulke, 2008).

Based on this broader theoretical framework, this chapter aims to contribute to existing standards literature[1] by focusing on different impacts that organic food standards have on value chain segments under specific national policy environments.

[1] For food standards, see also e.g. literature summarized in Higgins et al. (2010).

A. Bernzen (✉)
Institute of Geography, University of Cologne, Albertus-Magnus-Platz, 50923 Cologne, Germany
e-mail: a.bernzen@uni-koeln.de

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_19,


**Fig. 19.1** Environmental and social standards in the food sector (selection)

In a comparative approach between the EU and Australia, particular attention is given to sustainability on the environmental, economic and social levels. Assuming that value chain governance is a key to sustainable food security (El-Hage Scialabba, 2007) and standards are one aspect of this governance, I will also address the contribution organic agriculture can make to food security. Before discussing the two cases in more detail, a short overview of the rise and role of food and agricultural standards in global value chains will be given.

Due to their powerful position within international food value chains, environmental and social standards (Fig. 19.1) are set mainly by industrialized nations such as the EU or the USA, while developing countries are still broadly 'standard takers' (Nadvi, 2008). The increase in the number and variety of standards over the past decades can generally be explained by two parallel developments.

First, food products are highly sensitive consumer goods and are frequently in the spotlight of public and social discussions (e.g. Lockie, Lyons, Lawrence, & Halpin, 2006). Actual or perceived food scandals, environmental scandals[2] and scandalous working conditions caused media and civil society organizations (e.g. Greenpeace, Oxfam) to encourage critical observation of production methods among the general public. This led to an increasingly informed population and higher awareness in society and among consumers (Lockie, 2006; Nadvi & Wältring, 2002). A second trigger for the development and implementation of environmental and social standards was the concentration of the European food retail sector to a few large companies and/or chains (e.g. Busch & Bain, 2004). One could observe the rise of large international supermarket chains and manufacturing companies as well as increasingly complex contracts between producers, suppliers and customers along value chains that became more and more globalized. This complexity was to be reduced by the introduction of, adherence to and control of standards that apply to all segments of the respective value chain, and thus facilitated the coordination of trade flows.

[2] These include, respectively, e.g. mad cow disease, swine flu, dioxin, *E. coli* contamination, and the discussion around whaling and oil leakages.

The drivers behind these food standards are thus to be found both among public bodies (such as national governments) as well as in the private sector (Bingen & Busch, 2006; Busch & Bain, 2004). Due to increasing pressure from society, the large European food retailing chains saw the need to introduce their own standards. The number of these private standards, and especially the number of companies and products certified to them, has risen significantly over the past 15 years, and some have become quasi-mandatory (Busch & Bain, 2004; Dannenberg, 2008).

Apart from labelling regulations, an independent control system (third party certification) is a key element of many standards, by which companies can—at least to some extent—externalize certain control functions regarding, for example, product quality or production processes. Here, accredited certification bodies carry out regular audits to inspect whether the standard's requirements are met by all companies along the value chain and whether stringent documentation and traceability are guaranteed (e.g. Bingen & Busch, 2006). Depending on national regulations, certification bodies can be either state-operated or private, non-governmental businesses (e.g. Thiers, 2006).

Following this introduction, the structure of this chapter is as follows. Drawing on recent literature, the next two sections will give a brief overview of the existing organic standards and regulation in the EU and in Australia. The following section draws both on literature as well as on my own empirical data drawn from 60 qualitative interviews with company representatives and organic industry experts in Germany and Australia in 2010. It discusses both the positive and challenging impacts of these standards for the different segments of the value chain (i.e. producers and farmers, manufacturers, retailers and consumers), including the question of whether and how organic standards regulation can contribute to food security, sustainable or resilient food systems. The final section concludes this chapter with some remarks on the 'sustainability' potential of environmental standards and ongoing challenges.

## 19.2 Organic Standards in the EU and Australia

### *19.2.1 EU Regulation on Organic Farming*

Organic food products are currently experiencing double digit growth rates and are thus one of the fastest growing food sectors globally. In 2010, Germany was the largest market for organics in the EU and the second largest worldwide, with a turnover of EUR 5.8 billion and a 3% share of organics among the total national food sales (Willer & Kilcher, 2011). The total number of operating businesses certified against the EC-Eco-regulation has risen beyond the 200,000 mark (BÖLW, 2010).

In the EU, organic farming practices go back to the 1920s. The common idea was to grow and produce healthy, chemical-free and tasty food in a sustainable way, making sure that the environment was protected. Professional organizational structures were created since the 1980s in the shape of umbrella organizations and organic farmers associations, some of which still hold private organic standards today (e.g. in Germany: Bioland, Naturland, Demeter).

Over the past 20 years, the number of producers and manufacturers entering the organic market grew rapidly, which caused the previously manageable group of 'niche' actors in the organic sector to become much more extensive, confusing and anonymous. In order to maintain and strengthen consumer trust in the organic brand as well as protect them from misleading labelling practices, both private organic farmers associations and the international umbrella organization for organic farming (International Federation of Organic Agriculture Movement (IFOAM, founded in 1972)) urged European government to regulate the term 'organic' at an EU level. The basis for the first minimum EU standard launched in 1991 were private standards by farmers associations and the *Codex Alimentarius* issued by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Since then, products (including imports) sold on the EU market with an organic declaration (on their label) must fulfil (at least) the criteria of the EC-Eco-regulation, and all companies along the value chain must be certified accordingly by an accredited control body (Table 19.1).

**Table 19.1** Comparison of the EU and Australian settings (*grey*) and organic standards regulations

| Characteristics | EU | Australia |
|---|---|---|
| Geographic integration (spatial) | Europe, bordering on several non-EU countries | Australasia, geographical isolation (island) |
| Import and hygiene regulations | EU-harmonization of food standards; free movement of goods within the EU | Very strict (AQIS):<br>Quarantine Act 1908<br>Imported Food Control Act 1992 |
| Ecological conditions of agricultural land | Relatively good rainfall and soil fertility (regional variations) | Increasing problems due to soil degradation, drought, flooding, biodiversity loss (regional variations) |
| Support of organic industry | Subsidies, expected to increase; research funding programmes | No direct financial support; almost no funding of R&D |
| Standard names and year of implementation | Council Regulation (EC) No 834/2007 on organic production and labelling of organic products (2007, replaces first version of 1991) | The Australian Standard for Organic and Biodynamic Products—AS 6000–2009 (domestic and import standard) (1992)<br>The National Standard for Organic and Bio-Dynamic Produce (export standard) (2009) |
| Spectrum | Process standard | Process standard |
| Relevance | Crucial for food sold as organic in the EU; with increasing imports, gaining importance in non-EU countries producing for the EU market | AS 6000: reference document to assist enforcement of existing legislation in Australia<br>National Standard: crucial for Australian organic produce intended for export and common for the domestic market |
| Regional dispersion | EU (legally effective); globally (certification) | Australia |

(continued)

**Table 19.1** (continued)

| Characteristics | EU | Australia |
|---|---|---|
| Function | Quality and environmental standard | Quality and environmental standard |
| Key drivers | EU-Commission, EU member state Ministries of Agriculture, European organic farmers' associations | AS 6000: organic industry, government, consumer groups in Australia<br>National Standard: Australian government and certification bodies in response to 1991 EU standard |
| Forms | Management standard, labels | Management standard |
| Regulatory implications | Mandatory certification against standard for sale as 'organic' on EU market | AS 6000: voluntary certification against standard for sale on Australian market, but companies must be able to substantiate organic claim. AS 6000 reference document in court (leads to quasi-mandatory certification against AS 6000 or other 'equally reliable' standard)<br>National Standard: mandatory certification for exported Australian organic produce |
| Ongoing developments | New mandatory EU logo as of July 2012; international efforts made to harmonize standards and facilitate mutual acceptance of different standards worldwide | Ongoing development of AS 6000; efforts made to create one single standard for both domestic and export markets |

Today, the revised and effective version 'Council Regulation (EC) No 834/2007 on organic production and labelling of organic products' is one of the most important (supra-) national standards worldwide which set legal requirements for organic agriculture (Fig. 19.2).

### *19.2.2 Organic Standards in Australia*

In comparison to the EU, the Australian market for organic produce is small with a 2010 turnover of EUR 536 million (Willer & Kilcher, 2011). While it has also experienced steady growth rates of over 10% annually in recent years and is said to be one of the fastest growing markets worldwide (IBISWorld, 2010), its share of total national food sales lies at approximately one percent. The number of certified operators in Australia was approaching 3000 by the late 2000s (Mitchell, Kristiansen, Bez, & Monk, 2010), much less than in the EU, but also continually increasing by an average of four percent. At the same time, Australia features the largest area of organically managed land worldwide (over 12 million ha), most of this being extensive grazing land and pastures (Willer & Kilcher, 2011).

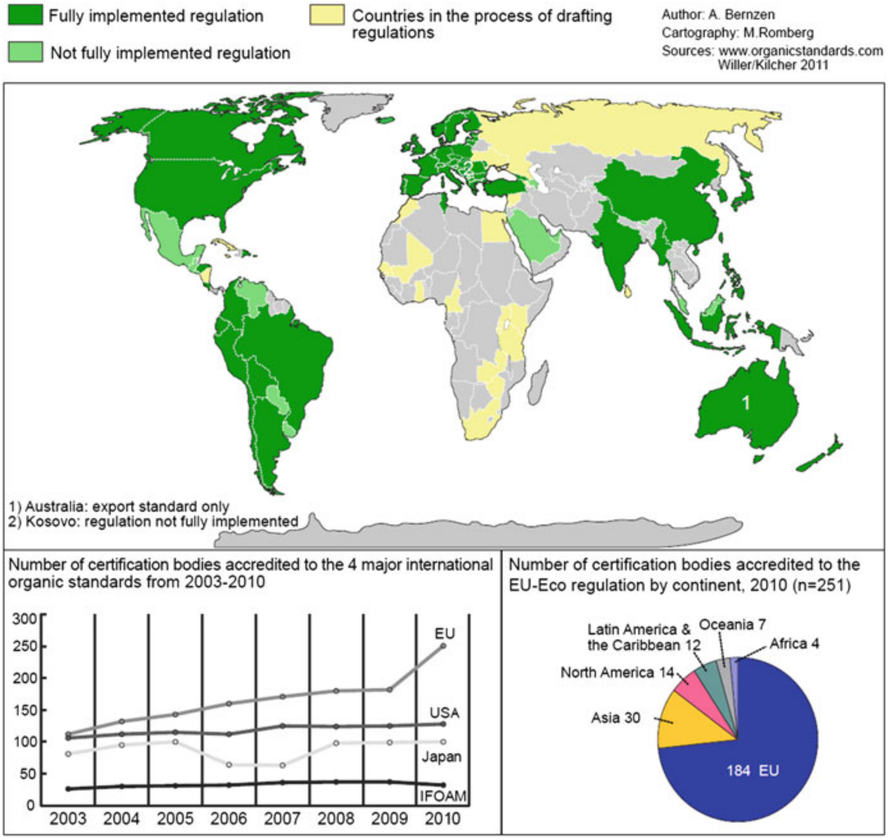



**Fig. 19.2** Implementation of organic standards worldwide/number and dispersion of EU-accredited control bodies worldwide (*Source*: Bernzen & Dannenberg, 2012)

Agricultural practices applied by Australia's first organic farmers in the 1940s were based on ideas and values imported from Europe (Jones, 2010). These often challenged the significantly different natural settings in Australia, which led to the native landscape being somewhat adapted to fit the ideals developed for European circumstances. Like in Europe, first attempts at more widely recognized organic standards and certification processes came in the shape of private organizations that audited operators against their own private standards and used their own logos (see Fig. 19.1).[3]

The story behind the development of public organic standards in Australia started off with quite a different motivation than in Europe, and has experienced some very recent dynamics which leads to a currently heterogeneous setting with two public (Government) standards and various private ones. Generally, Australia has very

[3] For example 1986: National Association for Sustainable Agriculture Australia (NASAA); more followed in the 1990s/2000s; the peak body Organic Federation of Australia (OFA) was founded in 1997.

strict food policies, labelling requirements and sanitary and phyto-sanitary standards which are supervised by the Australian Quarantine and Inspection Service (AQIS) (for imports). These can be related to Australia's geographic isolation (compared to the EU) and the perceived need to protect the natural environment and arable land from external threats[4] (e.g. Diamond, 2005). The Federal Government only slowly began taking an interest in more sustainable farming methods (including organic) from the 1980s (e.g. Andrée, Dibden, Higgins, & Cocklin, 2010; Higgins, Dibden, & Cocklin, 2008), later driven mainly by the implementation of the 1991 EC-Eco-regulation with its strict import requirements. State and federal governments have always been in strong support of policy measures that benefit conventional, export-oriented production and marketing. In order for Australian *organic* produce to be sold in the European market, the Government was forced to respond by implementing standards and a compliance scheme which was recognized by the EU as being equivalent to that of the EU itself (Wynen, 2007). The result was the 1992 national organic standard (in the following: National Standard) which became mandatory for export purposes. The main actors involved in its development were public (AQIS) and private (NASAA, Biological Farmers Australia (BFA), and other organic grower organizations) bodies. Today, we find in the Australian organic sector a co-regulatory system instead of a mandated (e.g. EU) or self-regulatory system. This implies that the organic sector and the government work together for standards as part of 'hybrid' governance strategies.[5]

A key event which triggered the launching of the second public organic standard, the Australian Standard for Organic and Biodynamic Products (AS 6000–2009; in short: AS 6000), was a 2007 court case regarding the mislabelling of conventional eggs as organic. At the time, judges faced the problem that there was no reference document providing a recognized definition for the term 'organic' within the Australian market. To fill this gap, AS 6000 was developed by a Technical Committee consisting of representatives from relevant organizations, such as government agencies, certification bodies, consumer interest organizations, organic farmers associations and trade/retailer associations, other industry representatives as well as technical experts. It was also open for public comment and received record numbers of responses from both the public and industry representatives. The first version was launched and published by Standards Australia in October 2009. In addition to regulations on sustainable food production, it also contains relevant paragraphs on organic cosmetics. This standard is voluntary[6] but can be used by government to execute existing legislation (e.g. misleading or deceptive conduct in labelling) (see Table 19.1).

[4] The past two centuries of European settlement have caused considerable ecological damage through the introduction of alien flora and fauna, unfavourable climatic conditions including drought and flooding, and habitat destruction from extensive tree clearing and urbanization. In combination with relatively infertile soils and inadequate farming methods, these factors have led to land degradation by soil erosion, salinity and deforestation.

[5] See Higgins et al., 2010 for a case on Environmental Management Standards in the Australian dairy industry.

[6] Generally speaking, very few standards are actually mandated in Australia, the general approach being to leave the market to regulate itself and only interfere when obvious market failure can be observed.

### 19.2.3 Organic Standards, Food Security, and Value Chain Sustainability

The last decade or so has seen a growing interest in the potential impacts that alternative and sustainable types of agriculture (such as organic farming) have on food security.[7] A good number of publications, ranging from peer reviewed papers and articles to conference proceedings (with collections of individual case studies), reviews or position papers, have emerged that deal with the potential of organic agriculture to contribute to food security, often in comparison to conventional (chemical) farming. One of the most detailed and comprehensive collections of overview reports and case study papers at present are the conference proceedings for the 'International Conference on Organic Agriculture and Food Security' organized by the FAO and held in Rome in 2007 (e.g. El-Hage Scialabba, 2007).

While keeping in mind that a considerable number of these publications fall into the 'grey literature' category, and the scope of this chapter does not allow for a detailed review, some general comments can be made. Overall, we can see that the authors differentiate between the impact of certified vs. noncertified organics, local vs. global food security, and the impact on food security in developing countries vs. developed countries. Regarding the latter point, most case studies in fact deal with the global South, where solving food security issues seems more urgent at present; those that deal with industrialized countries are mostly case studies in Europe or Northern America. Explicit studies on Australia are extremely scarce (see below). Many authors are positive or at least optimistic that organic farming is a future alternative to conventional (chemical) farming with positive impacts on food security (e.g. Badgley et al., 2007; Parrott & Marsden, 2002), while also recognizing the challenges organic agriculture is facing in this regard (e.g. El-Hage Scialabba, 2007; Halberg, Peramaiyan, & Walaga, 2009; Paull, 2010). Some are very critical of this prognosis (e.g. Connor, 2008; Trewavas, 2004). A few papers also highlight the need for stringent international, national and private organic standards, policies and regulations (e.g. El-Hage Scialabba, 2007). All publications stress the urgent need for more research in order to come to a comprehensive conclusion on the contribution that organic agriculture can make to food security.

As Badgley et al. (2007) point out, 'production methods are but one component of a sustainable food system'. We thus need to look beyond the farm level for a comprehensive understanding of the potential contribution organics can make towards sustainable food security and systems. This section will look at the positive and negative consequences of the described European and Australian organic regulations and standards for individual segments of the value chain. Where possible, the above mentioned literature on organic agriculture and food security will be drawn upon.

[7] 'Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'. (World Food Summit 1996 in Halberg et al., 2009) Four dimensions of food security are defined as: food availability, food access, food stability, food utilization.

*Producers and farmers* are in charge of the agricultural production of raw materials. How could organic farming (standards) enhance the environmental sustainability of food production or the viability of their farms? The viewpoints on this issue are quite heterogeneous. European policy tends to support organic food production as a contribution to environmental and regional sustainability; and there are EU rural development programmes and funds for research on organic agriculture, production and marketing. In Australia, organic farming is generally viewed by conventional farmers and farming organizations as environmentally damaging: it is equated with refusal to use chemicals such as herbicides and fertilizers, resulting (in this view) in degraded soils and the unchecked spread of weeds.[8]

The actual environmental impact of production according to organic standards has been addressed in a number of case studies over the past decade. The majority of these studies suggest that organic farming can be a sustainable alternative to conventional land management, as it is said to show major benefits to the environment, maintaining or even resulting in increased yields (Badgley et al., 2007; various chapters in Kristiansen, Taji, & Reganold, 2006; for Australia, Dumaresq & Greene, 2001; Wells, Chan, & Cornish, 2000). A few grey literature case studies for arid and semiarid countries have found organic systems to be more drought-resistant, a fact that could be worth looking at in the Australian climatic context.

However, it remains a controversial debate. There is no clear answer as yet to the question of whether organic agriculture will further 'conventionalize', including a further increase in scale (with larger organic farms) and remain environmentally sustainable in the process, as this depends on various factors (Best, 2008; Lockie et al., 2006; Thiers, 2006, see also literature summarized in Andrée et al., 2010). Critics also argue, for instance, that a complete shift to organic production would result in lower productivity which would be insufficient to guarantee food security around the world (Connor, 2008; Kirchmann, Bergström, Kätterer, Andrén, & Andersson, 2008; Trewavas, 2004). A major concern raised in Australian studies is the long-term low phosphorus level in soil under organic management (Burkitt, Small, McDonald, Wales, & Jenkin, 2007; Penfold, Miyan, Reeves, & Grierson, 1995).

While more research seems necessary to come to a clear conclusion regarding the environmental sustainability of organic farming methods, one economic incentive and motivation for farmers to produce according to organic standards is the attractive premium price that can be gained in the market for certified produce (e.g. Best, 2008; Hatanaka, Bain, & Busch, 2005; Higgins et al., 2010). This not only applies

[8] This latter view is interesting in so far as that (a) productivist agricultural practices (as found e.g. in Europe, Australia or the US) have been shown to include a broader set of practices that are 'widely recognized as environmentally damaging and probably unsustainable in the long term' (Andrée et al., 2010; Dibden & Cocklin, 2005, 2009), and (b) that organic standards, both in the EU as well as in Australia, have the explicit objectives to be sustainable. They accordingly prescribe detailed farming practices aiming to improve environmental management. These include, for instance, rules on biodiversity, landscape-, soil- and water management, plant protection and livestock husbandry.

to consumer markets such as the EU, Australia or the US, but to many other countries around the world. Organic standards have increased opportunities for producers in developing regions to participate in the organic markets of developed nations—not only for so-called 'exotic' products, but also for seasonal products or cost-competitive alternatives. In this way, the EC-Eco-regulation has a decisive impact on production and processing in so-called third countries which seek market access to the EU. Australian standards will have minimal effect in these countries due to more flexible import regulations (see below). At the same time, there is an ongoing discussion on the potential exclusion of smallholder farmers in developing countries from large international markets because they are unable to afford the time-consuming and cost-intensive certification of their operations (Bingen & Busch, 2006; for GlobalGAP see e.g. Dannenberg, 2008). This is the case especially if a separate certification is required[9] for every respective new market that could theoretically be tapped (e.g. González & Nigh, 2005; Hatanaka et al., 2005).

The next segments in the value chain are *food processors* who refine raw material and produce end products; and *retailers* who sell both fresh and processed food to commercial and private customers. For these types of firms, the implementation of standards and third party certification systems has facilitated the entry of formerly conventional companies to the organic market, contribute to competition and make organic products accessible for mass consumption (Mutersbaugh et al., 2005). This is shown for instance by the entry of large supermarket chains and discounters into the organic market.[10] Thanks to their powerful position and high demands in terms of volume and quality standards within global production networks, these companies often have a large potential to influence organic market growth and push certified organic production. In combination with growing consumer demand for local or regional produce, this can be especially applicable to local producers of organic goods. Suppliers are frequently not only required to adhere to minimum organic standards (such as the EC-Eco-regulation), but often also to stricter private retailer standards. Retailers often conduct their own audits on top of third party certification. The main reason here is to minimize any potential risk of a food scandal, resulting in negative press and a loss of reputation as a consequence (unpublished interview data 2010).

However, the regulation of organic agriculture and its related control systems also creates various problems. Scientists as well as trading companies criticize certain aspects of the existing *certification system*[11] (unpublished interview data 2010).

[9] There are still variations between the organic standards held by major economies with a high organic market share worldwide and mutual acceptance is still not always given.

[10] Recent years have also shown the establishment of purely organic supermarket chains, such as *basic* or *Alnatura* in Germany.

[11] Certifiers are accredited by Government authorities. In most European countries, certifiers are private, nongovernmental businesses that are independent of standard-setting (organic farmers') associations. In Australia, many organic farmers associations are simultaneously standard developers/holders and certifiers of these standards (or have subsidiaries).

While Australian interviewees tended to trust and rely on certification bodies and their inspections, in Germany a common accusation was that company audits were no more than an inspection of documentation and other 'paperwork' which could facilitate actions of fraud, e.g. declaring conventional goods as organic.

A further concern is *product quality*. An issue often addressed is the lack of knowledge regarding organic production and processing methods among those farmers, often in developing countries (Bingen & Busch, 2006), who have only recently been encouraged to convert to organic management as a result of increasing demands within the EU or other organic markets. This knowledge gap is often related to insufficient consultation and training. 'New' organic farmers are familiar neither with the organic 'ideology' nor with the details of overseas' organic standards (see also Thiers, 2006). Given that certifying bodies themselves are not permitted to consult the operators they inspect, some certifiers have (independent) subsidiaries which offer consultation services. Alternatively, necessary training of farmers is frequently only provided by committed importing companies in buying countries who place a strong emphasis on close relationships with their suppliers (see also Bingen & Busch, 2006). If this kind of involvement does not exist, either due to lacking expertise or personal and financial resources, there is a fair chance of mismanagement and employing farming practices that do not satisfy (European) standards. This is why some producing countries suffer from severe problems regarding their reputation, above all China (see also Thiers, 2006), but also Turkey, and—within the EU—Italy or Spain (unpublished interview data 2010).

While the above mentioned problems refer mainly to the EU, discussion regarding the use of organic standards remains more on a macro-level among traders in Australia. Formerly to gain consumer trust, most operators selling products labelled organic in Australia chose to be certified against an organic standard. Today, AS 6000 can serve Australia's regulatory authorities as a tool to enforce existing legislation (Lockie et al., 2006). This means that making false, misleading or deceptive claims on the quality of a product on its packaging is now illegal and can lead to prosecution.

However, companies are not forced to use one particular standard—unlike in the EU where EC-Eco-regulation is a requirement—and opinions vary on the usefulness of the new AS 6000 or National Standard, or the benefits of public versus private organic standards. AS 6000 is still at a very early stage, and hardly any operators are certified against this standard. On the domestic market, private standards are still predominantly used. For exports, until a single standard has been created from the existing two public organic Australian standards, companies still refer to the National Standard governed by AQIS. To import an organic product for sale in Australia, the importer should be able to prove that it comes from an 'equally reliable system'. These latter systems are determined by the Government.[12] Overall, import regulations of organic produce to Australia are much less restrictive than those of the EU and

[12] Currently accepted are the EC-Eco-regulation, USA National Organic Programme (USA NOP), Switzerland, Japan, Canada, Taiwan and New Zealand; as well as the IFOAM group of standards.

involve much less administrative involvement on the part of Government bodies and agencies (Grolink, 2010).

On another level, importing companies often complain that general AQIS import regulations are often more troublesome than organic standards themselves and can be an impediment to market access especially for fresh produce (see Table 19.1). For example, where AQIS requires a certain product to be fumigated before entering the country, this procedure is against the organic principle and goods would lose their organic status.

Like farmers, the values that *end consumers* associate with organic food are equally heterogeneous. Attributes range from a belief in 'healthy', 'sustainable', 'responsible', 'safe' and 'high quality' foods to confusion and scepticism regarding the integrity and trustworthiness of organically labelled products (Lockie, 2006). Recent studies have shown, however, that certification logos are crucial for end consumers as they make it possible to identify products that are monitored to meet a certain organic standard (e.g. Higgins et al., 2008). These logos can refer to public and private standards. The hexagon-shaped organic logo introduced by the German government in 2001 (see Fig. 19.1) has since been able to gain a high level of awareness and thus also consumer trust and acceptance. Some trading companies and retailers believe that having too many different logos is a disadvantage because this will confuse the consumer regarding the attributes of organic quality, conventional, and genetically engineered foods (Lockie, 2006), especially where there is no legal definition of the term 'organic'. The latter point of criticism is also apparent in a recent study on marketing communications of organic products on the Australian market (Henryks & Pearson, 2010). They argue that AS 6000 can contribute to sustainable growth of the organic market by enhancing consumer demand and assurance. The question of the relative commitment and responsibilities of government and industry in pushing an aligned marketing campaign (including a single logo) for higher consumer awareness is still undergoing renegotiation.

## 19.3 Conclusion

This chapter has shown the extent to which standards have gained importance in the production and trade of organic food in different national policy and environmental circumstances (Table 19.1) and has given some insight on the potential impacts of these standards on sustainable food systems and food security. When looking at improving food security on a local and national level, an important question still focuses on the degree to which farmers can increase domestic food production with cheap, low-cost, locally available technologies and inputs. At the same time, this should be carried out in a way that does not add to previous and ongoing environmental harm caused by agriculture. This is true and urgent not only for developing countries, but perhaps increasingly also for Australia given the environmental problems the country is facing and growing population that needs to be fed. While organic standards explicitly prescribe more environmentally friendly farming and production methods, and while some studies provide evidence that there is potential for contributing to longer term sustainability and food security, more research is needed in this regard. In contrast to Australia, the EU benefits from public funding for R&D projects on organics.

However, even if we assume that organic agriculture is environmentally, economically and sociably more sustainable in the long-term and can contribute to food security, increasing consumer demand for certified products is not sufficient to promote increased production. Relevant national political institutions are also crucial to encourage farmers to convert to these alternative types of agriculture[13] (see e.g. Andrée et al., 2010; Higgins et al., 2008). There are signs that the Australian organic industry would welcome increased Government involvement, including mandatory certification and a single standard with government-issued logo like in the EU. However, due to the current relatively higher commitment of the private sector, it is important that they support a single standard to increase the potential of organics to contribute to a more sustainable food system.

In countries with voluntary standards, like Australia, certification and product labelling become quasi-mandatory for companies to stay competitive and maintain consumer confidence. In the case of large markets with significant volumes of imported goods and mandatory certification systems, such as the EU or the US, the geographical range of relevant standards can extend far beyond the countries of the standards' origin. In both cases, the certification and unbroken documentation of the flow of goods along the value chain are thus crucial criteria when traders, importers and retailers choose their suppliers.

Despite various advantages of standards and third party certification, notably the improved (though not perfect) cross-border traceability and the possibility to implement and monitor farm management practices that aim towards more social and environmental sustainability, the examples discussed also show some problematic areas. On the one hand, committed importing companies see the need to invest in their own projects in production countries or provide training to ensure 'organic' knowledge and product quality. On the other hand, producers in developing countries who are faced with significant financial and management investments when implementing organic standards may ultimately be excluded from participating in the market. In order to reduce trade barriers, establish more transparency and avoid the exclusion of smallholder farmers as far as possible an 'International Task Force on Harmonization and Equivalence in Organic Agriculture (ITF)' was formed at the initiative of UNCTAD,[14] FAO and IFOAM between 2003 and 2008, which developed tools towards a harmonization and simplified mutual recognition of organic standards worldwide.

The observed difficulties in this global harmonization process, however, pose the question of how far national standards are deliberately employed as non-tariff

[13] Some studies show that this may not apply to such a degree to noncertified organic farming on the local level for own consumption e.g. in developing countries.

[14] United Nations Conference on Trade and Development

barriers (NTB) and protectionist measures. Another controversial point is the question of whether too much global harmonization will lead to a watering down of organic standards.[15] The Australian approach with its greater flexibility in the acceptance of several global organic standards for imports is seen by some as a 'role model' to overcome these NTB issues (Grolink, 2010).

In general, it can be assumed that the increasing importance of standards will have a continuous, strong impact on the world organic trade regime. Their relevance for society, both among consumers as well as producers, and persisting challenges for the public and private sectors in the implementation of standards to contribute to increasingly sustainable food systems and improve food security, make these standards—as one type of regulation in the global value creation processes—an important field of research.

**Acknowledgements** This paper is based on work supported by the German Research Foundation under the research project 'ImPOrt'. I am grateful for the constructive feedback of one anonymous reviewer, as well as for support received by Boris Braun, Peter Dannenberg and Paul Kristiansen.

## References

Andrée, P., Dibden, J., Higgins, V., & Cocklin, C. (2010). Competitive productivism and Australia's emerging 'alternative' agri-food networks: producing for farmers' markets in Victoria and beyond. *Australian Geographer, 41*(3), 307–322.

Badgley, C., Moghtader, J., Quintero, E., Zakem, E., Chappell, J. M., Aviles-Vázquez, K., Samulon, A., & Perfecto, I. (2007). Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems, 22*(2), 86–108.

Bernzen, A., & Dannenberg, P. (2012). Ein "Visum" für Obst. Umwelt- und Sozialstandards im internationalen Lebensmittelhandel. *Geographische Rundschau, 64*(3), 44–52.

Best, H. (2008). Organic agriculture and the conventionalization hypothesis: A case study from Western Germany. *Agriculture and Human Values, 25*(1), 95–106.

Bingen, J., & Busch, L. (2006). Shaping a Policy and Research Agenda. In J. Bingen & L. Busch (Eds.), *Agricultural standards: The shape of the global food and fiber system* (pp. 245–250). Dordrecht: Springer.

BÖLW, Bund Ökologische Lebensmittelwirtschaft (Ed.) (2010). Zahlen, Daten, Fakten: Die Bio-Branche 2010. Bonn.

Braun, B. (2005). Building global institutions: The diffusion of management standards in the world economy—an institutional perspective. In C. G. Alvstam & E. Schamp (Eds.), *Linking industries across the world: Processes of global networking* (pp. 3–27). Aldershot: Ashgate.

Burkitt, L. L., Small, D. R., McDonald, J. W., Wales, W. J., & Jenkin, M. L. (2007). Comparing irrigated biodynamic and conventionally managed dairy farms. 1. Soil and pasture properties. *Australian Journal of Experimental Agriculture, 47*(5), 479–488.

Busch, L., & Bain, C. (2004). New! improved? The transformation of the global agrifood system. *Rural Sociology, 69*(3), 321–346.

Connor, D. J. (2008). Organic agriculture cannot feed the world. *Field Crops Research, 106*, 187–190.

[15] See Dibden, Higgins, & Cocklin (2011) for a discussion of the *harmonization down*-process in the context of the Sanitary and Phyto-sanitary Agreement (SPSA) as part of World Trade Organization measures.

Dannenberg, P. (2008). Challenges for African food producer in the integration in international value chains—The example of the food standard GlobalGAP in the horticultural production region Mt. Kenya. *Zentralblatt für Geologie und Paläontologie, Teil I, 3*(4), 337–353.

Diamond, J. M. (2005). *Collapse. How societies choose to fail or succeed*. New York: Viking.

Dibden, J., & Cocklin, C. (2005). Sustainability and agri-environmental governance. In V. Higgins & G. Lawrence (Eds.), *Agricultural governance: Globalization and the new politics of regulation* (pp. 135–152). London: Routledge.

Dibden, J., & Cocklin, C. (2009). 'Multifunctionality': Trade protectionism or a new way forward? *Environment and Planning A, 41*(1), 163–182.

Dibden, J., Higgins, V., & Cocklin, C. (2011). Harmonizing the governance of farming risks: Agricultural biosecurity and biotechnology in Australia. *Australian Geographer, 42*(2), 105–122.

Dumaresq, D., & Greene, R. (2001). Soil structure, fauna and phosphorus in sustainable cropping systems. RIRDC Publication No. 01/130. Retrieved August 12, 2011 from https://rirdc.infoservices.com.au/downloads/01-130.

El-Hage Scialabba, N. (2007, May 3–5). Organic agriculture and food security. Conference document. International Conference on Agriculture and Food Security, Rome, Italy.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12*(1), 78–104.

González, A. A., & Nigh, R. (2005). Smallholder participation and certification of organic farm products in Mexico. *Journal of Rural Studies, 21*, 449–460.

Grolink (2010). The organic certification directory. In: *The organic standard 113*.

Halberg, N., Peramaiyan, P., & Walaga C. (2009). Is organic farming an unjustified luxury in a world with too many hungry people? In H. Willer, H. L. Kilcher (Eds.), *The world of organic agriculture. Statistics & Emerging Trends 2009* (pp. 95–100). Frick and Bonn: FiBL and IFOAM.

Hatanaka, M., Bain, C., & Busch, L. (2005). Third-party certification in the global agrifood system. *Food Policy, 30*, 354–369.

Henderson, J., Dicken, P., Hess, M., Coe, N., & Wai-Chung Yeung, H. (2002). Global production networks and the analysis of economic development. *Review of International Political Economy, 9*(3), 436–464.

Henryks, J., & Pearson, D. (2010). Misreading between the lines: Consumer confusion over organic food labeling. *Australian Journal of Communication, 37*(3), 73–86.

Higgins, V., Dibden, J., & Cocklin, C. (2008). Building alternative agri-food networks: Certification, embeddedness and agri-environmental governance. *Journal of Rural Studies, 24*(1), 15–27.

Higgins, V., Dibden, J., & Cocklin, C. (2010). Adapting Standards: The Case of Environmental Management Systems in Australia. In V. Higgins & W. Larner (Eds.), *Calculating the social: Standards and the re-configuration of governing* (pp. 167–184). Basingstoke: Palgrave MacMillan.

IBISWorld. (2010): Organic farming In Australia. Retrieved May 5, 2011 from http://www.ibisworld.com.au/industry/default.aspx?indid=1912.

Jones, R. (2010). *Green harvest: A history of organic farming and gardening in Australia*. Collingwood: CSIRO.

Kirchmann, H., Bergström, L., Kätterer, T., Andrén, O., & Andersson, R. (2008). Can organic crop production feed the world? In H. Kirchmann & L. Bergström (Eds.), *Organic crop production—Ambitions and limitations* (pp. 39–72). Dordrecht: Springer.

Kristiansen, P., Taji, A., & Reganold, J. (Eds.). (2006). *Organic agriculture. A global perspective*. New York: Comstock.

Kulke, E. (2008). *Wirtschaftsgeographie*. Paderborn: Schöningh UTB.

Lockie, S. (2006). Capturing the sustainability agenda: Organic foods and media discourses on food scares, environment, genetic engineering and health. *Agriculture and Human Values, 23*(3), 313–323.

Lockie, S., Lyons, K., Lawrence, G., & Halpin, D. (2006). *Going organic. mobilising networks for environmentally responsible food production*. Cambridge: CABI.

Mitchell, A., Kristiansen, P., Bez, N., & Monk, A. (2010). *Australian organic market report 2010*. Chermside: Biological Farmers of Australia.

Mutersbaugh, T., Klooster, D., Renard, M.-C., & Taylor, P. (2005). Certifying rural spaces: Quality-certified products and rural governance. *Journal of Rural Studies, 21*, 381–388.

Nadvi, K. (2008). Global standards, global governance and the organization of global value chains. *Journal of Economic Geography, 8*(3), 323–343.

Nadvi, K., & Wältring, F. (2002). *Making sense of global standards.* INEF Report 58. Duisburg: Gerhard-Mercator University.

Ouma, S. (2010). global standards, local realities: Private agrifood governance and the restructuring of the Kenyan horticulture industry. *Economic Geography, 86*(2), 197–222.

Parrott, N., & Marsden, T. (2002). *The real green revolution: organic and agroecological farming in the south*. London: Greenpeace Environmental Trust.

Paull, J. (2010). The future of organic agriculture: Otopia or oblivion? *Innovative Science, I*, 11–14.

Penfold, C., Miyan, M., Reeves, T., & Grierson, I. (1995). Biological farming for sustainable agricultural production. *Australian Journal of Experimental Agriculture, 35*, 849–856.

Thiers, P. (2006). China and Global Organic Food Standards: Sovereignty Bargains and Domestic Politics. In J. Bingen & L. Busch (Eds.), *Agricultural standards: The shape of the global food and fiber system* (pp. 193–217). New York: Springer.

Trewavas, A. (2004). A critical assessment of organic farming-and-food assertions with particular respect to the UK and the potential environmental benefits of no-till agriculture. *Crop Protection, 23*, 757–781.

Wells, A. T., Chan, K. Y., & Cornish, P. S. (2000). Comparison of conventional and alternative vegetable farming systems on the properties of a yellow earth in New South Wales. *Agriculture, Ecosystems and Environment, 80*, 47–60.

Willer, H., & Kilcher, L. (Eds.) Punkt weg. (2011). *The world of organic agriculture. Statistics and emerging trends 2011*. Bonn and Frick: IFOAM and FiBL.

Wynen, E. (2007). standards and compliance systems for organic and bio-dynamic agriculture in Australia: Past, present and future. *Journal of Organic Systems, 2*(2), 38–55.

# Chapter 20
# How do You Eat the Elephant in the Room? Agri-Food Sustainability and King Island

**Lea Coates**

## 20.1 Introduction

Food is a staple of life. It has also become a staple of political rhetoric and indecision as our governing institutions grapple with economic, social and environmental dilemmas in relation to food provision. Many academics have observed that it is the actions of international regulating bodies and transnational corporations (TNCs) that control food provision globally that lead to imbalances, with both 'starved' and 'stuffed' (Patel cited in Lawrence, Lyons, & Wallington, 2010) populations world-wide. For western style market economies the least politically appealing, least commentated reason for this imbalance—the elephant in the room—is the power of large corporations in the value chain.

Global value chain management, the process of exploiting value at every opportunity in the agri-food supply chain, is dominated by TNCs. Critics argue that this is a direct result of the World Trade Organization (WTO) and the Food Standards Program (FSP) calling for a 'harmonization' of food regulations (Marsden, 2003). This can be likened to a form of 'standardization' of food, enabling and empowering, if not intending, regulating bodies to be able to reduce or completely evaporate market alternatives for culturally diversified, socially embedded (local) food systems (Friedmann, 2005). Compete or die; get big or get out; 'it's the market, stupid' (anon); and rationalization are all rationalist concepts common in the industrialized food system of today that continually marginalize the small rural and regional food producer. In turn this threatens the sustainability of the communities in which these producers live and work. This most recent food paradigm becomes even more challenging when the community reliant on agri-food production is small, spatially bound, and remote such as the island communities (Baldacchino, 2011).

L. Coates (✉)
Institute for Regional Development, University of Tasmania, Burnie, TAS, Australia
e-mail: Lea.Coates@utas.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_20,

Godfrey Baldacchino (2011) suggests that islands cannot be 'islands' and be sustainable; they need to trade off-island, and often do so from a low competitive-advantage base. King Island, the subject of this case study, lies halfway between mainland Australia, and its only Island State, Tasmania, at the western end of the Bass Straight. The economy of King Island is dominated by the production of fine food products, most notably cheese and beef. Two of the most successful King Island brands are owned by transnational corporations, leaving the community exposed to global food 'shocks' and economic decisions made elsewhere. Globalization research which charts the rising power of TNCs would suggest King Island to be a vulnerable community in these circumstances (Clapp & Fuchs, 2009).

In an effort to gauge the resilience of King Island's food systems this work examines four questions as posed by Constance (2008): agrarian, environmental, food and social equity questions that can be used to measure agri-food sustainability. Applying these four lenses to the issue of supermarket dominance in the value chain helps break down the elephant, butcher style, into quarters, which we can then further dissect into manageable portions. How do you eat an elephant? One bite at a time.

## 20.2 Globalization and the Rising Power of TNCs

In their book, *Stories of Globalization: Transnational Corporations, Resistance and the State*, Bonanno and Constance (2008) bring together more than a dozen theorists who have published works on globalization and the rise in power of TNCs globally, with some describing it as the globalization project (McMichael cited in Bonanno & Constance, 2008, p. 35). This 'project' was devised as way of addressing a capital accumulation crisis brought about by the success of civil rights, labour rights and environmental protection movements which had drastically increased the costs of doing business in the developed world.

Bonanno and Constance (2008) chose the agri-food sector as their lens through which to examine some sociological aspects of globalization because they believe it to be one of the most globalized sectors of the economy today, and it cuts across traditional schools, or theories, and disciplines of research. They agree that TNCs hold a power advantage over nation-states; however the divergence lies in how to redress the situation. Some believe that supra-national bodies such as the WTO should be the primary focus for governing TNCs. However, others do not.

Clapp and Fuchs (2009) believe that while international governance of the food system provides limited safeguards from negative ecological and socioeconomic consequences, the very fact that TNCs are so dominant means they have a substantive say in the rules and roles of such governance. Because of globalization we have more food in both quantity and variety than ever before; however, the upshot is in having conversely less food security, and growing threats to the livelihoods of small farmers, food safety, consumer sovereignty and environmental quality (Clapp and Fuchs, p. 11). In a 2008 address to the Agriculture and Human Values Society in the USA, Constance delivered not answers, but four questions around the contradictions of globalization, and the power of TNCs in the global agri-food system, suggesting that perhaps in these we will find ‘fruitful avenues of resistance’.

## 20.3 The Agrarian Question

The agrarian question deals with the relationship between the structure of agriculture and quality of life for farmers and rural communities (Constance, 2008, p. 5). What influence do TNCs have on the structure of agriculture and the quality of life for farmers and rural communities? Lyson (2004), in his book *Civic Agriculture: Reconnecting Farm, Food and Community* writes that it was a century ago when economists realized that to industrialize food production and make more profit, as they had with the manufacturing industries, they had to separate, contextually, farming from ‘the community and household settings in which it was embedded’ (Lyson, 2004, p. 17). Making money in farming supposedly needed only four things; land, labour, capital and management/entrepreneurship. The social, environmental and other nonmarket issues affecting the operations were institutionalized as unimportant ‘externalities’ (ibid). Farming was deliberately reconstructed; the holistic way of life that included family, community and environment was demolished and replaced with ‘just’ a job, and the assumptions that farming inputs were extensively substitutable.

Morgan, Marsden and Murdoch (2006) agree that the political economic tradition has been for agri-food to follow the industrial sectors on the globalization path. Lawrence et al. (2010, p. 2) cite Peter Rosset (2006) who suggests that it is the WTO’s ‘neoliberal-based insistence’ for the economic law of comparative advantage to be applied to the production and consumption of foods, and the power of the TNCs who manage the production, distribution and sale of food, that contribute to the reorientation of agrarian values. The agri-food landscape of today is ‘socially denuded’ (Lawrence et al., 2010, p. 3) because the global agri-food system is driven purely for profit, with very little regard for the social and environmental consequences of an outdated, increasingly unworkable ‘economic law’.

Michael Shuman (2007) calls it ‘wreckonomics’ and says that in our current economic system *Community is just another obstacle to progress* (Shuman, p. 38). Advocates of what Shuman calls TINA (There Is No Alternative) economic thought believe we should *keep our bags packed so we can migrate at a moment’s notice to another job hundreds or thousands of miles away.* This is because agri-food producers are looking for economies of scale. The number of farms globally has declined, but the size of farms, and amount of hectares under cultivation have increased (Morgan et al., 2006).

What economists ignore, says Lyson (2004, p23), is that although farming can be ‘contextually’ (and financially) separated from households and communities, it cannot literally, physically, be separated from either place or the people who live there. Thus we find affected rural communities speaking out against the industrialization of agriculture. There are, for example, existing oppositional strategies to industrial agriculture, such as civic agriculture, gaining momentum worldwide (Lyson, 2004). One such strategy is *Whole Measures for Community Food Systems* (Centre for Whole Communities, 2009, p. 1) which is described as a values-based planning and evaluation tool that communities can use to help make their community food system ‘healthy and whole’. The originating funder of the project is the United States Department of Agriculture (USDA) and the research partners included the Community Food Security Coalition, the Centre for Popular Research, Education and Policy and the Centre for Whole Communities. The team does not use the term ‘indicators’, but does list ‘fields and practices’ against which they believe progress can be measured. They include:

- Justice and fairness
- Strong communities
- Vibrant farms
- Healthy people
- Sustainable ecosystems
- Thriving local economies

This is an excellent theoretical concept, but can it redress the issues highlighted above? The Centre for Whole Communities illustrates several examples of practice ‘on the ground’, including this one from New Mexico and the Taos Land Trust, described by Ernie Attencio.

> The Taos County Economic Development Corporation provides direct marketing assistance, business development assistance, a commercial kitchen where people can prepare, package, and market their product all in one place to add value to their agricultural products… (Centre for Whole Communities, 2009, p. 2).

There is a word of caution however in relation to such strategies and similar regional innovation systems (RIS) and regional development platforms (RDP). Christopherson and Clark (2007) warn of the assumption that TNCs and Small and Medium Enterprises (SMEs) work cooperatively in regional economies all the time. They do not. There is a power imbalance which Christopherson and Clark (2007, p1224) say can affect the innovative capacity of a region in three ways. The TNCs can:

1. Use political power to influence regulatory policy, affecting which innovations are commercialized and how knowledge is diffused, to whom and under what conditions.
2. Drive the innovation agenda within publicly supported research centres, including universities.
3. Dominate the regional labour market, using management resources to cater skill development to their particular skill requirements, and competing with SMEs for members of the regional skilled workforce.

There are contradictions for policy makers when trying to incorporate both SMEs and multinational corporations in RIS and RDP. Christopherson and Clarke (2007, p. 1233) state that

> The goal of regional innovation is a dynamic set of firms producing more jobs and opportunities. The goal of TNCs, by contrast, is to control any innovation not compatible with the firm’s

> interest in sustainable competitive advantage. Certainly TNCs have no incentive to promote the growth of small firms into regional competitors and producers who will challenge them for skilled labour and drive up the cost of other inputs.

How will this work in a small island economy such as King Island then? Baldacchino (2008, p. 190) believes that on face value at least, small island economies are amongst the least equipped economies to deal with the challenges of the new 'knowledge age'. Structurally, he believes, they are cheated; of markets, of economies of scale, and of institutional critical mass. How then can entrepreneurship and innovation exist, let alone be promoted and supported?

Innovation can exist in small, peripheral (often island) economies, suggest Baldacchino and Bertram (2009, p. 144), because actors faced with strong contextual features they cannot change instead adapt to them. They state that some longitudinal studies show that there is 'an agile and entrepreneurial responsiveness to shifting opportunities' demonstrated by the utilization of economies of scope, and the development of multioccupational skills within the population. Citing Brock (1988), they propose a 'flexibility of breadth' as opposed to depth, as the best option for responding to entrepreneurial opportunities.

Baldacchino (2008, p. 190) has defined five measurable variables that in studies have been equated with success in small manufacturing firms located is smaller economic jurisdictions. They are:

1. Local ownership, meaning majority or exclusive control of the firm vested in native islanders.
2. Small size, meaning firm has up to 50 employees or outworkers.
3. Manufacturing; meaning firm is producing a commodity that has weight, volume or form, which can be separated from its producer in the act of sale or purchase.
4. Export orientation, meaning the bulk of the firm's manufactures are destined to markets and clients elsewhere, and have been doing so for many years.
5. Technology adaptation, meaning that any key technological processes used by the firm in the manufacturing has been customized, if not invented by the locals.

The top examples of entrepreneurship from the businesses that met the above criteria according to Baldacchino (2008, p. 197) were 'glocal' in their strategic orientation, borne of both 'home' and 'away', combining the best of what they knew from 'home' with the knowledge gathered from travel and communication overseas.

Much of Australia's community food projects seem to be benevolent organizations focused on food access rather than local food systems. Like the United States, Australia is a large exporter of food commodities, and food insecurity exists in pockets of disadvantage nationwide. The Victorian Department of Health (http://www.dhs.vic.gov.au/__data/assets/pdf_file/0010/276436/FoodPolicyCoalitions.pdf) has launched a food policy coalition project that has a food security focus: *The aim of the council is to assess how the food system works in the community and propose strategies to develop and/or reorganise systems to create a sustainable food supply* (DHS Vic 2010, p. 1). There are also examples of Community Supported Agriculture groups around Australia such as Food Connect who look to reconnect farmer and consumer through healthy food (http://www.foodconnect.com.au/).

This is a clear indication that change has begun in an effort to address the agrarian question posed by Constance (2008) and industrial agriculture. Can it help King Island? On its own, no, but the underpinning values of civic agriculture can help inform and empower the King Island Community as necessary. But this movement is by no means 'mainstream'. As recently as August 2010, National Foods, owner of the King Island Dairy, and other Tasmanian and Australian cheese-making operations, announced a 'review' into the company's cheese-making arrangements, sending the Tasmanian Government into a panic. Premier David Bartlett announced the Department of Economic Development (DED) would stand ready to meet with National Foods and offer assistance (*The Advocate,* 2010, p. 4). National Foods is a multibillion dollar international corporation that made almost $165 million before tax in the 2009/1010 financial year (http://lnnf.com.au/2010/08/16/lion-nathan-national-foods-h1-result-2/). This same year Tasmanian dairy farmers were paid less for their milk than the cost of production, placing many in very difficult financial circumstances. It would appear Tasmanians may be asked to help National Foods so that they can continue to exploit their farmers, and make a fair rate of return on their investment. The Agrarian Question remains unanswered.

## 20.4 The Environmental Question

The environmental question focuses on the relationship between the structure of agriculture and the quality of the environment (Constance, 2008, p6). When asking what effect does the industrialized food system have on the environment responses are evident in the form of harmful pesticide use, soil degradation, salinity, water shortage and quality problems, excessive fertilizer use and increased vulnerability to pests and diseases (Burch & Lawrence, 2007; Lawrence et al. 2010; Morgan et al., 2006). Constance (ibid) calls it an 'inherent tension between capitalist accumulation and environmental sustainability' and many other academics agree. One, Richard Stirzaker, is an agricultural scientist, principal research scientist with the CSIRO in Australia, and honorary professor with the University of Pretoria, South Africa:

> In my line of work there has been tension between those who focus on the productivity of agriculture, and those who look at the ecological footprint of agriculture' (Stirzaker, 2010, p. 125).

In 2004, Allison and Hobbs wrote that in the Western Australian agricultural system the 'species mix has been transformed for commodity production' (p. 15). Native vegetation has been devastated, with only 10% remaining in some areas, and the ecosystem is so distorted now that functionality in the system is almost lost. Using an economic assumption, 'all else being equal', Allison and Hobbs (2004) argue that the commodity system of food production will continue to erode the resource base of agriculture, increase environmental pollution and abet social decline within agricultural regions.

Science has been heralded the hero of productivity gains in food production. The 'green revolution' was geared towards reducing the potential of mass starvation, but has since been criticized for its environmental impacts. Productivity and efficiency gains are central platforms for industrial agriculture; however they come at a price:

> … if we focus on doing one thing efficiently and sustainably and do more of it, we actually make ourselves more vulnerable to the inevitable shocks that are beyond our control. We need to invest in diversity, and foster the things that are not the most profitable today, because we will need them tomorrow (Stirzaker, 2010, p. 137)

What are the alternatives? Are there alternative forms of agriculture that can find a balance between production and protection? 'Alternative' is of itself a contested term in agricultural production; alternative to what? Is it mainstream agriculture perhaps, or commoditization, or 'productivism' or the conventional agricultural systems we know today? This is another example of where rhetoric and realism collide in a grey area of certification schemes, 'niche' markets, and supermarket dominance of the value chain. Or as Harriet Friedmann and Amber McNair (2008 p. 408) ask 'Whose rules rule?' Cribb (2010) states the following:

> Today the world faces looming scarcities of just about everything necessary to provide high yields of food—water, land, nutrients, oil, technology, skills, fish and stable climates, each one playing into and compounding the others....It's a wicked problem.

Organic agriculture, permaculture, and civic agriculture have all been held up as shining examples of 'sustainable' agriculture (Nousiainen et al., 2009 p. 567), but while they may use less chemicals and be more socially inclusive, successful 'niche' products such as organics can be commoditized, placing farmers back at square one, needing to find more value in the chain somewhere, or find another niche (Pirog & Paskiet, 2004 p. 7).

Cribb (2010) argues that a new science-based food system that is not geared towards the needs of agri-business corporations, but towards farmers large and small everywhere, is needed now. Like Stirzaker (2010) and Cribb (2010), Patricia Allen (2004 p. 98) calls for a change in science emphasis because 'sustainable agriculture is heir to the epistemological biases of conventional agriculture' and what is actually needed is a diversity of thought; Western science does not have all the answers, so it must be 'supplemented by other ways of knowing' (ibid). A holistic approach again is called for.

Constance (2008) not only lays the blame for environmental degradation on industrial agriculture, but also on the power of large corporations, and governance systems that have allowed such power to be accrued.

> Agricultural production and profits are predicated on externalizing environmental costs onto the public, most often through agri-corporate manipulation of state policies' (Constance, 2008, p. 7).

Economist Ross Gittens (2010) argues that environmental costs are externalized because the environment (as with community) is seen as an externality in the economic system. The economic model we live by holds no place for the environment, and environmental exploitation is not (yet) reflected in market prices (Gittens, 2010, p. 210).

The fatal flaw in this argument is that while the environment can live without the economy, the economy cannot live without the environment. Gittens (2010 p. 197) reminds us that because the global environment is finite, ‘there must be limits to the extent to which the economy can grow.’

The answer according to Gittens (2010 p. 210) is to ‘internalize the externality’. The natural environment must be bought into the economic equation because it is now one of the ‘scarce resources’ the economy is designed to redistribute. Evidence that there are, in Australia at least, moves toward making the environment part of the economy can be seen with water pricing. Also there have been discussions around carbon credits, and so on. This is a slow and painful process, one not likely to adequately support sustainable agriculture in Australia, or King Island, anytime soon.

This is not to say King Island has not moved toward environmentally sustainable agri-food industries. The local newspaper reports that both the cheese-making factory owned by National Foods and the abattoir, owned by JB Swift, are upgrading their plants to conform to environmental protection guidelines (http://www.kingislandcourier.com). Other moves reported include more solar and wind energy innovation resources, and research into the farming of trees used as shelter belts for renewable energy production (http://www.kingislandcourier.com). However, not all of this work was voluntary. JB Swift for example threatened to close the abattoir, at a cost to the island of 98 jobs, if they did not receive government assistance to upgrade their waste systems (http://www.kingislandcourier.com). This is a multibillion dollar, multinational company leveraging its power to minimize the effects of an ‘externality’ on its bottom line, although the company denies this (http://www.kingislandcourier.com). The environmental question remains unanswered.

## 20.5 The Food Question

The food question deals with the relationship between industrial agriculture and the quality of food and points towards nutrition and safety issues (Constance, 2008 p. 8). Is there evidence of TNC influence in this arena that challenges agri-food sustainability? According to Constance (2008 p. 8) the food question is one in which many researchers globally position themselves around such topics as organics, slow food, locavores, food policy councils, fair trade, sustainable food systems, chefs collaborative, appellations and more. This is where solutions are devised and implemented, and it is the frontier on which social scientists can work with communities and the natural sciences to find ‘other ways of knowing’. Issues such as nutrition and obesity and food safety and quality are high agenda items, a point well recognized by the global food system actors. According to Friedmann and McNair (2008 p. 409) ‘… trademarks, brands, seals of approval and certification become central to supply chains of all kinds. They become an arena of contestation, multiplication, confusion, and therefore open opportunities for creative strategies’.

American nutritionist, Marion Nestle (2007 p. 1) says that even after exports, the US produces enough food to feed every American inhabitant twice over, yet despite this abundance, food for many is so expensive that close to a billion of the world's population of six billion in 2008 were chronically hungry (Lawrence et al., 2010 p. 1). Nousiainen et al. (2009 p. 590) found that while some 'alternative' systems showed a positive relationship between themselves and their social relations, farmers in these systems were still unlikely to assert any influence on the vertical distribution channels of the globalized food chain. According to Cribb (2010), prices that TNCs now pay farmers will end up decimating agriculture and the resources on which they are based. They will hollow out food security. The health effects of over-abundance and scarcity of food, and externalized environmental and social effects of industrialized food production, have led Lawrence et al. (2010 p. 3) to label the food provision arena as one of the most contested and controversial fields of global politics today.

Marsden (2003) argues that corporate retailers play a key role in defining and disseminating 'quality' in the larger consumption spaces in Europe. They allocate the constraints and risks in the supply chain and develop their own regulatory systems (Marsden, 2003 p. 28). This ensures, says Marsden (ibid), dominance over food supply systems which 'has resulted in a more or less constant or declining value for the primary sector, despite rising consumer expenditure.'

Given that the food system is now a global one, it stands to reason that such practices are dominant worldwide. Growing, manufacturing and selling food is now an economic imperative, with other considerations a distant second. Both export and domestic markets have become 'buyer' driven (Vorley, Fearne, & Ray, 2007). This would seem to suggest that buyers (retailers, who argue they are responding to consumer demand) now have more influence on quality, safety standards, packing requirements and consistency of both product and supply (Coates, 2009). The value chain for food is now more heavily regulated in terms of production than ever before. According to Vorley et al. (2007), such chains are now more vertically integrated, with increasingly long-term relationships of coordination between farmers/producers/manufacturers, suppliers/agents, processors and retailers. To stay in this loop, farmers are requiring more structural organization around both financial and human resources and technology, the cost of which can threaten the comparative advantage of the smaller producer. Phillips (2006 p. 41) states 'the significant role of supermarkets in deepening the vertical integration of the production process has implied more vulnerability for small farmers'.

Resistance to this paradigm, through the development of shorter value chains, is evident with the growing popularity of farmers markets, community supported agriculture (CSA) and similar box schemes where the consumer feels they have a direct connection and trust relationship with the producer (Food Connect 2010). The popularity of farmers markets in particular is notable, given the increase in numbers of sites and attendance described in national and local media reports

Most agri-food producers on King Island, and indeed in Tasmania, are small producers. The push to differentiate themselves through branding King Island as clean, green and high quality is well documented. The success has led to contradictory circumstances. So popular did the beef and dairy products become, they were bought out by larger and larger operations leading to the situation of today.

The economic successes of previous 'growth' has made them more vulnerable, not sustainable, and debates over the King Island 'brand' have escalated to a point where the King Island residents want to claw it back into a 'place' brand to benefit all, rather than a 'product' brand to benefit a few (http://www.kingislandcourier.com). The food question remains unanswered.

## 20.6 The Emancipatory Question

The emancipatory question focuses on the relationship between the structure of agriculture and the quality of civil rights (Constance, 2008 p. 9). Do TNCs improve or devalue equality, cultural diversity or agency in the agri-food system of today? The push to 'get big or get out' marginalizes those who have no desire to become part of a corporate regime, and presses the need for these small producers to look at other strategies for sustainability. Recently, acting Director of the Tasmanian Institute for Agricultural Research (TIAR), Wes Ford, is reported as saying that family farmers have the option to take on equity partners, such as investment houses and corporate agriculture, to help their business grow (Prestt. K, 2010). 'If Tasmanian growers are to expand their business it will need to be done in partnership with the whole value chain' (Prestt 2010 p. 5).

According to Weis (2010 p. 32) the net outcome for farmers of increased corporate control over agriculture is an escalating cost–price squeeze. Others write that agri-food governance systems of today lead to 'accumulation by [regulatory] dispossession' (McMichael cited in McMahon, 2009 p. 405), and that value chain conditions of management 'are really conditions of captive-supply and value-extraction from farmers' (McMahon, 2009 p. 409), because it is mainly the packers and or retailers who hold the power in the globalized, value-driven agri-food supply-chains (ibid).

McMahon (2009 p. 408) states that 'Markets are organized by power relationships: class, race and gender being the most common.' The Canadian sociologist also believes that 'agri-food governance is profoundly gendered' (McMahon, 2009 p. 401). Patriarchal views, McMahon (2009) says, are realized in public food-safety regulations that welcome, if not expect, corporate investment in, and consequent dominance of, food regulatory systems, leading to market relationships distorted by corporate power. McMahon (2009) argues that women farmers are dismissed because they are usually small farmers who work only to feed family and community, not the world. This ignores the fact that women are credited with growing some 60–80% of food in the developing world, and sustaining much of that population. This has led women to play central roles in efforts to change the predominant global food paradigm into ones that more fully understands rights related to food. Examples McMahon (2009) identifies include the peasant movement La Via Campesnia, Slow food and other food localization movements. Localization she says is a 'strategic pathway' (McMahon, 2009 p. 410) to a more democratic food system.

Food democracy is echoed by Ikerd (2005) who argues for 'food sovereignty'—being free to choose, and he also calls for 'interdependency' for mutual gain instead of the weighted system of dependency and price pressure industrialized agriculture represents. Ikerd (2005) states that food security is found in food sovereignty; that much of the American population—and, it can be argued, much of the world's population—does not have food sovereignty—or can be truly food secure—because they are not free to choose. Alternative, sustainable, re-localized agriculture allows choice (ibid).

Constance (2008) warns against a headlong rush into re-localization however. The romantic visions some have of a back-to-the-future shift in agri-food may not include embedded inequalities that were pervasive in preindustrial times. Sexism, racism and classism were, and are (McMahon, 2009), evident in food production systems, although a more localized strategy is considered a better place to reveal the 'isms' and tackle them (Constance, 2008). The 'feminized consumer' argues McMahon (2009 p. 410) needs to be reinvented as an independent 'global citizen' who understands that food health and quality are measured by more than the food-safety regulations in place today, but include much broader ideas of health, economic justice, dignity and well being, for all food producers and their economic, social, and environmental sustainability.

Marsden (2003), however, reminds us that regional, rural and social policies are designed and implemented by those who oversee the current food dynamic; a dual role that will inevitably lead to conflict. Morgan et al. (2006) describes one site for resistance as 're-localization' and discusses the role of the Welsh government in an attempt to redress equity for rural areas with a policy of public procurement of local food for schools, hospitals and other public institutions. This however is viewed by EU trading policy and WTO principles as a barrier to free trade (Morgan et al., 2006).

King Island, as a distant market, is a problematic one for government authorities. Distance and low population alone makes it difficult to service, and it has a one gear economy, based almost entirely on agri-food, which in turn is dominated by beef and dairy production that must be exported. The sovereignty of King Island and its people is hostage to two individual TNCs, and they choose the marketplace, market price and market regulations under which King Island agri-food participants must compete. The emancipatory question remains unanswered.

## 20.7 Concluding Remarks

As sites for resistance against the power of TNCs in the global food supply chain, the four questions of Constance are an excellent starting point, but it is obvious that an elephant such as this is extraordinarily hard to chew. None of the four, the agrarian question, the environmental question, the food question, or the emancipatory question has been satisfactorily answered, although attempts have been identified. The agrarian, through alternative agri-food systems that resemble civic agriculture and regional development platforms such as the Centre For Whole Communities—the environmental, through various certification schemes identifying better environmental practice—the food, through shorter value chains and equity, through re-localization (Centre for Whole Communities, 2009).

In the King Island context, further research is required. How do the farmers and agri-food stakeholders feel in relation to the agrarian question? Is environmental management a help or hindrance to them given their current trading conditions? What regulations around food safety affect them the most? Are they free to choose the market in which they trade? These and many more questions spring to mind for not just King Island, but any food producing region. If however this elephant can be tackled from four directions at once, and the contradictions given a broader audience, some primal notions may be sectioned off and placed into a large pot to stew. Incrementalism such as this requires long-term strategic thinking, but the longer and slower the cooking process, the more tender the feast.

## References

Allen, P. (2004). *Together at the table: sustainability and sustenance in the American Agrifood System*. Pennsylvania: The Pennsylvania State University.

Allison, H., & Hobbs, R. (2004). Resilience, adaptive capacity and the 'lock-in trap' of the Western Australian agricultural region. *Ecology and Society, 19*, 3–19.

Baldacchino, G. (2008). Entrepreneurship in smaller jurisdictions: Appraising the glocal elite. *Comparative Education, 44*, 187–201.

Baldacchino, G. (2011, February 18). *Island enclaves: Tasmania is a sub-national jurisdiction.* Public Lecture, University of Tasmania, Sandy Bay Campus.

Baldacchino, G., & Bertram, G. (2009). The beak of the finch: Insights into the economic development of small economies. *The Round Table, 98*, 141–160.

Bonanno, A., & Constance, D. (2008). *Stories of globalization: Transnational corporations, resistance and the state*. University Park: The Pennsylvania State University Press.

Burch, D., Lawrence, G. (eds) (2007) *Supermarkets and agri-food supply chains: Transforamtions in the production and consumption of foods*. Cheltenham: Edward Elgar.

Centre for Whole Communities. (2009). *Whole measures for community food systems.* Vermont: Center for Whole Communities. Retrieved August 24, 2009 from http://www.wholecommunities.org/alumni_blog/?p=32.

Christopherson, S., & Clark, J. (2007). Power in firm networks: What it means for regional innovation systems. *Regional Studies, 41*, 1223–1236.

Clapp, J., & Fuchs, D. (2009). *Corporate power in global agrifood governance*. Cambridge: Massachusetts Institute of Technology.

Coates, L. (2009). *Tasmania: Food bowl or commodity ghetto?* Hobart: Institute for Regional Development, University of Tasmania.

Constance, D. (2008). The four questions in agri-food studies: A view from a bus. 2008 AFHVS presidential address. *Agriculture and Human Values, 26*, 3–14.

Cribb, J. (2010). *The coming famine: Risks and solutions for global food security*. Retrieved August 2010 24, from http://www.sciencealert.com.au/features/20101804-20862.html

Friedmann, H. (2005). From colonialism to green capitalism: Social movements and emergence of food regimes. In F. Buttel & P. McMichael (Eds.), *New directions in the sociology of global developments*. Amsterdam: Elsevier.

Friedmann, H., & McNair, A. (2008). Whose rules rule? Contested projects to certify 'local production for distant consumers'. *Journal of Agrarian Change, 8*, 408–434.

Gittens, R. (2010). *The happy economist: Happiness for the hard-headed*. Crows Nest, NSW: Allen & Unwin.

Ikerd, J. (2005) *Reclaiming our food sovereignty from the global economy*. Hartwirck College Guest Lecture Series 'Food in Our Lives'. Oneonta, New York.

Lawrence, G., Lyons, K., & Wallington, T. (2010). Introduction: Food security, nutrition and sustainability in a globalized world. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food security, nutrition and sustainability*. London: Earthscan.

Lyson, T. A. (2004). *Civic agriculture: Reconnecting farm, food, and community*. Medford: Tuffs University Press.

Marsden, T. (2003). *The condition of rural sustainability*. Assen, The Netherlands: Royal Van Gorcum.

McMahon, M. (2009). Standard fare or fairer standards: Feminist reflections on agri-food governance. *Agriculture and Human Values, 28*(3), 401–412.

Morgan, K., Marsden, T., & Murdoch, J. (2006). *Worlds of food: Place, power and provenance in the food chain*. Oxford: Oxford University Press.

Nestle, M. (2007). *Food politics: How the food industry influences nutrition and health*. Berkeley: University of California Press.

Nousiainen, M., Pylkkänen, P., Saunders, F., Seppänen, L., Mikko Vesala, K., & Hogskola, S. (2009). Are alternative food systems socially sustainable? A case study from Finland. *Journal of Sustainable Agriculture, 33*, 566–594.

Phillips, L. (2006). Food and globaisation. *Annual Review of Anthropology, 35*, 37–57.

Pirog, R and Paskiet, Z. (2004). *A geography of taste: Iowa's potential for developing pace-based and traditional foods*. Leopold Center for Sustainable Agriculture. Ames: Iowa State University. Retrieved August 24, 2010 from www.leopold.iastate.edu/pubs/staff/files/taste.pdf.

Prestt. K. (2010). Agricultural Institute says there is hope yet. *The Advocate*. October 19, 2010. P5

Shuman, M. (2007). *The small-mart revolution: How local businesses are beating the global competition*. San Francisco: Berrett-Koehler.

Stirzaker, R. (2010). *Out of the scientists garden: A story or water and food*. Melbourne: CSIRO.

*The Advocate*. (2010, August 26). National foods reveals importance of Tassie brands. p. 4.

Vorley, B., Fearne, A., & Ray, D. (2007). *Regoverning markets: A place for small-scale producers in modern agrifood chains?* Hampshire: Gower.

Weis, T. (2010). Breadbasket contradictions: The unstable bounty of industrial agriculture in the United States and Canada. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food security, nutrition and sustainability*. London: Earthscan.

# Chapter 21
# A New Harvest of the Suburbs

**Brendan Gleeson**

How should Australia, 'a nation of cities', respond to an age of growing food insecurity? Cities are often seen as the source of environmental and resource stress, contributors to food insecurity. But can they be reconceived as steady state systems that provide a large share of their own needs through a new urban process that values resource security and sustainability? Gaynor's (2006) book *Harvest of the Suburbs* reminds us that urban Australia was once a highly productive food landscape. Many of the forces for change that undermined this productivity are now implicated in the resource crises facing Australia and the world; viz., motorization, overwork, poor urban planning and design and relentless consumerism. How then should we proceed to reestablish productivity and sustainability in Australia's cities, with a view to heightening their food security?

This chapter begins by contemplating the dawn of an urban age, and the many threats facing human security, especially climate change, resource depletion and food insecurity. A new international literature, from both scholars and advocates, has embraced the ideal of urban resilience—of cities living within their ecological limits and possessing secure food and resource bases. The chapter then considers the Australian context for the increasingly urban challenges that face our species. Australians still overwhelmingly live in suburban settings, although densities are rising in the major metropolitan areas and a slowly rising proportion of households live in multiunit dwellings. The speed at which climate and resource threats are likely to manifest and the difficulty of effecting rapid large scale urban change means that urban resilience is an irreducibly suburban question for contemporary Australia.

B. Gleeson (✉)
The University of Melbourne, Melbourne, VIC, Australia
e-mail: brendan.gleeson@unimelb.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_21,

The chapter sketches an agenda for food resilience that takes the suburban ground of quotidian Australia as its starting point. Compaction will, however, progressively transform the Australian urban lifestyle, including in suburban regions. This will necessitate ever greater attention to the potential food productivity of higher density environments. The ability to consciously shape the evolving urban form around sustainability imperatives will critically determine the resilience quest. A market driven rather than planned process of urban consolidation is likely to deny the possibilities for restoring food production to urban neighbourhoods, across the density spectrum.

## 21.1 An Urban World at Risk

Humanity is now an urban species, *Homo urbanis*. A majority of humans now reside in urban settings. Contemporary urbanization wears many faces. It ranges from incremental planned expansion in developed nations to the explosive growth of mega city regions in the developing world. It includes contra flows, such as the sclerotic decline and even collapse of rustbelt cities in North America and Europe. Moreover, in the face of sustained environmental and scientific critique (e.g. Hirschhorn 2005), the low density suburban model continues to define and frame urban ambition in many nations, including in the wealthier, aspirational parts of developing cities. In such places many of the newer western planning ideals are anathema: it is modern suburbia not the urban village that is yearned for. In an age of cities, it is right to speak of the simultaneous blooming and withering of old and new urbanisms.

Contemporary urbanization takes thus many forms, ranging from wealthy urban village, through traditional suburb to mega-slum. The phenomenon nonetheless faces a set of common threats which beg a unifying, if multivalent frame of analysis. Global warming and resource insecurity emerge from the roots of the socio-ecological systems that are driving urbanization. The ‘wild horses’ of market expansion, political ambition, and cultural aspiration have driven an ever urbanized modernity towards the precipices of risk, uncertainty and self-doubt (Beck 2008). Add to this the terrifying and terrorizing currents of politico-cultural reaction that have used cities as potent sites to attack western modernization (Passman and Kirillov 2007). Ecological dysfunction and sociopolitical rejection are ‘dangerous feedbacks’ that threaten the stability and integrity of cities and the heterogeneous human communities that are claiming and building them.

It is no surprise, perhaps, that various currents of advocacy (e.g. Transition Towns, the permaculture movement) and scholarship (e.g. Newman et al. 2009; Pelling 2003) have applied an ecological metaphor—resilience—to the dilemmas of the contemporary urban age. Within academe, new interdisciplinary networks have emerged to focus on the question of urban and regional resilience—notably

The Building Resilient Regions network[1] and The Resilience Alliance.[2] Newman et al. (2009, p. 1) write:

> Resilience can be applied to cities. They too need to last, to respond to crises and adapt in a way that may cause them to change and grow differently; cities require an inner strength, a resolve, as well as a strong physical infrastructure and built environment.

## 21.2 Urban Food Vulnerability

If resilience is the new anthem of sustainability, what ‘food threats’ face this new ambition? Human food production and distribution systems, and the cultural practices that go with them, are facing deep challenges. These are currently reflected in declining indices of affordability and availability, especially in the developing world. Through 2010 and into 2011 spiralling food prices alarmed both the UN’s Food and Agriculture Organisation and the World Bank. *The Irish Times* reported that a new circuit of economic globalization, food speculation, was partly to blame, along with ‘…climate change-induced production collapses, export curbs, rising demand in an increasingly wealthy China and demand for biofuels’.[3]

System default is revealed in a number of multiple and overlapping stresses and breakdowns. Ocean acidification and resource exploitation is ruining global fish stocks. Rapid urbanization in the developing world is sucking the life-force from agricultural regions. Declining crop yields have large parts of the world on famine watch. These stresses are intensified by switching crops from food to biofuel production at a time of soaring population growth. The destruction of forests and conversion of farmland for biofuel production have made food much more expensive and less easy to obtain in the developing world. In 2007 a senior UN official, Jean Ziegler, called biofuels a ‘crime against humanity’. A year later UN secretary-general, Ban Ki-Moon, called for a comprehensive review of the policy on biofuels (Borger 2008).

Further, biofuel expansion will enlarge the global area of cultivated land through conversion of forests, grasslands and peat lands into crop fields. The European Institute for European Environmental Policy (Bowyer 2010) estimates that up to 69,000 km$^2$ will be affected—an area over twice the size of Belgium. The enlargement of ‘bad’ agriculture could generate as much as 56 million tonnes of extra $CO_2$ per year. This is the equivalent of adding an extra 12–26 million cars to Europe’s roads by 2020. The growth of biofuel agriculture is literally the transfer of food from stomachs to fuel tanks. It may testify more to the stubborn imperative of

[1] http://brr.berkeley.edu/.

[2] http://www.resalliance.org/.

[3] *The Irish Times*, February 17, 2011.

motor car dependency than to espoused ambitions for cleaner emissions and energy diversification.

The looming food crisis is also an embodied threat to human safety. In the West, prolonged indifference to nutrition and health generally has bequeathed a generation of obese children (Okie 2005). In Australia, poor diet and lifestyle lethargy are threatening an epidemic of type II diabetes. In the last 5 years in Queensland, for example, the number of diabetes 'hot zones' (i.e. predominantly urban places with abnormally high incidence) has risen *from 1 to 69*. There are 200,000 sufferers in Queensland with many again who do not yet know that they have the disease.[4] It has claimed the lives of 3,000 in the last 5 years. This is a problem amenable to improved education and public health programs. None of these interventions, however, will succeed without close recourse to healthy, affordable food for lower income communities—that is, food security as a fundamental issue of social equity.

The food disorders of the poor are mirrored in the neurotic, resource intensive eating habits of the rich. Food miles are tracking ever lengthening urban commuting distances. Just as importantly, the energy used globally in the production and distribution of food continues to rise in both intensity and in aggregate (McWilliams 2009). Urban resilience thus is undermined by failing food systems and distorted preferences: energy requirements track ever upwards whilst many indicators of human health flag or decline. The manifestations and closer causes vary enormously between rich and poor nations, between differently enabled cities and within social strata. And yet the common picture is of an increasingly ravenous yet undernourishing human food system.

## 21.3 The Greatest Spoiler

Tilting towards an increasingly vulnerable global economic system is a much bigger shock that threatens the entire human food regime. 'Global warming' is perhaps not the best way to describe the threat. It is a gentle term which may understate the warming's scarifying capacity to harm all life on Earth. Renowned British environmentalist, Lovelock (2009) sees global warming as a looming threat to all life worlds, not simply human existence.

Global warming is a diabolical challenge that undermines human food supply at a number of profound levels. First, it reduces the supply and reliability of that most vital precondition for food, water. Already in Australia, science confirms a permanent loss of catchment capacity in some regions (Pearce et al. 2007). Worryingly, these include highly urbanized parts, including Perth and hinterlands,

[4] 'Qld in grip of diabetes epidemic'. *ABC News*, December 2, 2010. Retrieved from http://www.abc.net.au/news/stories/2010/12/02/3082552.htm.

and the populous south-east corner. The Commonwealth Government's Major Cities Unit reports:

> There has been a marked reduction in surface water available for storage in Perth; where the average annual inflow into Perth's dams experienced four-step change reductions from 338 gigalitres (GL) over the period 1911 to 1974 to an average of 57.7 GL between 2006 and 2010 (MCU 2010a, p. 60).

Climate heating also attacks food on other fronts: making land less arable; local climates less predictable and thus less productive; and by scouring out biodiversity and future potential food sources. Reviewing the global scientific evidence on climate change and food production, Schmidhuber and Tubiello found that 'Essentially all quantitative assessments show that climate change will adversely affect food security' (2007, p. 19703). Moreover,

> Climate change will affect all four dimensions of food security, namely food availability (i.e., production and trade), access to food, stability of food supplies, and food utilization…. The importance of the various dimensions and the overall impact of climate change on food security will differ across regions and over time and, most importantly, will depend on the overall socio-economic status that a country has accomplished as the effects of climate change set in (ibid.).

The warming process will steadily erode the human resources of our food production. Australia's agricultural systems have a high level of dependency on irrigation and are particularly vulnerable to warming and resultant rainfall and catchment losses. Dryland agriculture is also gravely threatened. The Australian Greenhouse Office (2005) summarized the climate risks to food production:

- Drought reduction in pasture growth could cause an $8 billion loss in annual export earnings
- Fruit and vegetable crop lost earnings of $2 billion annually
- Perennial horticulture losses due to higher water demand and other costs to potentially reach $2 billion per annum
- Annual broad-acre crops lost production in marginal areas worth as much as $8 billion
- Adverse prospects for Australian fisheries

Finally the report underlined the potential of warming to heighten health morbidities amongst vulnerable populations, including low income groups. In a paper for *The Lancet*, Australian health researchers, McMichael et al. (2006) identified heightened human risks through declining regional food yields and rising levels of food borne disease (as well as other stressors, such as vector borne disease). A social risk gradient demonstrated the extreme vulnerability of ill, elderly and poor populations, which tend to be spatially concentrated within Australia's cities.

In September 2009, CSIRO chief, Dr Megan Clark, reported to the National Press Club that 'in the next 50 years, we will need to produce as much food as we have ever produced in the entire human history' (Clark 2009, p. 6). The challenge was not unprecedented Clark explained, 'Humans have met this challenge once before—from 1960 to 2000 the world food production doubled through a combination of new technology and investment in agriculture' (ibid.). But this time two things are different:

> Firstly we will need to achieve this where carbon and water have a price. We can no longer simply clear more forest and farm even more marginal land. **Secondly this is happening at a time when we are seeing the greatest migration of our species to urban centres**. We will see profound shifts in the trade and transport of food (emphasis added, ibid.).

Food vulnerability—a problem as old as humanity itself—was now rescaled and complicated by the realities of rapid urbanization, global warming and resource depletion. Food security is thus indissolubly a question of urban resilience, and this is particularly the case in Australia which possesses one of the highest levels of urbanization in the world. Moreover, the Australian urban settlement system is unique in developed nations for its extremely high levels of metropolitan primacy, meaning that an overwhelming share of the population lives in a relatively small number of urban regions. Presently more than three-quarters of Australians live in '17 major cities of 100,000 people or more and the majority of urban dwellers living in five cities—Sydney, Melbourne, Brisbane, Perth and Adelaide' (MCU 2010b, p. 1).

At the same time Australia's population growth—overwhelmingly concentrated in the cities—has recently reached historically high levels and is likely to continue to do so, barring a major policy shift (Australian Treasury 2010). Research in 2010 for the Department of Immigration and Citizenship concluded that the nation's capital cities will more than double in size within 50 years under current immigration rates, and raised concerns about impacts on quality of life and food security (Packham 2011). Much of the peri-urban land used for food production in the major city regions, especially Sydney, would be degraded or lost to urban use. An earlier investigation by Low Choy et al. (2008) concluded, however, that the agricultural productivity of much of Australia's peri-urban regions had already been seriously compromised by poor planning, haphazard development and a lack of environmental oversight of land use practices.

These urban assessments sounded a bleak tone at a time of declining agricultural possibilities, much of it attributable to climate change. One political optimist offered an alternative development scenario. In recent years, Liberal Senator Bill Heffernan, urged Australians and their leaders to look to the North as a new frontier of agricultural ambition. Among conservatives, Heffernan is notable for taking warming seriously. In January 2007, then Prime Minister John Howard appointed Heffernan to head a taskforce to investigate water and agriculture development in the north. Was a new food bowl in the Top End the means of escape from climate induced food insecurity?

The CSIRO doubts the North's suitability for large scale food production (CSIRO 2009). And crushingly, a Commonwealth initiated study by The Northern Australia Land and Water Taskforce reported in 2010 that Australia's north can only support around 60,000 ha of agriculture—up from a present 20,000 ha. This is a microcosmic extension of farming area given the scale of projected need.[5] Both the peri-urban

[5] 'Report kills northern food bowl dream'. *ABC News*, February 8, 2010, Retrieved from http://www.abc.net.au/news/stories/2010/02/08/2812753.htm.

and northern frontiers to major new food production seem stymied, whilst traditional rural regions face stress and declining productivity. Can Australia's suburban regions offer a new landscape for food production?

## 21.4 Heartlands not Frontierlands?

Australian environmentalism has been largely, often vocally, critical of the suburban form, seeing it as the urban embodiment of waste and cultural lethargy (Forster 2004). A widely shared, if not unanimous, assumption in scholarly and policy circles is that suburbs are at once the source and the worst reflection of the sustainability crisis. The view has resonated with increasing strength in some domains of popular culture—and perhaps more strongly in elite cultural circuits. Imported US totems, such as 'sprawl', 'smart growth' and 'new urbanism', have signed the landscape of Australian urban scholarship and debate. The geographer Clive Forster recalls comment from a national radio documentary in the early 1990s:

> Australian cities have reached a mid life crisis. Two hundred years after European invasion and the beginnings of urban development in this country, we are looking down at the sprawling belly of our cities and exclaiming, 'Oh my God, how did that happen' (2004, p. 171).

Suburban complaint has a long history, especially in the arts and in parts of the media. In 1964 Donald Horne noted how 'bohemians and rebels attack "suburbanism"' as a favourite pastime (Horne 1964, p. 16). But this older criticism now has a virulent green edge, adding ecological waste to the schedule of suburban crimes. Waste and sprawl are synonymous.

Although sprawl is correctly defined as *unplanned low-density urban development*, the term has largely been used to refer to the whole suburban form, well planned or otherwise. Sprawl's totemic power is signified by the deathly potency granted it in scholarship and commentary, especially in the United States. Hirschhorn's 2005 book reports that *Sprawl Kills* and annihilates comprehensively by also (as its cover notes) stealing 'your time, health and money'. Australian architectural critic Farrelly (2007, p. 26) provides forensic detail: 'the traffic jams and the water shortages, the poisonous air and the childhood asthma, the obesity, the neuroses, the depression'. Meanwhile, however, most suburban Australians remain unaware of, or untroubled by, the sprawl bogey.

Environmental opinion has, however, begun to shift. The 2007 urban consumption analyses produced for the Australian Conservation Foundation (ACF) by the Centre for Integrated Sustainability Analysis at the University of Sydney turn conventional eco-criticism of suburbia on its head. The Main Findings report concludes:

> …despite the lower environmental impacts associated with less car use, inner city households outstrip the rest of Australia in every other category of consumption. Even in the area of housing, the opportunities for relatively efficient, compact living appear to be overwhelmed by the energy and water demands of modern urban living, such as air conditioning, spa baths, down lighting and luxury electronics and appliances, as well as by a higher proportion of individuals living alone or in small households. In each state and territory, the

centre of the capital city is the area with the highest environmental impacts, followed by the inner suburban areas (ACF 2007, p. 10).

In the face of rapid climate change and with the threat of rapid collapse of food systems, environmental opinion is fixing on the adaptive capacity of suburbs, and their ability to bolster metropolitan resilience.

Patrick Troy, eminent Australian urbanist, believes that environmental censure has blocked thought on alternative possibilities for suburbia, including the prospect that it may be the landscape best suited to safe adaptation in a warming climate. Its space and greenery offer immediate resources for onsite collection and disposal of water, generation of energy, and production of food. In his view, suburbia's adaptive potential has been understated or ignored by commentary and policy (Troy 2003). In 2008 renowned international ecologist Herbert Girardet told the International Solar Cities Congress in Adelaide: 'The suburb is perfect for low energy … Low density is good for wind and solar power because there's more space to generate locally' (Cubby 2008, p. 1).

These new perspectives on suburbia betoken a new landscape of urban ingenuity that might flourish in the quest for sustainability and resilience. The implied emphasis is domestic, but there is no reason why a suburban adaptation agenda should not be extended to commercial and retails sectors, to schools, and to other uses and groups that inhabit suburbia. Indeed there are signs that this is occurring—for example through schools programs that involve children in food production and in wider sustainability practices such as recycling and landscape rehabilitation. The restaurateur and food writer, Stephanie Alexander has established a 'Kitchen Garden Program' bringing food to the curriculum of 180 Australian schools, mostly suburban. The program has children learning how to grow, harvest, prepare and share fresh, seasonal food.[6]

In this light Australia's vast 'suburban heartlands' (Gleeson 2006) might offer a far more practical and propitious frontline against threats to resilience, including food insecurity, than that offered by peri-urban and northern frontiers. The case is overwhelming on sheer demographic grounds. As the ground of everyday life for most Australians it arguably offers the best prospects for rapid transition of lifestyles as well as the room and flexibility for new forms of production that aim to secure food and resource systems. Suburbia is a diverse landscape bequeathed over a century and a half development cycle and assuming different historical forms. Whilst these contoured landscapes—the 'fibro frontier', the 'veneer frontier', 'McManion land' etc.—wear many faces they arguably share certain powerfully useful qualities that are suggestive of heightened potential for food output as well as resource capture and disposal. Does it have the resources, including land, to generate a new food yield? Arguably yes.

First, the vast suburbia of our metropolises and sea change regions occupies land with some of the best soil and water resources in the continent. Climate projections

[6] http://www.kitchengardenfoundation.org.au/.

suggest that they will continue to receive rainfall sufficient to provide for their inhabitants' needs. Second, with the exception of more recent 'small lot' estates, suburbia is a low density greenscape; a highly disorganized but potentially productive landscape.

There exist obvious barriers to producing food in suburbia. It is a fragmented, multiply owned patchwork that resists the extensive farming practices possible in rural areas. And yet fragmentation need not defy integration, which could be based upon property owners and users sharing produce or cooperating to produce large yields across individual holdings. The tendency to gating new residential communities works against the interests of productive integration.

At the lot level, a large proportion of suburban blocks have the room and the resources at hand to support food production. Environmentalist and permaculture advocate, David Holmgren, reflects Giradet's confidence in the adaptation potential of suburbia:

> 'Suburban sprawl' in fact gives us an advantage. Detached houses are easy to retrofit, and the space around them allows for solar access and space for food production. A water supply is already in place, our pampered, unproductive ornamental gardens have fertile soils and ready access to nutrients, and we live in ideal areas with mild climates, access to the sea, the city, and inland country (2005, p. 8).

The physical possibilities for suburban food production seem immense if not uncomplicated by tenure and layout. Ghosh and Head (2009) further demonstrate that the diverse suburban form offers a highly variegated set of possibilities for household self-provision and sustainability.

What are the social resources needed to realize this ambition? From a societal perspective, the suburbs are often wrongly miscast as antienvironmental. Davison (2006) argues that Australian anti-suburbanism engenders disenchantment and withdrawal by the suburban civil society. Stretton's (1976) earlier argument, he believes that suburban environmental values and enthusiasm are consistently underestimated and recalls that it was suburbia that originally gave birth to environmentalism. In his view, environmental sensibility remains, slumbering perhaps, but ready like all sleepers to be awakened by the right cause.

A witness to this reservoir of social possibility was the stunningly effective response of suburbanites in south-east Queensland during the grinding drought (2000–2007) that took our third largest conurbation to the very edge of possibility. With resolute state and municipal leadership, householders were able to reduce per capita water use to the lowest levels in the developed world, and a crisis was staved off (Spearritt 2008). Arguably, suburban response rescued the situation.

We may now ponder the legacy of this and other responses to urban water crises in Australia. A clear inheritance is a substantial renovation of the urban form, with many residential properties adapted permanently to water conservation. In 2007, 21% of households resided in a dwelling with a rainwater tank (ABS 2010). City specific use differed widely—in Adelaide over 40% of households had water tanks, whilst the figure for Perth, Sydney and Canberra was considerably lower (MCU 2010b). This must amass to a substantial new catchment capacity in our cities. Presently it is largely used for ornamental gardens, but it could easily service a new suburban food endeavour.

History further underlines the prospects for suburban food production. Until relatively recently Australian suburbs were highly productive food regions. In simpler times, the dictate of self-sufficiency was carefully abided by. Queensland sociologist, Patrick Mullins, demonstrated that even up until the 1950s and 1960s a very substantial proportion of produce consumed in the cities was sourced in suburban backyards (Mullins 1981a, b). And the rest was mostly sourced from the immediate hinterlands of our cities.

Gaynor (2006) in *Harvest of the Suburbs* documents the long history of suburban self-sufficiency that obtained in Australia's cities through the twentieth century and up to the 1960s. A gendered division of labour frequently prevailed—Father tended the veggie plot and the fruit trees and Mother the chooks. In times of stress—War or Depression—the suburban soil was tilled that much harder and with great success. Australia was not unique. Lovelock (2009) recalls that in Britain during the Second World War, 'a great surprise…was the discovery that the output of food per acre was four times greater in gardens and on allotments than it was on farms'.

The suburbs beckon a new, comprehensive makeover which will make them fit for food production. This means dispensing with those unbending green critiques of suburbia which neglect its vast latent potential to aid the causes of climate adaptation and social resilience. As Ghosh and Head observe 'suburban developments will continue to dominate Australian landscapes in the timeframe available for adapting to climate change' (2009, p. 319). However, this recognition also requires acceptance that the suburban landscape must evolve to embrace social and spatial changes driven by, inter alia, metropolitan sustainability imperatives. This includes steady densification of the entire urban for arising from a need to restrain further outward growth. Planning restraint must protect surviving peri-urban lands with productive potential and/or recognize the declining possibilities for greenfield development in the increasingly 'browned' and hardened edges of Australia's metropolitan regions. Suburban adaptation begins with a great reservoir of potential, including space, but will need to embrace rising population and dwelling densities—a process already evident in the middle suburbs of Australia's cities.

What are the barriers to a suburban renovation in quest of resource resilience, as Holmgren (2005) envisions? Leadership appears to be the most immediate barrier to change. At the federal level, there is little yet on the cities other their role as sites for 'shovel ready' infrastructure projects. The States which carry principal responsible for urban management have compromised and hindered themselves with inflexible visions of the compact city (Forster 2004). The compact city vision is heavily freighted with anxiety about the 'sprawling' suburban form and, as yet, unwilling to embrace the idea of suburban possibility. At the municipal level, things are more promising but patchy. Community gardens are flourishing but unlikely to cohere into a major source of food supply without higher leadership and integrated planning at all levels.

One integrated governance ideal that might advance the cause of resource resilience in Australia's fragmented cities is that of metropolitan commissions.

Recent advocacy (Gleeson et al. 2010) favours new metropolitan commissions that would independently manage the cities and guide them through the unfolding climate and resource crises, removed from the distractions and non-urban agendas of state politics. In quest of resilience, a coherent approach to urban food production would be a necessary aim of integrated metropolitan governance.

There are other social barriers to suburban agriculture. First, we cannot restore it as before; given the new, diverse social structure that comprises contemporary suburbia. Women are in the paid labour force, not minding children and chickens, and, Australians generally work more intensively than in the 1960s, when urban food production still thrived. Who will tend the plots in a time poor society? Perhaps part of the answer is to end our prolonged hand-wringing about population ageing and recognize the grey, and largely fit, army that is potentially available and willing for a new type of gardening? Food production at schools, tens of thousands of them, would provide a new focus for pedagogy and involve children in the nurturing and consumption of healthy food.

Finally, there are a host of difficult sundries that have to have to be addressed—farming nuisances and private property rights, public liability issues, health and safety concerns relating to non-organic produce, safe storage of water, and the like. These details will bedevil ambition unless firmly addressed through new enabling and protecting legislation, the provision of expertise to householders and, above all, through attentive municipal guidance. Councils should be the coalface managers of suburban food production, and could provide community exchanges for the sale and trading of produce.

In generations past, a mixture of material necessity, cultural preference and personal enjoyment brought in the 'harvest of the suburbs'. It ended with our brief flirtation with fantasy, when we believed ourselves utterly freed from Nature and released to the freeways of boundless gratification. In an urbanized world at risk Promethean modernism now appears as a dangerous enterprise. And yet it bequeathed some of the resources—notably, suburbia—that might, if used with ingenuity and resolve, provide for a more resilient urban future.

## 21.5 Concluding Reflections: Compaction and Resilience

The relentless rise of global food insecurity seems to have gained an unstoppable momentum. In February 2011, IMF chief Dominique Strauss-Kahn warned that soaring food prices could generate 'rising social and political instability within nations—even war' (cited in Kelly 2011). We may expect a prolonged period of social instability and political reaction, including the cessation of food exports across some national boundaries and emergency measures to secure regional food stocks. The 'long summer' of climate change will only prolong and intensify this process. It is likely that autarky—that is national, regional and urban self-sufficiency—will re-enter the global political canon. The idea—associated with left thinking—was thought banished by globalization but is waiting in the wings as the drama of food and resource insecurity unfolds on the world stage.

Leaving aside its desirability as a human social ambition, autarky is emerging as a new axiom of urban resilience. Its microscopic form is the movement of thought and action favouring re-localization of food and resource circuits. Australian cities—now complex, multi-centred urban regions—must ponder the prospects for higher levels of self-sufficiency in a context of unique urbanization. Our urban system is distinctive for its high level of metropolitan primacy, the dominance of the suburban form, the rapidity of population growth, and shadowing this, mounting resource insecurity.

Importantly, a rapidly shifting characteristic is urban density. Driven by historically high levels of population growth in tandem with planning restraint, the major urban regions are now recording ever higher population and dwelling densities. At one level this is to be welcomed. The metropolitan edges were by the 1990s pushing into hinterlands with high environmental and resource values (catchments, regional open space, peri-urban farms, etc.) and the costs of outward extension were demonstrably high. Moreover, the newer urban frontiers were less well watered and generally propitious than those developed behind them over the last two centuries.

The practicalities were buttressed by ideological enthusiasm for compaction from green advocates and many planners, beginning in the 1980s and strengthening since then. And yet, as the ACF analyses enlisted earlier showed, the relationship between density and urban footprint is complex and not linear. Whilst densification appears inevitable, as long as population growth is maintained, it appears increasingly fraught with resilience risks. A mounting body of research is suggestive of 'vertical sprawl'; viz., poorly designed and managed high density environments that use more per capita energy than do traditional urban forms (Gray et al. 2010). This does not negate the inevitability or desirability of carefully planned densification but points to the risks of market driven compaction.

Whilst the possibilities of vertical farming in high density environments are being essayed and trialled internationally, the barriers to food production that may emerge from *unplanned* compaction bear serious consideration. Poor compaction is characterized by near or total replacement of greenspace with impervious surfaces, overly intense site layouts that preclude resource generation (especially food and water), and a host of ancillary externalities that compromise resilience (pollution, congestion, stress). The resilient alternative is consciously planned and designed medium density environments that cultivate the possibilities for sustainability practices by firms and households (Hall 2010).

In a rapidly urbanizing world with a shrinking resource base, including land, the future will inevitably be more compact for much of humanity. This need not foreclose on the urgent imperative of resilience if planning and experimentation guide new pathways towards a more productive and self-sufficient urban form. In Australia, this means generating a new resource harvest from our vast suburban heartlands. And it beckons a compassionate and thoughtful approach to the necessity of urban consolidation.

## References


Australian Bureau of Statistics (ABS). (2010, January). *4613.0—Australia's environment: Issues and trends.* Retrieved April 22, 2011, from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4613.0Chapter75Jan+2010

Australian Conservation Foundation (ACF). (2007). *Consuming Australia: Main findings*. Retrieved April 6, 2011, from http://www.acfonline.org.au/consumptionatlas

Australian Greenhouse Office. (2005). *Climate change risk and vulnerability promoting an efficient adaptation response in Australia*. Canberra: Australian Government.

Australian Treasury. (2010). *Australia to 2050: Future challenges*. Canberra: Commonwealth of Australia.

Beck, U. (2008). *World at risk*. Cambridge: Polity Press.

Borger, J. (2008, April 5). UN chief calls for review of biofuels policy. *The Guardian.*

Bowyer, C. (2010). *Anticipated indirect land use change associated with expanded use of biofuels in the EU. An analysis of Member State performance*. London: Institute for European Environmental Policy.

Clark, M. (2009, September 30). *Securing the future in a connected planet. Address to National Press Club of Australia*. Retrieved April 20, 2011, from http://www.csiro.au/files/files/psvs.pdf

CSIRO. (2009). *Water in Northern Australia. Summary of reports to the Australian Government from the CSIRO Northern Australia Sustainable Yields Project*. Canberra: CSIRO.

Cubby, B. (2008, February 23). Our place in the sun. *The Sydney Morning Herald*, 3pp. Retrieved April 20, 2011, from http://www.smh.com.au/news/environment/our-place-in-the-sun/2008/02/22/1203467388940.html

Davison, A. (2006). Stuck in a cul-de-sac? Suburban history and urban sustainability in Australia. *Urban Policy and Research, 24*(2), 201–216.

Farrelly, E. (2007) Our cities reveal the ugly side of democracy, *The Sydney Morning Herald*, 6-7 October, p.26.

Farrelly, E. (2007, October 6–7). Our cities reveal the ugly side of democracy. *The Sydney Morning Herald*, p. 26.

Forster, C. (2004). *Australian cities: Continuity and change*. Melbourne: Oxford University Press.

Gaynor, A. (2006). *Harvest of the suburbs*. Perth: University of Western Australia Press.

Ghosh, S., & Head, L. (2009). Retrofitting the Suburban Garden: Morphologies and some elements of sustainability potential of two Australian residential suburbs compared. *Australian Geographer, 40*(3), 319–346.

Gleeson, B. J. (2006). *Australian Heartlands: Making space for hope in the suburbs*. Sydney: Allen and Unwin.

Gleeson, B. J., Dodson, J., & Spiller, M. (2010). *Metropolitan governance for the Australian city: The case for reform*. Issues Paper no. 12, Urban Research Program, Griffith University, Nathan.

Gray, R., Gleeson, B. J., & Burke, M. (2010). Urban consolidation, household greenhouse emissions and the role of planning. *Urban Policy and Research, 28*(3), 335–346.

Hall, T. (2010). *The life and death of the Australian backyard*. Melbourne: CSIRO.

Hirschhorn, J. (2005). *Sprawl kills*. New York: Sterling and Ross.

Holmgren, D. (2005, March 31). Retrofitting the suburbs for sustainability. *CSIRO Sustainability Network*, Update 49, 1–9.

Horne, D. (1964). *The lucky country*. Melbourne: Penguin.

Kelly, P. (2011, March 16). High food prices feed unrest in developing world. *The Australian*.

Lovelock, J. (2009). *The vanishing face of Gaia: A final warning*. London: Penguin.

Low Choy, D., Sutherland, C., Gleeson, B. J., Dodson, J., & Sipe, N. (2008). *Peri-urban futures and sustainable development*. Research Monograph 4, Urban Research Program, Griffith University, Nathan.

Major Cities Unit (MCU). (2010a). *Background and research paper: Our cities—The challenge of change*. Canberra: Commonwealth of Australia.

Major Cities Unit (MCU). (2010b). *State of Australian cities 2010*. Canberra: Commonwealth of Australia.

McMichael, A., Woodruff, R., & Hales, S. (2006). Climate change and human health: Present and future risks. *The Lancet, 367*, 859–869.

McWilliams, J. (2009). *Just food: Where Locavores get it wrong and how we can truly eat responsibly*. New York: Little Brown.

Mullins, P. (1981a). Theoretical perspectives on Australian urbanisation: 1. Material components in the reproduction of Australian labour power. *The Australian and New Zealand Journal of Sociology, 17*(1), 65–76.

Mullins, P. (1981b). Theoretical perspectives on Australian urbanisation: 1. Material components in the reproduction of Australian labour power. *The Australian and New Zealand Journal of Sociology, 17*(3), 35–43.

Newman, P., Beatley, T., & Boyer, H. (2009). *Resilient cities: Responding to peak oil and climate change*. Washington, DC: Island Press.

Okie, S. (2005). *Fed up! Winning the war against childhood obesity*. Washington, DC: Joseph Henry Press.

Packham, B. (2011, January 24). Cities to more than double in size under current immigration levels, says news research. *The Australian*.

Passman, H., & Kirillov, I. A. (Eds.). (2007). *Resilience of cities to terrorist and other threats: Learning from 9/11 and further research issues* (NATO Science for Peace and Security series). Dordrecht: Springer.

Pearce, K., Holper, P., Hopkins, M., et al. (Eds.). (2007). *Climate change in Australia: Technical report 2007*. Canberra: CSIRO.

Pelling, M. (2003). *The vulnerability of cities: Natural disaster and social resilience*. London: Earthscan.

Schmidhuber, J., & Tubiello, F. (2007). Global food security under climate change. *Proceedings of the National Academy of Sciences of the United States of America, 104*(50), 19703–19708.

Spearritt, P. (2008). The water crisis in Southeast Queensland: How desalination turned the region into carbon emission heaven. In P. N. Troy (Ed.), *Troubled waters: Confronting the water crisis in Australia's cities* (pp. 19–36). Canberra: ANU ePress.

Stretton, H. (1976). *Capitalism, socialism and the environment*. Cambridge: Cambridge University Press.

Troy, P. N. (2003). Saving our cities with suburbs. *Griffith Review, 2*(Summer 2003–2004), 115–128.

# Chapter 22
# Farming in Rural Amenity Landscapes: Maintaining Food Productivity in a Changing Environment

**Jane Roots, Joanne Millar, and Rik Thwaites**

## 22.1 Introduction

Rural amenity landscapes combine attractive natural physical features with tangible evidence of human endeavour. Sometimes historic but generally agrarian, they are scenic and accessible cultural landscapes (Bunce 1998), attracting tourists as well as new residents with their 'images of picturesque working farms and rural service towns' (Halfacree and Boyle 1998). Situated within commuting distances of major cities or regional towns, these landscapes attract in-migration of people from metropolitan areas and elsewhere, seeking a rural lifestyle with good views, a benign climate or abundant rainfall, good communication infrastructure and relatively close proximity to a well-developed regional centre (Barr 2003; Burnley and Murphy 2004; Buxton et al. 2007; Halfacree and Boyle 1998; Hugo 2005). The amenity landscape supports a wide range of land uses and is evolving as a fundamentally new form of settlement pattern—creating a clearly discernible and increasingly important 'middle landscape' between the suburban and the rural (Aslin 2006; Cocklin et al. 2006; McKenzie 1996). Often described as 'multi-functional' landscapes, rural amenity areas contain a mix of production, consumption and protection values and uses (Argent et al. 2007; Holmes 2006) where both the view and the outputs from activities which create the view are consumed (Curry et al. 2001; Tonts and Grieve 2002). It is the current and future agricultural productivity of these evolving landscapes and their role in food security that is the focus of this chapter.

In some amenity areas of Australia, market demand has enabled farmers wanting to retire to subdivide their farms or sell lots for development due to land use zoning changes (Curry et al. 2001; Millar and Roots 2012; Tonts and Grieve 2002). Loss of prime agricultural land due to subdivision and development of low density residential

J. Roots • J. Millar (✉) • R. Thwaites
School of Environmental Sciences, Charles Sturt University, Albury, NSW, Australia
e-mail: jmillar@csu.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_22,

lots in these landscapes has been a cause of concern as it increases the price of land relative to farm income, reducing the ability of farmers to pay rising costs or expand their land holdings (Gill et al. 2010). There is also concern about the increase in conflicts between farming and 'lifestyle' landowners in some areas where issues such as noise or smells from agricultural operations impact upon non-agricultural residents (Condon et al. 2010; Gibson et al. 2005; Henderson 2003).

However, the extent that these issues are influencing food production and responding to issues of food security has not been widely studied. Barr (2005) contends that just over a third of Australian farms are located in rural amenity landscapes, producing 21% of the total value of Australia's food and fibre. These farms tend to be small and family-owned, with the average farm producing a little less than $100,000 of production per year. Despite this, they contribute significantly to the overall physical attraction of an amenity landscape which draws tourists and new landowners (Argent et al. 2007; Ecker et al. 2010; Mendham and Curtis 2010).

Campbell (2008, p. 5) points out that in-migration to these areas by those seeking rural amenity and lifestyles 'does not necessarily displace agricultural production, though it tends to change the nature and intensity of that production, and asks more questions of it'. Rural subdivision has the potential for diversification and development of niche agricultural industries (Gibson et al. 2005). The influx of people into these regions for lifestyle reasons has brought with it new money and urban preferences, so these areas now cater for culinary and heritage tourism (Campbell 2008; Mitchell and de Waal 2009). These small farms and businesses can contribute to local food production and tourism through food trails and farmer's markets (Ecker et al. 2010).

While it is well known that the contribution of small properties to overall agricultural production is very low compared to large farms (Barr and Karunaratne 2002), the role of these farms in providing a secure and acceptable source of local food is less understood. Concerns have been raised about the rate of loss of arable land and how this affects regional food security (Millar and Roots 2012; PMSEIC 2010). Land use policy and rural planning are challenged by the role that small farms play in providing food for local and regional consumption (Budge and Slade 2009). The increasing popularity in farmers' markets, farm-gate sales, agri-tourism, and local branding of food and wine products reflects a public desire to reconnect with food, food-producing landscapes and rural communities (Coster and Kennon 2005; Caldwell et al. 2011). This could play a part in enhancing societal attitudes and understanding of food production, a component of ensuring food adequacy (PMSEIC 2010).

This chapter explores food production and issues of local food security in an amenity landscape from the different perspectives of farmers, local and state government officers, councillors and agribusiness representatives. Indigo Shire is used as a case study, as it is picturesque and agriculturally diverse, combining historical towns with a broad variety of commercial agricultural enterprises. The Shire has become a destination for 'tree-changers', typically ex-urbanites seeking a quieter and more bucolic lifestyle (Tonts and Grieve 2002). While the Shire's towns have attracted the majority of new migrants, it is the subdivision of farms and construction of new dwellings on small lots in traditionally agricultural areas which has become an issue of increasing concern in terms of future food production and the aesthetics of a rural landscape. These trends and concerns apply equally to rural amenity landscapes in Australia, New Zealand, North America and Europe (Alterman 1997; Bills and Gross 2005; Buxton et al. 2006).

## 22.2 Methodology

A qualitative case study approach was used to explore the situational complexity of food and fibre production in an amenity landscape. Indigo Shire is a small rural shire located in North East Victoria, approximately 270 km north east of Melbourne. It encompasses an area of just over 2,000 km$^2$, stretching from the higher rainfall and inland slopes of the Great Dividing Range to the drier and flat River Murray floodplain. The Shire includes parts of the Kiewa River valley as well as the historic towns of Beechworth and Rutherglen (Fig. 22.1).

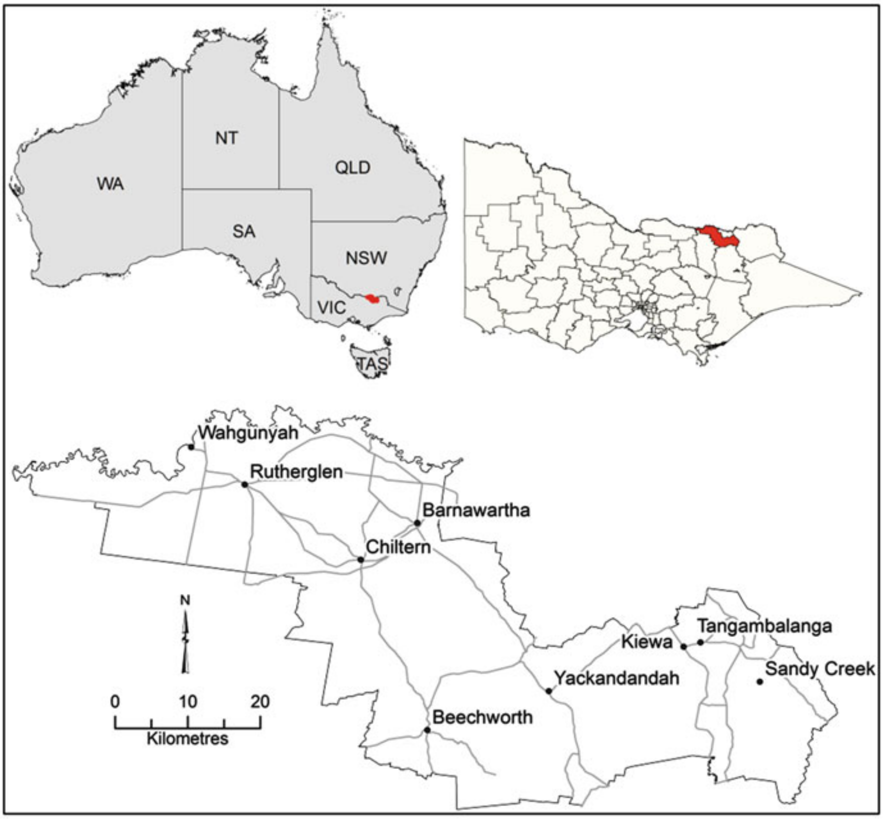



**Fig. 22.1** Location of Indigo Shire in North East Victoria

**Table 22.1** Interviewee sectors

| Sector | Number of people interviewed |
|---|---|
| Dairy | 14 |
| Horticulture (including wine grapes and bee-keeping) | 7 |
| Broad-acre/cropping | 4 |
| Grazing (beef and sheep/lamb) | 10 |
| *Total farmers* | *35* |
| Councillors | 4 |
| Planners (Local and State government) | 4 |
| Other local government senior staff | 3 |
| Agribusiness consultants | 2 |
| *Total agency/agribusiness* | *13* |
| *Total interviewed* | *48* |

**Table 22.2** Location of farmer interviewees

| Location | Number of people interviewed |
|---|---|
| Kiewa Valley (east) | 14 |
| Chiltern and Rutherglen (north) | 9 |
| Wooragee and Yackandandah (central) | 4 |
| Beechworth and Stanley (south) | 8 |
| *Total* | *35* |

In 2010, Indigo Shire had an estimated population of 16,111 and an annual growth rate of just over 1% between 2009 and 2010 (Department of Planning and Community Development 2011). This growth rate is higher than average for regional Victoria and reflects the drawcard of a rural amenity landscape. The Shire is nestled between the regional centres of Wodonga and Wangaratta, both growing at a rate of 1.9% and 0.9% respectively (Department of Planning and Community Development 2011). The Shire's economy is based on agriculture and tourism. In 2008, there were 503 farms, with 601 people employed directly in agriculture, and 1,121 people in manufacturing, largely agribusiness related (Indigo Shire Council 2008). A broad range of agricultural industries are present, including dairy, beef, sheep, wine, horticulture, viticulture and grains. The effective contribution of agriculture to the economic base of the Shire was $151.3 million in 2006, with tourism contributing $73 million; however tourism supports significantly more jobs than agriculture (Indigo Shire Council 2008).

Forty-eight qualitative semi-structured interviews were conducted in 2010 and 2011 with farmers, local and State government staff, Councillors and private agribusiness advisors as shown in Table 22.1. Study participants were identified through purposive sampling; selecting individuals with broad knowledge and experience in farming and land use change issues in Indigo Shire as well as across a broad geographical spread in the Shire (Table 22.2). Analysis of the qualitative data was inductive and interpretive, using a systematic process of coding involving NVIVO software and categorizing to de-contextualize and re-contextualize the data according to themes and topics. This was done through examining an initial subset of the data for major and minor concepts, similarities and contrasts, then creating categories based on themes and relationships.

## 22.3 Results

### *22.3.1 Farmer Perspectives on the Shire Being a Food-Productive Area*

On the whole, farmers were optimistic about food production and the future of their respective industries in Indigo Shire despite challenges created by the recent drought, an increasing rural population and uncertain market prices for their products. For many, this optimism was based on a sense of stability arising from their geographical location in the headwaters of the Murray-Darling Basin catchment, as well as perceived proximity to markets. However, there were quite marked differences between agricultural sectors as to the definition of 'market'.

For cropping and beef farmers, being close to the Wodonga and Wangaratta Livestock Saleyards, the Wodonga abattoirs, the local retail centres of Albury/Wodonga, Wangaratta and Corowa, the local dairy industry as well as easy access to the Hume Highway transportation corridor were big advantages to doing business in the area. As one broad-acre farmer stated:

> Our business is definitely going to expand in the future. From our perspective, the business is ideally situated. We are not far off the main route between Sydney and Melbourne, into the two biggest logistical hubs on the east coast, so that gives us an advantage to freight our products all over Australia… and this area is a high rainfall area, it really is an ideal area for grain production. There could even be an argument for more intensive farming to go in the area and there could be potentially room for that (Farmer 32).

Many of these farmers referred to the flexibility of their industry in terms of utilizing more or less land depending on availability and seasonal conditions, being able to plant different crops or focus on different stages in beef production. For a few farmers, the traditional three 'staples' of farming—'the sheep, the crop and the cattle' provided security, even though prices fluctuated. These farmers were generally older and had family members involved on a part-time basis on the farm. For other farmers, who owned and leased larger properties, adaptability and diversity were essential to their profitability and longevity in the area. Many of them referred to soil management, taking advantage of technology and good animal husbandry as being essential to creating efficiencies and long-term value in their business.

The majority of horticulturalists and grape growers in the region believed that the location and marketing image of their product was an essential part of their current success and they felt that this aspect would continue to be important into the future. The existing attractive rural landscape and the historical connection to the land created an advantageous image of healthy products and 'earthiness'. Farm-gate sales, local farmers' markets and the potential of 'pick-your-own fruit' enterprises were viable options that benefited from the tourist trade as well as the increasing base of local customers, as highlighted in this statement:

> Close to 80 per cent of our business was farm-gate last year, and that has grown enormously. So I think there is huge potential there. And in this valley there is huge potential for people to do more of that. I think there is potential for more combinations of tourism and agriculture (Farmer 06).

Horticulture producers were optimistic that the market for fresh fruit would grow both locally and regionally and that their businesses would be viable into the future, but they cautioned that it was a lot of physical work which would make the industry less attractive to newcomers. They recognized that the increase in the rural population meant there was more demand for their product. However, they also noted that keeping up with production was a struggle at times due to climatic conditions—drought and water availability, heat waves, hail, predation by birds and increases in pest infestations. As the following producer explained:

> I think, like a lot of farmers, unless you're passionate about it and really enjoy it, you're not going to put in those long hours; it is not a nine to five job where you can say 'okay I can go and have tea now'. You've actually really got to enjoy it because there are so many extra hours. I think people that don't have that obsessive nature then just don't last. I don't think you can do any farming unless you really, really enjoy it, I don't think it's possible (Farmer 22).

The dairy sector is an important industry in the eastern part of the Shire and dairy farmers were cautiously optimistic about their future, with many saying that there was still enough profit in dairy to retain farming families. They said the few downturns in recent years and the drought would be offset by the majority of good years.

> Most dairy farms are struggling financially, like ours in the last six months, but over the last many years, quite a few years, we've made farm management deposits which have held us in good stead in times that aren't so good. So effectively it evens out our ride, but you've got to be able to make farm management deposits when times are good (Farmer 35).

Many dairy farmers thought that the land was being managed better than ever before, and that once a certain scale in milk production was reached, the business was certainly viable and profitable. However, the cost of land due to rural residential encroachment was preventing some farmers from expanding and taking advantage of economies of scale.

> [Success] depends on scale to some degree. But in this area we have some very efficient and effective farmers and most of them are trading quite profitably I would suggest. There are a couple of them that are at a smaller scale that find it more difficult because the payment systems in general favour… well, there are more incentives for the bigger producer, put it that way (Farmer 18).

All the dairy farmers interviewed mentioned issues around succession planning and ensuring there was a next generation of farmers. More than half of the dairy farmers said they knew their children or other members of the family would be taking over the farm. In quite a few of these families, the next generation was already actively involved either in a role on their family's farm or leasing and share-farming other land in the area. Several of these farmers commented on the challenges of having the next generation come on board in the business, and noted that there were much better support systems in place now to manage the transition than there had been when 'they took over from their parents'. Four of the fourteen dairy farmers said they thought their businesses would probably not continue into the future. Two of these farmers were at the point of selling their properties (to other farmers) due to health reasons, another farmer was selling because their children were not interested and the 'writing was on the wall' as the surrounding land had been rezoned for residential development, and the fourth farmer said that the property was too small and the work too tough to make the business appealing to the children.

> [The children] are not really interested, not in dairy farming. Because we haven't employed [anyone to help out], it means we've worked seven days a week forever and that's what our kids see as dairy farming (Farmer 15).

This sentiment was echoed by a few horticulturalists as well, although there was less evidence of orchards being managed by successive generations. All of the fruit growers spoken to had bought in or started the business themselves. For winemakers, the multi-generational aspect of the vineyard was an important marketing aspect:

> [It is about] keeping the uniqueness of the winery, the authenticity as we see it as a package, with us involved, and contact with the family is part of all of that (Farmer 31).

### *22.3.2 Local Government Perspectives on the Role of Agriculture in the Shire*

While farmers were quietly confident about their ability to produce food within the Shire, there were markedly different responses between local government staff and Councillors on the role of agriculture in the Shire. Local government staff noted that agriculture played an important economic role in the Shire:

> When we talk about it being an agricultural shire, I guess it's predominantly around employment and economic contribution and it's probably also fundamentally about the predominant use of most of the land within the municipal boundaries, you know with the exception of townships, the balance is clearly agricultural use (Shire staff 04).

However, Councillors' understanding of the value of agriculture in the Shire was varied and appeared to reflect their own personal interests and level of connection with farming activities. For the most part, farming was viewed through a 'consumption' lens rather than a 'production' one. The prominence of tourism and historical sites in the Shire's operational activities was also highlighted in responses from Councillors when asked about the role of agriculture in the Shire.

> To be honest I don't see it as an agricultural shire because of the domination of tourism and heritage and history and all that sort of stuff, and wine. My thinking of agriculture is more to do with farming and growing wheat and all that sort of thing (Councillor 01).

It was noted by some Councillors that it was difficult to separate agricultural activities from tourism activities such as cellar door sales, farmers' markets and touring through attractive scenery, and that all these activities created employment in the Shire.

> I think a lot of people would think [the Shire] would be more tourism-driven but we have had some fairly recent statistics about that…. basically the main income driver in the Council area is agriculture (Councillor 02).

> We have our citizens working in these places so I think there is a real appreciation [on the part of Council] that agriculture is absolutely fundamental to the future of the Shire (Councillor 03).

Councillors and local government staff mentioned that the diversity of food production in the area also contributed to the success of community events and activities such as the farmers' markets as well as tourism festivals, and it was noted that the Shire had been an important facilitator in the feasibility investigations for the farmers' market in Beechworth. A few Councillors and local government staff members said that tourism activities, based on appreciating local produce and festivals focussing on local food and food producers, were important ways to educate the public about the values of local agriculture and the importance of healthy diets, and could help raise awareness of local farmers and their contribution to the community. Increased community access to agricultural activities and products, such as through farm-gate sales or farm stays would reinforce this educational component.

> I think [farm gate sales] are an opportunity which helps us to diversify or change the way we might think about agriculture. In some ways I think people still have an affiliation or an affection if you like, to the broad-acre farm and even if those industries weren't as strong or disappeared I'm sure there's still going to be that tension about what we do with that land because I still think there's that feeling 'that's why I'm here' (Shire staff 03).

Most Councillors stressed the importance of the Shire's diversity of agricultural activities and products, and expressed concern that this diversity could narrow over time, due to factors such as climate, water availability, rising operating costs and a decrease in the farming population. Some Councillors said they thought there should be incentives or mechanisms in place to encourage agricultural businesses to stay or to attract new ones. However, it was also noted that the Council did not yet have a specific policy around promoting agriculture or food production in the Shire. While there was a draft Economic Development Strategy, this was seen as only a discussion paper. A few Councillors saw a need for a more focussed strategic planning exercise which embraced the economic contribution of agriculture in the Shire as well as defining the role of the Shire in food security.

> I have talked about getting more of a focus on agriculture into our strategic plan. I think there is more that could be done to think about how we can really play our part in [promoting agriculture]. I'm not really sure that has been thought through as much, whether [local government] can play more of a role, whether it can or it can't (Councillor 03).

### *22.3.3 Food Production as a Desired Land Use in a Rural Amenity Landscape*

From a local government perspective, the issue of food security and supply was acknowledged as important and likely to become more so in the next few years.

Local government planners expressed concern that issues around food security on a local scale 'were just not on the policy radar yet' (Shire staff 01). They thought there had been very little direction from State government as to how local government should deal with it. There was acknowledgement that protecting food-producing areas as a component of food security was now being flagged as an issue across government and private sectors, raising concerns in a number of areas from environment to marketing.

Local government staff, Councillors and some farmers noted that having food produced locally was an important aspect of people's satisfaction and enjoyment of living in or visiting the area, and therefore was an issue that needed to be addressed by the Shire. Food security and supply was a fundamental issue for local government because 'it goes to the heart of how people live their lives, and we [local government] have got a stake in that' (Shire staff 03). Councillors were particularly vocal and quite passionate on the issue of food production;

> I think there is, psychologically and emotionally, a comfort in being able to drive around and see where your food comes from, to see order, to see activity, to see endeavour (Councillor 03).

One aspect of local government's involvement in food production was an interest in improving the ability of people to grow food and to protect that investment into the future by identifying and protecting highly productive farm land.

> I think there is a role for local government in food security. We have a pretty good understanding of the categories of land capability that we have. And part of the land use strategy is to identify the land that is not just high grade but quite usable agriculturally. It may need extra nutrients or whatever, but make sure we have the capacity to develop those areas and still have the capacity to produce food. We are all concerned about the production of food (Councillor 04).

This concern was echoed by quite a few farmers who saw the connection between the loss of farm land, impacts on local food production and broader food security issues. The issue of breaking up existing farms was expressed as a potential sustainability issue, with several Councillors noting that some land use changes could drive increased productivity, diversity and value-adding on farms, but this had not yet been explored. Some farmers thought that rural residential lots could be accommodated alongside existing productive farms. They saw this as requiring strategic planning and a targeted approach using incentives or some supportive processes, with possibly more investigation into appropriate agricultural industries or alternate ownership arrangements.

> It's pretty country, it's really lovely around here and we've already got small blocks but whether or not people should be given the opportunity to develop the smaller blocks into other alternative agricultural industries is what it would come back to (Farmer 27).

> I am strongly interested in the idea of a co-op style venture to lease land and I would like to see the idea further advanced [as it could mean that] we would have people living on the land and still getting the use out of it. I see that as the real benefit (Councillor 04).

Councillors, Shire staff and some farmers were forthright in their view that food production from the Shire was a local issue that could and should be promoted better, not only for health reasons, but also as an economic and cultural stimulus for businesses and the community as a whole.

> I think this is a beautiful part of Australia, it is a beautiful area to live in, we have a great climate here, and I can understand why people want to live here but I think we have to preserve the country feel to the area and keep the primary production because it adds to the economy. There is a big argument to keeping agriculture local (Farmer 32).

## 22.4 Discussion and Conclusion

Across Australia, rural amenity landscapes are undergoing significant change. These areas are marked by an emergence of market-driven, amenity-oriented uses and changing societal demands and values, as demonstrated in our research in the Indigo Shire in North East Victoria. Unlike peri-urban and coastal amenity areas that have experienced land use conflicts and compromised agricultural production (Buxton et al. 2007; Gibson et al. 2005), we found that farmers were generally optimistic about the future of their respective industries, and had experienced minimal conflicts with newcomers. Despite recent rises in land value and succession uncertainties, the majority of farmers were able to adapt by changing management practices, diversifying, value-adding and selling produce on-farm or locally. The connection between local produce and landscapes was valued by the Councillors and farmers alike, with many recognizing the diversity of farm products enhancing the 'liveability' and attractiveness of the area for tourists as well as residents. There was significant support expressed verbally by local government officials to enhance and protect local food production, recognizing that locally produced food had economic and social outcomes as well as environmental and ethical benefits.

Local marketing, tourism and economic development strategies were seen as important avenues to maintain and enhance the functionality and stability of food production in an amenity landscape like Indigo Shire. Experiences from other countries such as Canada, the United Kingdom, the Netherlands and Italy demonstrate the interdependence of agriculture, tourism, heritage and local sustainability in multifunctional landscapes (Alterman 1997; Bills and Gross 2005; Churchyard 2010; Marsden and Sonnino 2008). Comments from local government staff and Councillors indicated that this integration had yet to be formally recognized or acted upon in this Shire. Agricultural production and local food creation as an activity central to tourism, land use and community well-being had not been emphasized or even discussed in current Shire policies and plans. There were no clear links between food production and land use planning, or food production and economic development. Indigo Shire is not alone in this regard, with other local and regional government agencies struggling to 'fit' food production and security issues into their respective agendas (Budge and Slade 2009; Commonwealth of Australia 2010; Larsen et al. 2008).

Food security encompasses the issues around reliability of food supply and access to safe, nutritious food produced in environmentally sustainable ways

(PMSEIC 2010). The traditional farm lands of amenity landscapes attract residents and tourists who in turn are increasingly seeking nutritious, fresh food that is locally produced. The connection between the local environment, the local economy, the local community and individual food choices is an important and integral part of the rural lifestyle these new residents are seeking. It is recognized that this style of food production will not 'feed the world', however, it will assist in raising awareness and support for farm-related issues and food production (Campbell 2009; Department of Agriculture Fisheries and Forestry 2011).

The Federal government has recognized public concern over food security and the loss of agricultural labour and expertise over the last two decades (Department of Agriculture Fisheries and Forestry 2011). The Victorian state government has also produced various strategies in recent years with calls for stricter controls over development on high value agricultural land as one way of protecting food production, but it has also been recognized that this is fraught with difficulty and requires a much more comprehensive approach (Department of Planning and Community Development 2009). Indigo Shire has embarked on its own Rural Land Use Strategy to protect productive areas (CPG Australia Pty Ltd 2009) but has struggled with the complexity of local environmental and social issues (Indigo Shire Council 2011). To date, this draft document does not mention food security issues, nor does it take a holistic view of the economic and social aspects of producing food from the land. This reflects our findings of a loss of government connection with the farming community and the challenges of taking an integrated approach to food production and planning.

Some farmers and local government Councillors were able to articulate the advantages of food production as a means of linking rural farming activities, farmer's aspirations and an increasing non-farming rural residential population. However, there was a significant gap between the rhetoric and actual steps to embed agriculture as a sustainable business in this dynamic landscape. If amenity landscapes are to continue producing food for both local consumption and export, a more proactive and integrated governance approach is needed. Creating innovative partnerships between local government and agricultural businesses that take advantage of the opportunities created by an increasing non-farming rural population could help build stability and acceptability in food production from these diverse landscapes, thereby contributing to food security on both local and regional scales.

## References

Alterman, R. (1997). The challenge of farmland preservation: Lessons from a six nation comparison. *Journal of the American Planning Association*, Spring, 220–244.

Argent, N., Smailes, P., & Griffin, T. (2007). The amenity complex: Towards a framework for analysing and predicting the emergence of a multifunctional countryside in Australia. *Geographical Research, 45*(3), 217–232.

Aslin, H. (2006). *Rural lifestyle landholders: Implications of rural policy makers, natural resource managers and communicators*. Barton: Bureau of Rural Sciences.

Barr, N. (2003). Future agricultural landscapes. *Australian Planner, 40*(2), 123–127.

Barr, N. (2005). *Understanding rural Victoria/The changing social landscape of rural Victoria*. Melbourne: State of Victoria, Department of Primary Industries.

Barr, N., & Karunaratne, K. (2002). *Victoria's small farms* (CLRP Report 89). Conservation and Land Protection Research Branch, Department of Natural Resources and Environment, Victoria.

Bills, N., & Gross, D. (2005). Sustaining multifunctional agricultural landscapes: Comparing stakeholder perspectives in New York (US) and England (UK). *Land Use Policy, 22*, 313–321.

Budge, T., & Slade, C. (2009). *Integrating land use planning and community food security; A new agenda for government to deliver sustainability, economic growth and social justice*. Victorian Local Governance Association, supported by VicHealth.

Bunce, M. (1998). Thirty years of farmland preservation in North America: Discourses and ideologies of a movement. *Journal of Rural Studies, 14*(2), 233–247.

Burnley, I., & Murphy, P. (2004). *Sea change: Movement from Metropolitan to Arcadian Australia*. Sydney: University of New South Wales Press.

Buxton, M., Tieman, G., Bekessy, S., Budge, T., Butt, A., Coote, M., et al. (2007). *Change and continuity in peri-urban Australia, peri-urban case study: Bendigo Corridor*. Melbourne: RMIT University.

Buxton, M., Tieman, G., Bekessy, S., Budge, T., Mercer, D., Coote, M., et al. (2006). *Change and continuity in peri-urban Australia—State of the peri-urban region: A review of the literature* (Vol. 1). Melbourne: RMIT University.

Caldwell, W., Collett, A., Ludlow, T., Sinclair, I., & Whitehead, J. (2011). *Planning and Food Security within the Commonwealth*: Discussion Paper. Commonwealth Association of Planners.

Campbell, A. (2008). *Paddock to plate: Food, farming and Victoria's progress to sustainability*. Melbourne: Australian Conservation Foundation: The Future Food and Farm Project.

Campbell, A. (2009). *Paddock to plate: Policy propositions for sustaining food and farming systems*. Melbourne: Australian Conservation Foundation.

Churchyard, A. (2010). *Planning regional food systems—A guide for municipal planning and development in the Greater Golden Horseshoe*. Guelph: University of Guelph—School of Environmental Design and Rural Development.

Cocklin, C., Dibden, J., & Mautner, N. (2006). From market to multifunctionality? Land stewardship in Australia. *The Geographical Journal, 172*(3), 197–205.

Commonwealth of Australia. (2010). *Food production in Australia*. Canberra: Senate Select Committee on Agriculture and Related Industries.

Condon, P. M., Mullini, K., Fallick, A., & Harcourt, M. (2010). Agriculture on the edge: Strategies to abate urban encroachment onto agricultural lands by promoting viable human-scale agriculture as an integral element of urbanization. *International Journal of Agricultural Sustainability, 8*(1 and 2), 104–115.

Coster, M., & Kennon, N. (2005). *'New generation' farmers' markets in rural communities*. Canberra: Rural Industries Research and Development Corporation.

CPG Australia Pty Ltd. (2009). *Indigo Shire rural land use strategy—Phase 4 (Draft)*. Yackandandah: Indigo Shire Council.

Curry, G., Koczberski, G., & Selwood, J. (2001). Cashing out, cashing in: Rural change on the south coast of Western Australia. *Australian Geographer, 32*(1), 109–124.

Department of Agriculture Fisheries and Forestry. (2011). *Issues Paper to inform development of a National Food Plan*. Canberra: Department of Agriculture, Fisheries and Forestry.

Department of Planning and Community Development. (2009). *Future farming: Improving rural land use. Independent report to the Minister for Planning*. Melbourne: Department of Planning and Community Development.

Department of Planning and Community Development. (2011). *Victorian population bulletin 2011*. Melbourne: Spatial Analysis and Research.

Ecker, S., Clarke, R., Cartwright, S., Kancans, R., Please, P., & Binks, B. (2010). *Drivers of regional agri-tourism and food tourism in Australia*. Canberra: Australian Bureau of Agricultural and Resource Economics—Bureau of Rural Sciences.

Gibson, C., Dufty, R., & Drozdzewski, D. (2005). Resident attitudes to farmland protection measures in the Northern Rivers region, New South Wales. *Australian Geographer, 36*(3), 369–383.

Gill, N., Klepeis, P., & Chisholm, L. (2010). Stewardship among lifestyle oriented rural landowners. *Journal of Environmental Planning and Management, 53*(3), 317–334.

Halfacree, K., & Boyle, P. (1998). Migration, rurality and the post-productivist countryside. In K. Halfacree & P. Boyle (Eds.), *Migration into rural areas: Theories and issues* (pp. 1–20). Chichester: Wiley.

Henderson, S. (2003). Regulating land use conflict on the urban fringe: Two contrasting case studies from the Australian poultry industry. *Australian Geographer, 34*(1), 3–17.

Holmes, J. (2006). Impulses towards a multifunctional transition in rural Australia: Gaps in the research agenda. *Journal of Rural Studies, 22*, 142–160.

Hugo, G. (2005). The state of rural populations. In C. Cocklin & J. Dibden (Eds.), *Sustainability and change in rural Australia* (pp. 56–79). Sydney: University of New South Wales.

Indigo Shire Council. (2008). *Draft economic development strategy*. Beechworth: Indigo Shire Council.

Indigo Shire Council. (2011, March 8). *Ordinary Council Meeting Minutes*. Beechworth.

Larsen, K., Ryan, C., & Abraham, A. B. (2008). *Sustainable and secure food systems for Victoria: What do we know? What do we need to know?* Melbourne: Victorian Eco-Innovation Lab (VEIL).

Marsden, T., & Sonnino, R. (2008). Rural development and the regional state: Denying multifunctional agriculture in the UK. *Journal of Rural Studies, 24*, 422–431.

McKenzie, F. (1996). *Beyond the suburbs: Population change in the major exurban regions of Australia*. Canberra: Australian Government Publishing Service.

Mendham, E., & Curtis, A. (2010). Taking over the reins: Trends and impacts of changes in rural property ownership. *Society and Natural Resources, 23*(7), 653–668.

Millar, J., & Roots, J. (2012). Changes in Australian agriculture and land use—Implications for future food security. *International Journal of Agricultural Sustainability, 10*(1), 25–39.

Mitchell, C., & de Waal, S. B. (2009). Revisiting the model of creative destruction: St. Jacobs, Ontario, a decade later. *Journal of Rural Studies, 25*, 156–167.

PMSEIC. (2010). *Australia and food security in a changing world*. Canberra: The Prime Minister's Science, Engineering and Innovation Council.

Tonts, M., & Grieve, S. (2002). Commodification and creative destruction in the Australian rural landscape: The case of Bridgetown, Western Australia. *Australian Geographical Studies, 40*(1), 58–70.

# Chapter 23
# Food Security in a Two-Speed Economy: Horticultural Production in Western Australia

**Fiona Haslam McKenzie**

## 23.1 Introduction

Western Australia has experienced sustained economic and population growth over the last decade in response to the prolonged resources boom. The strength of the Western Australian economy was one of the main reasons why Australia avoided a recession during the recent global economic downturn. The sustained growth has made Western Australia one of the wealthiest places in the world according to the United Nations Human Development Index (United Nations Development Program 2009). However, despite the enviable international liveability status, the statistics mask a less attractive reality (Abjorensen 2009). Evidence suggests that in fact the Western Australia community has become increasingly polarized by the resources boom due to a rising cost of living, of which the cost of food is a crucial component (Australian Bureau of Statistics 2011a; Conley 2010; Langton 2010). The gap between the 'haves' and the 'have nots' is widening, depending upon people's access to the wealth generated by the resources boom. This is prompting concerns of a two-speed or 'patchwork' economy (Daley and Lancy 2011; Garton 2008). The economy is bifurcated; the resources-related industries on the one hand are booming, generating high paid jobs and export earnings, pushing up spending capacity. On the flip side, retail, service industries, agriculture and tourism are lagging. This chapter will consider the booming local economy in Western Australia and the impact this is having on horticultural food production in particular, and food affordability more generally.

The chapter begins by providing the historic context for food production in Western Australia. Ironically, it was the first Western Australian resource boom at the turn of the nineteenth century that prompted food production to increase to

F. Haslam McKenzie (✉)
Curtin University and the Co-operative Research Centre - Remote Economic Participation, Perth, WA, Australia
e-mail: F.McKenzie@curtin.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_23,

commercial levels. For a century food production was concentrated around the Perth urban fringes where there was relatively fertile soil and regular rainfall. Government policies protected these areas from development, although as the city's population grew, development pressures took precedence (Paul and Haslam McKenzie 2011). Other areas around the State were developed for horticultural production but poor soils, unreliable water supplies and vast distances limited their viability. The potential consequences of increased food miles and the public policy responses to the provision of food and food supply chains are also discussed in this chapter.

The following sections of the chapter examine the impact of the current mining boom and the consequent increase in population, straining housing markets and increasing the demand for developable land. Areas close to the city, previously reliable horticultural production land, are now prime building locations. The boom draws into focus potential threats to food security due to diminished local food production and hence local food availability. While there has been increased affluence for some, especially those involved directly with the mining industry or the servicing of it, there are many who have been disadvantaged by it—a dilemma increasingly referred to as the resource curse (Humphreys et al. 2007). The cost of food production and the inevitable questions of affordability and viability are considered in the light of a strengthening currency and sustained demand for developable land. The effect of the currency turnaround has not been a welcome development for Australian food producers; Australian products such as food exports are less price-competitive on global markets. Further, competition for scarce resources such as labour and land mean that food production margins are slim and risks are high, given the heightened competition from other labour markets and climatic variability.

The final section of the chapter assesses the future of food production in Western Australia. The resources will eventually run out and it is likely that mining land will be rehabilitated but that does not account for the productive land on what was once the urban fringe and which has now been covered by houses. Arable tracts of land with reliable water supplies cannot be invented. It is inevitable that food for the vast majority of Western Australians will come long distances at considerable economic and environmental costs. Quality food may indeed become a highly prized and very expensive commodity that only a few can afford.

## 23.2 The Historical Context of Food Production and Food Security in Western Australia

When Western Australia was settled in 1829, the colonists settled the Swan River in the area now known as Perth where the riverside flats were relatively fertile and there were reliable sources of water. It took time to understand the climate and the productive capacity of the ancient western-edge soils and on several occasions the colony came close to starving (Statham 1981). Later, broadacre agriculture became a viable industry not only for domestic purposes but eventually as a valued source of export income. However, food production, and horticulture in particular, tended to be conducted on a domestic scale. It was not until Federation when the Western Australian population quadrupled as a result of the 1890s gold rush that food growing became a commercial enterprise. The total area of land used for orchards, vineyards and vegetable growing rose from 1,900 hectares(ha) ha in 1896 to 4,600 ha in 1903 (Library Services of Western Australia 2001). After World War II Italian and Slav families developed land around Perth and introduced farming practices such as the use of fertilizers, enhancing the growing capacity of the sandy soils, and sprinklers to regulate watering.

As the city expanded, food production was pushed to the northern and southern city fringes and these areas became important and, until recently, largely protected horticultural areas. Expansion further has been constrained by poor soils, limited water supplies, urban expansion and State forest boundaries which protect important potable water catchments. By 1999 a total of 9,322 ha were used for the cultivation of vegetables and fruit, supplying Western Australians with produce all-year round (Library Services of Western Australia 2001).

Beyond Perth there are several other horticultural production areas. In the South West there are well-established fruit and vegetable growing areas. Two other important food production areas in Western Australia are Carnarvon, established in the 1930s on the banks of the Gascoyne River, 900 km north of Perth and the Ord River region in the Kimberley region. The Ord River Irrigation Area blossomed as a potential food bowl in the 1980s but the horticultural production area is considerably smaller than the Gascoyne horticultural area and the growing season is limited to the dry, winter season. The Ord River basin is wholly irrigated and there is considerable potential for expansion. However, being 3,000 km north of Perth, the cost of transport to key markets is limiting, especially without economies of scale. The expansion of lucrative sandalwood plantations has eroded the area dedicated to horticultural production and since 2000 the value of horticultural production in the Kimberley has dropped by a third (Kimberley Development Commission 2010).

## 23.3 Threats to Urban Food Production in Western Australia

Houston (2005) and Low Choy et al. (2008) show that city fringe areas produce a high proportion of Australia's food. Paul and Haslam McKenzie (2011) observed that metropolitan food production is crucial in several different ways: proximity provides significant opportunities for guaranteeing freshness, the longer and further food travels 'from plough to plate' the more likely it is to be vulnerable to fossil fuel supply, preservatives and chemical colour enhancements. Food produced locally is likely to be less expensive than food that has travelled over long distances. 'Food miles' is an interpretative concept related to carbon footprints, measuring the distance food travels from where food is grown to where it is ultimately purchased or consumed by the end user (Paul and Haslam McKenzie 2011). Although the notion of food miles has not been an issue for planners or strategists in Australia to date, it is an emerging issue particularly now that a carbon tax has been legislated. In Europe and the United Kingdom there is growing public policy concern regarding the environmental consequences of food production, and particularly the carbon emissions associated with the transport of food (Pretty et al. 2005; Smith et al. 2006).

Large areas, previously on the city fringe, and which have been Perth's traditional food growing locations, have disappeared under housing developments (Paul and Haslam McKenzie 2011). The only area that has been left largely intact as urban fringe food producing land, albeit not without considerable threats from development, is the Swan Valley which follows the upper reaches of the Swan River. This area has been largely protected by the Western Australian Planning Commission (2002) for agricultural purposes, the protection of natural resources and for the purposes of recreation. Increasingly, the Chittering Valley, 65 km from the city, which traditionally has had some horticulture but is also highly valued grazing and broadacre agricultural land, is being eyed for expanded food production. However, adequate water supplies cannot be guaranteed (Hughes and Ingram 2011).

The southern half of Western Australia largely depends on rainfall for most of its water supply and for the last 25 years the average rainfall has been declining while median temperatures have increased. This has occurred at the same time as the State's population has almost doubled. Ground water is also an important source of water but supplies quickly diminish further away from Perth. The scarcity of water combined with poor soils which require expensive fertilizers to maintain productivity add up to risky business scenarios which are exacerbated when the cost of casual labour is factored in.

As key food production areas near to the city are increasingly constrained, production shifts further away from Perth to the Gascoyne and Kimberley regions, hundreds, if not thousands of kilometres distant. The cost of land is considerably less and the water supply is more consistent, although both these regions are vulnerable to cyclone events which can wipe out a season's production. Food products from these regions are either transported by road or by air, pushing up the packing and transportation costs considerably and of course the 'food miles'. While food production in Western Australia is important, the focus of the Western Australian economy post World War II has been broadacre agricultural production and mining. As discussed in the following section, those few areas which are suitable for food production are also those areas which have been favoured for housing development.

## 23.4 Growing Pains in a Booming Western Australian Economy

Ironically, despite Australia being highly urbanized, its economy is characterized as 'a farm and quarry'. This is certainly the case for Western Australia where mining and farming dominate the economy (Australian Bureau of Statistics 2011b). Even so, the population of Western Australia is concentrated in Perth (Western Australian Planning Commission 2010). Since 1970, Perth has doubled in area, expanding north and south in the same directions as horticulture and with the same expansion constraints. Between 1986 and 2006, the number of houses increased in the State by 63% overall and by 40.5% in Perth (Australian Bureau of Statistics 2009a). The Western Australian population growth rate, currently the highest in the nation (Australian Bureau of Statistics 2010a), continues to put pressure on housing supply. Resource industry-led demand has increased house prices and rents dramatically in Western Australian metropolitan, rural, regional and remote areas resulting in serious affordability issues (Beer et al. 2011; Garton 2008; Haslam McKenzie et al. 2009; Pick et al. 2008).

Consequently, productive agricultural land with accessible water supply has increasingly been developed for housing in response to the rapacious appetite for land suitable for single, detached residential housing estates. Not surprisingly, the availability of fertile lands for horticultural production in relatively close proximity to urban centres is becoming scarce (Paul and Haslam McKenzie 2011). Currently, the closest agricultural areas that provide food to Perth are more than 40 km from the city centre and urban expansion is continually threatening these areas. Further, food is no longer cheap in Western Australia (Australian Bureau of Statistics 2010b, 2011c) for a variety of reasons including expensive land, the increasing cost of water, high transportation costs and adverse climatic conditions, such as cyclones and drought.

As the mining and mining services industries have ramped up post the global financial crisis (GFC), unemployment statistics have dropped in Western Australia (Australian Bureau of Statistics 2011d) and there is growing concern over the availability of skilled workers (Chamber of Commerce and Industry Western Australia 2011). These sectors tend to pay higher salaries, drawing employees away from other sectors. The low paid cohorts, including casual and short-term labour such as backpackers, are filling the gaps in some industries. The food production industry relies on this sector of the labour market to harvest and pack produce but with higher wages paid elsewhere, the food industries increasingly struggle to compete for labour.

To date, the Western Australian government has not been particularly anxious about an emerging food insecurity status. While mining and resource extraction underpin not only the State economy but that of the nation, the diminution of food production land close to large population areas and the increasing shortage of water resources for food production have not been a priority (Western Australian Planning Commission 2010). The overarching metropolitan planning guidelines for Perth and the Peel region, released in 2010, focused on accommodating an additional 500,000 people over the next two decades, while preserving 'the qualities and characteristics we most value—the beaches, parks and bushland, the Swan River, lakes and wetland habitats and the Darling Escarpment' (Western Australian Planning Commission 2010, p. 11). The primacy of urban development is clear; 'rural land should be protected until conversion to urban use is required' (Western Australian Planning Commission 2010, p. 50). The privileging of urban development over food production underscores the potential for food insecurity based on the physical ability to provide for the nutritional needs of the population. The Western Australian

Department of Agriculture and Food projects that if the Perth population reaches two million people then an additional 630 ha dedicated to horticultural production with the necessary buffer zones, transport links and hydrology should be secured to ensure food security sources (Science Matters and Economics Consulting Services 2008). It is not clear where that land resource might be found.

## 23.5 The Two-Speed Economy or the Resource Curse?

Despite the buoyant State economy there are many businesses which are not reaping benefits from the boom conditions and in fact claiming that they are disadvantaged by it (Chamber of Commerce and Industry Western Australia 2011; Conley 2011). There are socio-economic outcomes of the prolonged boom that are symptomatic of the 'resource curse'. As has been observed in African and South American communities where mining dominates the local economy (Humphreys et al. 2007; Maconachie and Binns 2007; Pineda and Rodriguez 2010), it tends to be those places in closest proximity to mining activity and resource extraction which have experienced the lowest levels, per capita, of infrastructure investment, the most unaffordable housing, the highest levels of population mobility, escalating cost of living and higher than average crime rates. The same indicators of disadvantage are evident in the Western Australian Pilbara region (Pick et al. 2008).

The cost of living in Perth, and more especially regional Western Australia, exceeds that of any other State in Australia (Australian Bureau of Statistics 2011c). In late 2007 when the housing pressures in Western Australia began to drive up prices, the State Department of Local Government and Regional Development undertook a regional prices index, disaggregating cost of living across each of the nine regional areas. In 2007, the two regions most distant from Perth were the most expensive; the Kimberley region had an overall cost of living 17% higher than Perth, and in the Pilbara region, where the most intense competition for housing has occurred due to mining activity, the cost of living was 20% higher (Department of Local Government and Regional Development 2007). Food was most expensive in both of these regions in addition to the Goldfields Esperance region (Department of Local Government and Regional Development 2007). Unfortunately this index has not been updated but data collected by agencies such as the Australian Bureau of Statistics (2011b) suggest that the trends in place in 2007 have not changed but have in fact intensified.

The Reserve Bank of Australia (2009) has reported that nationally, wages growth has been approximately 4% over the past few years. At the same time, the consumer price index (CPI) has increased with the net effect being that real wages have increased only marginally (Richardson 2009). CPI for the December quarter of 2010 showed that over the last 5 years, Perth has consistently exceeded prices for comparable goods, including food, compared to other States (Australian Bureau of Statistics 2010b). This is largely attributed to the cost of housing, labour and food. The 2011 June Quarter Consumer Price Index (Australian Bureau of Statistics 2011c) showed that the cost of food in Perth was the most expensive of all Australian capital cities. Western Australia has also experienced a much greater average wage increase over the last 5 years. Since 2003, the annual average wage growth in Western Australia of 6.9% has outstripped the national average of 4.8% (Australian Bureau of Statistics 2011e).

However, it is incorrect to assume that high wages are the norm across Western Australia. Income polarity is evident when comparing the increase of average weekly earnings for males in the mining industry over 5 years (33%) compared to workers in retail, accommodation, cafes and restaurants who received increases of 12.3% (Australian Bureau of Statistics 2009b, 2011e; Richardson 2009), less than the rate of inflation. As noted by the Australian Bureau of Statistics (2011d), there are several regional hotspots, in particular the Pilbara region, where there has been a considerable increase in wages over the 5 years. However, there are other regions which recorded both low incomes and low growth rates in average wages and salaries.

Much has been written about the 'resource curse' and whether countries that specialize in primary products are prone to suffer Dutch disease problems (a decline in domestic sectors of the economy, such as agricultural production, due to an appreciation in the exchange rate arising from an increase in resource trading (Humphreys et al. 2007) and rent-seeking behaviour). The debates prompt conjecture whether an abundance of natural resources is a blessing or a boon for local socio-economic development (Auty 1993; Davis and Tilton 2005; Humphreys et al. 2007; Maconachie and Binns 2007; Pineda and Rodriguez 2010). The terms-of-trade (export income), currently the most favourable since the Korean War (Conley 2009), has had a significant impact on Real Net National Disposable Income (RNNDI) (Richardson 2009). As a consequence, the Australian dollar has strengthened meaning the cost of imports is relatively lower while the value of Australian exports, most particularly non-resource tradable sectors (Pineda and Rodriguez 2010), increased. This classic Dutch disease scenario accentuates the risks associated with food production where the margins are already slender.

On the positive side, the mining companies, particularly the large multinational corporations, have contributed directly to regional infrastructure and services as well as indirectly through royalties. Mining has boosted construction, spurred growth in mineral processing and significantly increased government revenue, lifting consumption (Conley 2011). However, domestic resources such as labour and materials have moved away from agricultural and services sectors to the natural resource sector, attracted by higher pay rates and consistent demand. It is these shifts which have contributed to the decline of agricultural exports as a percentage of total exports and have had a critical impact on food production in Western Australia in particular (Australian Bureau of Statistics 2010b).

## 23.6 Food Production and Food Affordability in a Two-Speed Economy

The Australian dollar reached parity with the American dollar in early 2011, the impact of which has meant that Australian exports are more expensive, putting even more pressure on the food production industries. Export data (Department of

Agriculture and Food 2009) shows that while markets for, and supply of, broadacre agricultural products are steady, the horticultural industry has been hampered by a lack of logistics, particularly cool chain facilities, infrastructure and consistent marketing. Western Australia has largely ignored the food manufacturing sector and relies on exporting fresh produce. However, international markets such as New Zealand, which do not depend on mining to underpin their economy, are aggressive and have much shorter supply chains. The rising value of the Australian dollar makes competitors' products increasingly attractive.

International competition is not the only threat. The rising costs in Western Australia have given inter-State competitors the opportunity to make further inroads into the Western Australia food production market. Queensland, New South Wales and Victoria all have much bigger food production industries and already represent approximately 80% of the Western Australia food market (Department of Agriculture and Food 2009). There are less obvious knock-on impacts from the downsizing of Western Australian food industries; for example, there has been reduced capacity of local research and development, less scope for training and retaining pertinent skills sets and reduced economies of scale for packaging and other ancillary services.

The government has acknowledged that food production is compromised by the high cost of doing business in Western Australia, particularly in recent years (Chamber of Commerce and Industry Western Australia 2011; Department of Agriculture and Food 2009). When compared to the other States, taxes and utilities, especially water, gas and fuel, are more expensive. There is a limited transport network with much of the regional rail network downgraded and with increasing competition on the road networks from the growing population and the mining industry. Further, the isolation of Western Australia and the relatively small market makes associated costs such as packaging more expensive. The Western Australian government has noted the drop in annual growth rates in the food production industries in recent years and claims to be refocusing investment and policy to ensure long-term industry stability (Department of Agriculture and Food 2009). However, the aspirations of the government food and agriculture agency sharply conflicts with that of the peak planning agency, the Western Australian Planning Commission, as identified earlier in this chapter (Western Australian Planning Commission 2010). Generally, the private sector has been loath to invest in the food industry. The margins are slender and as noted earlier, the risks greater than other industries. In addition, infrastructure investment has been made more difficult since the GFC when banks tightened lending.

Beyond the CPI data, which shows that food in Western Australia is less affordable than other parts of Australia, research undertaken in a Western Australian region with consistently low socio-economic indicators demonstrates the relationship between socio-economic status and consumption of healthy food (McManus et al. 2007). The research was conducted to ascertain equity of access to healthy, affordable foods across the socio-economic spectrum. The range, variety and availability of foods in 132 food outlets were audited. The results show that the majority of food was pre-prepared and much of it was bread-based, high in fat content and with limited choice. Maintaining business profitability was a key concern for proprietors and they admitted fresh food did not provide the necessary turnover or margins. Food with low nutritional value but relatively high mark up was the most accessible and the local cohort with a relatively low educational attainment did not discriminate between this and similarly priced fresh food. More expensive quality food was, quite simply, not affordable.

Limited access to affordable, quality food is a problem in remote communities (see Chap. 7). Diabetes and heart disease are chronic illnesses common in Aboriginal communities and which is exacerbated by poor diet, particularly fatty and sweet-enhanced foods (Australian Bureau of Statistics 2010c). The areas with some of the highest incidence of poor Aboriginal child health are those areas where there is the most mining activity. High mortality, chronic illness and poor nutrition are a consistent concern in Aboriginal communities in remote areas, such as the Kimberley, Goldfields and Pilbara regions (Altman et al. 2008; Dockery 2010) where mining are key industries. Fruit and vegetables are less accessible to Indigenous people living in remote areas, and the Australian Bureau of Statistics (2010c) has reported that one in five (20%) reported no usual daily fruit intake compared with one in eight (12%) in non-remote areas. The disparity was even greater for vegetable consumption, where 15% of people in remote areas reported no usual daily intake compared with only 2% in non-remote areas. Poor nutrition is often blamed for Aboriginal children's poor education performance which is ultimately linked to low workforce participation (Biddle and Taylor 2008; Gray and Hunter 2002).

## 23.7 The Future of Food Production in Western Australia

Agricultural production does not boast the profit margins or scale of the resources sector, and it would appear is not the focus of government or public attention. This chapter has shown that the accelerated population growth and wealth for some sectors of the Western Australian economy has had unexpected repercussions for other sectors, particularly the food production sector. It is clear that peri-urban land, particularly on the fringes of Perth, which has been important for food production in the past, now has a higher value for housing development purposes. Despite statements from the peak government food and agriculture agency regarding the need for appropriate food production land to feed the growing population, there has been no land set aside for this purpose. Food security is not currently a public policy concern but with a growing population and demand for housing, urban food sources are not sustainable.

Horticultural production in areas such as Carnarvon and the Ord River Basin are therefore increasingly important. The Ord River Basin is away from the coast and not as vulnerable to cyclonic events as is the Gascoyne region. This fertile plain has good access to Lake Argyle, one of the biggest inland fresh water resources in the nation, by way of the Ord River and Lake Kununurra. However, expansion to the irrigation area has been slow to materialize, although 8,000 ha was released in 2011 supported by extensive irrigation, drainage and road infrastructure investment.

The State and Commonwealth governments have committed to provide significant social infrastructure including large-scale investments in education, health, community, housing and transport infrastructure to support the expansion, but there has been limited recognition of the environmental costs associated with the transportation of bulk food over such long distances.

Mineral resources are finite—they will eventually run out or become too expensive to mine. However, those mines on the urban fringe, or close to the urban fringe, are unlikely to revert to food production areas. It is unlikely that land which is now taken for housing will revert to food production. Instead, it seems likely that the new food producing areas in the Gascoyne area and Kimberley are the future Western Australian food bowls but, as noted here, they come at a considerable environmental and economic cost to those who can least afford it.

## 23.8 Conclusions

Horticultural production in Western Australia has always been limited to the few areas where there is productive soil and reliable rainfall. To date, the majority of this production has been on the urban fringes of Perth. There are other areas but production is constrained by accessibility to markets due to long distances or adverse climatic conditions for at least part of the year. There is now another constraint. Farmers are competing with developers for housing land. The mining boom and the associated population growth have put food growing areas, particularly around Perth, under considerable pressure for development.

There is increasing acceptance that Western Australia is a two-speed economy (Chamber of Commerce and Industry Western Australia 2011; Garton 2008; Reserve Bank of Australia 2009). Government and many companies and people, mostly in Perth, are enjoying affluence due to the record property prices and additional revenues generated by the sale of resources. At the same time however, others in Western Australia are significantly disadvantaged and marginalized because of intense competition for labour and housing, insufficient capital and government investment in infrastructure, thus driving up costs. The growth in population—as a result of demand for labour to service the mining industries in addition to those people who come to Western Australia in the hope of reaping some of the benefits—have put pressure on housing supply. The most productive land close to the city is being gobbled up for development. High costs, poor soil and uncertain water and labour supplies make food production, especially in and around Perth, a risky business. Simple demand and supply correlations have influenced wages and the cost of living, including the affordability of food (Australian Bureau of Statistics 2011c).

These trends have all contributed to food becoming increasingly expensive throughout the State but most especially in the remote areas, where ironically, the bulk of the State's economic wealth is generated; the Pilbara, the Kimberley and the Goldfields Esperance regions. As research has shown, areas in Perth are not immune to food affordability issues either. It is suggested that these trends are symptomatic of the resource curse identified in other countries.

The future of Western Australian food production is likely to be hundreds, if not thousands of kilometres distant from Perth, extending the distance between 'plough and plate' and hence the food miles with all the attendant social, economic and environmental costs. There are no signs that food security and affordability are a concern for government; the high cost of food is simply accepted as a price to pay for affluence, regardless of one's status or capacity in the Western Australian community.

## References


Abjorensen, N. (2009). *Australia: The state of democracy*. Canberra: Democratic Audit of Australia, Australian National University.

Altman, J., Biddle, N., & Hunter, B. (2008). *How realistic are the prospects of 'closing the gaps' in socio-economic outcomes for indigenous Australians?* Discussion Paper 287/2008. Canberra: Centre for Aboriginal Economic Policy Research, Australian National University.

Australian Bureau of Statistics. (2009a). *A picture of the nation* (Cat. 2070.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2009b). *Average weekly earnings* (Cat. 6302.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2010a). *Regional population growth* (Cat. 3218.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2010b). *Consumer price index, December*. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2010c). *The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples* (Cat. 4704.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2011a). *Household income and income distribution, 2009-10* (Cat. 6523.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2011b). *Australian national accounts: State accounts 2009-2010*. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2011c). *Consumer price index, June Quarter* (Cat. 6401.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2011d). *Labour force, July* (Cat. 6202.0). Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics. (2011e). *Wage and salary earner statistics for small areas, time series, 2003-04 to 2008-09* (Cat. 5673.0.55.003). Canberra: Australian Bureau of Statistics.

Auty, R. (1993). *Sustainable development in mineral economies: The resource curse thesis*. London: Routledge.

Beer, A., Tually, S., Rowland, S., Haslam McKenzie, F., Schlapp, J., Birdsall-Jones, C., et al. (2011). *The drivers of supply and demand in Australia's rural and regional centres* (Final Rep. #165). Adelaide: Australian Housing and Urban Research Institute.

Biddle, N., & Taylor, J. (2008). *A regional analysis of indigenous participation in the Western Australian labour market* (CAEPR Working Paper 45/2008). Canberra: Centre of Aboriginal Economic Policy Research, Australian National University.

Chamber of Commerce and Industry Western Australia. (2011). *Challenges hiding behind WA's rapid economic recovery*. Retrieved April 2, 2011, from http://www.cciwa.com/14_February_2011_1.aspx#22922

Conley, T. (2009). Globalisation and Australian economic vulnerability. In E. Van Acker & G. Curran (Eds.), *Business and the politics of globalisation: After the global financial crisis*. Sydney: Pearson.

Conley, T. (2010). The politics of prosperity. *The Griffith Review, 28*, 1–10.

Conley, T. (2011, August). Structural shenanigans in the Australian economy. *Australian Policy Online*, 1–18.
Daley, J., & Lancy, A. (2011). *Investing in regions: Making a difference*. Melbourne: Grattan Institute.
Davis, G., & Tilton, J. (2005). The resource curse. *Natural Resources Forum, 29*(3), 233–242.
Department of Agriculture and Food. (2009). *Food industry development*. Perth: Department of Agriculture and Food.
Department of Local Government and Regional Development. (2007). *Regional price index*. Perth: Department of Local Government and Regional Development.
Dockery, A. M. (2010). Culture and wellbeing: The case of indigenous Australians. *Social Indicators Research, 99*(2), 315–332.
Garton, P. (2008). *The resources boom and the two speed economy* (Economic Roundup Issue 3). Canberra: The Australian Government Treasury.
Gray, M., & Hunter, B. (2002). A cohort analysis of the determinants of employment and labour force participation: Indigenous and non-indigenous Australians 1981-1996. *The Australian Economic Review, 35*(4), 391–404.
Haslam McKenzie, F. (2011). Fly-in fly-out: The challenges of transient populations in rural landscapes. In G. Luck, D. Race, & R. Black (Eds.), *Demographic change in rural landscapes: What does it mean for society and the environment?* (Landscape series, pp. 353–374). London: Springer.
Haslam McKenzie, F., Rowley, S., Phillips, R., Birdsall-Jones, C., & Brereton, D. (2009). *Housing market dynamics in resource boom towns*. Perth: Australian Housing and Urban Research Institute. Retrieved from 5th February 2011 http://www.ahuri.edu.au/publications/p80370/
Houston, P. (2005). Re-valuing the fringe: Some findings on the value of agricultural production in Australia's peri-urban regions. *Geographical Research, 43*(2), 209–223.
Hughes, M., & Ingram, C. (2011). Recreational access to urban water supplies. In L. Crase & S. O'Keefe (Eds.), *Water policy, tourism and recreation* (pp. 132–147). Abingdon: Taylor and Francis Group.
Humphreys, M., Sachs, J., & Stiglitz, J. (Eds.). (2007). *Escaping the resource curse*. New York: Columbia University Press.
Kimberley Development Commission. (2010). *Kimberley economic perspective: Agriculture*. Kununurra: Kimberley Development Commission.
Langton, M. (2010). The resource curse. *The Griffith Review, 28*.
Library Services of Western Australia. (2001). *Western perspectives on a nation*. Perth: National Council for the Centenary of Federation.
Low Choy, D., Sutherland, C., Gleeson, B., Dodson, J., & Sipe, N. (2008). *Change and continuity in peri-urban Australia*. Brisbane: Urban Research Program, Griffith University.
Maconachie, R., & Binns, T. (2007). 'Farming miners' or 'mining farmers'?: Diamond mining and rural development in post-conflict Sierra Leone. *Journal of Rural Studies, 23*, 367–380.
McManus, A., Brown, G. P., & Maycock, B. (2007). *Western Australian food security project*. Perth: Western Australian Centre for Health Promotion Research, Curtin University.
Paul, V., & Haslam McKenzie, F. (2011). Agricultural areas under metropolitan threats: Lessons for Perth from Barcelona. In G. Luck, D. Race, & R. Black (Eds.), *Demographic change in rural landscapes: What does it mean for society and the environment?* (Landscape series). London: Springer.
Pick, D., Dayaram, K., & Butler, B. (2008). Neo-liberalism, risk and regional development in the Western Australia: The case of the Pilbara. *International Journal of Sociology and Social Policy, 28*(11/12), 516–527.
Pineda, J., & Rodriguez, F. (2010). *Curse or blessing? Natural resources and human development*. New York: United Nations Development Programme.
Pretty, J., Ball, A., Lang, T., & Morison, J. (2005). Farm costs and food miles: An assessment of the full cost of the UK weekly food basket. *Food Policy, 30*, 1–19.
Reserve Bank of Australia. (2009, January). The level and distribution of recent mining sector revenue. *Reserve Bank Bulletin*.

Richardson, D. (2009). *The benefits of the mining boom: Where did they go?* (Technical Brief #3). Canberra: The Australia Institute.
Science Matters and Economics Consulting Services. (2008). *The feasibility of a new horticultural precinct on the Gnangara Mound*. Perth: Department of the Agriculture and Food.
Smith, A., Watkiss, P., Tweddle, G., McKinnon, A., Browne, M., Hunt, A., et al. (2006). *The validity of food miles as an indicator of sustainable development*. Oxford: AEA Technology.
Statham, P. (1981). Swan River Colony 1829-1850. In C. T. Stannage (Ed.), *A new history of Western Australia*. Nedlands: University of Western Australia Press.
United Nations Development Program. (2009). *Human development report: Overcoming barriers human mobility and development*. New York: United Nations.
Western Australian Planning Commission. (2002). *State planning policy 2.5. Agricultural and rural land use planning*. Statement of Planning Policy No. 11. Retrieved from 25th March 2011 http://www.wapc.wa.gov.au/Publications/138.aspx
Western Australian Planning Commission. (2010). *Directions 2031 and beyond: Metropolitan planning beyond the horizon*. Perth: Western Australian Planning Commission.

# Chapter 24
# Case Studies on Food Production, Policy and Trade

**George Wilson, Maarten Ryder, Glenn Fitzgerald, Michael Tausz, Robert Norton, Garry O'Leary, Saman Seneweera, Sabine Tausz-Posch, Mahabubur Mollah, Jo Luck, and Grant Hollaway**

## 24.1 Native Animals in Food Production

**George Wilson**

Few native animals, other than fish and crustaceans, are used in food production by the humans who recently arrived in Australia. Even Aboriginal Australians have now become reliant on introduced species which evolved elsewhere. In part, this is due to cultural dominance, first of the British and then other western perspectives in last 200 years. It is also because introduced species generally have higher production rates following centuries of agricultural selection and recently, energy-intensive farming practices. But it need not always be that exotic species are superior, particularly in the context of climate change. Replacing cattle and sheep on the rangelands

G. Wilson (✉)
Australian National University, ACT
e-mail: georgewilson@awt.com.au

M. Ryder (✉)
University of Adelaide, South Australia
e-mail: maarten.ryder@adelaide.edu.au

G. Fitzgerald (✉) • G. O'Leary • M. Mollah • G. Hollaway
Department of Primary Industries, Victoria
e-mail: glenn.fitzgerald@dpi.vic.gov.au

M. Tausz • S. Seneweera • S. Tausz-Posch
University of Melbourne, Victoria

R. Norton
International Plant Nutrition Institute, IPNI, Victoria

J. Luck
Plant Biosecurity Cooperative Research Centre, ACT

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_24,

with well-adapted species such as kangaroos and making greater use of them just as Aborigines did for 40,000 years, is a prospect worthy of further investigation.

More than 75% of Australia is broadly defined as rangelands (ANRA 2009). The area includes a diverse group of ecosystems such as tropical savannas, woodlands, shrublands, and grasslands whose role in food production is based on extensive grazing of native pastures. Grasses and shrubs on the rangelands are converted into meat protein by herbivores, making a valuable contribution to food production in an area in which broadscale cropping and cultivation generally cannot take place. At the moment most of the production which comes from the rangelands and which is available commercially, comes from exotic animals.

In the future, climate change and rising carbon dioxide levels have the potential to alter vegetation including on the rangelands. If rainfall decreases in southern Australia in winter and spring, some cropping and irrigation areas will be replaced by grazing and rangeland animal production (DCC 2002). Thus rangelands are likely to increase, although at the same time some currently marginal pastoral areas could be expected to become unproductive.

Aboriginal Australians again have title to much of Australia's rangelands (Altman et al. 2007). If they choose to, they have an important role to play in supporting a return to greater use of native animals in food production that is adapted to these environments. They managed the land for this purpose for thousands of years (Gammage 2011). It is axiomatic that Australian wildlife has adapted to the Australian environment and its highly variable and erratic climate. Animals introduced in the last 200 years have not yet acquired these attributes (and are never likely to through natural selection). For example, kangaroo reproduction responds to droughts which occur with regularity with minimal impact on the adult (Newsome 1975). Kangaroos are able to move significant distances with minimal energy expenditure (Baudinette 1989) to take advantage of their preferred green grass following isolated showers and patchy storms. On the other hand, introduced livestock are managed under regimes which restrict movement behind domestic stock fences, confining animals to areas from which they might otherwise move as seasonal conditions deteriorated.

This observation raises one of the key issues constraining greater use of kangaroos by landholders—a lack of ownership and landholder capacity to benefit. To address the issue there needs to be a regional approach to wildlife management and decision-making capacity by landholders about kangaroo harvesting levels across property boundaries (Ampt and Baumber 2010).

Kangaroos are shot in the field at night using a high-powered spotlights and rifles by certified and licensed shooters. A Code of Practice requires head shots and instantaneous death (NRMMC 2008). Most carcasses are processed to human consumption standard and kangaroo meat is currently exported and sold in Australia to the food service industry, retail outlets and also as pet food (Kelly 2005). Kangaroo skins are valued for their high strength to weight ratio. Quotas are set to ensure harvests are sustainable. They are based on research and rigorous monitoring of population numbers and breeding patterns and are only set for species which are abundant and not threatened or endangered. Populations remain high in areas where commercial hunting is most intense. Endorsement of the management program from professional ecologists and wildlife managers and their associations has been consistent (Lindenmayer 2007).

Kangaroo harvesters are generally independent small businesses paid per kilogram for the kangaroo carcasses they supply to processors. They have access to properties with the permission of the landholders who nevertheless do not gain any benefit from the animals taken from their properties. At Mitchell in central Queensland a different model of managing kangaroos is being tested following an investment 5 years ago by the Rural Industries Research and Development Corporation (Wilson and Mitchell 2005). Further support for research and innovation is needed to continue this opportunity. Under the banner of the local Landcare Association, landholders have formed a cooperative with kangaroo harvesters to purchase and process kangaroos, thus demonstrating that kangaroo production can be integrated into farm productivity and income without needing to muster and transport live kangaroos. In 2011 the cooperative was humanely harvesting 500 kangaroos per week from free-ranging populations across cooperative land.

From this relatively small scale, the cooperative has opportunities to expand by bringing on more landholder participants, improving the quality of the product, and marketing it directly down the value chain. However a lack of information about the financial impacts of land use change and other scientific and technical issues is limiting the growth in membership and interest by potential investors.

Under the sustainable use scenario, the primary aim of management is meat production and may require continuation of management practices such as provision of artificial water, selective harvesting of males and possibly predator control because high dingo numbers are associated with lower kangaroo numbers. The process proposed has parallels in other countries, taking advantage of uniqueness of locally evolved species, and a capacity to deliver comparative advantage and diversity to the marketplace.

In other countries, landholder involvement in wildlife management has increased populations on private lands and encouraged maintenance of habitats in their natural state. In southern Africa, wildlife industries are replacing cattle production (Bothma and Toit 2010) and in Europe and North America game species thrive on private lands integrated with conventional agricultural production (Deer Commission for Scotland 2008). Equally, iconic species and national symbols—springbok in South Africa, (Conroy 2007), red deer in Scotland, (Scottish Venison Partnership 2012) and bison in the United States (Turner 2008) are in expanding production systems.

Some people object to utilizing national icons for commercial gain. They are opposed to private ownership and value for wildlife for ethical reasons because they believe it will threaten species. Such opposition need not be insurmountable. Wildlife scientists have published scientifically based responses promoting the notion of conservation through sustainable use (Cooney et al. 2009). The conservation benefits of less livestock more kangaroo could include not only more kangaroos but improved soil conservation, increased capacity of vegetation to respond after drought, reduction in damage cattle and sheep do to riparian environments, improved water quality, and long-term sustainability of vegetation used in production processes.

The case for greater use of adapted native species such as kangaroos which are widely distributed across Australia becomes even stronger in a climate change context, both from the perspective of capacity to adapt to change and emissions reduction. Kangaroos produce low levels of methane compared to other domestic herbivores. The source makes up 11% of all of Australia's emissions and is two-thirds the size of the transport sector. Greater use of kangaroos would reduce this liability (Wilson and Edwards 2008). The concept is worth investigating and the Carbon Farming Initiative (DCCEF 2011) of the Australian Government creates an incentive for landholders on the rangelands to take advantage of this and mitigate methane by producing low-emission meat by utilizing kangaroos. It would also prepare for the day when there is full coverage of agriculture in national carbon accounting and carbon pricing in agriculture exposes cattle producers to the substantial liability generated from domestic livestock.

In addition, the Australian rangelands have been subject to considerable modification by livestock. Grazing damage to native ecosystems has contributed to the extinction of at least 20 species of mammals (Lunney 2001) and continues to threaten around one quarter of the plant species listed as endangered (State of the Environment Report 2006). Although the proposal for greater use of kangaroos is for an increase in kangaroo numbers, the net planned effect is for a lower grazing impact and for maintenance of kangaroo and other wildlife habitat. It is probable that the kangaroos' adaptations to Australia's erratic, variable climate, and recurring droughts will bring a range of environmental services such as biodiversity, water and healthy soils in addition to offsets in the carbon market. Monitoring the effects on biodiversity would be an essential part of such a transition and would indicate the extent of the co benefits of the change.

Landholders, Landcare groups, and governments need to know more about these and other scientific and technical issues such as what are the total emissions from kangaroo production compared with beef/sheep (including transport), and whether closer management of product, maintenance of quality and accuracy of description of the product as low-emission meat can increase the value of the product. Landholders also need practical support and training on how to enter the carbon market with minimal cost and risk. To enable such innovative land use change to expand and generate useful results for wider application, further investment in capital equipment, infrastructure and research is also needed.

Research is also needed to test if reducing cattle numbers can produce the same amount of meat from the kangaroos and generate offsets which can be traded in the carbon market and whether there is increased soil C sequestration, biodiversity, and other landscape benefits to be traded as those markets develop. Research could also assess further the human health benefits of greater use of kangaroo meat which is reputed to be a healthier source of red meat.

The case presented here is for greater use of adapted species and indeed for landholders to use kangaroos as a primary source of meat production compared to the exotic introduced animals. The change could lead to a more stable and resilient agriculture and enhanced food security.

## 24.2 The Role of Australia's Native Food Plants in Food Security: History and Opportunities

**Maarten Ryder**

Australia's Aboriginal people lived on this continent for more than 40,000 years before European people brought with them new species of plants and animals for their own sustenance. Aboriginal people had long ago learned the value of hundreds of Australia's native plants for both food and medicine. This knowledge, in a variety of locally specific forms, was spread across the continent with its huge range of climates, soils and, consequently, plant species. Early white explorers also became familiar with some of these plants out of necessity, often after learning their uses from Aboriginal people. Many native food plants continue to be used by Aboriginal people to this day, and are often a popular part of the diet. For example, the 'bush tomato' (*Solanum centrale*) that is native to the arid regions of central and western Australia is harvested by large numbers of Aboriginal people, mainly women and children, when seasonal conditions are suitable (Walsh and Douglas 2009). Much of the fruit is sold to the wider native food industry based in capital cities but the 'bush harvest' activity also contributes to the food security of Aboriginal Australians. Many senior Aboriginal women are very passionate about the food plants of their region and they continue to hold detailed knowledge about these important species.

While some native food plants such as the quandong (*Santalum acuminatum*) have been used for many decades by white Australians, most of the useful species remain under-utilized in present-day Australian society. This means that there is a considerable wealth of natural resources that could be developed in the future.

With the exception of *Macadamia* species, the modern native food industry in Australia is quite a small part of the whole food industry. The *Macadamia* industry is a mature part of Australia's horticultural production capability, whereas 50 years ago this industry was in its infancy. There is much potential for development, and in the next 10–50 years we could have more native food industries on the scale of *Macadamia* if we put our collective minds, energies and resources into it.

There are a number of reasons why it will be beneficial to develop more native food plant industries in the future, several of which relate to food security.

- Within the huge range of native food plant species there are many useful characteristics. Some of these characteristics could be important for future food security. Drought tolerance is one of the key properties of Australia's arid zone food plants. Included in any list of drought tolerant plants are a range of *Solanum* and *Acacia* species (for wattleseed) as well as the desert lime. Bush tomato (also known as desert raisin), wattleseed and *Citrus glauca* (grafted on to conventional Citrus rootstocks) are all being grown and harvested in a wide range of dry climate conditions across Australia. Of course water is still required for a healthy crop of any species of plant, but the ability to withstand dry periods gives an insurance against crop loss until water again becomes available, whether through rainfall or irrigation. Salt tolerance of crops is another characteristic that is likely to become more important in the future, with changes in climate and with land degradation. We have evidence for high levels of salt tolerance among some of the arid zone native food species. These characteristics are useful in enabling crops to be grown under difficult conditions, and the Australian native species could also be useful as subjects for research into improving the salt tolerance of other major crops.

- New crops based on native food species can contribute to food security by providing greater opportunities for diversification in fruit, nut and vegetable production. Most of the native food species under development still require optimization of planting material (yield, flavour, quality) and production systems but the questions are eminently answerable with targeted research and development programs (RIRDC 2008a, b).
- The fruits of many native food plants contain high levels of compounds such as antioxidants that are beneficial to human health (Netzel et al. 2006; Konczak et al. 2010). This is another aspect of food security—the ability of foods to help maintain or improve our health. Many of the highly pigmented native fruits contain very high antioxidant levels (much higher than for blueberry) and the fruit of Kakadu plum (*Terminalia ferdinandiana*) has the highest known concentration of vitamin C of any plant. Edible wattleseed have a low glycaemic index (GI) and can therefore be useful in diets requiring a low GI.
- Aboriginal people, in family and community groups, are establishing income streams from their traditional native foods (Bryceson 2008). This type of activity appears to be increasing, and often with a view to presenting native foods in a cultural setting.
- It is very likely that if we do not develop native food species in Australia, then other countries will take up the opportunities, as happened initially with *Macadamia* and also with many Australian species of wildflowers. The more the intellectual property in new varieties of Australian food plants is held in Australia, the stronger our position will be.

Several of the subtropical Australian native *Acacia* species that produce edible seed including *Acacia colei*, *A. torulosa* and *A. tumida* have in the past 20 years contributed significantly to food security in parts of sub-Saharan Africa. This story has been well documented and is worth noting because it is a clear demonstration of the positive contribution of wattleseed in improving the nutrition (dietary protein content) of people living in poverty (Harwood et al. 1999). Based on this example, there is potential for Australian food plant species to be part of global food security. Indeed many species are 'multiple use' plants that can provide timber, medicines and other useful products as well as food ingredients. In southern Australia there are ~50 species of *Acacia* that produce edible seed (Maslin et al. 1998).

Some challenges facing the native food industry include the question of shared 'industry goals' and how we can reconcile different approaches to industry development and information sharing among Aboriginal and non-Aboriginal people. These issues can be dealt with if we establish and maintain good communication channels among the various sections of the native food industry. Development and sharing of intellectual property is another issue worthy of consideration. There are models for successful sharing of Indigenous intellectual property in new plant cultivars in Africa (for example, see Leakey et al. 2003).

In conclusion, native food species have the capacity to make a significant contribution to Australia's food security in the future. There is a large range of species to choose from for development and for inclusion in the mainstream diet. At the moment, the native food industry is focused on developing about 12 main species: bush tomato (also known as desert raisin, *S. centrale*), quandong (*S. acuminatum*), *Acacia* species for wattleseed, Kakadu plum (*T. ferdinandiana*), muntries (*Kunzea pomifera*), riberry (*Syzygium luehmannii*), lemon myrtle (*Backhousia citriodora*), aniseed myrtle (*Syzygium anisatum)*, Davidson's plum (*Davidsonia* species), mountain pepper (*Tasmannia lanceolata*) and *Citrus* species including the desert lime and finger lime (RIRDC 2008a, b). These species originate from a range of environmental conditions, from the arid zone to the tropical or temperate rainforest. Native food plants can become crops, some of which have strong survival properties in adverse conditions, and native food ingredients contain a variety of constituents that can benefit health as well as nutrition. The development of native food industries offers continuing opportunities for Aboriginal and non-Aboriginal people to form fruitful partnerships.

## 24.3 Sustaining Crop Yields in a High $CO_2$ World

**Glenn Fitzgerald, Michael Tausz, Robert Norton, Garry O'Leary, Saman Seneweera, Sabine Tausz-Posch, Mahabubur Mollah, Jo Luck, and Grant Hollaway**

The Australian Grains Free Air $CO_2$ Enrichment (AGFACE) experiment is an outdoor laboratory located in Horsham, Victoria Australia which seeks to understand the effects of increased atmospheric carbon dioxide ($CO_2$) concentrations on wheat and field pea crop production under a range of environments. It was designed to raise $CO_2$ concentrations from the present 380 to 550 ppm which is expected to occur in 2050. The data gathered help validate current crop production models providing confidence that, when linked to climate change models, the estimates of future crop yields in other locations across the landscape can be more accurately predicted (Fig. 24.1).

Key adaptation objectives of this research include:

- Identifying plant traits responsive to elevated $CO_2$ ($eCO_2$), taking advantage of the intra-specific variability that can be incorporated into future breeding lines
- Identifying management changes that maximize cropping system response to elevated $CO_2$
- Understanding how yield and quality can be maintained while adapting to changes caused by increasing atmospheric $CO_2$

Carbon dioxide taken up by plants provides the building blocks to make roots, stems, leaves and the parts of plants we eat (e.g., grain). Increasing atmospheric $CO_2$ concentration means that more carbon is available for growth. The response of many

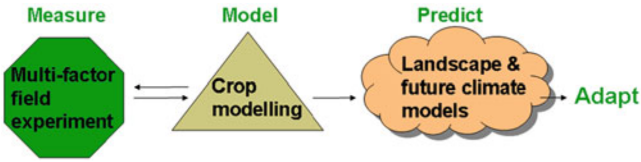



**Fig. 24.1** AGFACE approach to extrapolating field data to landscapes using crop and climate modelling to assess impacts and analyse adaptation options

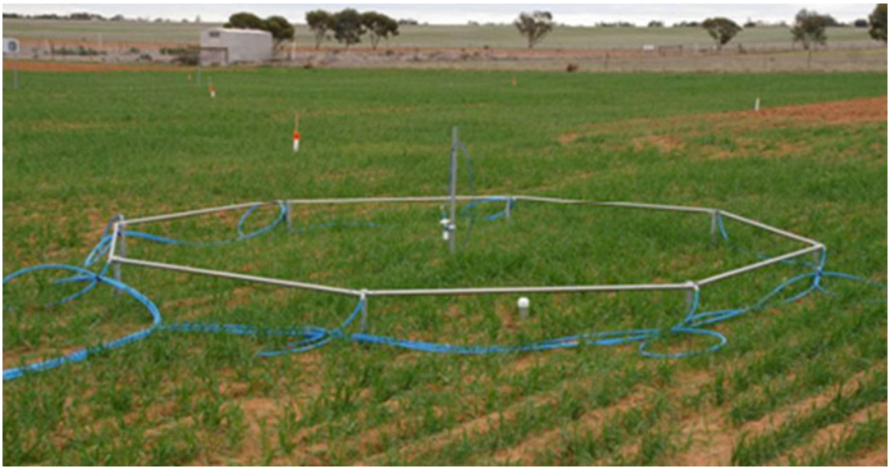


**Fig. 24.2** Example of a FACE octagonal 'ring'. Pure $CO_2$ is injected upwind, whereby it is carried across the ring. Air is continuously sampled from the centre and a controller maintains central $CO_2$ concentrations at 550 ppm

C3 crop plants to $eCO_2$ (without limiting water or nutrient supply) is to increase biomass and yield. If these were the only consequences of increasing atmospheric $CO_2$, it would be a boon to global agriculture. However, future climate is predicted to have generally higher temperatures and altered rainfall distribution, intensity and amount. Thus, the interactions of $CO_2$ with water supply and temperature will cause changes to crop production, food quality and food security.

The FACE methodology allows measurement of crops under field conditions free from artefacts of enclosed chambers. Each FACE 'ring' is composed of eight horizontal pipes in an octagonal shape suspended on supports maintained just above the growing crop (Fig. 24.2). Each pipe has small holes through which pure $CO_2$ is injected into the prevailing wind, allowing the $CO_2$ to distribute across the ring. A computer monitors wind speed and direction and $CO_2$ concentration at the ring centre, maintaining central concentration at 550 ppm. The experiment is fully replicated and composed of eight elevated $CO_2$ ($eCO_2$) and eight ambient $CO_2$ ($aCO_2$) areas. A series of small plots with a range of treatments are encircled by the rings.

From 2007 to 2008, at Horsham two cultivars of wheat were included and then in 2009 the rings were expanded to allow sowing of eight cultivars. There were two levels of irrigation (rain fed and supplemental), two times of sowing (typical and late) and one cultivar had two levels of nitrogen fertilizer applied. Additionally, a second site in a hotter, drier region in the Victorian Mallee (Walpeup) was run for 2 years. The time of sowing treatment and the hotter Walpeup site provided an indirect measure of the effect of increased temperature during the critical time of anthesis when the wheat grain develops. All together, these experimental treatments allowed a wide range of environments in which to measure and model wheat response to $eCO_2$.

In 2010, the experiment was altered to a long-term wheat-field pea rotation in which other questions concerning the effects of $eCO_2$ on a legume crop, nitrogen fixation processes and carry-over effects of soil N on wheat and legume grain quality could be addressed.

Key research questions have included the following:

- What are the impacts of $eCO_2$ on wheat and pea growth and yield?
- What are the effects of $eCO_2$ on grain protein, micronutrient composition and bread and noodle quality?
- How does water use efficiency change as a result of $eCO_2$?
- What are the long-term effects of the wheat-field pea rotation on soil and plant nitrogen?
- How do the wheat pests and diseases, crown rot, barley yellow dwarf virus and wheat stripe rust change under $eCO_2$?
- Are there any interactions between $eCO_2$, soil water levels and nitrogen fertilization on crop productivity?

It has been documented in other FACE experiments in wheat and other crops that there are distinct changes to growth, yield and quality. This has been confirmed in AGFACE and we have shown that under current temperatures and rainfall patterns:

- At Horsham, mean yield increased in wheat and peas by 24% and 22%, respectively
- Aboveground biomass of wheat and pea increased (mean of 27% for each crop)
- At Walpeup, the 2-year mean yield increase was greater than 50%
- Wheat grain protein decreased, depending on environmental conditions (mean of 5% at Horsham and 13% at Walpeup)
- Wheat nitrogen uptake increased due to increases in biomass (20% at Horsham, 32% at Walpeup)
- Wheat grain iron and zinc concentrations decreased by about 10% at Horsham
- Elevated $CO_2$ promoted tillering in wheat
- Elevated $CO_2$ increased grain yield through increased head number, grain number per head and single grain mass.

Crop modelling allows evaluation of the effects of future temperature increases and changing rainfall patterns on crop production. Thus, although $eCO_2$ by itself increases yield, increasing temperature is expected to erode this gain, leading to yield decreases as global temperature rises. Climate change models also indicate that rainfall amounts and timing will change and there will be more rainfall later in the season in Victoria. Preliminary modelling results suggest that by 2050, without adaptation there could be about 10–20% yield reduction in the drier Mallee and an increase of about 10–20% in high rainfall zones in southern Victoria. Thus, adaptation may include shifting to longer season cultivars and sowing later to take advantage of late season rainfall.

Pests and diseases in wheat have been studied in the AGFACE resulting in better understanding of how they will respond in a higher $CO_2$ world. For example, wheat crown rot was shown to have greatly increased fungal biomass under $eCO_2$ compared to $aCO_2$. This may be because this fungus overwinters in crop residues and the increased biomass from $eCO_2$ led to increased stubble. There was no effect from $eCO_2$ on wheat stripe rust pathogenicity, so this disease may become less serious under future climate.

The above results lead to the following adaptation possibilities and questions to ensure future food security:

- Tillering response can be incorporated in new breeding lines but the response must be matched to environment, since too many tillers may not lead to higher yields under rainfed terminal drought conditions
- Breeding for longer season cultivars and delaying sowing times may allow crops to take advantage of warmer conditions and late season rainfall
- Given that bread and noodle quality are likely to be affected by decreased wheat grain protein, protein quality and micronutrient contents under $eCO_2$, can cultivars be developed to overcome these limitations and be adapted to different regions?
- Can cultivars be developed that will maintain yield and quality in the presence of changing pest and disease dynamics?
- Will robust crop-climate models allow us to predict, within an acceptable degree of error, future crop yields?
- How will grain quality changes affect bread and noodle parameters and how will this effect marketability?
- How will people with limited access to meat maintain their intake of protein and micronutrients?

Current and future research will focus on cereal–legume systems to inform cultivar development and test crop management solutions to understand soil and plant nitrogen dynamics, while maintaining yields and grain quality under changing climate.

## References

Altman, J.C., Buchanan, G.J., & Larsen, L. (2007). *The environmental significance of the indigenous estate: Natural resource management as economic development in remote Australia*. Discussion Paper No 286. Canberra: Centre for Aboriginal Economic Policy Research.

Ampt, P., & Baumber, A. (2010). *Building cooperation and collaboration in the Kangaroo industry*. A report for the Rural Industries Research and Development Corporation. ACT: Barton.

ANRA. (2009). Rangelands overview—Australia. Retrieved October 2011, from http://www.anra.gov.au/topics/rangelands/overview/index.html

Baudinette, R. V. (1989). The biomechanics and energetics of locomotion in Macropodoidea. In G. Grigg, P. Jarman, & I. Hume (Eds.), *Kangaroos, wallabies and rat-kangaroos* (Vol. 1, pp. 245–253). Sydney: Surrey Beatty and Sons.

Bothma, Jd. P., & Toit, J. G. (2010). *Game ranch management* (5th ed.). Pretoria: Van Schaik.

Bryceson, K. P., (2008). *Value chain analysis of bush tomato and wattle seed products*, DKCRC Research Report 40. Desert Knowledge Cooperative Research Centre, Alice Springs, NT, Australia. Retrieved August 3, 2012, from http://www.desertknowledgecrc.com.au/resource/DKCRC-Report-40-Value-Chain-Analysis.pdf.

Conroy, A. (2007). *Karoo gold—producers of quality springbok products*. Retrieved April 2008, from http://karoogold.co.za

Cooney, R., Baumber, A., Ampt, P., & Wilson, G. (2009). Sharing Skippy: How can landholders being involved in kangaroo production in Australia? *The Rangeland Journal, 31*, 283–292.

DCC. (2002). *Living with climate change: An overview of potential climate change impacts on Australia*. Australian Greenhouse Office: Canberra.

DCCEF. (2011). *Carbon farming initiative*. Retrieved December 2011, from http://www.climatechange.gov.au/cfi

Deer Commission for Scotland (2008). *Scotland's Wild Deer, A National Approach, (Strategy for wild deer management)*. Retrieved August 3. 2012, from http://www.snh.gov.uk/docs/C249895.pdf.

Gammage, B. (2011). *The biggest estate on earth—how aborigines made Australia*. Sydney: Allen & Unwin.

Harwood, C. E., Rinaudo, T., & Adewusi, S. (1999). Developing Australian *Acacia* seeds as a human food for the Sahel. *Unasylva, 196*, 57–64.

Kelly, J. (2005). *Kangaroo Industry Strategic Plan 2005–2010*. 05/108. Canberra, ACT: Rural Industries Research and Development Corporation.

Konczak, I., Zabaras, D., Dunstan, M., & Aguas, P. (2010). Antioxidant capacity and phenolic compounds in commercially grown native Australian fruits. *Food Chemistry, 123*, 1048–1054.

Leakey, R. R. B., Schreckenberg, K., & Tchoundjeu, Z. (2003). The participatory domestication of West African indigenous fruits. *International Forestry Review, 5*, 338–347.

Lindenmayer, D. (2007). *On borrowed time*. Camberwell: Penguin.

Lunney, D. (2001). Causes of the extinction on native animals of the Western Division of New South Wales: an ecological interpretation of the nineteenth century historical record. *Rangeland J, 23*, 44–70.

Maslin, B. R., Thomson, L. A. J., McDonald, M. W., & Hamilton-Brown, S. (1998). *Edible wattle seeds of Southern Australia. A review of species for use in semi-arid regions.* (p. 108). Australia: CSIRO.

Netzel, M., Netzel, G., Tian, Q., Schwartz, S. J., & Konczak, I. (2006). Sources of antioxidant activity in Australian native fruits. Identification and quantification of anthocyanins. *Journal of Agricultural and Food Chemistry, 54*, 9820–9826.

Newsome, A. E. (1975). An ecological comparison of the two arid zone kangaroos of Australia and their anomalous prosperity since the introduction of ruminant stock to their environment. *Quarterly Review of Biology, 50*, 389–424.

NRMMC. (2008). *National code of practice for the humane shooting of Kangaroos and Wallabies for commercial purposes*. Available Retrieved August 3, 2012 at http://www.environment.gov.au/biodiversity/wildlife-trade/publications/kangaroo/practice.html

RIRDC. (2008a). *The new crop industries handbook—native foods*. Publication No. 08/021. Canberra: Rural Industries Research and Development Corporation.

RIRDC. (2008b). *Native foods: R&D priorities and strategies 2008–2013*. Publication No. 08/022. Canberra: Rural Industries Research and Development Corporation.

Scottish Venison Partnership. (2012). *Deer in Scotland*. Available Retrieved August 3, 2012 at http://www.scottish-venison.info/

State of the Environment Report. (2006). *Australian state of the environment 2006.* Retrieved May 26, 2008, from at http://www.environment.gov.au/soe/2006/publications/report/land.html

Turner, T. (2008). *Ted's Montana Grill*. Retrieved June 11, 2008, from http://www.tedsmontanagrill.com/ted.html

Walsh, F., & Douglas, J. (2009). Harvester–trader exchanges: Critical elements of small-scale commercial bush produce harvesting in central Australia sustained to at least 2006. In M. Ryder, F. Walsh, J. Douglas, M. Waycott, H. Robson, Z. Singh, M. Majer, T. Collins, J. White & B. Cheers (Eds.), *Sustainable bush produce systems*. Working Paper 31. Alice Springs: Desert Knowledge Cooperative Research Centre.

Wilson, G., & Edwards, M. (2008). Native wildlife on rangelands to minimize methane and produce lower-emission meat: Kangaroos versus livestock. *Conservation Letters, 1*, 119–128.

Wilson, G., & Mitchell, B. (2005). *A strategic plan for trialling sustainable wildlife enterprises: Guidelines for conservation-based enterprises as an incentive to restore on-farm habitat*. Publication No. 05/106. Canberra, ACT: Rural Industries Research and Development Corporation.

# Part III
# Land Use Planning

# Chapter 25
# Is Food a Missing Ingredient in Australia's Metropolitan Planning Strategies?

**Trevor Budge**

## 25.1 Introduction

The sustainable supply of fresh nutritious food at a reasonable cost and distributed so that all consumers across a city can equitably access it is not part of the agenda in Australia's metropolitan planning strategies. Historically secure access to regular supplies of fresh food had been a key element in the location, existence and urban form of towns and cities since humans started coming together in settlements. Food in cities is now increasingly sourced from around the world. Food and how a city grows and is planned are now generally seen as unrelated agendas.

This chapter examines the historical relationship between cities, their food supply and the planning of large metropolitan areas. In particular the chapter focuses on the Australian metropolitan scene, but it also includes reference to the role of food in contemporary metropolitan planning strategies in selected cities in the developed world. The chapter explores the growing interest in food as part of the urban planning agenda and speculates that a greater range of forces is now likely to see food, in all its various aspects, play an increasingly more important role in the preparation of Australia's metropolitan planning strategies.

## 25.2 Food and Cities: A Historical Overview

Steele (2008, p. ix) in exploring the role of food in the historical shaping of London, writes that 'feeding cities takes a gargantuan effort, one that arguably has a greater social and physical impact on our lives and planet than anything else we do'.

T. Budge (✉)
La Trobe University, Bendigo, Australia
e-mail: T.Budge@latrobe.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_25,

The production and management of food, ensuring reliable supplies, storing it for lean times, facilitating its sale and distribution have been critical factors in how cities have been organized economically, administratively, socially, politically and spatially. Securing a sustainable food supply has not only been a basic need for cities and their populations but has been a primary reason for their very location and it has partly explained their growth, urban form, shape and extent (Clark 2009; Cronin 1991; Duis 1998; Russell 1997, Mazoyer and Roudart 2006, Mougeot 2006).

The growing of food and the raising of livestock took place within the walls of the city. Food markets in cities have been prominent (central) locations and one of the great social places and a constant reminder of the role of food as part of the local economy. Cities were partly organized around the daily supply of food and still are in many developing countries. The massive population growth of cities associated with the industrial revolution initially spawned the need for substantially increased levels of horticultural product on the edges of cities (Cockayne 2007). The limits of transport and the highly perishable nature of much of the product, particularly many vegetables, meant that it was essential that a substantial amount of production took place in close proximity to cities or in some cases within the city itself. The rapid growth in the population of cities led to the spread of their physical area. In many cases large areas of quality soil resources devoted to food production were paved over. It was also the time when metropolitan areas began to realize the need to undertake large-scale forward strategic plans to manage growth and change.

## 25.3 The Commoditization of Food and the Impact on Cities

During this period of rapid urban expansion a progressive series of inventions not only compensated for the loss of food producing areas in and around cities but also actually facilitated the loss. Refrigerated storage was combined with faster and larger transport capacity, which was then superseded by refrigerated transport. The necessity for ready access to 'fresh' food, particularly vegetables, had disappeared from an essential element in the day-to-day land use needs of the city. Food became a globalized commodity. Corporations provided access all year round to food, no matter what the season or issues with production. Large supermarkets increasingly offered an expanding range of products not possible under traditional home-grown or horticultural methods. Food in cities was no longer something that one grew, or one saw being grown and taken to market. Food including perishable items became a commodity that one bought in a large supermarket when you needed it. The globalization story of food is now well known and popularized by authors such as Roberts (2008). Residents in expanding low-density cities in developed countries like Australia travelled by car to supermarkets where they were able to buy out-of-season product.

Food has always been an intrinsic part of the economy of cities, so intrinsic that it has simply been assumed. Metropolitan planning strategies frequently focus on core industries that are major employers and that shape a city's future. However, it is rare to find food recognized as one of the key economic sectors of a metropolitan area. Recent analysis of the Melbourne metropolitan area (SGS Economics and Planning 2008) indicates that about 12% of the metropolitan area's economic activity is directly related to food. The Toronto Food Policy Council in 1999 identified that about 10% of all employment in the city was in the food sector and that food was the basis of 14% of the business establishments (Toronto Food Policy Council 1999, p. 1).

In many cities around the world, campaigns at grass roots level, and increasingly with the support from civic leaders, are calling for more resilient, sustainable and equitable systems and cities. The long-term production and capacity of systems heavily reliant on fossil fuels for fertilizers, machinery and transport and on sustained water supplies for irrigation of crops is being increasingly questioned. These issues are starting to be heard in the development of some metropolitan planning strategies and are now influencing processes and outcomes in a number of cities in the western world.

## 25.4 The Development of Metropolitan Planning Strategies in Australia

Support for private large-scale land development in Australia's cities as the primary means of managing land supply for residential demand (Sandercock 1975) resulted in a massive expansion of the urban footprint and consequently the loss of large areas of productive land to what the market termed 'higher and better uses' (Budge 2007; Buxton et al. 2006). Rutherford et al. (1967) noted an unplanned 'rolling wave' of development of the Sydney hinterland, where more profitable agricultural uses were replaced by extensive, low profit agricultural activities, and then the general termination of these activities by residential development. The continuation of agriculture on the immediate urban edge saw a clash of value systems and a rise in 'nuisance' complaints against those attempting to make a living (Houston 2005).

Coincidentally, when the nexus between food production and urban form was starting to be broken, metropolitan-scale planning, driven by newly formed metropolitan authorities, began to emerge in Australia (Budge 2009). Market-led land development processes threatened agricultural production. The first reaction of those early planning authorities was to seek to use newly created strategic and regulatory planning systems to 'protect' these areas of production from at least ad hoc development. The Melbourne and Metropolitan Board of Works in Victoria were charged with the responsibility to develop the city's post-war metropolitan planning scheme. It was concerned that sprawling urban development was threatening to overrun horticultural production areas. It stated 'a line must be drawn somewhere, or the city will continue sprawling over a wider and wider area, increasing the disabilities inherent in this type of growth and putting out of production more and more food producing areas' (Melbourne and Metropolitan Board of Works 1954,

p. 22). As food supplies were sourced further and further from the city's consumers this post-war imperative began to fall on deaf ears.

During the last decade the respective State governments in Australia have prepared new or revised comprehensive metropolitan planning strategies. These strategies have increasingly had at their core policies and initiatives to control and limit urban sprawl. These objectives have generally been driven by concerns over the implications of such a pattern for transport access and costs and the provision of infrastructure, facilities and services, rather than a deep concern about encroaching on productive agricultural land. There has been some recognition in Australia's metropolitan strategies of the significance of agricultural production at the urban edge and the need for urban form and transport planning to consider access to food supplies but none of them have given more than modest consideration to this issue.

Given the profound changes that have occurred in relation to food production and distribution it is perhaps readily understandable that metropolitan-scale land use and strategic planning paid increasingly less attention to agriculture as a core component of the urban form (Kennedy 1993). Much of the Australian population appear to have little interest in how food gets from the paddock to the plate. Why should they? Access to food for most people is easy, convenient and low cost. In a short time an age-old connection with the land and the growing of food had been lost. Once, the backyard vegetable garden and fruit trees epitomized many a suburban home. Gaynor's (2006) idyllic portrait of the backyard in Australia depicts vegetables and fruit as core elements when home food production was about self-reliance. Timms (2006) and Hall (2010) note that such utilitarian values were lost as the backyard was transformed from a utility space to become an extension of the living room and the kitchen and a status symbol.

## 25.5 Land Use Planning and the Food System

The food system is notable in its general absence in land use planning agendas in Australia and indeed in other developed countries such as the US (Pothukuchi and Kaufman 1999, 2000). Clancy (2004) points out that a sustainable food system encompasses production, processing, distribution and marketing of food in all contexts, urban and rural. Land use planning and planners can impact all these parts of the food chain. Pothukuchi and Kaufman's (2000) survey of planning departments in 22 US communities revealed that limited attention was being given to the food system because the food system is not seen as directly linked to the built environment and that it is dominated by the private sector. As Morgan (2009) notes, the American Planning Association has only recently produced a Policy Guide on Community and Regional Food Planning (Raja et al. 2010). Morgan considers it as 'a belated attempt to make amends for the fact that the planning community, academics and professionals alike, had signally failed to engage with the food system' (2009, p. 341). Raja et al. (2010) assert that the food system is a 'multifunctional factor' that impacts on a host of factors where planners have legitimate interests.

In that list of factors she identifies public health, social justice, energy, water, land, transport and economic development.

Incorporating recognition of planning for food has been a relatively late concept in land use planning in Australia (Cassidy and Patterson 2008). Ironically it was concerns about health impacts that drove the initial development of formal arrangements for what is now a rather antiquated term—'town planning'. As Thompson and Gallico (2007) note, planning originated out of concerns for the health of urban inhabitants; disease, poor nutrition and pollution. Zoning was created to separate incompatible land uses and protect amenity. Zoning would subsequently be used to try and protect areas of productive agricultural land in urban areas from residential expansion. After planning allowed and fostered urban sprawl it has now come full circle with an increasing recognition that the low-density urban form is bad for our health and destructive of our land resources with consequent impacts on access to, and the costs of, food and the health system (Budge 2011).

Thompson and Gallico (2007, p. 13) note that 'health is embedded in the London Plan' and that it is 'established as a key interconnecting theme at the outset of the Plan'. A similar finding could be made in respect to the London Plan in relation to food which was considerably influenced by the London Mayor's Food Strategy: Healthy and Sustainable Food for London. This states, 'few attempts have been made to consider food as part of an integrated and interdependent system. Indeed, the full extent of food's contribution in London—whether as an economic driver, provider of health or a key means of celebrating the city's cultural diversity—is rarely acknowledged or fully capitalized upon' (2006, p. 18).

The wider social, health and community roles of land uses including food production and consumption are beginning to be documented (Campbell 2004; Knox 2003; Lang et al. 2009). This realization has been assisted by concerns and movements associated with concepts such as: 'food miles', grow local campaigns, 'slow food', farmers markets, food security, the benefits of growing your own food, community gardens and the evidence of the links between food, the local economy and climate change. Urban agriculture is being revived and it is being advocated that metropolitan planning strategies and urban design practices need to catch up with this agenda and begin to look at how to integrate and incorporate food production as a core element of the metropolitan planning agenda (Donovan et al. 2011).

The emerging direction is that good planning practice principles will be increasingly called upon and required to have an enhanced appreciation of the relationship between city form and the provision of opportunities for a healthy lifestyle and for access to sustainable healthy food supplies. Significantly the interdisciplinary ways of working with these elements require a paradigm shift for many planners. This is rather ironic given the historical origins of planning and the journey it has come. Few professions can have so lost their way in such a relatively short time. The most effective means to engage the planning profession in terms of issues such as food supply and security, health outcomes and health impacts is to frame them as part of the sustainability agenda which is now overwhelming metropolitan planning imperatives.

## 25.6 Australia's Approach to Food and Metropolitan Strategic Planning

The economic, environmental and social future of Australia is now largely bound up with how well its large cities 'perform' (Spiller and Budge 2000). By 'perform' it is meant their capacity to be *livable* places for their population, to operate as efficient urban areas and be the engines of growth and development, of innovation and global linkages. While urban planning and particularly metropolitan-scale land use planning was always centralized the respective State governments have now largely taken over that role (Gleeson and Low 2000). The concept of either a group of local governments working together, or the far more productive and practical approach of establishing metropolitan wide authorities with planning powers, has effectively been abandoned in Australia (Spiller 2004). Establishing independent metropolitan planning authorities has been cast aside in favour of state governments assuming an interventionist (political) approach to metropolitan policy and planning.

The rhetoric of Australian state governments has been that they are better at coordinating the range of conflicting agenda and investment both public and private at the metropolitan scale. Developing a coherent and comprehensive effective form of governance arrangements for large urban areas has been one of the great challenges in the last century across much of the world. There are few metropolitan governance models across the world's developed cities that can be held up as best practice. An examination of the decision-making processes and the key decisions made about land use and infrastructure by Australia's state governments provides little evidence that the Australian model has much to offer (Gleeson and Low 2000). Is it any wonder that in respect to those metropolitan-scale plans that delivering on issues such as sustainable food systems are at best patchy and ad hoc? Ironically the most effective results in Australia have generally been seen at the local and community level where the messages about the importance of linking strategic land use planning to health and securing food production is best understood (Budge and Slade 2009).

Each of the five major Australian cities is located in a different state jurisdiction; each has their own legislated planning arrangements and each has established their own mechanisms to manage their metropolitan area. Each metropolitan area, with one exception Brisbane, is comprised of numerous relatively small local government areas. The federal (Commonwealth) government has almost totally (in its over 100 year history) avoided direct intervention in the management and financing of cities. The Australian Constitution does not explicitly reference land use, environmental matters, urban planning, or management of agricultural land resources or production as tasks for a national government. These governance arrangements mean that coordinated policy for metropolitan planning and infrastructure provision is largely absent from explicit decision-making at the national level. The lack of contemporary city governance mechanisms bedevils most continents, nations and cities.

The impact of the lack of any coherent model of urban governance on the social, structural and urban morphology of Australia's cities has been commented on widely (Gleeson and Low 2000). City governance in Australia has often been dominated by short-term political responses that favour engineering 'fixes' and major investment programmes in localized impact, single purpose infrastructure. Decisions about land use change and new locations for major new urban growth are often handled as completely stand-alone events and elements. Items of wide potential scale and with substantial long-term beneficial impacts on issues such as health and food are generally seen as outside of a narrow departmental 'planning' responsibility.

Highly productive farmland is scarce in Australia, it is generally found in only limited areas on the fringes of the continent with significant areas of some of the most productive areas located on the edges of the rapidly expanding metropolitan areas (Gillespie and Mason 2003). However, preventing the loss of productive farmland is not seen as an issue of significance by governments. A recent national assessment of the actions by national, State and local governments in preventing the loss of farmland to urban growth across Australia confirms that view (Buxton et al. 2006). Ensuring a continuing supply of fresh healthy food from nearby productive agricultural land Australian has not been a recent part of the agenda of Australian metropolitan strategies (Budge 2007; Kelleher 2001; Gardner 1994). The protection and management of productive areas of agricultural land as a national or regional resource has largely lacked any coordinated action or consistent policy approach (Budge 2007; Buxton et al. 2006). There is no agreed national framework for the protection of farmland and there are no signs that one will emerge.

Despite this failure at the national level, and the lack of explicit attention in the respective metropolitan strategies, it has been apparent that over the last decade or so in Australia there has been a growing concern to protect productive agricultural land (Bunker and Houston 2003). This concern has essentially derived from a loose coalition of a number of land use planners, agricultural resource practitioners, farmer groups, public health advocates and conservationists who have identified that a limited land resource is under threat and that the loss of highly productive agricultural land is likely to have profound impacts on levels of food production, the costs of product, energy demands on transport and on food prices (Houston 2005; Slade 2008).

Generally state government efforts at policy formulation on retaining productive farmland could be largely characterized as aspirational (Budge 2007). These policies have usually lacked any real implementation and when confronted by strong development forces have often been put aside. Specific regulatory measures on the ground have often been watered down or lost under the pressure of landowners looking for a windfall retirement savings boost by cashing in their landholding.

## 25.7 The Emergence of Food as a Key Component in the Metropolitan Planning of Some Cities

There is increasing recognition that local food production represents an important part of community and regional economies and that there are many benefits including substantial health gains that can emerge from stronger community and regional food systems (Drescher 2001; Slade and Budge 2008). The fact that cities have become accustomed to consuming a far greater amount of food than they can supply from within their own boundaries or adjoining areas is raising concerns. Food gathered from a global system promotes a disregard for the heavy ecological footprint created through transport and the creation of massive amounts of waste (Larsen et al. 2008) with much going to landfill through this open system of consumption. The establishment of large conglomerate shopping centres consolidates the dislocation between all the links in the food chain. Growers see their products bypass the local markets, going to wholesalers in cities and then appearing again, after travelling many ‘food miles’, back into their local store.

The lack of attention to food in the metropolitan planning agenda in Australia is in contrast to the emerging practice in a number of cities across the developed world. Table 25.1 presents a selection of cities from the developed world. It notes the date of their latest metropolitan planning strategy and it notes the number of times food is referenced in the strategy. It is evident in a number of large metropolitan areas that food has become an important item. Cities such as London, Chicago, Vancouver, Portland (Oregon) and Toronto make extensive reference to the role that food plays in their metropolitan-scale long-term strategic plans. Where the strategy has

**Table 25.1** Selected cities: references to food in their metropolitan planning strategies

| City | Metro-scale strategy (year) | Number of references to ‘food’ | Food strategy |
|---|---|---|---|
| New York | 2008 | 4 | Yes |
| London | 2008 | 23 (29: Re-draft, 2009) | Yes |
| Tokyo | 2005 | 0 | No |
| Paris | 2010 | 0 | No |
| Hong Kong | 2009 | 0 | No |
| Chicago | 2010 | 486 | Yes |
| Los Angeles | 2001 | 0 | No |
| Singapore | 2001 | 0 (5: Review, 2010) | No |
| Washington | 2006 | 0 | No |
| Toronto | 2009 | 16 | Yes |
| Berlin | 1998 | 1 | No |
| Madrid | 1996 | 0 | No |
| Boston | 2005 | 4 | No |
| Shanghai | 2006 | 0 | No |
| Amsterdam | 2009 | 0 | No |
| Sydney | 2010 | 18 | No |
| Melbourne | 2002 | 8 (2: Update, 2008) | No |
| Adelaide | 2002 | 8 (2: Update, 2008) | No |
| Perth | 2010 | 1 | No |
| Brisbane—SE QLD | 2009 | 12 | No |
| Vancouver | 1996 | 2 (26: Revised, 2010) | Yes |
| Portland | 2009 | 18 | Yes |
| Birmingham | 2008 | 4 (18: Comp. Plan, 2010) | No |
| Milwaukee | 2010 | 29 | No |

considerable references to food that has been followed through with some analysis of the context within which food is addressed. Where relevant, supporting documents that specifically integrate food as part of the metropolitan strategy, have been investigated.

Vancouver and Portland have adopted specific food system strategies. Singapore, Washington, Berlin and Amsterdam make brief references to food in their metropolitan strategies and/or supplementary policies, but only in relation to logistics, economic and environmental matters or historical events. The growing recognition and representation of food in metropolitan planning strategies is highlighted by the manner in which food is being seen in some metropolitan planning strategies as a critical element (Budge 2011). Set out below are a number of extracts from metropolitan strategies where food is being addressed as a critical component of the strategy.

The London Plan (2009, p. 194) states 'providing land for food growing will have many benefits, it will help promote more active lifestyles, better diets, social benefits and support for local food growers'. Chicago's recently released metropolitan planning strategy, GOTO 2040 (2010), has 486 references to food. The plan seeks to link the concept of liveable communities to the promotion of sustainable local food. It notes in the section on *Livable Communities—Promote Sustainable Local Food* 'Three times per day, we decide what to eat, often without consideration of how that food was produced or where it comes from. These daily decisions have consequences whether or not we are aware of them, and they directly shape the food industry that feeds us' (GOTO 2040 2010, p. 142).

The recently released Sydney metropolitan planning strategy 'Metropolitan Plan for Sydney 2036' (NSW Planning 2010) has 20 references to food reflecting in part a widely supported community-based campaign by groups such as the Sydney Food Fairness Alliance (see Chap. 8) advocating that the government address the protection of food producing areas. However the Plan almost exclusively addresses food as an agricultural land use issue and largely the references are to land on the periphery of the metropolitan area rather than as a cross-cutting theme in the holistic planning of the metropolitan area (Budge 2011). A much more ambitious approach is set out in the City of Sydney Strategy 'Sustainable Sydney 2030 The Vision' (City of Sydney 2008), which sets targets (Budge 2011). In respect to food, Target 8 [of 10]—[states] 'by 2030, every resident will be within a 10 min (800 m) walk to fresh food markets, childcare, health services and leisure, social, learning and cultural infrastructure' (City of Sydney 2008, p. 38).

The Toronto Official Plan (2009, p. 16) states 'in May 2000 Council adopted a Food Charter with the objective of making Toronto a food secure City where a variety of healthy foods would be available to Torontonians at a reasonable cost and our food production capacity would be safeguarded. Access to food is carried into the Official Plan through references to reducing loss of food lands to urban sprawl and the creation of community gardens'. Blay-Palmer notes that the Toronto Food Policy Council (TFPC) 'connects food issues with a suite of agendas to make the food lens more visible and relevant to policymakers, businesses, citizens/eaters, chefs, farmers, food processors and activists, among others' (2009, p. 401). The Vancouver Regional

Food System Strategy (Metro Vancouver, 2011 p.1) states ‘Food is a top of mind issue for many people. There are growing concerns about the rising incidence of obesity, food safety, disappearing farmland, depleted fish populations, food waste, and the carbon footprint of food. At the same time there is a renewed interest in growing food, preparing healthy meals, buying local foods, and working with others to provide equitable access to nutritious food in our communities’.

The executive summary to the Portland Plan (2009 p.4) in Oregon State USA identifies the cross cutting nature of food, ‘planners have long addressed several of the essentials of life – air quality, water quality and housing - while food remained off planners’ radar. However, growing awareness about the impact of the food system on climate change, local and regional economies, fossil fuel resources, community health and land use have piqued planners’ interest in recent years. More intersections are now visible between food and what planners already do.

Sonnino (2009) notes that more comparative and comprehensive studies of the emerging urban food strategies are necessary to fully capture the potential of fast-growing cities in creating or recreating more sustainable social, economic and environmental futures. Morgan and Sonnino (2010) state that far from being confined to the countries of the global South, food security is now a major issue for the global north. Reynolds (2009) focuses on London and identifies that it is crucial that cities like London consider the adaptability, and moreover sustainability, of their food systems in the light of many seemingly inevitable and sizeable changes in the future.

An analysis of emerging metropolitan planning agendas from selected cities across the developed world indicates that new forces are at work. Some planning strategies are giving increasing attention to food production, access to food and how the consideration of food can and needs to shape the very form and design of the city. Food in some cities is now a driving factor in the planning agenda.

## 25.8 Conclusion

Food has historically been central to the functioning, development and land use of cities. However food lost its place as a key element in the morphology of cities and was generally relegated to an inconsequential role in the metropolitan planning agenda, particularly in Australia. By exploring the emerging imperatives around food and examining some cutting edge work that is being undertaken in other cities from around the world this chapter advocates a new approach that would see food being a critical ingredient in Australia’s metropolitan planning strategies. Metropolitan areas in some parts of the developed world are beginning to realize the importance of food as a ‘cross-cutting’ agenda. Food and access to it links to peak oil, to climate change, to health and to equity in cities. A number of large cities in the United States, Canada, Britain and Europe now understand the fragility of their current arrangements in terms of secure food supplies. They are promoting and incorporating food strategies as part of their metropolitan planning which are seen to be good for economic and social outcomes.

Australia's metropolitan areas and those undertaking their strategic planning need to examine these issues and consider embracing similar agendas. They need to examine the role and importance of food as a key component of the future planning of the city. Food in all its dimensions needs to be increasingly factored into how we organize, plan and manage our cities, and Australia's metropolitan areas will be unlikely to be able to avoid this imperative.

**Acknowledgments** The author wishes to thank Mark Chesterfield for assisting with the background research on international cities.

## References

Blay-Palmer, A. (2009). The Canadian pioneer: The genesis of urban food policy in Toronto. *International Planning Studies, 14*(4), 401–416.

Budge, T. (2007). Farmland preservation in Australia: Emerging issues—fragmented responses. In W. Caldwell, S. Hilts, & B. Wilton (Eds.), *Farmland preservation around the globe: Challenges and opportunities*. Canada: University of Guelph.

Budge, T. (2009). *Food and health: The missing ingredients in Australia's metropolitan planning strategies*. In Paper presented to the 47th international making cities livable conference, Portland, OR.

Budge, T. (2011). *The failure of a set menu: Can we have a metropolitan planning agenda without food*? In Paper presented at the 3rd World Planning Schools Congress, Perth, WA.

Budge, T., & Slade, C. (2009). *Health, food, land use planning and jobs*. Melbourne: Victorian Local Governance Association.

Bunker, R., & Houston, P. (2003). Prospects for the rural-urban fringe in Australia: Observations from a brief history of the landscapes around Sydney and Adelaide. *Australian Geographical Studies, 41*(3), 303–323.

Buxton, M., Tieman, G., Bekessy, S., Budge, T., Mercer, D., Coote, M., & Morcombe, J. (2006). *Change and continuity in Peri-urban Australia, State of the Peri-urban regions: A review of the literature*. Melbourne: RMIT University.

Campbell, M. (2004). Building a common table: The role for planning in community food systems. *Journal of Planning Education and Research, 23*, 341–355.

Cassidy, A., & Patterson, B. (2008). *The planner's role in the urban food system*. Accessed September 12, 2008, from http://www.planning.org/thenewplanner/2008/spr/urbanfoodsystem.htm

City of Sydney. (2008). *Sustainable Sydney 2030 the vision*. Sydney: City of Sydney.

Clancy, K. (2004). Potential contributions of planning to community food systems. *Journal of Planning Education and Research, 2004*(23), 435.

Clark, P. (2009). *European cities and towns 400–2000*. Oxford: Oxford University Press.

Cockayne, E. (2007). *Hubbub: Filth, noise and stench in England 1600–1770*. New Haven: Yale University Press.

Cronin, W. (1991). *Nature's metropolis: Chicago and the Great West*. New York: Norton.

Donovan, J., Larsen, K., & Carlisle, R. (2011). *What is FSPUD? Food sensitive planning and urban design: A conceptual framework for achieving a sustainable and healthy food system*. Melbourne: Heart Foundation.

Drescher, A. (2001). *The integration of urban agriculture into urban planning—an analysis of the current status and constraints*. Available: http://www.ruaf.org/sites/default/files/ab_landuse_planning.pdf. [Accessed 3 August 2012].

Duis, P. (1998). *Challenging Chicago: Coping with everyday life 1837–1920*. Urbana: University of Illinois.

Gardner, B. (1994). Highly productive agricultural land—Australia's limited resource. In *Agriculture and rural industries on the fringe*. Australian Rural and Regional Planning Network and TBA Planners, Bendigo, Australia.
Gaynor, A. (2006). *Harvest of the suburbs: An environmental history of growing food in Australian cities*. Perth: University of Western Australia Press.
Gillespie, P., & Mason, D. (2003). *Value of agriculture in the Sydney region*. Windsor: NSW Agriculture.
Gleeson, B., & Low, N. (2000). *Australian urban planning: New challenges, new agendas*. St Leonards: Allen and Unwin.
GO TO 2040. (2010). Comprehensive Regional Plan for Metropolitan Chicago. Chicago Metropolitan Agency for Planning.
Hall, T. (2010). *Life and death of the Australian backyard*. Melbourne: CSIRO Publishing.
Houston, P. (2005). Re-valuing the fringe: Some findings on the value of agricultural production in Australia's Peri-urban regions. *Geographical Research, 43*(2), 209–223.
Kelleher, F. (2001). *Urban encroachment and loss of prime agricultural land*. Hawkesbury: Centre for Farming Systems Research, University of Western Sydney.
Kennedy, A. (1993). *Agriculture in the Sydney region: A fringe activity critical to the regional economy*. In Paper presented at planning for harmony, Royal Australian Planning Institute (NSW) annual conference, Penrith.
Knox, S. (2003). Planning as a public health issue. *Urban Policy and Research, 21*(4), 317–319.
Lang, T., Barling, D., & Caraher, M. (2009). *Food policy: Integrating health, environment and society*. Oxford: Oxford University Press.
Larsen, K., Ryan, C., & Abraham, A. (2008). *Sustainable and secure food systems for Victoria: What do we know? What do we need to know?* VEIL Research Report No. 1. University of Melbourne.
London Plan. (2009). http://www.london.gov.uk/shaping-london/london-plan/docs/london-plan.pdf. [Accessed 3 August 2012].
Mayor of London Food Strategy: Healthy and Sustainable Food for London. (2006).
Mazoyer, M., & Roudart, L. (2006). *A history of agriculture: From the neolithic age to the current crisis*. New York: The Monthly Review Press.
Melbourne and Metropolitan Board of Works. (1954). *Melbourne metropolitan planning scheme 1954 report*, Melbourne.
Metro Vancouver. (2011). Regional Food System Strategy. Vancouver.
Morgan, K. (2009). Feeding the city: The challenge of urban food planning. *International Planning Studies, 14*(4), 341–348.
Morgan, K., & Sonnino, R. (2010). The urban foodscape: World cities and the new food equation. *Cambridge Journal of Regions Economy and Society, 3*(2), 209–224.
Mougeot, L. (2006). *Growing better cities: Urban agriculture for sustainable development*. Ottawa: International Development Research Centre.
New South Wales Planning. (2010). *Metropolitan plan for Sydney 2036*. Sydney: NSW Government.
Pothukuchi, K., & Kaufman, J. (1999). Placing the food system on the urban agenda: The role of municipal institutions in food systems planning. *Agriculture and Human Values, 16*, 213–224.
Pothukuchi, K., & Kaufman, J. (2000). The food system a stranger to the planning field. *Journal of the American Planning Association, 66*(2), 113–124.
Portland Plan. (2009). Background Report Food Systems. City of Portland Bureau of Planning and Sustainability.
Raja, S., Born, B., & Russell, J. (2010). *A planners guide to community and regional food planning: Transforming food environments, facilitating healthy eating*. Chicago: American Planning Association.
Reynolds, B. (2009). Feeding a world city: The London food strategy. *International Planning Studies, 14*(4), 417–424.
Roberts, P. (2008). *The end of food the coming crisis in the world food industry*. London: Bloomsbury.

Russell, E. (1997). *People and the land through time: Linking ecology and history*. New Haven: Yale University Press.

Rutherford, J., Logan, M., & Missen, G. (1967). *New viewpoints in economic geography*. Sydney: Martindale Press.

Sandercock, L. (1975). *Cities for sale: Property, politics and urban planning in Australia*. Carlton: Melbourne University Press.

SGS Economics and Planning. (2009). Economic Significance of the Food Sector. La Trobe University for the Victorian Local Governance Association. Melbourne.

Slade, C. (2008). *Literature Review: Land Use Planning and Community Food Security*, prepared for Victorian Local Governance Association, Melbourne.

Slade, C., & Budge, T. (2008). *Land-use and community food security in Victoria: Implications and responses for the future paper*. Prepared for the Victorian Local Governance Association. Melbourne.

Sonnino, R. (2009). Feeding the city: Towards a new research and planning agenda. *International Planning Studies, 14*(4), 425–435.

Spiller, M. (2004). *Rethinking metropolitan governance in the quest for a sustainable Sydney*. Paper presented to the joint conference of NCOSS and Shelter NSW—bursting at the seams, social sustainability and Sydney's future November 2004 Parrammatta.

Spiller, M., & Budge, T. (2000). The case for a national cities and regional development policy: Nature and scope of city and regional development policy. *Australian Planner*, *37*(3), 133–137.

Steele, C. (2008). *Hungry city: How food shapes our lives*. London: Chatto and Windus.

Thompson, S., & Gallico, T. (2007). Are Metropolitan planning frameworks Healthy? The Broader Context. *Social City*, *13*. Accessed 3 August 2012. http://www.griffith.edu.au/__data/assets/pdf_file/0018/81405/social-city-13-thompson.pdf.

Timms, P. (2006). *The story of the ordinary suburban garden: Australia's quarter acre*. Melbourne: The Miegunyah Press.

Toronto Food Policy Council. (1999). A wealth of food: A profile of Toronto's food economy. Toronto: Toronto Food Policy Council.

Toronto Official Plan. (2009). http://www.toronto.ca/planning/official_plan/pdf_chapter15/chapters1_5_dec2010.pdf. [Accessed 3 August 2012].

# Chapter 26
# Help or Hindrance? The Relationship Between Land Use Planning and Urban Agriculture on the Gold Coast

**Victor Pires and Paul Burton**

## 26.1 Introduction

Cities have always been dependent on a variety of resources not only for their survival, but also to enable them to serve as places of innovation and civilization. As those who in the past laid siege to cities knew all too well, one of the most important of these resources is food. Over the course of the last century cities have been supplied with their food from an increasingly wide area. Indeed most Australian cities are now supplied with food from many parts of the world as well as from different parts of Australia (Gaballa and Abraham 2008). In response to actual and anticipated threats to the supply of food and in light of emerging threats from climate change, peak oil and economic crises, attention has focused in recent years on the potential to supply a greater proportion of the food requirements of cities by producing and processing more food locally, either within or close by the city in question (Larsen and Baker-Reid 2009; Newman 2007). In this sense urban food security and urban agriculture have been seen as inextricably connected.

There is evidence that in a relatively food secure country like Australia, many people have limited access to fresh, nutritious and affordable food. Conservative estimates indicate that food insecurity in Australia affects at least 5% of the general population (Temple 2008). On the Gold Coast in South East Queensland, a recent Queensland Health survey showed that 6.7% of the population is food insecure (Pollard et al. 2009). Famous for its entrepreneurial tradition, relaxed lifestyle and extensive beaches, the Gold Coast has been one of Australia's fastest growing cities for some time. Experiencing a growth rate of over 2.5%, the city could be home to

V. Pires (✉)
Urban Research Program, Griffith University, Gold Coast, QLD, Australia
e-mail: victor.pires@griffithuni.edu.au

P. Burton
Professor of Urban Management and Planning and Deputy Director of the Urban Research Program, Griffith University, Gold Coast, QLD, Australia

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_26,

over 875,000 residents by 2031 (Queensland Treasury 2011). The Gold Coast has also been described as one of the most exposed of all Australian cities to the physical impacts of climate change (Voice et al. 2006; GCCC 2009). Its social and economic vulnerability is also noteworthy. With an ageing population and a relatively high degree of residential turnover in many of its suburbs, it can be seen as a place with low levels of social capital and resilience. Coupled with high unemployment rates and increased costs of living, food access and affordability on the Gold Coast could become a critical issue affecting quality of life in the city—one that needs to be engaged with sooner rather than later.

In principle, there are ample opportunities for urban agriculture to flourish in most Australian cities and especially in the Gold Coast. Apart from some high density areas in the coastal strip, most of the city's suburbs have relatively low population densities, and of the total land area, approximately 60% is in the form of green or open space (GCCC 2008a). Yet, for urban agriculture to play a greater role in supplying our urban food needs, it must be recognized as a legitimate urban land use activity within city planning regimes, for urban land use planning can only encourage and support activities that are recognized. Urban planning is however not renowned for recognizing urban agriculture as a land use, and various studies suggest that formal recognition is paramount for the development of urban agriculture (Cabannes and Dubbeling 2003; De Zeeuw 2004; Kaufman and Bailkey 2000; Petts 2003; Quon 1999; van Veenhuizen 2007; Velez-Guerra 2004; Zimbler 2001). An understanding of how urban agriculture is treated by land use planning frameworks is therefore critical for its expansion.

This chapter considers the extent to which the existence and expansion of urban agriculture is constrained or supported by drawing on a detailed case study of the City of the Gold Coast in South East Queensland. Through a detailed analysis of current planning frameworks, it charts how urban agriculture is encouraged, tolerated and restricted, and explores the rationale behind this regulatory framework. The structure of this chapter is set up to provide a contextual overview of urban agriculture and its relationship with urban planning, prior to discussing the extent to which urban agriculture is recognized as a land use, and some recommendations to elevate its status.

## 26.2 Agriculture and Cities

Urban agriculture can be viewed as an oxymoron: it is something that happens in rural areas, which, by definition, are not urban places (Mougeot 2005). However, agriculture has been common practice in cities since the beginning of human settlements. Agriculture has the potential to provide cities with numerous social, environmental and economic benefits. Socially, food security and improved access to good quality and affordable food are often highlighted (Barbolet et al. 2009; Lam 2007; Moustier and Danso 2006). Environmentally, urban agriculture can improve water and waste management, reduce urban heat and improve air quality, reduce carbon emissions, conserve biodiversity as well as helping nutrient recycling and supporting effective environmental education (Deelstra and Girardet 2001; Girardet 2004).

Economic benefits also arise from urban agricultural practices. These include employment and income generation, development of micro-enterprises, increased access to markets as well as the possible monetary gain associated with better environmental management (van Veenhuizen 2006).

These social, economic and environmental benefits allow urban agriculture to contribute to the multifunctionality and sustainability of cities. From a land use planning perspective, multifunctionality is a great asset, and urban agriculture can deliver a variety of potential benefits simultaneously (van den Berg 2000), making it a 'cheap' producer of public goods (Moustier and Danso 2006). Urban agriculture is also considered an acceptable, affordable and effective tool for more sustainable forms of urbanization (Deelstra and Girardet 2001). Nevertheless, urban agriculture may also pose risks. A common concern is the potential impact that it may have on the health of urban farmers and consumers of urban produce. Although detailed information on the specific risks of urban agriculture are still scarce, there are real concerns that need to be acknowledged and understood in order for them to be minimized (van Veenhuizen 2006). Additionally, environmental risks, such as contamination, pollution, nuisance and pest management issues have also to be considered.

Despite the widespread acknowledgement that urban agriculture provides far greater benefits to cities than risks to its communities, urban agriculture is typically treated with great caution by planning departments. Often, little or no support exists for urban agriculture in planning policy, substantially hindering its widespread adoption (Deelstra and Girardet 2001). Indeed, Pothukuchi and Kaufman (2000, p. 118) claim that:

> It is difficult to believe that planners…disregard the food system… [when] clearly, it would be extraordinarily difficult to have high-quality human settlements without safe and adequate air, water, food and shelter.

Numerous reasons for this lack of support are offered. Howe (2003) suggests that this situation arises from a combination of low awareness and insufficient budgets. Mubvami and Shingirayi (2006) suggest that urban planners and other professionals lack the appropriate levels of information and technical knowledge to facilitate the integration of urban agriculture considerations into urban planning policy and practice. Martin and Marsden (1999) argue that lack of political will is the main constraint, and Sonnino (2009) goes a step further and claims that urban agriculture is not on the urban planning agenda for two main reasons: first, food is seen as an issue to be dealt at higher levels of government (i.e., national and supra-national); and second that the conventional conception of urban places as 'non-agricultural' has presented food as an urban issue only in terms of its consumption rather than its production. Regardless of this lack of support, many argue that urban agriculture, rather than being considered an impediment to urban development, needs to be understood as a sustainable and feasible land use, one that should be promoted and managed through policies and incentives that meet public needs, while encouraging social and environmental benefits (Dubbeling and Santandre 2003).

There are many opportunities for urban agriculture to be integrated into urban planning frameworks (Raja et al. 2008). However, urban planning is not only renowned for a lack of supportive measures regarding urban agriculture, but also known for a number of prohibitive policies and by-laws that directly or indirectly inhibit urban food production, processing and marketing (De Zeeuw et al. 2001). Thus, in order to successfully plan for urban agriculture, a critical review of all land use planning guidance is needed to better understand the scope for removing potential impediments to its development (Broadway 2009; De Zeeuw et al. 2001; Petts 2003). The next section of this chapter provides this critical review within the Gold Coast context.

### *26.2.1 Study Approach*

To construct a complete picture of how urban agriculture is seen within the land use planning framework applied in the City of Gold Coast, relevant State, regional and local land use provisions have been reviewed, including:

- Queensland State Planning Policies
- South East Queensland Regional Plan 2009–2031
- Gold Coast Planning Scheme 2003
- Gold Coast Planning Scheme Policies
- Gold Coast City Council Corporate Plan 2009–2014
- Other relevant Gold Coast City Council local laws, strategies, plans and programs

State and regional provisions, in addition to local planning documents, were included in this research in light of the hierarchical framework established under the *Sustainable Planning Act*, 2009 (Fig. 26.1), which stipulates that state and regional requirements must be accounted for, and if discrepancies exist, state and regional provisions should prevail.

Urban agriculture concerns not only food production, but also food processing, marketing, distribution and resource recycle/reuse (Mougeot 2001). Thus, there are numerous avenues for urban agricultural practices to be recognized in land use planning documents. In order to identify these opportunities in the context of the City of the Gold Coast, we have analysed the Gold Coast Planning Scheme Glossary. This analysis revealed all formally recognized land uses that could relate to growing, harvesting, raising, processing, distributing and marketing urban produce as well as land uses related to organic waste recycling and reuse.

These urban agriculture-related land uses were used to analyse the extent to which the current Gold Coast Planning Scheme and its associated policies restricted or encouraged urban agriculture developments. The analysis consisted of identifying these land uses, recognizing whether and where they were permissible, and identifying the level of restriction imposed on them—whether they were classified as exempt, self-assessable, code assessable or impact assessable. Documents not part of the local Planning Scheme were also analysed. However, as these documents do not set out detailed regulations for specific parts of the city, the analysis focused on their content rather than the permissibility of a land use. A search for urban

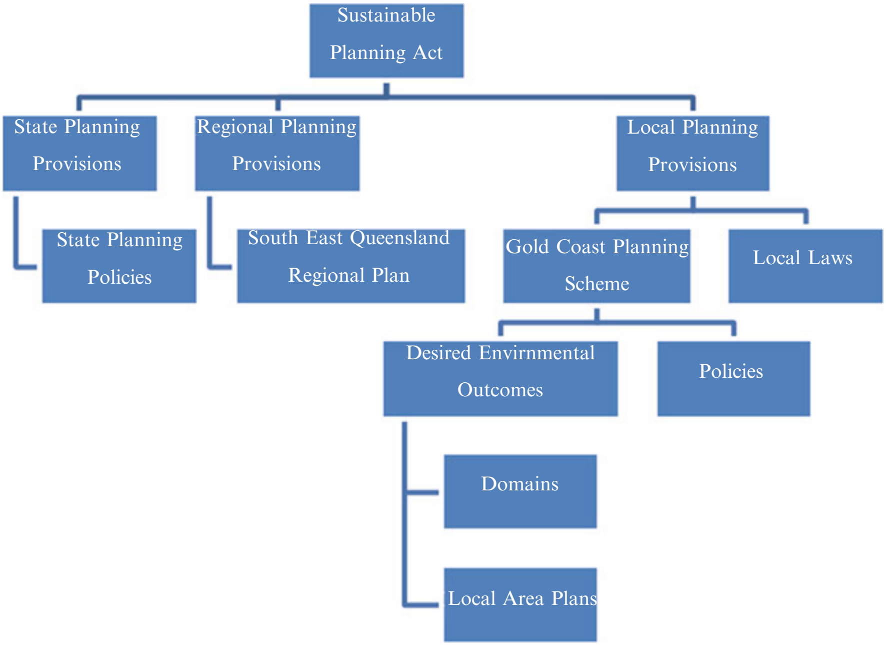



**Fig. 26.1** Conceptual diagram of the gold coast land use planning system

agriculture-related land uses as well as urban agriculture practices (e.g., farming, community gardening, rooftop gardening, composting, etc.) within these documents was carried out. If an urban agriculture-related term was found, its content and implication for land use on the Gold Coast was analysed.

## *26.2.2 Urban Agriculture and Planning on the Gold Coast*

### 26.2.2.1 State and Regional Provisions

The State of Queensland has the capacity to influence land use at the local level through state and regional provisions, which are seen as important to help Queensland as a whole to meet the challenges associated with managing growth, population change, economic development, protecting the environment and providing infrastructure. State Planning Policies and Regional Plans are of particular interest and have to be accounted for when considering applications for land use changes. However, the reality is that no specific State or regional provision limits or even mentions urban agriculture in any of its manifestations.

#### 26.2.2.2 Gold Coast Planning Scheme 2003

In attempting to achieve ecological sustainability the Gold Coast Planning Scheme is the overarching document for assessing land use change and other development proposals within the city. The development approval process is guided by a set of desired environmental outcomes (DEOs). But the Gold Coast Planning Scheme regulates land uses by dividing the city into land units that share a particular development character. These land units are grouped within Domains or local area plans (LAPs), which are used to classify the desirability of various land uses in particular parts of the city. Also, to ensure that the planning scheme deals appropriately with matters of local planning detail, such as design standards, detailed Planning Scheme Policies have been put in place.

#### 26.2.2.3 Permissibility of Urban Agriculture-Related Land Uses

Based on the definitions of urban agriculture-related land uses, the Gold Coast Planning Scheme has been analysed regarding the extent to which various forms of urban agricultural practice are supported or hindered by its key elements, including its DEOs, Domain descriptions, LAPs and Planning Scheme Policies.

#### 26.2.2.4 Desired Environmental Outcomes

DEOs provide the fundamental context for the development assessment codes and other measures contained in the planning scheme, and therefore are a primary focus of the entire Scheme. There are a total of 17 DEOs that guide the development process on the Gold Coast. However, none of the DEOs recognize urban agriculture and hence do not restrict or support these practices.

#### 26.2.2.5 Domains

The term ‘Domain’ is used to identify land units with a particular common development character. Each domain identifies compatible and incompatible land uses, while providing specific information about development provisions for any proposed land use within a specific domain. The ‘Table of Development’ is a fundamental part of every domain description, for it sets out the assessment requirements of land uses in the area covered by a domain. The table of development indicates that a development type may be classified as exempt, self-assessable, code assessable or impact assessable, which relates to the desirability of land uses and the consequent level of assessment. That is, a land use that is identified as exempt, self-assessable or code assessable is generally a land use that is to be encouraged. Conversely, land uses that are classified as impact assessable, are either considered undesirable or are very complex in nature and require a much more detailed level of assessment. Furthermore, any land use not listed in the table of development ‘should be considered as undesirable or inappropriate…[and] will be treated as impact assessable' (GCCC 2003a, p. 2). Therefore, there is a clear hierarchy of assessment processes which correlates with the scale and cost of the assessment task and implicitly of its relative desirability. There are 18 domains described in the Gold Coast Planning Scheme, with varying levels of relevance to urban agriculture-related land uses. Table 26.1 demonstrates the different domains and how tolerant they are of urban agriculture-related land uses.

#### 26.2.2.6 Local Area Plans

Within domain maps, there are areas that have been assigned specific planning provisions through the development of LAPs. LAPs identify areas of the Gold Coast City with a particular local identity, and similar to domains, they also identify desirable and undesirable land uses, while providing specific information for development proposals. For areas where a LAP applies, the local plan replaces the function of the domain controls (GCCC 2003b). The current Gold Coast Planning Scheme has 30 LAPs at present and most have precincts that define separate areas of distinct land use and development within the plan boundary. Proposed land uses should accord with the intent and land use provisions for the precinct in which the part of the development is located (GCCC 2003b). A total of 176 LAP precincts have been defined in this way.

Table 26.2 shows the proportion of LAPs and precincts that allowed urban agriculture-related land uses within their table of development, and also indicates the prevalent level of assessment required.

#### 26.2.2.7 Planning Scheme Policies

Planning Scheme Policies have been formulated to support the Planning Scheme in dealing appropriately with matters of local planning detail. The version of the planning scheme analysed here (Version 1.2—amended in October 2010) has 21 such policies, none of which is directly related to urban agricultural practices.

#### 26.2.2.8 Gold Coast City Council Local Laws

Under the Queensland *Local Government Act*, 2009 the Gold Coast City Council has the authority to make and enforce appropriate local laws. These laws are made to: 'reflect community needs and to ensure safety, harmony and good rule' (GCCC 2011). Numerous local laws have been prepared and are enforced, however, only a few of these relate to urban agriculture, including:

- *Local Law No. 7*—mandates that no business can be carried on in a public place (GCCC 2008b).
- *Local Law No. 8*—prohibits beekeeping without the supervision of a registered beekeeper under the *Apiaries Act* 1982 (GCCC 2008c).

**Table 26.1** Permissibility of urban agriculture-related development within specific domains (🟩 exempt; 🟨 self-assessable; 🟧 code assessable; 🟥 impact assessable development; and 🟪 development not included within the table of development)

| Land use | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Domain | Agriculture | Stall | Minor aquaculture | Aquaculture | Market | Retail plant nursery | Animal husbandry | Rural industry | Community purposes | Bulk garden supply |
| Rural | 🟩 | 🟨 | 🟨 | 🟥 | 🟥 | 🟥 | 🟨 | 🟧 | 🟧 | 🟧 |
| Park living | 🟪 | 🟧 | 🟪 | 🟪 | 🟥 | 🟥 | 🟪 | 🟧 | 🟪 | 🟪 |
| Village | 🟪 | 🟨 | 🟪 | 🟪 | 🟥 | 🟥 | 🟪 | 🟪 | 🟪 | 🟪 |
| Detached dwelling | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 |
| Residential choice | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 |
| Tourist and residential | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 |
| Integrated business | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 |
| Local business | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟧 | 🟪 | 🟪 | 🟧 | 🟪 |
| Fringe business | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 | 🟪 | 🟪 | 🟧 |
| Industry 1 | 🟩 | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟧 | 🟥 | 🟪 | 🟨 |
| Industry 2 | 🟩 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 |
| Extractive industry | 🟩 | 🟪 | 🟪 | 🟥 | 🟪 | 🟪 | 🟧 | 🟥 | 🟪 | 🟧 |
| Community purposes | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 | 🟪 | 🟪 | 🟨 | 🟪 |
| Conservation | 🟥 | 🟨 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 |
| Private open space | 🟪 | 🟪 | 🟪 | 🟥 | 🟥 | 🟪 | 🟪 | 🟪 | 🟪 | 🟪 |
| Public open space | 🟪 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 | 🟪 | 🟪 | 🟧 | 🟪 |
| Emerging communities | 🟨 | 🟨 | 🟪 | 🟪 | 🟥 | 🟥 | 🟨 | 🟪 | 🟪 | 🟥 |

**Table 26.2** Proportion of urban agriculture-related land use allowed within local area plans and their precincts and their prevalent level of assessment

| Land use type | Proportion of LAPs that allow urban agriculture-related land uses (%) | Proportion of Precincts within LAPs that allow urban agriculture-related land uses (%) | Required level of assessment |
|---|---|---|---|
| Agriculture | 23 | 11 | Mostly E or IA |
| Stall | 6 | 1 | SA |
| Minor aquaculture | 0 | 0 | IA |
| Aquaculture | 20 | 6 | IA |
| Market | 70 | 33 | IA or CA |
| Retail plant nursery | 40 | 15 | CA or IA |
| Animal husbandry | 30 | 7 | Mostly IA or SA |
| Rural industry | 20 | 5 | Mostly IA |
| Community purposes | 60 | 25 | Varied |
| Bulk garden supplies | 36 | 10 | CA |

*E* exempt; *SA* self-assessable; *CA* code assessable; *IA* impact assessable development

**Table 26.3** Restrictions on the keeping of animals in the city of the gold coast

| Animal | Lot size ($m^2$) | Allowance |
|---|---|---|
| Bees | N/A | Refer to local law no. 8 |
| Pigeons | <800 | Nil |
| | >800 | Up to 20 |
| Roosters, peacocks, ostriches and emus | <4,000 | Nil |
| | >4,000 | No restrictions |
| Geese, ducks, chickens, turkeys and other poultry | <800 | Nil |
| | 800–4,000 | Up to 6 |
| | >4,000 | Up to 30 |

*Source*: GCCC (2008f)

- *Local Law No. 9*—mandates that no business can be carried on parks or reserves (GCCC 2008d).
- *Subordinate Local Law No. 11.3*—prohibits mobile or stationary roadside vending unless a conditional permit is obtained (GCCC 2008e).
- *Local Law No. 12 and Subordinate Local Law No. 12*—regulates the keeping of animals, imposing the following restrictions (Table 26.3).

#### 26.2.2.9 Gold Coast City Council Strategies, Plans and Programs

The City Council has also developed numerous strategies, plans and programs that are a public statement of how Council intends to achieve a particular objective or a set of objectives. There is no urban agriculture-specific strategy or plan. However there are official documents that relate directly or indirectly to various urban agricultural practices.

#### 26.2.2.10 Planning Scheme Review Program

The preparation and approval of a new Planning Scheme is a strategic priority for the Council and a requirement of the *Sustainable Planning Act* 2009. To develop and draft the new planning scheme, a Planning Scheme Review Program has been established, which recently released a draft Statement of Proposal (GCCC 2010) outlining key directions, some of which clearly indicate that urban agriculture could play a role in the future of the city.

The Statement of Proposal makes a number of recommendations that are of relevance to urban agriculture. These include the review and update of provisions to promote the flexible use of land for parks and community purposes, including market type events, and community gardens; measures to support local food production and encourage local markets through land use planning; the implementation of suitable planning measures to protect and promote a viable rural economy that supports a variety of sustainable rural activities, including local markets and to ensure a long-term production base to reduce food miles; the review and update of existing policies to protect good quality agricultural land and, consideration of the role of the planning scheme in supporting localized food production.

#### 26.2.2.11 Climate Change Strategy 2009–2014

The Climate Change Strategy has been prepared by the Gold Coast City Council as a response to the many challenges imposed by an uncertain future under climate change. It aims to set directions and enable actions for both the Council and the Gold Coast community to achieve a climate resilient city. Of interest to fostering urban agriculture, the Climate Change Strategy envisages an increase in the proportion of locally grown food available to the Gold Coast community (GCCC 2009, p. 15).

## 26.3 Discussion and Recommendations

This analysis reveals a somewhat confusing situation regarding urban agricultural practices on the Gold Coast. On the one hand State and local governments express support for improving the sustainability of cities and recognize the need to increase local food production and purchase as well as reducing waste through recycling and reuse. On the other hand, the Gold Coast Planning Scheme, which is the primary document that regulates land use in the city, does not specifically recognize the benefits associated with urban agriculture. In fact, through a rather rigid regulatory approach, the current Planning Scheme discourages urban agriculture-related land uses from most of its urban footprint, with the exception of a few land units classified as industrial or in relatively remote and peripheral parts of the city that are typically zoned for rural uses.

**Table 26.4** Recommendations and envisaged outcomes

| Recommendation | Outcome |
|---|---|
| Formally recognize urban agriculture and its associated practices within all planning provisions | Encourage, support and regulate different forms and scales of urban agriculture-related land uses |
| Introduce definitions for urban agriculture-related land uses into the Planning Scheme (e.g., small-scale agriculture, community composting, farmers' market, residential stall, etc.) | Provide clear guidance to the community and Council officers on what is meant by urban agriculture and its practices |
| Incorporate urban agriculture land uses within Domains and LAPs and stipulate appropriate assessment levels | Allow urban agriculture to be part of city planning, and permit its lawful existence in denser areas of the city |
| Encourage urban agriculture into public and semi-public lands (e.g., parks, along roads, schoolyards, institutional lands and other public buildings) | Facilitate food production while putting idle lands into productive use |
| Review all Planning Scheme Policies, but in particular Policy 4 and 18, and recognize urban agriculture as a tool for their realization | Expand urban agriculture in the city by allowing it to occur on land underneath, above and adjacent to electricity infrastructure, and recognizing it as a facility of public benefit worthy of floor ratio bonuses |
| Systematic review of the rationale and effectiveness of all Local Laws | Remove unnecessary constraints on urban agriculture |

The analysis of the glossary of terms in the Gold Coast Planning Scheme revealed that the list of urban agriculture-related land uses is not extensive, suggesting that problems regarding urban agriculture practices may arise, as it did through the analysis of domains and LAPs. For example, the land use defined under the term 'agriculture' makes no distinction between large-, medium- or small-scale agricultural ventures. Consequently, if a small horticultural enterprise is proposed it will trigger the same level of assessment as a large-scale agricultural development, even though the risks and operations associated with each are substantially different. Similarly, if a household has surplus produce from fruit trees in their backyard and they wish to sell these in front of their property, it would be classified as a stall and subject to a lengthy and costly land use approval and licensing process.

This analysis suggests that if urban agriculture is to be fostered on the Gold Coast, specific definitions will have to be developed and incorporated into the new Planning Scheme (see Table 26.4 for a list of recommendations). For example, agriculture could be broken into small, medium and large scale, and as organic and inorganic. In this way, the Planning Scheme would be able to permit some forms and scales of agriculture within higher density areas while excluding practices associated with large-scale operations, nuisance and pollution. In addition, terms such as 'composting station' and 'urban farmer's market' could be introduced to the new planning scheme as ways of expanding the opportunities for urban farmers and the community to exchange urban produce and close the waste loop, without being caught in complex and costly processes of land use regulation.

In terms of the core regulations and outcomes of the planning scheme, the analysis shows that if integrated and planned for, urban agriculture has great potential to achieve various DEOs and hence improve the overall sustainability of the city. However, despite the need to take DEOs into consideration when assessing development applications for land uses related to urban agriculture, these land uses must also be recognized as desirable within domains and LAPs, for they dictate which land uses are or are not compatible within existing land parcels.

Regarding the domains, Table 26.1 reveals that the only domain that accommodates all of the land uses associated with urban agricultural practices is the rural domain. Thus, urban agriculture-related land uses are only desirable in places where denser urban living is discouraged such as rural and industrial areas. In fact, none of the domains designated to accommodate higher density living (i.e., detached dwelling, residential choice and tourist residential) allow for any urban agriculture-related land uses. This suggests that to foster urban agriculture practices on the Gold Coast, either the definitions of land uses have to be amended to allow for specific and small-scale urban agriculture-related land uses, or domains need to recognize the benefits that urban agriculture can bring to areas that are not designated as rural or industrial.

Similarly, when looking at food production land uses (i.e., agriculture, animal husbandry, aquaculture and rural industry), they are not described as desirable in the majority of domains. With the exception of agriculture (that fits under industry and conservation domains), all other food producing land uses are desirable in less than 25% of all domains. This hinders the ability of the Gold Coast to significantly increase its capacity for local food production, distribution and sale.

In terms of the level of assessment required by urban agriculture-related land uses, with the exception of agriculture in very specific domains, all other land uses require some level of assessment, most of which are code or impact assessable. This designation clearly signals that urban agriculture-related land uses are deemed to be relatively undesirable, for an application for impact assessable development is usually time consuming and very costly, and serves in practice to discourage many if not most proposals.

In terms of the defined domains, it is clear that the western part of the city is characterized mainly as rural, while the eastern side is acknowledged as a place of higher density urban living. As such, it is apparent that there are very limited opportunities for urban rather than rural agriculture to flourish. Consequently, food production, which is allowed mainly in rural and park living domains, can only occur on the far western part of the city, where very few potential farmers and even consumers live.

The different scales of urban agricultural practices should allow it to occur in the denser and more urban parts of the city. The domain analysis confirms that there are opportunities within the current layout of the city to take agriculture into higher density areas. One such opportunity could be the allocation of a proportion of the land parcels classified as open spaces, which are found throughout the city, to urban agricultural uses. Activities such as small-scale food production and marketing, or composting could take place in these land parcels without compromising their primary function or the overall structure of the city. Smit and Nasr (1992) and De Zeeuw (2004) note that urban agriculture can successfully take place on public lands through the formal or informal use of idle public lands in parks, along roads and land reserved for future uses or on ‘semi-public’ land such as school fields and the grounds of hospitals and other public buildings.

The analysis of LAPs and their precincts suggests a similar restrictive situation—very limited opportunities for urban food production. However, one positive prospect for urban agriculture in LAPs relates to the marketing of urban produce where 70% of all LAPs recognize markets as a desirable land use. This indicates that although difficulties exist in producing local food, there are opportunities within the Planning Scheme for selling local produce directly to local consumers.

Planning Scheme Policies could also serve as an important tool in fostering urban agriculture on the Gold Coast. Despite the lack of specific urban agriculture policies or (to date) a city-wide urban agriculture strategy, various policies could recognize urban agriculture as a tool for its realization. For example, Planning Scheme Policy 4 could allow urban agriculture on land underneath, above and adjacent to electricity infrastructure. Such areas, as recognized by Policy 4, are unsuitable for other forms of development, and often incur high maintenance costs.

Another example is Planning Scheme Policy 18, which allows for floor ratio bonuses to be granted for the inclusion of a public benefit facility in a proposed development. Urban agriculture practices (e.g., community gardens) could be classified as facilities for public benefit, and therefore could potentially be used as an incentive for bonus floor ratios. Alternatively, other economic benefits could also be introduced as shown by the example of the municipality of Governador Valadares in Brazil, which exempts (as per law No. 5.265) private landowners from land taxes if their land is put to productive use such as agriculture (Lovo and Costa 2006).

A further regulatory regime that could be made more pro-agriculture is the set of local laws that impose significant constraints on actual and prospective urban farmers. Through prohibitions, conditions or regulations, the keeping of animals, selling of urban produce and the use of open public space for urban agriculture is severely constrained by these local laws. While some of these laws may be appropriate and necessary, it would be worth conducting a more systematic review of their rationale and effectiveness in achieving the aims of the city. For example, Local Law No. 9 could be revised to allow urban agricultural activities to take place in public open spaces, including in many of the underutilized grassed open spaces found throughout the city. Local Law No. 9 could also offer opportunities for urban farmers to use public open spaces as a marketing venue to sell and/or exchange their produce.

Local Law No. 12, which regulates the keeping of animals, serves as a major impediment to the development of some urban agriculture practices. It currently prohibits the keeping of chickens and other small animals that could provide food and many other environmental services such as composting, fertilization and pollination. This law should also be reviewed in light of recognized best practice in Australia and elsewhere.

## 26.4 Conclusion

The City of the Gold Coast, like many other Australian and world cities, can look forward to an uncertain future of food insecurity if the status quo prevails. Climate change, peak oil and many social, environmental and economic crises could seriously compromise food supplies and significantly increase food prices. Recent natural disasters in Queensland illustrated the vulnerability of our food supply and the problems that a centralized food system generates in respect of urban resilience.

Urban agriculture provides an opportunity for local governments to prevent and ameliorate the threats of food insecurity. However, it is important to acknowledge that urban agriculture will neither replace rural agriculture nor make cities entirely self-sufficient in food. Nevertheless, it does have the potential to provide local, low carbon, high-quality food and other produce, while allowing numerous beneficial economic, social and environmental services to flourish.

A general willingness to accept urban agriculture-related land uses was found in the higher level plans and strategies of State and local governments. Yet, these could be greatly enhanced by the acknowledgement of urban agricultural practices as an important element in achieving greater sustainability. The analysis of the Gold Coast Planning Scheme shows how these higher level ambitions can struggle to be realized in practice.

The Gold Coast City Council has claimed through its Corporate Plan, Bold Future vision and Climate Change Strategy that it would like to increase the proportion of local food production and purchase while moving towards a more sustainable way of dealing with its organic waste. Its new planning scheme needs to reflect this higher level intent. Definitions, outcomes, domains, LAPs, policies and local laws need to be better aligned in order to provide a stronger structure that recognizes the value of urban agriculture in all its forms, and provides a strong but flexible framework for assessing and supporting new urban agriculture initiatives in the city in the future.

## References

Barbolet, H., Cuddeford, V., Salle, J., Dominoni, K., Geggie, L., & Rideout, K. (2009). *Dig it! A practical toolkit- how local government can support community gardens*. British Columbia: Union of British Columbia Municipalities.

Broadway, M. (2009). Growing urban agriculture in North American cities: The example of Milwaukee. *Focus on Geography, 52*(3), 23–31.

Cabannes, Y., & Dubbeling, M. (2003). Urban agriculture: Land management and physical planning. No 3 In *Guidelines for municipal policymaking on urban agriculture*. Canada: IDRC International Development Research Centre. Retrieved September 21, 2012, from http://web.idrc.ca/uploads/user-S/10530120730E3.pdf.

De Zeeuw, H. (2004). The development of Urban Agriculture; some lessons learnt, Key note paper for the International Conference: *Urban Agriculture, Agro-tourism and City Region Development*, Beijing, 10-14 October, 2004. Retrieved September 21, 2012, from http://www.ruaf.org/sites/default/files/development_ua_lessons.pdf.

Deelstra, T., & Girardet, H. (2001). Urban agriculture and sustainable cities. In N. Bakker, M. Dubbeling, S. Gundel, S. Koschella, & H. Zeeuw (Eds.), *Growing cities, growing food: Urban agriculture on the policy agenda* (pp. 43–65). Leusden, Netherlands: ETC and DSE.

DeZeeuw, H., Guendel, S., & Waibel, H. (2001). The integration of agriculture in urban policies. In N. Bakker, M. Dubbeling, S. Gundel, S. Koschella, & H. Zeeuw (Eds.), *Growing cities, growing food: Urban agriculture on the policy agenda* (pp. 161–180). Leusden, Netherlands: ETC and DSE.

Dubbeling, M., & Santandre, A. (2003). Urban agriculture: A tool for sustainable municipal development. No 1 In *Guidelines for municipal policymaking on urban agriculture*. Canada: IDRC. International Development Research Centre. Retrieved September 21, 2012, from http://web.idrc.ca/uploads/user-S/10530054240E1.pdf.

Gaballa, S., & Abraham, A. B. (2008). *Food miles in Australia: A preliminary study of Melbourne, Victoria*. Melbourne, Australia: CERES.

GCCC. (2003a). *Gold coast planning scheme 2003: Part 5 domains*. Gold Coast, Australia: Strategic & Environmental Planning & Policy Branch—Gold Coast City Council.

GCCC. (2003b). *Gold coast planning scheme 2003: Part 6 local area plans*. Gold Coast, Australia: Strategic & Environmental Planning & Policy Branch—Gold Coast City Council.

GCCC. (2008a). *Gold Coast City broadhectare study*. Gold Coast, Australia: Gold Coast City Council.

GCCC. (2008b). *Local law no. 7* (*council property and other public places*). Gold Coast, Australia: Gold Coast City Council.

GCCC. (2008c). *Local law no. 8* (*public health, safety and amenity*). Gold Coast, Australia: Gold Coast City Council.

GCCC. (2008d). *Local law no. 9* (*parks and reserves*). Gold Coast, Australia: Gold Coast City Council.

GCCC. (2008e). *Subordinate local law no. 11.3* (*roadside vending*). Gold Coast, Australia: Gold Coast City Council.

GCCC. (2008f). *Local law no. 12* (*keeping and control of animals*). Gold Coast, Australia: Gold Coast City Council.

GCCC. (2009). *Climate change strategy*. Gold Coast: Gold Coast City Council.

GCCC. (2010). *Bold future planning scheme: Statement of proposal*. Gold Coast, Australia: Gold Coast City Council.

GCCC. (2011). *Local laws*. Retrieved March 9, 2011, from http://www.goldcoast.qld.gov.au/t_standard2.aspx?pid=428.

Girardet, H. (2004). *Cities people planet: Liveable cities for a sustainable world*. Great Britain: Wiley-Academy.

Howe, J. (2003). Growing food in cities: The implications for land-use policy. *Environmental Policy and Planning, 5*(3), 255–268.

Kaufman, J., & Bailkey, M. (2000). *Farming inside cities: Entrepreneurial urban agriculture in the United States*, Working paper product code WP00JK1, Madison: Lincoln Institute of Land Policy. Retrieved September 21, 2012, from http://www.urbantilth.org/wp-content/uploads/2008/10/farminginsidecities.pdf.

Lam, S. O. (2007). *Urban agriculture in Kingston: Present and future potential for re-localization and sustainability*. Kingston, Canada: Queen's University.

Larsen, K., & Baker-Reid, F. (2009). Adapting to climate change and building urban resilience in Australia. *Urban Agriculture Magazine, 22*, 22–24.

Lovo, I. C., & Costa, Z. R. P. (2006). Making laws for urban agriculture: The experience of Governador Valadares, Brazil. *Urban Agriculture Magazine, 16*, 45–47.

Martin, R., & Marsden, T. (1999). Food for urban spaces: The development of urban food production in England and Wales. *International Planning Studies, 4*(3), 389–412.

Mougeot, L. J. A. (2001). Urban agriculture: Definition, presence, potentials and risks. In N. Bakker, M. Dubbeling, S. Gundel, S. Koschella, & H. Zeeuw (Eds.), *Growing cities, growing food: Urban agriculture on the policy agenda* (pp. 1–42). Leusden, Netherlands: ETC and DSE.

Mougeot, L. J. A. (2005). Neglected issues on form and substance of reseacrh on urban agriculture. In L. J. A. Mougeot (Ed.), *Agropolis: The social, political and environmental dimensions of urban agriculture* (pp. 267–280). London: Earthscan & International Development Research Centre.

Moustier, P., & Danso, G. (2006). Local economic development and marketing of urban produced food. In R. van Veenhuizen (Ed.), *Cities farming for the future: Urban agriculture for green and productive cities* (pp. 200–231). Philippines: RUAF Foundation, IDRC and IIRR.

Mubvami, T., & Shingirayi, M. (2006). Integration of agriculture in urban land use planning. In R. van Veenhuizen (Ed.), *Cities farming for the future: Urban agriculture for green and productive cities* (pp. 53–80). Philippines: RUAF Foundation, IDRC and IIRR.

Newman, P. (2007). Beyond peak oil: Will our cities collapse? *Journal of Urban Technology, 14*(2), 15–30.

Petts, J. (2003). *Feeding the future: Policy options for local food, a discussion paper*. Food links UK. London: Sustain. Retrieved September 21, 2012, from http://www.sustainweb.org/publications/?id=97.

Pollard, G., White, W., & Harper, D. (2009). *Self-reported health status: Gold coast health service district 2009 survey report*. Brisbane: Queensland Health.

Pothukuchi, K., & Kaufman, J. L. (2000). The food system: A stranger to the planning field. *American Planning Association, 66*(2), 113–124.

Queensland Treasury. (2011). *Population and housing profile: Gold coast city council*. Brisbane, Australia: Queensland Government.

Quon, S. (1999). *Planning for Urban Agriculture: A Review of Tools and Strategies for Urban Planners*. Cities Feeding People Series Report 28. Ottawa, Canada: International Development Research Centre. Retrieved September 21, 2012, from http://idl-bnc.idrc.ca/dspace/bitstream/10625/33697/4/114252.pdf.

Raja, S., Born, B., & Russel, J. K. (2008). A planners guide to community and regional food planning: Transforming food environments, facilitating healthy eating. In *Report number 554*. Chicago, IL: American Planning Association.

Smit, J., & Nasr, J. (1992). Urban agriculture for sustainable cities: Using wastes and idle land and water bodies as resources. *Environment and Urbanization, 4*(2), 141–152.

Sonnino, R. (2009). Feeding the city: Towards a new research and planning agenda. *International Planning Studies, 14*(4), 425–435.

Temple, J. B. (2008). Severe and moderate forms of food insecurity in Australia: Are they distinguishable? *Australian Journal of Social Issues, 43*(4), 649–668.

van den Berg, L. M. (2000). *Urban agriculture as the combination of two 'impossible' though sustainable trends*. In Paper presented at the PUSAN conference, Korea.

van Veenhuizen, R. (2006). Introduction to cities farming for the future. In R. van Veenhuizen (Ed.), *Cities farming for the future: Urban agriculture for green and productive cities* (pp. 1–18). Philippines: RUAF Foundation, IDRC and IIRR.

van Veenhuizen, R. (2007). *Profitability and sustainability of urban and peri-urban agriculture*, Agricultural Management, Marketing and Finance Occasional Paper 19. Rome: FAO Food and Agriculture Organization of the United Nations. Retrieved September 21, 2012, from ftp://ftp.fao.org/docrep/fao/010/a1471e/a1471e00.pdf.

Velez-Guerra, A. (2004). Multiple means of access to land for urban agriculture: A case study of farmers' groups in Bamako, Mali. In A. Velez-Guerra (Ed.), *Cities feeding people*. Ottawa: IDRC.

Voice, M., Harvey, N., & Walsh, K. (2006). *Vulnerability to climate change of australia's coastal zone: Analysis of gaps in methods, data and system thresholds*. Canberra, Australia: Report to the Australian Greenhouse Office, Department of the Environment and Heritage.

Zimbler, R. L. (2001). *Community gardens on the urban land use planning agenda: Experiences from the United States, Germany, and the Netherlands*. Chapel Hill: University of North Carolina.

# Chapter 27
# Farming the City Fringe: Dilemmas for Peri-Urban Planning

**Darryl Low Choy and Michael Buxton**

## 27.1 Introduction

Australian metropolitan regions have experienced unprecedented rapid growth during the last three decades. This has been particularly noticeable on the fringes of cities through their outward expansion into their peri-urban zones (*peri*: around, about or beyond) (Buxton et al. 2006). In the Australian context, peri-urban areas have been defined as 'the urbanized edges of cities plus the spaces into which they expand, both physically and functionally' (Burnley and Murphy 1995, p. 245). This city orientation has resulted in peri-urban areas being defined in relation to an expanding city which 'constantly absorbs its fringe area and creates a "new" fringe further from the city center' (Golledge 1960, p. 243).

Historically however, these peri-urban areas on the periphery to our expanding cities have been the location of intensive agricultural enterprises and have thus come under constant threat of being swallowed up and displaced by the continuously expanding 'urban tidal wave'. One of the enduring legacies of a 'pioneer' nation, such as Australia, is the belief that there will always be more land available and that technology will continue to increase production. This belief continues to lead to the consumption of large areas of land for urban purposes and the continual displacement

D. Low Choy (✉)
Professor, Environmental & Landscape Planning,
Urban Research Program, School of Environment,
Griffith University, Nathan 4111, Australia
e-mail: d.lowchoy@griffith.edu.au

M. Buxton (✉)
Professor, Environment and Planning,
School of Global, Urban and Social Studies, RMIT University,
Box 2476V, Melbourne 3001, Australia
e-mail: michael.buxton@rmit.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_27,

of agriculture from peri-urban land. Land use planning systems are intricately related to this process, either protecting or facilitating the conversion of agricultural land.

This chapter examines the complex relationships between land use planning and peri-urban agriculture and focuses on the contribution of peri-urban agriculture and the role of planning systems in assisting its retention or displacement. It begins by reviewing two case studies of agriculture and planning systems in the peri-urban areas of South East Queensland (SEQ) and Metropolitan Melbourne—two of Australia's fastest growing metropolitan regions. It does so through the lens of future scenarios and a scenario planning exercise which was utilized to assess the adequacy of existing land use and natural resource planning policies. The chapter then focuses on the Melbourne Metropolitan region to provide a post-scenario planning review of that region's peri-urban agricultural viability and the adequacy of its associated planning policies.

## 27.2 The Value of Peri-Urban Agriculture

The economic and broader value of peri-urban agriculture is often underestimated. But peri-urban agriculture is significant. The agricultural value of peri-urban areas internationally is consistently high. One-third of all US farms, for example, are in peri-urban areas. Australia's agricultural production has doubled in the last 25 years (ABARE 2004) but its share of GDP has fallen from about 20% 50 years ago to below 4% today. Unfortunately, there has been little systematic work at a national level to quantify the national or even state importance of urban fringe land for agriculture. To Houston (2005, p. 210) 'conventional wisdom about agriculture in Australia's peri-urban regions tends to be dismissive about its economic significance'. He estimates that Australia's peri-urban regions comprise less than 3% of the land used for agriculture, but are responsible for almost 25% of the gross value of agricultural production in the five mainland states, a figure which 'consistently and substantially understates the value of agricultural production in peri-urban regions' by adopting a statistical threshold which ignores smaller and intensive industries situated close to major population centres (Houston 2005, p. 217). Houston refers particularly to under-reporting for flower, nursery and wine grape industries, fruit production and vegetables. Using Houston's defining peri-urban characteristics, the Victorian Department of Sustainability and Environment states that 'Victoria's peri-urban region accounts for around one quarter of the State's land area but half of the agricultural production value' (DSE 2006, p. 16).

Melbourne's green belt (or inner peri-urban area), corresponding generally with the Port Phillip and Westernport region, is the second highest producer of agricultural products in Victoria with a gross production in 2001 of $890 million from 4,010 farms, although the true value may be closer to double this figure (Gardner 2002; Langworthy and Hacket 2000). The agricultural output per hectare of this area is the highest in Victoria, at least three times greater than any other region in the state and four times the state average (PPWCMA 2004). Werribee South provides up to 70% of south eastern Australia's leaf and kale crops (Buxton and Goodman 2002). Agricultural activities in 2004 occurred on 64% of land in Melbourne's green wedges.

Whilst the SEQ region constitutes only 2% of the State's area it produces ~18% of Queensland's agricultural economic activity (QDPI&F undated). As the hub for Queensland's agricultural manufacturing and processing industries, it generates a turnover of $6.24 billon per annum (Q.DPI and SEQROC 2002). Production and processing of agricultural produce in the SEQ region constitutes some 60% of Queensland's annual gross value of agricultural production (Doughton 2005).

The vegetables produced in SEQs Lockyer Valley constitute a third of Queensland's vegetables (Department of Natural Resources and Mines 2005). Doughton (2005) notes: 'There are over 100 agricultural industries in this sector, several of which, e.g., carrots, ginger, mushrooms, strawberries, lettuce, cut flowers, turf, feed lotting, aquaculture, poultry, pigs and beef processing, contribute very significantly to the state's economy. In this region, agriculture, forestry and fishing comprise the third largest employment group following retail and manufacturing. These peri-urban industries employ more people in the region than construction, health services, property and business services, education, transport and storage and several other major employment sectors'.

A similar situation can be found in other states. For example, agriculture in the Sydney basin has been valued at about $1 billion per year, representing 20% of the total annual NSW vegetable tonnage (Gillespie and Mason 2003). This value increases when vegetable production rates are broken down into varieties of perishable commodities that need to be located close to the market they serve. The Sydney region produces 100% of the state's Chinese cabbages and sprouts, 80% of fresh mushrooms and 91% of spring onions and shallots (Gillespie and Mason 2003).

Some researchers, such as Versterby and Kruppa (1993) and Hart (2001), argue that the loss of agricultural land to urban development is minor and not problematic. Fischel (1985) claimed that the loss of farmland nationally in the US was small and the impacts on production minor, and that farmland loss could be offset elsewhere by new methods of production. However, there is strong evidence of serious farmland loss in the US, with the total amount of farmland falling between 1949 and 1997 by 20%, and by 50% in the Mid-Atlantic region, with even higher losses on the fringes of metropolitan areas (Lynch and Carpenter 2003). Nelson (1990) estimated that one-fifth of prime agricultural land in the US was located within 50 miles of the 100 largest urban areas, and showed that between 1982 and 1992 nearly ten million acres of cropland were lost in the US and total sales of farm produce fell by over $42 billion. In peri-urban areas, sales of farm produce fell by $19 billion. Nelson claimed that most of this reduced production was due to losses of cropland, and estimated that each new household on former farmland cost the nation's agricultural economy $100,000 in lifetime sales. The 12 million new households expected to be added to peri-urban areas between 1,990 and 2,040 may reduce national sales of farm produce by up to $100 billion annually. Ex-urbanization threatens much of the cropland located within about one hundred miles of US cities. As Nelson (1999, p. 147 and p. 137) points out, 'it is not difficult to see that if recent trends continue, much of exurbia's cropland will be taken out of inventory within the next generation … at a cost to the American economy of perhaps trillions of dollars in farm sales … [and] … much of the contiguous 48 states may no longer be distinguishable as either urban or rural, being instead characterized mostly as low density, exurban development'.

Others have reinforced these conclusions. Halsey (1999) pointed out that the greatest conversion of prime farmland to urban use had occurred in 20 major land resource areas representing 7% of the total US land base including some of the most productive land in the US, such as the Sacramento and San Joaquin Valleys in California. Goodenough (1978) argued that in many regions, the rate of farmland conversion would mean an end to most agriculture within a generation. Within 50 years much of the United States east of the Mississippi river will be urbanized at current rates of urbanization (Cunningham-Sabot 2006; Pallagst 2006).

The loss of peri-urban land used for productive agriculture is a global phenomenon. Chinese cities will eventually hold 900 million people (Friedman 2005) resulting in massive conversion of land to urban uses (Gu and Han 2009). Marius-Gnanou and Denis (2009, p. 135) show that India's urban settlements are expected to comprise 41% of inhabitants by 2011. In Canada, the rate of urban conversion of agricultural land is about one-tenth that of the US loss, but is still substantial. In the Toronto region, for example, over 117,000 ha were lost between 1986 and 2001 (Walton 2003). In the UK (England and Wales) the total loss was 2.5% in the decade from 1970, with farmland declining from 19,414,000 to 18,920,000 ha in that period. Bouteille (1990) estimated that the rate of transfer of agricultural land into urban uses in the UK during the past 30 years has been about 5% of total cultivated land. The Netherlands is particularly vulnerable to this trend. Needham et al. (1993) suggested that, if current rates of urbanization continue, all Netherlands' farmland will be built on by the year 2280. Kraemer (2005) reported that, although the average size of farms is increasing in Germany, the number of active farms and full-time farmers is decreasing. The expansion of farm size is constrained by proximity to urban areas due to the operation of the land market. Structural change in agriculture is affected by national, EU and global policies, but land use influences on farming tend to replicate those described by Barr (2005) for Australia. Agricultural losses on the fringes of Australian cities continue. For example, the total area of agricultural land in Melbourne's green belt declined by 18% between 1986 and 2001 (Parbery et al. 2008). Since then, over 53,000 ha have been excised from the green belt including important intensive agricultural land.

## 27.3 Peri-Urban Growth Perspectives

Current notions in the literature on peri-urban growth and the peri-urbanization process present two contrasting rural and urban perspectives. These involve a debate over whether urban expansion is primarily a threat or whether adjacent rural areas are the means to satisfy urban needs by providing land and resources.

The rural perspective concentrates on the resilience of rural resources. Bunce and Walker (1992, p. 54) argue that rural land is not 'a fragile shell just waiting for the impact of urban invasion...[that] rural areas are resilient and urbanization is a weak force which only moves into rural areas because the emptying countryside and agricultural transformations create a near vacuum and present opportunities for encroachment'. Their view is that the underlying cause of change in peri-urban areas is not the pressure exerted by the nearby urban centre but declining returns from agricultural activity.

The urban perspective advocates the view that adjacent rural areas exist to satisfy urban needs by providing land and resources. This contrasting urban centric view holds that amenity landscapes close to urban centres are subject to the greatest pressure for residential development (Barr 2003, 2005). To Barr (2003) '… proximity to nearby urban centres, along with sought after amenity values of the fringe areas, are the critical factors affecting the development of peri-urban land … land speculation is a major cause of rural land conversion and not the declining financial returns from agricultural production'. Barr (2003, 2005) argues that whilst such declines are characteristic of agricultural land generally it is rural land close to urban centres that is generally sought by urban dwellers. Under these circumstances, rural landowners close to urban centres have been able to take advantage of their comparative proximity to that centre, irrespective of their motives or declining agricultural returns. Essentially, this view sees proximity to nearby urban centres, along with sought after amenity values of the fringe areas as the critical drivers influencing the rural conversion process and the development of peri-urban land.

Regardless of these contrasting views on the principal drivers of peri-urban land use change, and in the absence of planning controls to contain urban expansion, the 'urban tidal wave' continues its outwards thrust, exacerbating landscape fragmentation to the point where peri-urban areas exhibit the hallmark characteristics of a blurred transitional zone of urban and rural activities randomly existing without apparent order and exhibiting a high degree of heterogeneity, continual change and conflicting values. These resulting landscapes display a consistent set of distinguishing characteristics, namely:

- A dynamic area undergoing constant and rapid change
- Within the sphere of influence of adjacent urban areas with a dependency on these centres for employment, cultural, social and recreational needs
- Attributes of a transition area dominated by the temporary nature of land uses
- An increasingly fragmented landscape
- Low to ultra-low housing densities
- A heterogeneous population
- An increasing diverse range of heterogeneous and conflicting rural and urban land uses
- Questionable landscape management skills of the newer residents
- Natural resource values at threat
- A poorly planned and managed landscape
- Disjointed planning and policy approaches

(Buxton et al. 2007 and Low Choy et al. 2007).

State and Local Governments have responded with a range of growth management strategies which have sought to achieve sustainable outcomes through initiatives aimed at containing and managing this urban growth and protecting agricultural lands. However, these attempts to manage the outward expansion of our cities and the fringe or peri-urban areas through conventional urban planning and growth management strategies have been brought into question. Hence, in the face of increasing uncertainty associated with climate change, peak oil, continued globalization, emergent 'green' economies and trends, towards localization, the question must be asked: in terms of continuing peri-urbanization in high growth regions, will the planning policies of regional growth management strategies achieve their stated goals and objectives?

This question was addressed through a scenario planning exercise which was utilized as a 'wind tunnel' or 'test bed' to evaluate existing 'official' and proposed strategic plans and policies which have a strategic time horizon of 20 plus years (Low Choy et al. 2008). As a strategic tool, scenario planning provides a systematic approach for the development and testing of existing and proposed plans and strategies in an uncertain environment through the creation of possible futures to test them in (O'Brien 2000).

## 27.4 Policy Review Through a Scenario Planning Approach

Scenario planning can be used to develop a science-based decision-making framework in the face of high uncertainty and low controllability (Peterson et al. 2003). It 'simplifies the avalanche of data into a limited number of possible states' (Schoemaker 1995, p. 27) and involves the consideration of likely trends, uncertainties and possible shocks and surprises (welcome and unwelcome). In order to test plans and strategies, scenario planning creates possible futures to inform present decision-making. It is based on the premise that the future is not 'knowable' and scenarios about the future are hypothetical—possible futures that may or may not be realized (O'Brien 2000). They should, however, be built from research that can identify the pre-determined and the uncertain elements of the future with the objective being the creation of plausible, coherent descriptions of possible futures and the identification of their drivers (of change).

Two opposing scenarios, based on the previously described theoretical debate in the literature, were developed, namely: an *Agriculturally Declining* and an *Agricultural Revival* scenario. They served as a 'test bed' to assess the likely performance of each case study region's current statutory land use planning and natural resource management (NRM) instruments with time horizons of 20 plus years (Low Choy et al. 2008). They specifically addressed the Focal Question which asked:

> What are the plausible changes in the case study region's agricultural industry over the life of the official Regional Plan and the Regional NRM Plans, and what will be the consequences of those changes for existing peri-urban areas in these regions?

They also served to address the secondary question: *What steps are necessary to achieve sustainable peri-urban landscapes in these regions in the medium to long term?*

Both regions displayed early signs of the *Agriculturally Declining* scenario, alongside signs of the alternate *Agricultural Revival* scenario, suggesting that they are at the cross-roads of significant change. The study foresaw the continuation of land use intensification with increasing investment in intensive high capital forms of agricultural production and non-urban industries including the equine industry. This would have the effect of continuing spatial landscape fragmentation and brings into question the effectiveness of existing statutory planning tools to manage the continued spatial landscape fragmentation from the ongoing peri-urbanization process.

The review of both case studies highlighted two particular findings. It was concluded that past landscape fragmentation will continue and will be dominated by activities associated with ongoing peri-urbanization processes. It was shown that the existing statutory planning initiatives that attempted to prevent this continued fragmentation would not contain ongoing peri-urbanization. This would result largely from the sale and split up of multi-titled farms comprised of a number of small lots, where, in the case of SEQ, many of these registered lots are below the regulated minimum subdivision size of 100 ha. The second principal finding noted that there had been increasing investment in intensive high capital forms of agricultural production in both regions, along with an increasing dominance of non-urban industries including the equine industry and related activities of a growing 'horse community'. It was concluded that these processes will continue under current planning and management arrangements.

These emergent trends of peri-urban spatial fragmentation and land use intensification present a dilemma for current planning and landscape management efforts as they strive to meet future regional needs whilst responding to community aspirations for a sustainable landscape. The overarching conclusion reached was that '… within the context of continuing peri-urbanization involving an evolving and maturing 'new settlement' landscape—one that is neither truly 'rural' nor truly 'urban'—the regions investigated are at the cross-roads of significant change' (Low Choy et al. 2008, p. viii).

This scenario planning study made a case to understand peri-urban landscape fragmentation, and its ensuing negative legacies by firstly addressing the overarching institutional fragmentation. Vertical and horizontal alignment of State and Local government planning systems is an initial and essential change. This should subsequently lead to the integration of individual agency plans which operate across the same peri-urban landscape. Only after reform of these planning and institutional settings is achieved can the real purpose of planning be fulfilled. To this end the study recommended the following immediate steps: understanding the new landscape managers who now own and inhabit these peri-urban spaces and who now have responsibility for the management of peri-urban lands from the traditional farmers they have displaced, development of discrete policy for agriculture and non-urban economic development, climate change impacts and adaptation and biosecurity threats. In the short term it was proposed that additional steps should be taken to address: internal coordinating frameworks; a suite of peri-urban planning tools; an improved understanding of new forms of agricultural production and emergent forms of non-urban industries; the advent of tree farming and carbon offsetting schemes and the possibility of a new form of settlement emerging in these peri-urban spaces (Low Choy et al. 2008).

## 27.5 Policy Review Post-Scenario Planning

In the Melbourne Metropolitan region case study, further investigations into that region's peri-urban agricultural viability has been undertaken. This region's peri-urban areas consist of inner and outer peri-urban areas (see Fig. 27.1). The inner area corresponds to Melbourne's green belt recognized formally in the metropolitan strategic plan, *Melbourne* 2030; the outer area consists of the next belt of eight rural councils. An even broader peri-urban zone has been identified by researchers such as Barr (2003) and McKenzie (1996) extending over 100 km from Melbourne's CBD. Melbourne's peri-urban area can be regarded as a region sharing common characteristics, problems and opportunities which many existing policies do not

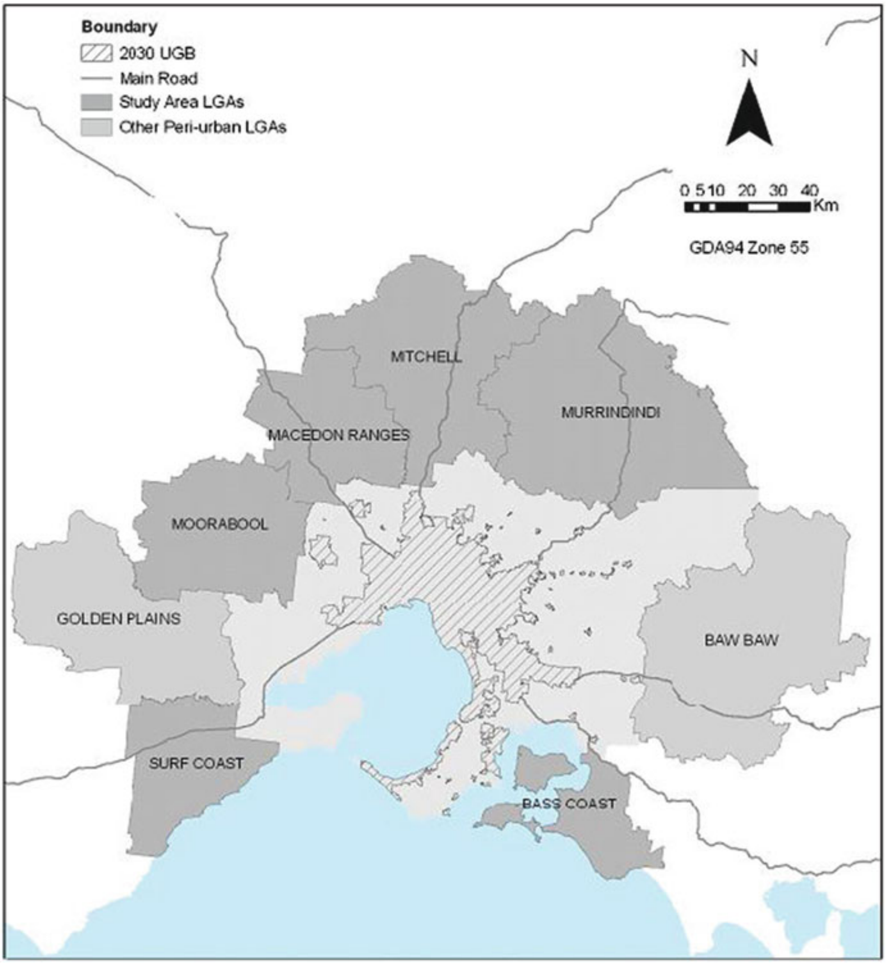



**Fig. 27.1** Outer and inner Melbourne peri-urban belts. Source: Buxton et al. (2008)

recognize. Agriculture and land use in the Melbourne peri-urban region has been extensively studied for the outer peri-urban area by Buxton et al. (2006, 2007, 2008) and for the inner area by Parbery et al. (2008). This section summarizes studies of Melbourne's outer peri-urban area.

This region is growing more rapidly than any other regional area in Victoria, with a population of 188,103 persons in 2006 increasing by 1.8% annually compared to the rest of regional Victoria at 0.8%. The three main attractors of population movement are amenity, lower land and house prices and accessibility.

Five of the eight municipalities in Melbourne's outer peri-urban belt contributed over 5%, or $390 million, of Victoria's $7.5 billion farm business turnover in 2006, an increase from their share of 4.1% in 1997. These municipalities contain almost 2,500 farm businesses,[1] or 7.6% of the total farm businesses in the state, an increasing proportion, largely a product of growth in small farm numbers. The number of small farm businesses has remained stable since 1997 while declining across the state. About 35% of all production occurs in less that 2%of farm businesses, and the 71% of farm businesses with a turnover of less than $100,000 provide 16% of the region's value of agricultural output. Despite a large number of farm businesses remaining reliant on some level of off-farm income, an increase in the value of output and in the scale of operation has occurred in a number of industry sectors.

Agriculture here is dominated by small livestock enterprises. However in terms of farm business output, larger farm businesses remain significant. Turnover growth is focused on larger operations such as horticulture, poultry for meat production and activities such as nurseries and flower production which have all increased significantly in scale and production. This suggests significant local employment, locational and investment advantages to some agricultural enterprises and these advantages account for growth, maintenance and change in different types of agricultural businesses.

Poultry numbers, horticultural production and grape growing have increased in value since the mid-1990s. Potentially high value and comparatively high employment industries such as cut flower production, turf production and nurseries continue to increase in production scale. Horticultural production in the region and the land area managed for horticulture has increased at proportions far more significant than in the state overall. Significant agricultural resources exist also in other outer peri-urban municipalities, such as dairying in the Shire of Baw Baw, and in Melbourne's inner peri-urban region as shown above.

Extensive land fragmentation has occurred in the outer peri-urban region. Over 53,000 rural lots exist, the vast majority under 4 ha in size. Undeveloped clusters of even smaller lots exist across rural landscapes. Over 24,000 of these lots do not contain dwellings and a further 6,881 lots could be created by further subdivision. The progressive development of these lots would change fundamentally the

---

[1] Farm businesses included in the 2006 ABS Agricultural Census have an annual turnover in excess of $5000, this, coupled with the part-time, often informal and small-scale nature of some businesses may in the peri-urban region underestimate the value of agricultural production. Houston (2005) discusses this issue.

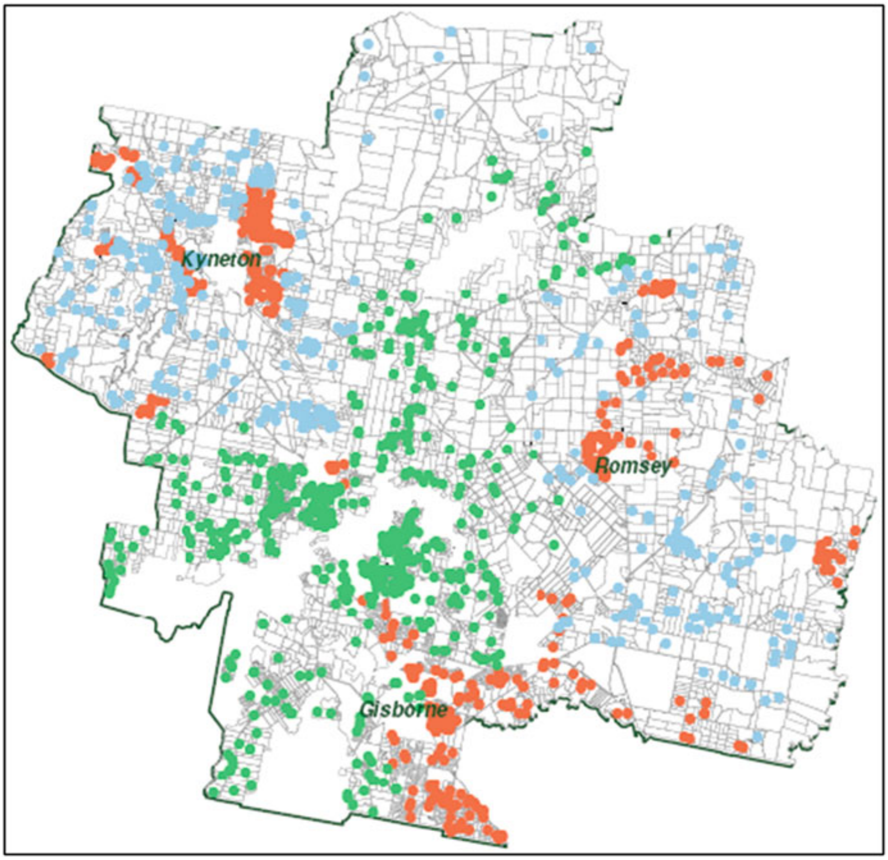



**Fig. 27.2** Dwelling permits 1997–2008 Shire of Macedon ranges. Source: Buxton et al. (2008)

appearance and functions of these rural landscapes. This situation is similar to that in the SEQ region.

A pattern of ad-hoc, incremental housing development on smaller rural lots has been a feature of this study region over the decade to 2007 in all zones (see Fig. 27.2). During this period, 75% of the 4,181 recorded housing approvals within the rural zones of five municipalities occurred on properties of less than 20 ha in area, and almost 60% on properties less than 8 ha. In Farming Zone, over 60% of all housing approvals occurred on properties under 20 ha in area, despite the majority of planning schemes generally nominating larger minimum lot sizes for subdivision. This development is invariably inconsistent with the objectives and strategic intent of each of the relevant planning schemes in which municipal strategic statements and local provisions ostensibly support agriculture and rural uses.

Land size is related to vegetation protection, with land parcels greater than 100 ha and between 40 and 100 ha in size accounting for 49% and 22% by area, respectively, of native vegetation on private land within peri-urban LGAs.

Zones often are matched inadequately to lot and property size. All zones contain a wide range of lot sizes. For example, in the Farming Zone in Murrindindi, 27%, or 2,185 lots, of the total number of lots are sized 0–2 ha. The Rural Living Zone is most adequately matched to lot and property size in all LGAs displaying a high proportion of lots in the size ranges 0–2, 2–4 and 4–8 ha. Most LGAs include a high proportion of lot and properties 0–2 ha in the Rural Conservation Zone. On the other hand, properties 40 ha or larger comprise almost 28% of all properties. These larger properties remain important for agriculture and biodiversity, containing most of the remaining native vegetation on private land, and provide a range of future options that would be prudent to retain.

The Farming Zone covers the largest area of land, affecting 88% or 7,167 km$^2$ of the area of the rural zones. The Rural Conservation Zone has been applied rarely except by Macedon Ranges Shire where it is used for only 594 km$^2$. The Rural Living Zone is used typically for smaller areas, including formalized 'estate' style rural residential areas, and covers 298 km$^2$.

The importance of developing integrated policy and strategies can be illustrated by the need to consider the reciprocal impacts between spatial and water resource planning. An increase in farm dams arising from dwelling construction on the large number of existing small lots has the potential to significantly affect water supply. A licence is required for the construction and use of commercial dams but not for stock and domestic dams. In some catchments, stock and domestic farm dams represent a substantial share of the overall water use within that catchment, for example, at 47% in South Gippsland, 35% in Maribyrnong and 30% in Otway Coast.

## 27.6 Discussion

Peri-urban areas in the vicinity of our metropolitan centres contain significant agricultural activity and enterprise that continue to make major contributions to their respective state and to the national agricultural output. Whilst much of this output is contributed by small-scale enterprises, and possibly not adequately accounted for in official statistics, these areas also contain a growing number of larger scale establishments with many of a non-agricultural nature but requiring a non-urban location (e.g., equine industry). It is anticipated that there will be increasing investment in intensive high capital forms of agricultural production along side growth in rural (non-urban) industries in both regions.

Much of the agricultural activity in these peri-urban areas is largely focused on nearby urban markets and includes: vegetable production; cut flowers, turf, feed lotting, aquaculture, poultry, pigs and beef processing. It has also been shown that these peri-urban agricultural enterprises are the major employers in their regions.

Urban growth in these regions, and the significant local employment, locational and investment advantages that many of these agricultural enterprises enjoy has seen a significant increase in the scale and production of these high value and comparatively high employment industries—horticulture, poultry for meat production, nurseries and flower production in particular.

But the rapid growth being experienced by these regions has resulted in extensive land fragmentation which is putting the continued agricultural production from these regions at serious risk. The studies reported here demonstrate that the property size is related to agricultural activity. In the Melbourne case this has also been demonstrated that the rural/farming/conservation zones of various planning schemes are poorly matched to the existing lot sizes. It has also been conclusively demonstrated that the pattern of ad-hoc, incremental housing development on smaller rural lots will continue under the current planning and policy regimes operating in these high growth regions, thus exacerbating their already highly fragmented landscape challenges.

In times of rapid change with unpredictable outcomes, the resources of peri-urban areas are likely to increase in importance. It would seem prudent to maintain the values of peri-urban areas, certainly in the short to medium term during times of increasing change and threat. Integrated regional planning is essential if reciprocal impacts of sectors are to be considered and such planning requires a strong role for governments. This in turn will require a return at least in part to the principles of regulatory land use planning. Large areas of rural and peri-urban land near Australian cities have already been subdivided into lots varying in size below 40 ha. The size of many of these lots is less than the minimum subdivision size for the relevant zone. These lots are generally held in a pattern of multiple joint owners but are not subject to tenement controls (which restrict the number of houses on jointly owned lots) or other prohibitions on house construction. In some jurisdictions, some zones allow the construction of more than one house per lot. Many rural zones have inadequate land and environmental controls. Where stronger controls exist they are rarely applied and in other instances they are absent. Allowable minimum lot sizes through subdivision are often small, increasing the price of land by adding a speculative component to the detriment of continued farming. A range of innovative subdivision practices based around commercial or residential uses are increasingly being employed in Australian peri-urban areas. However, a return to regulatory practice will need to consider readoption of planning techniques formerly used, included tenement controls, rural lot restructuring and strong subdivision and use controls.

Institutional and policy fragmentation is hampering the ability of governments at all levels to develop anticipatory policies which can assist the peri-urban region to adapt to rapid and fundamental change. Australian peri-urban policy is horizontally fragmented between State agencies, vertically fragmented between Commonwealth, State, regional and local government bodies, and is not integrated even within multi-sectoral natural resource agencies.

The consistent findings reported highlight the imperative of pursuing recommendations arguing for stronger and integrated policy and planning controls at all levels of government that are vertically and horizontally aligned. This will become increasingly essential as a raft of global, national and regional drivers of change place increase pressures on the regional resources of these peri-urban areas. For example, climate change (e.g., heat stress and water issues), peak oil, peak phosphate, loss of land to urbanization, land degradation, air pollution and climate change policies (e.g., carbon markets, biofuels) will present continued production challenges which will in turn lead to a likely reduction of the resilience of peri-urban human and natural systems leading to their tolerance thresholds being exceeded and to their increased vulnerability.

## 27.7 Conclusions

These continuing trends of peri-urban spatial fragmentation and land use intensification present a dilemma for current planning and landscape management efforts. Current planning initiatives have embraced urban growth management strategies that seek to meet future regional growth needs whilst responding to community aspirations for a sustainable landscape, including the protection of good quality agricultural land and the maintenance of a viable agricultural industry. Aspirations to maintain a viable peri-urban agricultural industry bring into sharp focus this complex relationship between land use planning and peri-urban agriculture, particularly the role of planning systems to assist in its retention or displacement. For example, should the planning and policy endeavors of local, region and state levels continue the growth management paradigm, thus giving preference to urban growth and infrastructure provision, or should they prioritize the protection of natural resources and land required to maintain a viable agricultural industry in peri-urban areas? Could they in fact pursue both objectives within an integrated and balanced vision where one objective is not pursued at the expense of the other?

An environment of uncertainty may require the capacity for flexibility and redundancy in order to be capable of meeting future unpredicted shocks and surprises that increasingly characterize our uncertain world. If peri-urban areas are to make a contribution towards Australia's future overall food security position, they must do so within the context of one major and overarching conclusion: that continuing peri-urbanization will involve the evolution and maturing of a 'new settlement' landscape—one that is neither truly 'rural' nor truly 'urban'. Under these circumstances, it is highly unlikely that existing growth management and traditional urban planning approaches will be capable of satisfactorily addressing the peri-urban agriculture dilemma.

## References

ABARE. (2004). *Australian commodity statistics*. Canberra: Australian Bureau of Agricultural Resource Economics.

Barr, N. (2003). Future agricultural landscapes. *Australian Planner, 40*(2), 123–127.

Barr, N. (2005). *The changing social landscape of rural Victoria*. Tatura, Victoria: Department of Primary Industries.

Bouteille, A. (1990). Is periurban growth a transitory phase of a definite change?. In V. Renard, & J. Comby (Eds.), *Land Policy in France* (pp. 75–82), Paris: ADEF.

Burnley, I. H., & Murphy, P. A. (1995). Exurban development in Australia and the United States: Through a glass darkly. *Journal of Planning Education and Research, 14*, 245–254.

Bunce, M., & Walker, G. (1992). The transformation of rural life. In I. Bowler, C. Bryant, & C. M. Nellis (Eds.), *Contemporary rural systems in transition, volume 2, economy and society* (pp. 49–61). Melksham: Redwood Press.

Buxton, M., & Goodman, R. (2002). *Maintaining Melbourne's green wedges: Planning policy and the future of Melbourne's green belt*. Melbourne: School of Social Science and Planning, RMIT University.

Buxton, M., Tieman, G., Bekessy, S., Budge, T., Mercer, D., Coote, M., et al. (2006). *Change and continuity in peri-urban Australia: State of the peri-urban regions—a review of the literature, Monograph 1—Change and Continuity in Peri-Urban Australia*. Melbourne: RMIT University.

Buxton, M., Tieman, G., Bekessy, S., Budge, T., Butt, A., Coote, M., Mercer, D., O'Neill, D., & Riddington, C. (2007). *Change and continuity in peri-urban Australia, peri-urban case study: Bendigo corridor, Monograph 2—Change and Continuity in Peri-Urban Australia*. Melbourne: RMIT University.

Buxton, M., Alvarez, A., Butt, A., Farrell, S., (Spatial Vision Innovation Pty Ltd), & O'Neill, D. (2008). *Planning sustainable futures for Melbourne's peri-urban region*. Melbourne: School of Global Studies, Social Science and Planning, RMIT University.

Cunningham-Sabot, E. (2006). *How Changes in Governance Affects the Shrinking Glasgow Conurbation, 2nd World Planning Schools Congress, 'Planning for Diversity and Multiplicity'*. Mexico City, 12–16 July.

Department of Natural Resources and Mines (NRM). (2005). *Lockyer Valley Discussion Paper - Declaration of the Whole Lockyer Valley as a Subartesian Area.* Brisbane: Government of Queensland.

Department of Sustainability and Environment (DSE). (2006). *Regional matters. An Atlas of Regional Victoria 2005*. Melbourne: Victorian Government DSE.

Doughton, J. (2005). *Peri-urban agriculture case study*. Canberra: Primary Industries Ministerial Council; Primary Industries Standing Committee—National R&D Task Group.

Fischel, W. A. (1985). *The economics of zoning laws: A property rights approach to American land use controls*. Baltimore: John Hopkins University Press.

Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. New York: Farrar, Straus and Giroux.

Gardner, B. (2002). *Agriculture in the Port Phillip and Westernport catchment (draft). Produced for draft 2002 regional catchment strategy for the Port Phillip and Westernport region*. Victoria: Department of Primary Industries.

Gillespie, P., & Mason, D. (2003). *Value of agriculture in the Sydney region*. Windsor: NSW Agriculture.

Goodenough, R. (1978). An approach to land-use control: The California land conservation act. *Urban Studies, 15*, 289–297.

Golledge, R. G. (1960). Sydney's metropolitan fringe: A study in urban–rural relations. *Australian Geographer, 7*(6), 243–255.

Gu, C., & Han, S. (2009). Climate change and China's mega-urban regions. In G. Anant (Ed.), *Multilayered cities and urban systems*. Hyderabad: International Geographical Union-Hyderabad Metropolitan Development Authority-Osmania University.

Halsey, L. (1999). Beyond the rural–urban edge. In O. Furuseth & M. Lapping (Eds.), *A contested countryside: The rural fringe in North America*. Aldershot, London: Ashgate.

Hart, J. (2001). Half a century of cropland change. *Geographical Review, 91*(3), 525–543.

Houston, P. (2005). Revaluing the fringe: Some findings on the value of agricultural production in Australia's peri-urban regions. *Geographical Research, 43*(2), 209–223.

Kraemer, C. (2005). Commuter belt turbulence in a dynamic region: The cast of the Munich city-region. In K. Hoggart (Ed.), *The city's hinterland, dynamism and divergence in Europe's peri-urban territories*. Aldershot: Ashgate.

Langworthy, A., & Hacket, T. (2000). *Farming real estate: Challenges and opportunities for agri-business on the urban fringe—Yarra Valley region*. Department of Employment, Workplace Relations and Small Business, Commonwealth of Australia in conjunction with the Shires of Yarra Ranges and Nillumbik, Melbourne.

Low Choy, D. C., Sutherland, C., Scott, S., Rolley, K., Gleeson, B., Dodson, J., & Sipe, N. (2007). *Change and continuity in peri-urban Australia—peri-urban case study: South East Queensland, Monograph No 3—Change and Continuity in Peri-Urban*. Brisbane: Urban Research Program, Griffith University.

Low Choy, D., Sutherland, C., Gleeson, B., Sipe, N., & Dodson, J. (2008). *Change and continuity in peri-urban Australia: Peri-Urban futures & sustainable development, Monograph 4, Urban Research Program*. Brisbane: Griffith University.

Lynch, L., & Carpenter, J. (2003). Is there evidence of a critical mass in the Mid-Atlantic agriculture sector between 1949–1997? *Agricultural and Resource Economics Review, 32*(1), 116–128.

Marius-Gnanou, & Denis, E. (2009). The urbanisation of what? Metropolitanization and merging bottom agglomeration process in India. In G. Anant (Ed.), *Multilayered cities and urban systems*. Hyderabad: International Geographical Union-Hyderabad Metropolitan Development Authority-Osmania University.

McKenzie, F. (1996). *Beyond the Suburbs: Population Change in the Major Exurban Regions of Australia*, Bureau of Immigration Multicultural and Population Research, *Canberra:* Australian Government Publishing Service.

Needham, B., Koenders, P., & Kruijt, B. (1993). *European urban land and property markets: The Netherlands*. London: University College of London Press.

Nelson, A. (1990). Economic critique of prime farmland preservation policies in the United States. *Journal of Rural Studies, 6*, 119–142.

Nelson, A. (1999). The exurban battleground. In O. J. Furuseth & M. B. Lapping (Eds.), *Contested countryside: The rural urban fringe in North America*. Aldershot, UK: Ashgate.

O'Brien, P. (2000). *Scenario planning—a strategic tool: Bureau of rural science: Department of Agriculture, Fisheries and Forestry Australia*. Canberra: Commonwealth of Australia.

Pallagst, K. (2006). *Patterns of Urban Shrinkage in the US in the Rustbelt and Beyond, 2nd World Planning Schools Congress, 'Planning for Diversity and Multiplicity'*. Mexico City, 12–16 July.

Parbery, P., Wilkinson, R., & Karunaratne, K. (2008). *Square pegs in green wedges? Landholders and natural resource management in Melbourne's rural hinterland*. Melbourne: Department of Primary Industries and Port Phillip and Westernport CMA.

Peterson, G. D., Cumming, G. S., & Carpenter, S. R. (2003). Scenario planning: A tool for conservation in an uncertain world. *Conservation Biology, 17*(2), 358–366.

Port Philip and Westernport Catchment Management Authority [PPWCMA]. (2004). *Regional catchment strategy 2004–2009*. Melbourne: Port Phillip and Westernport Catchment Management Authority.

Queensland Department of Primary Industries and Fisheries. (undated). *Is there a sustainable future for peri-urban agriculture in SEQ?* A collaboration to prioritise science needs and develop projects and partnerships to enhance policy, planning, production & practice, unpublished.

Queensland Department of Primary Industries and Fisheries and South East Queensland Regional Organisation of Councils (Q.DPI and SEQROC). (2002). *Rural futures SEQ2021: Regional strategy for rural communities and agriculture*. Brisbane: Queensland Department of Primary Industries.

Schoemaker, P. J. H. (1995). Scenario planning: A tool for strategic planning. *Sloan Management Review, 36*(2), 25–40.

Versterby, M. & Krupa, K. S. (1993) Effects of urban land conversion on agriculture. In E. M. Thunberg & J. E. Reynolds (Eds.), *Proceedings of Urbanization and Development Effects on the Use of Natural Resources*, Publication No. 169 Bx: Southern Rural Development Centre.

Walton, M. (2003). *Agriculture in the Central Ontario Zone*, Issue paper no 1, Neptis Foundation. Toronto: University of Toronto.

# Chapter 28
# By Accident or Design? Peri-Urban Planning and the Protection of Productive Land on the Urban Fringe

**Nicole Cook and Stephanie Harder**

## 28.1 Suburbs in Waiting

In April 2008, three members of Planning Panels Victoria (PPV) were charged with the task of reviewing the Municipal Strategic Statement (MSS) of Moorabool Shire Council on Melbourne's urban fringe. Developed by local council planners over a 6-year period, the key objective of the MSS was to provide guidelines to balance growing demand for housing activity in the predominantly rural municipality without compromising its long-term agricultural productivity. One of the key localities governed by the MSS is Bacchus Marsh—a picturesque town of around 17,000 people comprising market gardens that supply fruit and vegetables to Melbourne retailers and further afield. Without a doubt, the revised MSS sought to balance pressures for housing and urbanization while maintaining the considerable amenity values and productive agricultural lands of both Bacchus Marsh and the wider Shire (Planning Panels Victoria 2008). However, when the MSS was exhibited for public comment in 2006 many land owners sought greater acknowledgement of the development potential of rural land. In the 4-month review and 2-week intensive deliberation, the Panel waded through a suite of objections. Many submissions sought opportunities for rezoning and wider acknowledgement of development potential. They emerged most strongly from rural landholders, growers, horticulturalists, and intensive farming businesses, complete with their own expert witnesses and labour representation.

The level and nature of community resistance at the Panel Hearing around the MSS epitomizes many of the tensions over the preservation of productive land in

N. Cook (✉)
University of Melbourne,
Melbourne, Victoria
e-mail: nicole.cook@unimelb.edu.au

S. Harder
RMIT University, Melbourne, Victoria

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_28,

peri-urban areas in Australia. Merson et al. (2010) point out that competitive national and international imports and rising land values mean that the diversification of operations and subdivision of agricultural land can be a key source of financial security for many growers. Because the value of agricultural property increases when it is rezoned for residential uses, fringe farms can be regarded by growers as a property investment or 'capital nest egg' (Knowd 2006). This has fuelled a widespread perception of peri-urban areas in Australia as 'suburbs-in-waiting' (Bunker and Holloway 2001 p. 13). For some growers, selling land at a premium and shifting operations to areas with lower land values is a real strategy to sustain their businesses. This incentive to subdivide at the grass roots is often matched by political support for rezoning land at the State level. Between 2005 and 2010 for example, the Victorian State Parliament incorporated approximately 55,000 ha of land designated in the city's Strategic Plan Melbourne 2030 for nonresidential uses in its revisions to the Urban Growth Boundary (Buxton and Goodman 2008; Moncrief and Dowling 2008).

The resilience of urban expansion in peri-urban areas is at fundamental odds with an emerging movement urging greater responsibility towards food production, consumption, and supply, including a new interest in food localization. Houston (2005) has already documented the economic significance of peri-urban and fringe agricultural production in Australia estimating that peri-urban areas produce around a quarter of the total value of agricultural output nationally. Work by the Urban Research Centre (URC) at the University of Western Sydney (UWS) shows that peri-urban areas can be significant suppliers of food for metropolitan areas. In its submission to the Commonwealth Senate Inquiry into Food, the URC attributed around 40% of food consumed in NSW to Sydney's market gardens (James 2009 p. 2). But the wider debate around food security is concerned with the instability of national and global food networks in the context of declining oil stocks, unpredictable, and extreme weather events, competing demands for land uses and corporate control of global food economies (Farmar-Bowers 2010; Lawrence et al. 2010). While the impacts of these factors are difficult to predict, peri-urban regions are taking on renewed importance as one of several food sources that, along with existing global and national sources, are critical in maintaining the resilience of Australian food systems (Campbell 2008; James et al. 2010; Larsen et al. 2008; Larsen 2009; Saunders et al. 2006; Woods 2009).

The creation of local and regional food economies hinges on a range of actors operating at multiple scales (Maye et al. 2007; Morgan et al. 2006). Within this ensemble, planning systems can play an important role. In Australia, State Planning Policy Frameworks (SPPFs) set out collective and public priorities for land use. Linking the SPPF to specific locations are Local Planning Policy Frameworks (LPPF) developed by planning departments at the local government level. Multiple and complex links exist across these planning frameworks and food systems (Budge and Slade 2009; Condon et al. 2010; Donovan et al. 2011). Planning controls for instance, may ensure the provision of community gardens in precinct-based planning instruments or reflect by-laws limiting the extent of fast-food retailing. But they also relate to the protection of agricultural land. In Victoria, rural, green wedge, and other nonurban zones are protected from development impacts through objectives to limit the dispersal of urban activity (DPCD 2011 Clause 11-05: 4 p. 20–21;

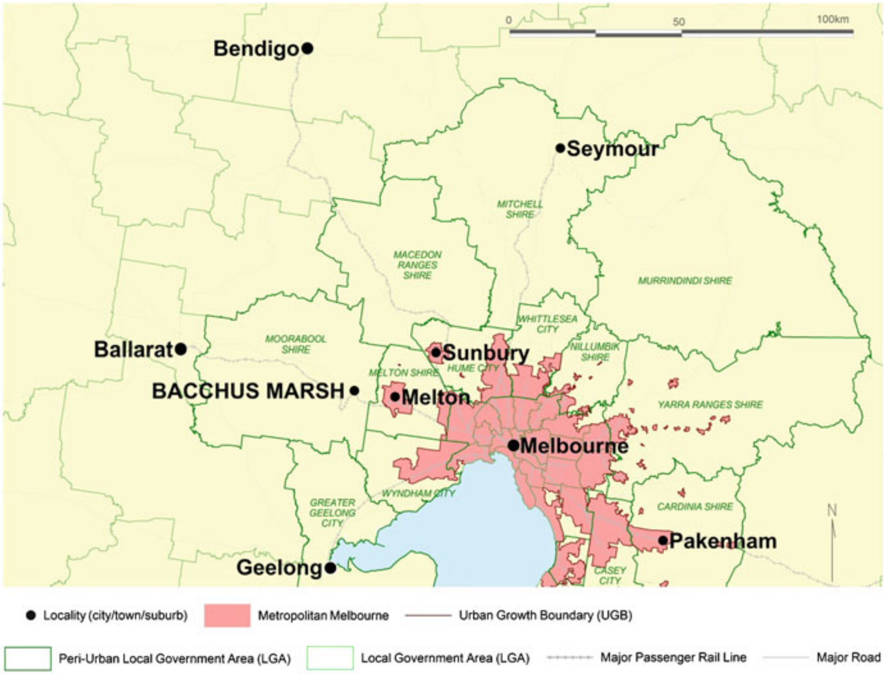



**Fig. 28.1** Bacchus Marsh and surrounds

DPCD 2011 Clause 11-05: 3 p. 18–21). Moreover, the protection of agricultural land from unplanned loss also comprises one of the overarching objectives of the Victorian Planning Provisions (DPCD 2011 Clause 17.05).

Despite the protectionist impulses of the State and Local Planning Policy Frameworks, extending urban growth boundaries has been a strategy pursued by politicians of all stripes in managing cities and regions in Australia. As McCarthy (2008) points out, this trend towards suburbanization and exurban development characterizes the peri-urban experience of many parts of the world. In this context, the planning process around Bacchus Marsh for Moorabool—introduced at the beginning of this chapter—stands as something of an exception. Despite the groundswell of support for the rezoning of rural land for residential development by growers, the attempts of council planners to prevent encroachment through the MSS in this case were successful. Yet as shown in Fig. 28.1, even though it is regarded as 'high value agricultural land', Bacchus Marsh is in close proximity to the urban growth area of Melton where population is expected to increase by 117,000 over the next 20 years (Melton Shire Council online). It also lies within commuting distance of both Ballarat and Melbourne by train and is experiencing a reported increase in the rate of housing approvals (Dobbin 2010). At the same time, water supply is characterized by long-term uncertainty. Whether and how the planning process will continue to balance urban expansion is by no means clear.

In this chapter, we consider the development of the MSS in Moorabool as a means of exploring State and local planning processes within the context of local and regional food economies. Our approach is motivated by the growing acknowledgement that planning occurs through discussion and debate; comprising a range of actors spanning planning and non-planning networks (Healey 2007). In the material that follows, we focus on two key periods of deliberation about peri-urban agriculture on the fringe. The first is the amendment and review of the MSS, a key part of the Local Planning Policy Framework (LPPF) of Moorabool Shire, a peri-urban municipality beyond the Melbourne metropolitan boundary. The planning process in this case ensured the retention of agricultural land, in spite of widespread support from landholders for its consideration for rezoning. The findings suggest that the protection of rural land in this case was a contingent achievement, reflecting the economic imperative to reduce the public costs of dispersed settlement as much as the benefits of localized food production. However, the case also offers new insights into the interaction of local and SPPFs around local and regional food economies in peri-urban areas.

Second, the chapter explores submissions to the Outer Suburban/Interface Services and Development Committee (OSISDC) Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne. The Inquiry explored the future of outer-suburban agriculture on Melbourne's fringe in 2009–2010, including in Moorabool, at a time of intense drought. Incorporating the views of landholders, planners, water authorities, and researchers, the Inquiry provides an insight into a set of experimental narratives of adaptation that emerged in response to the uncertainties of water uncertainty. These accounts question traditional boundaries between 'urban' and 'peri-urban' areas; as well as between 'planning' and 'environment'. If this repositions the fringe in ways anticipated by the concept of rural hybridity (Woods 2009), it also shows that preservation is the beginning, not the end of planning's role in a food secure future.

## 28.2 Bacchus Marsh and the Implementation of State Planning Policy

Bacchus Marsh (BM) is one of two key irrigated agricultural areas on Melbourne's western fringe that supplies food to the city and further afield. It comprises roughly 25 enterprises with an average farm size of 84 ha and combined sales turnover of 55.4 million in 2008–2009. Activities principally relate to market gardening (377 ha), fruit orchards (281 ha), lucerne (110 ha), and pasture production (412 ha) (Moorabool Shire Council 2009 pp. 3–6). Despite the mostly rural qualities of the municipality, the amendment and review of the MSS provided an opportunity for landholders to assert their long-held views regarding its development potential. Budge and Slade (2009) have reported that landholder pressure for rezoning and subdivision in Bacchus Marsh has spanned nearly three decades, reflecting both the ageing farming population and the losses and contraction in output from drought and other conditions over time. As pointed out by the Planning Panel in their review of submissions, pressure from land owners had accompanied the evolution of the MSS since 1995. When it came time to respond to the MSS exhibited in 2006, the vision that landholders felt the MSS ought to convey—and one that reflected both the social and economic pressures facing the rural economy—was as 'suburbs in waiting'.

Despite the preference of many landholders that the MSS prioritize development, PPV took a protectionist approach in its assessment of the MSS. In its deliberations, the Panel referred extensively to Ministerial Direction No 6, which provides guidelines for councils in rezoning rural zones to rural living zones, and recommends new zones should only be considered if housing demand can be sufficiently demonstrated. In its review, the Panel advised a reduction in the 'provision for residential land' from 1,126 to 328 ha (PPV 2008 pp. 43–44). This included limiting areas for urban development and residential development as well as reducing the land available for residential investigation, satellite villages, and rural living areas (PPV 2008 pp. 4–6). However, the Panel's rationale for preserving agricultural land outside the urban growth boundary was at no point explicitly framed in terms of ensuring and reinforcing food supply. Rather, it found the criteria for rezoning—namely, demonstrated demand for housing and containment—were not met (PPV 2008 p. 34). From the Panel's perspective, the rural zones were valuable in facilitating more compact urban form and from this, in helping to contain the costs of infrastructure and service delivery:

> Marginal agricultural viability … does not establish a sound justification for endorsing an alternative land use – the suitability of the land for an alternative use, costs to the community in providing infrastructure and ongoing services and implications for other uses in a locality must be taken into account. A laissez faire approach to development planning for lifestyle housing promotes dispersed residential development, whereas compact urban forms support efficient more cost effective delivery of infrastructure and services (PPV 2008 p. 34).

In a case study of fringe housing development in NSW, Cook (2006) has shown how planning decisions often have unintended outcomes. Taking the case of Regional Environmental Plan 30 (REP 30) in Penrith, this work revealed how Council aspirations to take on a coordination role within the region saw the eventual modification of the REP to increase the proportion of remnant Cumberland Plain Woodland at the Australian Defence Industry site St Marys (see also Cook and Ruming 2008). While Council's aim was to assert its authority within the region, the outcome (itself shaped by a wide range of actors) resulted in stronger ecological conservation. In Moorabool, the contribution the MSS makes to resilient food spaces bears something of these tangential, indirect qualities. Despite the Panel's aim to reduce the costs of delivering services and infrastructure in the rural Shire, the recommendations nonetheless preserve the stocks of productive land on Melbourne's fringe. Hillier (2008) argues that these types of unexpected outcomes in planning are not unusual. The sheer range of actors and processes gathered in the achievement of planning outcomes unsettles the hold of singular intention or a direct relation between cause and effect. So while it is fortuitous that a strategy of minimizing the public costs of dispersed settlement results in the protection of peri-urban agriculture, it is also true that the preservation of this space—like the Cumberland Plain Woodland in REP 30—is more by accident than by design.

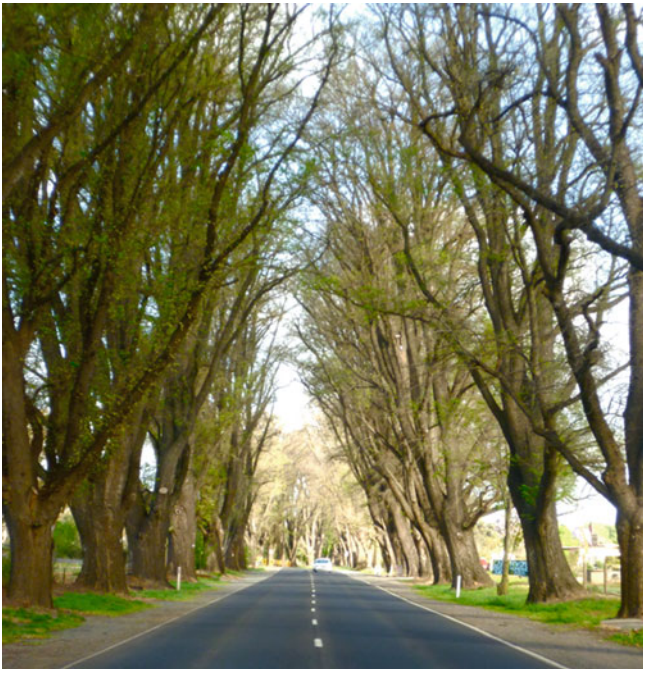


**Fig. 28.2** Avenue of honour

Amenity values and tourism can also work to protect productive land in an indirect way. Food-based tourism and off-farm income for some farm businesses can provide new economic opportunities against declining terms of trade and escalating land prices (Barr 2003). Resident preferences for rural amenity can also directly shape the development of planning policies and processes (Gibson et al. 2005). In Bacchus Marsh, the protection of agricultural land is linked to the preservation of the town's rural amenity and heritage values. Shown in Fig. 28.2, the main approach to the town, the Avenue of Honour, is lined by hundred of elms. Planted in 1918 to remember and honour residents who had fought in the First World War, it has been acknowledged by the Heritage Trust as one of the most significant examples of its type (Webb 2010 p. 3). In 2010, a plan to remove some of the trees for the realignment of the Western Highway was resisted by residents including one time local Peter Carey who during the press coverage and appeal, dubbed the Avenue the 'tunnel of light' (Webb 2010 p. 3). The elms are flanked either-side by market gardens whose protection, in the Bacchus Marsh Avenue of Honour Strategic Management Plan (Moorabool Shire 2004 p. 24) is required to maintain the 'integrity' of the Avenue, estimated by the National Trust of Australia in 2010 to be worth $8 million per annum (Hughes 2010). In the MSS, agriculture is identified as a key component of the shire's 'rural landscape setting', while the Panel identified the role of the market gardens in Bacchus Marsh as a 'critical element of the local economy that supports tourism and the character and lifestyle appeal of the area' (PPV 2008 p. 29).

While not explicitly concerned with ensuring food supply, economic, and social factors along with the Panel's endorsement of the protectionist impulse of the State and Local Planning Policy Frameworks produce a type of 'de-facto' food policy that helps protect Melbourne's productive hinterland. Still, in a round-up of current food and farming policies, Harder (2010) has shown that peri-urban regions are conspicuously absent at higher levels of the planning system. Similarly, trends in farming policy set out in the Future Farms discussion paper (DPCD 2009a) and interim findings (DPCD 2009b) did not acknowledge the full importance of peri-urban agriculture in supplying major urban markets or the challenges of maintaining this food supply in the face of land fragmentation. So, even though, in Moorabool, amenity and heritage values combined with the economic and social costs of dispersed settlement to ensure the protection of peri-urban farming land, this is not the local implementation of a coherent State food policy framework. Without clear strategic and statutory oversight of urban and peri-urban food production at the State level, it is by no means clear whether the existing framework will hold up against new housing demand, or as we set out next, water uncertainty. Drawing in more detail on the debate and deliberation over the Bacchus Marsh Irrigation District that emerged in a related inquiry, we turn to this question next.

## 28.3 Water Uncertainty and the Spaces of Peri-Urban Food Production

Graham and Healey (1999) have suggested that cities and spaces are complex flows and forces that cannot be reduced to singular entities. Their work draws on the conceptual frameworks of human geography where economic and political processes such as globalization, neoliberalism, and urbanization are also simultaneously spatial processes. In this configuration, space is not the fixed, bounded container in which these forces play out, but part of the same continuum as the forces themselves. However, as Graham and Healey (1999) point out, it is not only political and economic processes that progress through and reshape borders and boundaries. Reflecting new trends across the planning literature, it is ecological fields that trouble the idea of space as bounded or contained (Davoudi and Strange 2009; Steele and Gleeson 2009). In this section, we draw on the transcripts from the Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne, to examine the ways that nonhuman agents further unsettle planned responses to issues of food security, especially those based on clear separations between 'peri-urban' and 'urban' landscapes. Even though Bacchus Marsh's productive soils are protected, these sites are also in a precarious position. They span the space between a productive, irrigated, well-protected agricultural landscape; and an area of water insecurity and human induced climate change.

At the time of the Panel Hearing, Bacchus Marsh was experiencing a sustained drought. The condition of water scarcity was deeply implicated in the vision of Bacchus Marsh shared by many landholders as 'suburbs in waiting'. Water supply from its two main reservoirs, the Pykes Creek Resevoir and Merrimu Dam, was constrained as water levels dropped and stayed below their minimum for more than 12 months. In 2009/2010, the water level in Pykes Creek Reservoir, which has a capacity of 22,000 ML, did not exceed 2,000 ML in any month (Southern Rural Water 2010a). The low storage levels in both 2009/2010 and preceding years, resulted in minimal water allocations for farmers who in 2009/2010 received just 14% of their total water allocation, compared to a minimal 5% in 2008/2009 and 8% in 2007/2008 (Southern Rural Water 2010b). An interview with Southern Rural Water in 2010 reported by Harder (2010) confirmed that the region was experiencing the 'worst case' climate change scenario of 2050 with regard to rainfall. Conditions were sufficiently dire in 2009 for the water authority to transport emergency supplies from Thomson Reservoir (Victorian Government 2010 p. 124). Accounts presented by growers in the Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne in early 2010 describe a significant contraction in range of product and volume of output. One grower, interviewed in 2010, estimated only 40% of the land was still in production with relationships with retailers threatened or severed.

There is no doubt that water scarcity unsettles the coherence of Bacchus Marsh as a food producing region. Yet the condition of water scarcity is not absolute. At the time of writing, water stocks in the Pykes Resevoir had climbed steadily to 22,139 ML by December 2010 and allocations for growers in the BMID were set at 60% for 2011. In Bacchus Marsh, like many parts of Australia, water scarcity vies with abundance. But this is not only a question of water uncertainty. In their account of climate change and planning in South East Queensland, Steele and Gleeson (2009) make a distinction between planning in climate change, and planning for climate change. The distinction acknowledges that climate change throws up uncertainties that unsettle foresight and prediction, thus challenging planning to adopt a more active and experimental approach. As the authors point out, the perception that climate change is still 'out there' continues to hinder the evolution of planning policy and practice in the context of environmental change. In contrast, the debates around Bacchus Marsh at the time of the MSS and the OSISDC were all conducted in a period of water scarcity and long-term drought by those experiencing the impacts of those droughts. To this end, these discussions offer insights into a set of more experimental narratives of adaptation.

The central theme of these discourses was around the supply, use, and recycling of water. In part, they parallel broader policy trajectories aimed to create flexibility of water supply across the State by connecting diverse parts of the water storage and irrigation network. One grower for instance saw Bacchus Marsh as part of a much wider water supply and irrigation network that connected the Murray, Goulburn, Thomson and Macalister systems, (Victorian Government 2010 p. 140). But discussion through the hearings was also based on a more integrated vision of water supply that incorporated waste water from other sources into farm inputs. Consider for instance, the view of one BM grower reported in the press in 2010 who felt piping recycled water from nearby housing subdivisions could alleviate water constraints during sustained periods of drought (White 2009 p. 1). Similarly, one member of the

OSISDC claimed the supply of Class A recycled water to the BMID would be an ideal alternative to the existing rights to Pyke's Creek Reservoir in times of drought. The idea of reusing residential grey water as an input into food production also emerged in the Committee's final report where it recommended that current water recycling and reuse targets be reset and that dual-pipe systems capable of supplying recycled water to housing be mandated in all new housing development (rec 7). It provocatively recommended the government commit to recycled water schemes for agriculture in peri-urban areas (rec 10). Given that approximately 70% of water goes to irrigation compared to only 10% to residential use and 10% to regional town use, these initiatives could supplement demand during periods of extended drought where landholders are dealing with less than 10% of their expected allocations from river flows.

The idea that peri-urban and urban areas are connected, and can work in synergy, challenges their dominant conceptualization as separate spaces. Gallent and Andersson (2007) argue that discourses of the threatened peri-urban fringe emerge from a desire and longing for a rural idyll; of 'unspoiled nature' and picturesque landscapes. Their work shows how these desires have fuelled landscape design strategies to rid the fringe of urban features: of industry, technology and modernity. At the same time, these desires work nostalgically to obscure the connections and synergies between peri-urban and urban landscapes that, for a growing number of rural researchers, do not preclude these diverse spaces from sharing a more even footing. Within this literature, the fringe is 'entangled' with urban (and other places) in relations of co-dependency, co-constitution and hybridity (McCarthy 2008; Parr 2005; Woods 2009). Here, even though peri-urban and urban areas are entangled in power relations, the way in which these relations play-out are set in less certain terms; peri-urban and urban areas are likely to shape each other, to benefit from shared resources and synergies. Moreover, the boundaries and borders of the 'peri-urban' and 'urban' cannot be assumed least of all can the conceptualization of urban–rural interactions be seen as a one-way affair between a powerful urban and its weaker fringe. Instead, the urban and the peri-urban are characterized by 'multiple flows and dependencies linking city and countryside' (Woods 2009 p. 853).

The notion that boundaries can be arbitrary and contingent is not new to planning—it is precisely this idea that underpins the relational planning paradigm. As pointed out by Graham and Healey (1999), this approach rejects universal forms and spaces, embracing instead multiple meanings and connections to place. But there is a significant difference between this model of peri-urban and urban space, and the protectionist flavour of SPPFs which tend to position peri-urban areas in opposition to a more powerful, and at times undesirable urban influence. There is a significant difference too, between this and the conceptualization emerging through the discourses of the growers, planners and politicians living and working on the fringe. The latter are far more likely to position urban activities as a resource for peri-urban areas. The Victorian Eco-Innovation Lab (VEIL) has captured some of these connections and benefits in the idea of the 'edge effect'. In its submission to the OSISDC (Larsen 2009) and its Research Report (Larsen et al. 2008), it notes for instance, that peri-urban and outer suburban food producers are likely to have greater potential access to recycled water sources as they are in reasonable proximity to the major urban treatment plants. The Western Treatment Plant in Werribee currently works in this way, supplying growers with water, although salinity can be problematic. Moreover, there is significant capacity within Melbourne to harvest rainwater and stormwater suggesting the city might ease its dependence on supplies from elsewhere in the state. At the precinct planning level, VEIL has suggested there are opportunities to integrate residential and agricultural water systems (though it is not specific about the treatment process or scale). At the same time, they suggest that both peak oil and peak phosphorous means there are reasons to tap organic waste from urban areas as an alternative. Together, the alternative perspectives emerging from researchers, growers and planners experiencing and working in the fringe anticipate new approaches to water integrated (peri-urban) planning. These perspectives not only envisage shared infrastructures that cross the rural–urban divide. They also unsettle the hold of ‘suburbs in waiting’: opening up a much larger set of connections, possibilities and future visions.

## 28.4 Food Security and Shared (Peri)-Urban Spaces

Food security looms large on the national and global agenda of cities, spaces and localities. Oil shocks, environmental change and population growth are set to intensify the uneven qualities of this network. In this context, the productive fringes of Australian cities are taking on new public meanings and values. While there is no doubt the contemporary planning framework reported on here values agricultural land, it is also true that these values are subject to a myriad of competing imperatives. Without a coherent and secure food policy framework at the State level to inform planning decisions by local authorities, or a concise statement of the key strategic planning, land use and development objectives for the municipality, the protection of agricultural land is an uneven achievement. Any further attempts to dilute State and Local planning instruments around the protection of agricultural land will only lengthen the odds of maintaining food production on the urban fringe in the future.

If this points to the gaps across the food and planning policy framework, it also shows that the routine deliberations over local planning instruments held in Melbourne offices and public consultation spaces are key sites in negotiating the boundaries of food secure cities and spaces. The need for greater research around peri-urban food supply chains is deeply implied in this study. However, it is the views of those stakeholders working, living, planning and researching through the drought of 2008 and 2009 that may already provide clues about how to ‘plan’ in this uncertain space. Their perspectives draw attention to the connections and synergies of urban and peri-urban space, exploring the possibility for shared resources and re-use. If this productively re-casts the boundaries implicit in discourses of ‘protection’, it also suggests preservation is the beginning, not the end, of planning’s role in a food secure future.

## References


Barr, N. (2003). Future agricultural landscapes. *Australian Planner, 40*, 123–127.

Budge, T., & Slade, C. (2009). *Integrating land use planning and community food security*. Bendigo: La Trobe University.

Bunker, R., & Holloway, D. (2001). *Fringe City and Contested Countryside: Population Trends and Policy Developments Around Sydney*. Issues Paper No. 6 Ur-ban Frontiers Program. University of Western Sydney.

Buxton, M., & Goodman, R. (2008). Protecting Melbourne's green wedges—fate of a public policy. In M. Amati (Ed.), *Urban greenbelts in the twenty-first century* (pp. 61–82). Aldershot: Ashgate.

Campbell, A. (2008). *Paddock to plate: Food, farming and Victoria's progress to sustainability*. Melbourne: Australian Conservation Foundation.

Condon, P., Mullinix, K., Fallick, A., & Harcourt, M. (2010). Agriculture on the edge: Strategies to abate urban encroachment onto agricultural lands by promoting visible human-scale agriculture as an integral element of urbanization. *International Journal of Agricultural Sustainability, 8*(1/2), 104–116.

Cook, N. (2006). *Conflict and Consensus in the Redevelopment of De-industrialised Property in Sydney.* Unpublished PhD Thesis, Macquarie University.

Cook, N., & Ruming, K. (2008). On the Fringe of Neoliberalism: Residential development in outer suburban Sydney. *Australian Geographer, 39*(2), 211–228.

Davoudi, S., & Strange, I. (Eds.). (2009). *Conceptions of space and place in strategic spatial planning*. Oxon: Routledge.

Department of Planning and Community Development. (2009a). *Future Farms Discussion Paper*. Retrieved March 7, 2011, from http://www.dpcd.vic.gov.au/__data/assets/pdf_file/0018/42705/FF_Interim_Findings_Report.pdf

Department of Planning and Community Development. (2009b). *Future Farms Interim Findings*. Retrieved March 7, 2011, from http://www.dpcd.vic.gov.au/__data/assets/pdf_file/0019/42706/Future.Farms.Planning.Group.Discussion.Paper.pdf

Department of Planning and Community Development. (2011). *Victorian Planning Provisions*. Retrieved March 7, 2011, from http://www.dse.vic.gov.au/planningschemes/VPPs/

Dobbin, M. (2010). Melbourne: Coming to a paddock near you. Developers make mockery of urban boundary. *The Age,* 1.

Donovan, J., Larsen, K., & McWhinnie, J. (2011). *Food-sensitive planning and urban design: A conceptual framework for achieving a sustainable and healthy food system*. Melbourne: Report commissioned by the National Heart Foundation of Australia (Victoria Division).

Farmar-Bowers, Q. (2010). *Food security: An essential aspect of sustainable communities*. Paper presented at Agrifood XVII Conference. Melbourne: Monash University, 29 Nov-Dec 1.

Gallent, N., & Andersson, J. (2007). Representing England's rural–urban fringe. *Landscape Research, 32*(1), 1–21.

Gibson, C., Dufty, R., & Drozdzewski, D. (2005). Resident attitudes to farmland protection measures in the northern rivers region. *New South Wales Australian Geographer, 36*(3), 369–383.

Graham, S., & Healey, P. (1999). Relational concepts of space and place: Issues for planning theory and practice. *European Planning Studies, 7*(5), 623–646.

Harder, S. (2010). *Towards Localisation: Peri-Urban Planning for a Food Secure Future.* Unpublished Honours Thesis, School of Global Studies, Social Science and Planning, RMIT University.

Healey, P. (2007). *Urban complexity and spatial strategies: Towards a relational planning for our times*. Oxon: Routledge.

Hillier, J. (2008). Plan(e) speaking: A multiplanar theory of spatial planning. *Planning Theory, 7*(1), 24–50.

Houston, P. (2005). Re-valuing the Fringe: Some findings on the value of agricultural production in Australia's peri-urban regions. *Geographical Research, 43*(2), 209–223.

Hughes, S. (2010). *Avenue of Honour Bacchus Marsh*. Victoria: National Trust.

James, S. (2009). *Submission to senate inquiry into food production in Australia Urban Research Centre*. Sydney: University of Western Sydney.

James, S., O'Neill, P., & Dimeski, B. (2010). *Sydney's Agricultural Lands: An Analysis*. Prepared for the NSW Department of Planning by the Urban Research Centre. University of Western Sydney.

Knowd, I. (2006). Tourism as a mechanism for farm survival. *Journal of Sustainable Tourism, 14*(1), 24–42.

Larsen, K. (2009). *Submission to the outer Suburban Interface Services and Development Committee—Inquiry into Agribusiness in Outer Suburban Melbourne*. Melbourne: Victorian Eco Innovation Lab.

Larsen, K., Ryan, C., & Abraham, A. (2008). *Sustainable and Secure Food Systems for Victoria Research Report No 1. April*. Melbourne: Victorian Eco Innovation Lab.

Lawrence, G., Lyons, K., & Wallington, T. (Eds.). (2010). *Food security, nutrition and sustainability*. London: Earthscan.

Maye, D., Holloway, L., & Kneafsey, M. (Eds.). (2007). *Alternative food geographies: Representation and practice*. Oxford: Elsevier.

McCarthy, J. (2008). Rural geography: Globalizing the countryside. *Progress in Human Geography, 32*(1), 129–137.

Melton Shire Council. (online). Retrieved March 7, 2011, from http://www.melton.vic.gov.au/Page/Page.asp?Page_Id=1998&h=−1

Merson, J., Attwater, R., Ampt, P., Wildman, H., & Chapple, R. (2010). The challenges to urban agriculture in the Sydney basic and lower Blue Mountains Region of Australia. *International Journal of Agricultural Sustainability, 8*(1&2), 72–85.

Moncrief, M., & Dowling, J. (2008). Go-ahead for urban sprawl. *The Age*.

Moorabool Shire Council. (2004). *Bacchus Marsh avenue of honour: Strategic management plan*.

Moorabool Shire Council. (2009). *Economic contribution assessment: Bacchus Marsh Irrigation District Moorabool.*

Morgan, K., Marsden, T., & Murdoch, J. (2006). *Worlds of food: Place, power and provenance in the food chain*. Oxford: Oxford University Press.

Parr, J. (2005). Perspectives on the city-region. *Regional Studies, 39*, 555–566.

Planning Panels Victoria. (2008). *Moorabool planning scheme amendment C34: Panel Report*. Melbourne: DPCD.

Saunders, C., Barber, B., & Taylor, G. (2006). *Food miles: Comparative energy/emissions performance of New Zealand's agricultural industry*. Christchurch, New Zealand: Lincoln University.

Southern Rural Water (SRW). (2010a). *Bacchus Marsh*. Retrieved June 29, 2010, from http://www.srw.com.au/Page/PagePrint.asp?Page_Id=157

Southern Rural Water (SRW). (2010b). *Allocations*. Retrieved December 21, 2010, from http://www.srw.com.au/Page/PagePrint.asp?Page_Id=194&h=0

Steele, W., & Gleeson, B. (2009). *Planning in climate change: Towards a relational framework for action Urban Research Program: Research Paper 26.*

Victorian Government. (2010). *Victorian Government Response to the Report of the Outer Suburban/Interface Services and Development Committee: Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne September*.

Webb, C. (2010). Writer's plea for tunnel of light. *The Age,* 3.

White, L. (2009). *Future Uncertain for Bacchus Marsh Growers*. Retrieved July 19, 2010, from http://www.vgavic.org.au/communication/e_news/future_uncertain_for_bacchus_marsh_growers.html

Woods, M. (2009). Rural geography: Blurring boundaries and making connections. *Progress in Human Geography, 33*(6), 849–858.

# Chapter 29
# Development, Dilution, and Functional Change in the Peri-Urban Landscape: What Does It Really Mean for Agriculture?

**Andrew Butt**

## 29.1 Introduction

Population and housing growth in the peri-urban regions of Australian cities has been rapid in recent decades (Buxton et al. 2009; McKenzie 1996). The concurrent processes of urbanization and counter-urbanization (population movement to the peri-urban fringe of cities and within other regions of urban influence) that are occurring in Australia can be understood as products of changes in both rural and urban economies. These changes have led to modifications in employment, travel times, property markets, and household structures, as well as changes in the structure of rural activity and industry.

In Australia, since at least the 1960s, the emergence of *peri-urban* areas as structurally and functionally differentiated regions—compared to urban, suburban, or rural places—has remained a key challenge for agricultural futures and for spatial planning policy and practice (Bowie 1993; Hugo and Smailes 1985). Growing peri-urban areas, beyond the formal fringe of urban land uses, have challenged the ability of policy to effectively produce desired land use and rural industry outcomes. These notions of the use of rural space have a traditional basis in a clear urban–rural dichotomy which has been rendered seemingly less relevant in the face of the increasing prevalence of nonagricultural (and urban-related) activities in rural areas (Barr 2005; Champion and Hugo 2003).

In Australia, planning under neoliberal policy has become typified by less interventionist approaches to land use allocation, resulting in competing and often conflicting land markets and landscape objectives, and little clarity or certainty in planning for future uses of urban fringe and rural land as a resource or landscape (Buxton and Goodman 2008). Throughout Australia, while broad objectives for the

A. Butt (✉)
Planning and Community Development Program, La Trobe University, Bendigo, Australia
e-mail: A.Butt@latrobe.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_29,

future of peri-urban areas as rural (and agricultural) places are articulated at a planning policy level, land use realities, along with market preferences and public and private investment (particularly in transport), are often in conflict with the effective implementation of planning objectives. Processes of rural land use dilution and agricultural displacement continue to occur, resulting in larger populations living beyond the urban fringe, with an increasing concentration of this population in areas that are accessible to metropolitan and regional cities.

Despite the changes in land use and landscapes, levels of agricultural production and output within Australia's peri-urban regions have not experienced dramatic region-wide decline during the recent decades of population and housing expansion into these areas (Buxton et al. 2009; Houston 2005). However, the structure of agricultural industries in peri-urban regions is changing, as are threats to future adaptive capacity for peri-urban agricultural networks and systems. Agricultural activity has polarized in these regions, with many small and few large operations accompanying a proliferation of housing and a resulting mosaic of often competing nonagricultural land uses and land markets. The consequences of this for food production in the peri-urban regions of Australian cities are therefore not evident from existing overall production data. However, despite the current situation there are long-term risks to the viability of agricultural production in the peri-urban areas as a consequence of the changes flowing from peri-urbanization.

This is true of peri-urban Melbourne, an example of a region where despite increased levels of population and housing in rural landscapes and the restructure and spatial re-patterning of many agricultural industries, overall output, and the share of agricultural output in the broader region (the state of Victoria) has not declined (ABS 1983–2008). Nonetheless, the challenges to future agricultural viability and adaptability are considerable. This chapter explores the nature of farming enterprise change in the context of peri-urban Melbourne, and seeks to determine the implications for agriculture of change in peri-urban land use and landscapes.

## 29.2 Agriculture in Peri-Urban Regions

As in other rural areas, farming activities and agricultural production within the peri-urban region of Australian cities has experienced processes of change and structural adjustment over many decades. Some of these changes can be placed within the context of the broader structural changes in local and global agriculture, but many others are associated more specifically with expanding peri-urban settlement and population growth, and consequent land markets and land use change, as outlined below.

In these peri-urban regions, an increasingly urban-focused culture (Champion and Hugo 2003), and expectations of *amenity* or landscape *quality* (Gosnell and Abrams 2009; McCarthy 2008; Moss 2006) have served to alter perceptions of the role of these landscapes for urban and rural communities. These changes occur in the immediate metropolitan fringe and in the rural regions that are influenced by commuting and amenity migration.

Processes of social, economic, and landscape change have reduced many of the social and economic factors that distinguish these areas from adjoining urban locations, while increasingly differentiating them from agricultural regions that do not have a strong urban influence. Whether considered as a "post-productivist" transition (Wilson 2001), or the more encompassing "multifunctional rural transition" (Holmes 2002), the consequences include the broader understanding of landscape values and the decreasing importance of agricultural interests in policy and community discourse, with issues such as recreational and environmental values assuming greater importance at a local and political level. The resulting policy (and political) agenda exposes tensions between land use objectives, markets and community values in these regions.

However, significant examples of agricultural activity and adaptation remain evident in peri-urban Melbourne and other Australian peri-urban regions (Buxton et al. 2007; Low Choy et al. 2007). While forms of agricultural activity and their relative role within local economic structures have altered, farming in peri-urban regions remains an important land use and a significant feature of the physical and cultural landscapes. Agricultural activity in Melbourne's peri-urban region includes large intensive farming operations, an increasing number of small-scale grazing properties, and other emerging agricultural industries, many of which benefit from proximity to large urban centers and markets.

## 29.3 Farm Structure, Viability, and Land Use Change

The experiences and processes of economic and landscape transition in Australian agriculture are intertwined. Not only with structural change within specific industries, but also with social preferences and settlement systems that have origins outside agriculture. Within peri-urban areas these processes have been documented in Australia and elsewhere since at least the 1970s (Hugo and Smailes 1985; McKenzie 1996).

With reference to peri-urban agriculture, the focus of research and policy discussion has considered two broad themes:

– The impact of increased *nonfarm housing* in rural landscapes.
– The declining levels of *farm viability* at a regional-system and farm-business scale.

The nature and realities of these processes and the consequent impacts of change are varied. The nature of the processes that have lead to increasing nonfarm housing and reduced farm viability have varied from place to place so that changes in peri-urban areas and in agriculture in these areas cannot be assumed to be uniform. However, some distinct patterns of change are evident. These changes are associated with the development of multifunctional rural landscapes, where contrasting (often competing) activities demand different social and economic priorities beyond the productivist concerns of traditional agriculture (Argent et al. 2007).

Over the past 30 years of peri-urban population growth, a broader process of restructure in Australian agriculture has occurred. Australia-wide, farm numbers decreased by ~10,000 in the decade to 2009 (ABS 2010). Remaining farm businesses in Australia have increased in scale to maintain viability in the face of declining terms of trade (ABARE 2007). Comparatively high levels of productivity growth in the agricultural sector in Australia over several decades (Mullen 2010) have been both a cause and consequence of globalization and restructure of local industries within the agricultural supply chains and new policy environments. The consequences of restructure have been uneven between industries and across regions.

Small-scale farms have grown in number in peri-urban regions and production has been concentrated in a number of key industries notably cattle production. Within remaining large-scale operations, there have been variations in farm viability within and between industries (Alexander and Kokic 2005), with farms responding through corporate structures and new models of shared family farming (Pritchard et al. 2007).

Kirschenmann et al. (2008) describe the phenomenon of a declining "middle" in a North American agricultural context, linking it to risks in the broader food production and supply system. They contend that the polarization of farm structure (to large or small) has implications for the diversity of food production and the nature of local processing networks. Moreover, they describe a dualism of processing and marketing at the large and small (local) scale, with consequent challenges for farm economic viability emerging for farms operating between these scales. Coupled with the increasing presence of nonfarm rural land use in many (but particularly peri-urban) areas, restructure has resulted in a dual process of fewer larger farms with an increased agricultural output, and a growing number of small rural landholdings operating at a sub-commercial scale, or with no agricultural output at all (Budge et al. 2012; Buxton et al. 2009).

Increased off-farm income and linkages to the nonfarm economy are also features of the transition in land use and land markets for many farm business and farming communities (Gleeson et al. 2003). Associated demographic shifts include declining farmer numbers and an ageing profile of farmers across Australia, including peri-urban areas (ABS 2007). Increasing part-time farming and an increase in non-farming land use in the landscape are defining features of peri-urban regions. Although access to off-farm income offers opportunities to reduce vulnerability to adjustment and cost factors (as described by Nelson et al. 2007), the market costs for farm adjustment and restructure through the purchase of local land are increased in these areas.

The processes of agricultural restructure and change has been geographically varied and has differed significantly between industry types. For example, in Victoria since the 1980s, industries such as dairying and horticulture have seen significant growth in production from fewer farms, while beef cattle and viticulture have grown only modestly, with only a small increase in producer numbers (Barr and McKenzie 2007). These latter industries are increasing components of agricultural activity and land use (including part-time agriculture) in peri-urban landscapes, including the Melbourne peri-urban region.

Victoria's rural landscapes are varied, with continuing areas of high production and increasing farm scale in the state's west and in northern irrigation areas and other, smaller, areas that might be described as *amenity* landscapes (Barr 2005) or shifting *transitional* landscapes where non-farming land use and influence is increasing. Peri-urban landscapes reveal characteristics of the more general trend in agricultural restructure, and some very specific changes are emerging from new land and real estate markets that facilitate these land uses.

## 29.4 Perspectives on Changes in Peri-Urban Agriculture

The role and prospects for peri-urban agriculture can be broadly described within the context of at least four processes of change: *loss*, *dilution*, *transition*, and *transference* (Buxton et al. 2007). Although these are often competing discourses, examples of each process can be identified within Melbourne's peri-urban region.

Managing the *loss* of agricultural land (especially "high-quality" land) and production is historically a focus of planning literature and policy, which considers the process of change as one where a land resource and agricultural economy is at risk, and requires protection through policy and regulation. This is of course a contested concept, given current preferences for market-based resource allocation in Australia (Bowie 1993; Wills 1992), and the tensions between land use and industry perspectives (Houston 2005). In reality, the relationship between farm business viability, land "quality" and the actual use of land is dynamic and contingent in most settings, not just in the peri-urban regions. This process reveals the limits of planning in the Australian context, where the risks of the loss of a land resource rarely influence long-term planning decisions, despite policy settings. Examples such as Melbourne's Yarra Valley (Buxton 2010) offer a notable exception; an instance where clear planning controls and landscape protection over 40 years are considered to have supported the emergence of a wine industry and associated tourism activities.

Alternatively, the notion of the *dilution* of rural landscapes and of agricultural economies corresponds with broader understandings of the drivers of counter-urbanization into peri-urban areas, and consequent changes in population and settlement (Smailes 2002). Dilution is not simply a matter of farms and farmers being "squeezed out," but is rather an increasing mix of emerging activities, with agricultural production becoming a less significant component of the landscape and (consequently) the economy and community-life. The viability, scale, and concentration of farms and farm-related businesses and commodity "clusters" are understood to be threatened by dilution (Brabec and Smith 2002; Daniels 1999). From a policy perspective, this dilution in the (assumed) homogeneity in rural landscapes has resulted in planning policy approaches that generally seek to problematize non-farming communities and land use in rural areas. Typically, these include planning controls that seek to enforce larger properties and preclude nonfarm developments in rural areas, despite trends of fragmentation and nonfarm housing.

Processes of *transition* between agricultural industry sectors (and commodity types) are also apparent in many peri-urban areas, not only mirroring broader trends in agriculture change, but also reflecting pressures in land markets and scope for adjustment that are particular to peri-urban regions. Farm diversification is a common phenomenon in response to deregulated commodity markets, climate and water availability, new markets for food and fiber (and potentially fuel), emerging export opportunities, trade policy, and as a mechanism to manage increasing price risks for agriculture (Mullen 2010). Traditional industries are seen to give way to new farming activities and farm-business types, and the previous "critical mass" of similar producers is diminished, as are the nonfarm industries that support these locally such as processing and businesses that support farming. Land use and landscape changes (e.g., grazing areas being planted with tree crops) are visible symbols of transition (Barlow and Cocklin 2003).

The locational *transference* of productive activity and of specific farm businesses is a process most clearly evident in industries such as poultry-raising, piggeries, and horticulture, where scope to expand on the urban fringe is limited and land prices offer the potential for substantial reinvestment beyond likely areas of population expansion. Examples include the movement of sugarcane growing from Sunshine Coast peri-urban regions (Coggan et al. 2008) and the movement of poultry-raising from the fringes of Melbourne since the 1980s (Henderson 2005).

These four processes are not the only explanations of change, but they do offer perspectives on change as experienced in different localities, communities, and industries. Examples of each can be identified in Melbourne's peri-urban region, and they provide a means to understand the consequences of change for farm businesses and industries on agricultural viability at the local level.

## 29.5 Policy and Planning for Peri-Urban Agriculture

Policy approaches to agriculture and agricultural adjustment in Australia have broadly mirrored other industry policy regimes since the 1980s (Vanclay 2003). Earlier periods of rural industry protection have given way to an increasing emphasis on efficiency, competition, self-reliance, and risk in the absence of direct government support. Subsequently, policy support for agricultural activities has become contingent on farm viability and industry sustainability, rather than thinking about agriculture as a nation-building (or food security) project. Concurrently, the previous *productivist* priorities of government have been incorporated within broader rural policy concerns, including community development and environmental management (Argent et al. 2007), although the pervasiveness of agriculture and productivist logics in rural policy remains.

In peri-urban areas, the emergence of a policy emphasis on efficiency and restructure has presented challenges to many of the longstanding objectives of land use policy. The industry adjustment that has been a feature of agriculture since the 1970s has resulted in significant spatial adjustment in farming activity. In Victoria, planning approaches have included objectives of supporting agriculture by reducing the market for smallholdings, particularly through controls on subdivision and use, and using differentiated zoning, particularly where "high-quality" agricultural land resources have been identified (Future Farming Rural Planning Group 2009). Even these approaches have been strongly contested (see, for example, National Party 2010) and identified as being misaligned with the "free-market" objectives of broader agricultural policy.

Arguments against planning for agricultural protection generally include that:

- Agriculture can, if necessary be a land market competitor if and when commodity prices allow.
- Substitutes for high-value land exist in the form of irrigation and other technologies.
- Development such as housing in rural landscapes is eventually reversible, allowing future agricultural use with the support of favorable market conditions (Bowie 1993; Wills 1992).

Planning policy in peri-urban Australia has also included a number of other objectives, often complementary, such as limiting the landscape and infrastructure impacts of scattered rural (nonfarm) housing. Moreover, changing water supply, transport costs, and climate mean that previous market decisions were not necessarily undertaken with an appropriate level of market knowledge about current and future value of a land resource.

In addition, the process of land use conversion exhibits external impacts and "threshold" effects, whereby remaining agricultural activities are affected by adjoining, incompatible land uses, as well as by the dilution of activities in industries (for example, dairying) where a critical level of local production is often necessary to support regional processing activities. Further, the fragmentation and conversion of rural land to nonfarm uses, and its sale through effectively nonfarm land markets, can render future reversion difficult, even if agricultural viability supports it.

Recent analysis of land sales in Victoria (Barr and McKenzie 2007) suggests a strong divergence in the characteristics and prices between small and larger rural land markets since the 1990s. Sales prices per hectare have doubled for properties under 20 ha, although there has been less significant change in sales prices for larger properties. The rezoning and subdivision of land into small lots is an intervention in the rural land market that may in fact remove it from farming use and farming land markets. By raising the price of rural land, it reduces the comparative ongoing viability of larger agricultural landholdings; limiting the capacity for increased property size in these areas, lowering the return on investment in relation to the value of the land asset, and increasing the capital return from development when compared to recurrent incomes from agricultural enterprises. There is tension between the planning policy inclination to protect land as a resource from nonfarm uses, with the aim of addressing impacts of land use, urban expansion, and the realities of private markets and public preferences.

## 29.6 Change in Melbourne's Peri-Urban Region

The peri-urban region surrounding metropolitan Melbourne has almost uniformly experienced growth in lifestyle development and a decline in the number of commercial farm businesses. This landscape-scale shift is connected to broad trends in

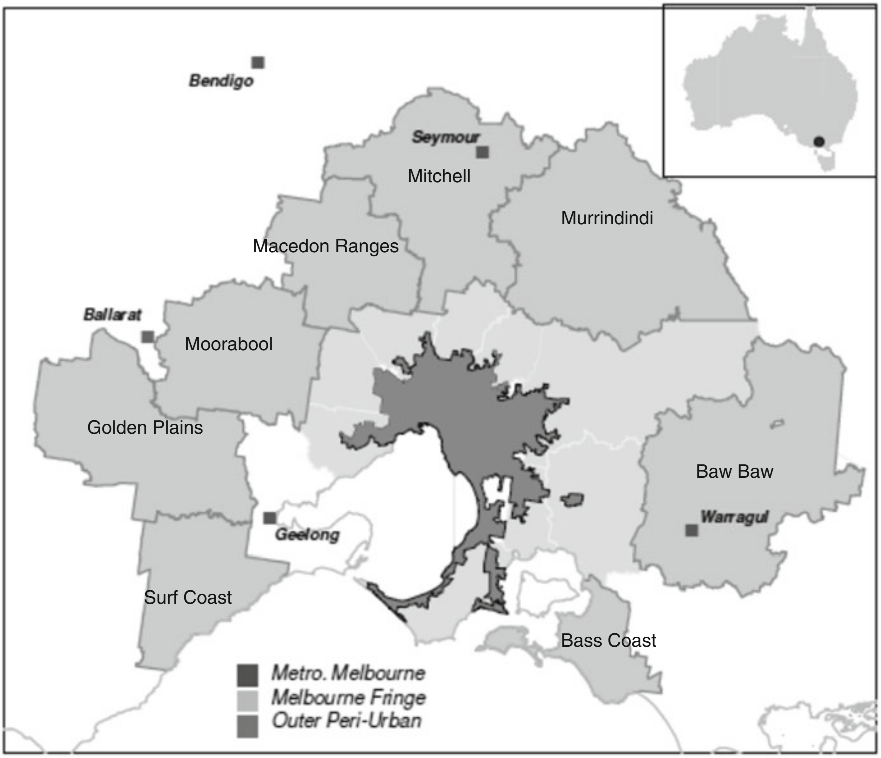



**Fig. 29.1** Metropolitan Melbourne and the inner/outer peri-urban region

agriculture and to pressures for new urban-type and rural lifestyle developments beyond the urban fringe (Buxton et al. 2009). Growth in population and housing in peri-urban Melbourne has occurred over several decades in both "greenfield" metropolitan fringe locations, and in (semi) rural locations beyond the fringe (see Fig. 29.1).

Melbourne's metropolitan population has increased by about 1% per year since the mid 1980s, with accelerating growth since a period of slow growth in the late 1990s (ABS 2007). Continued projected growth of up to 1.3% per year is anticipated to 2036, to over 5.5 million people (DPCD 2009). While a significant reversal of longer term trends has seen renewed population growth in inner-urban areas, outer metropolitan growth on the fringe remains the dominant development pattern.

Immediately beyond the metropolitan fringe (the inner peri-urban area), growth has occurred in and around smaller urban centers and across rural landscapes. In rural areas, the prominent process of change is the development of housing on comparatively small rural lots in rural areas—the development of post-agricultural landscapes. This form of housing development is a significant component of all new housing in many areas of peri-urban Melbourne, although urban growth is still important in many of the local government areas in this region (see Fig. 29.2 below).

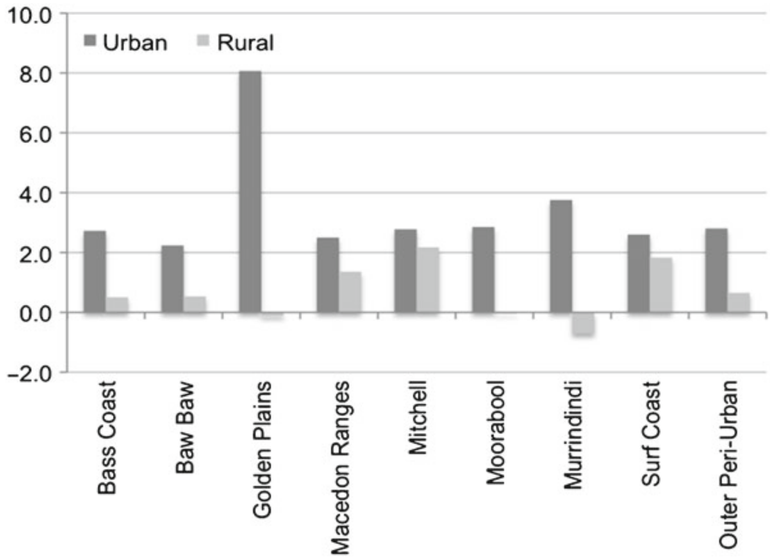



**Fig. 29.2** Annual Average household change (%) urban and rural—outer peri-urban Melbourne 1986–2006. Source: DPCD (2008)

Rural housing growth has generally resulted in scattered development on small properties. This growth has been considerable in recent decades, including development in areas where "rural lifestyle" estates have been developed intentionally, and where scattered development has occurred on existing small lots and properties that have been sold. Incremental development of this nature has replaced and displaced the previous farming patterns.

In Melbourne's outer peri-urban area, more than 5,000 new housing approvals were recorded in rural areas in the decade to 2007. However, over 75% of these approvals were on properties below the 40-ha threshold nominated by planning schemes to maintain agricultural holdings and prevent nonagricultural activities in rural areas (Buxton et al. 2009). Importantly, the spatial distribution of this housing development appears to have only a limited relationship with proximity to existing urban centers and infrastructure. The scattered nature of development suggests a range of housing markets where land availability and landscape are also drivers of development. These markets include development in rural settings that is not demonstrably different to fringe urban housing as well as the development of hobby farms, "bush blocks," and other forms of scattered rural housing.

At a policy level, the emergence of a defined and mandated urban growth boundary in the past decade and the protection of nominated "Green Wedges" on the urban fringe and inner peri-urban area has [despite the apparent transience of core elements of this policy (Birrell et al. 2005)], allowed for a degree of long-term clarity for the future management of specific non-urban places (e.g., key market-gardening and resource extraction sites). Beyond this immediate metropolitan fringe area, however, the level of competition between urban and agricultural use is less evident. Consequently, diffuse and scattered housing development has occurred in many locations, without the clarity and guidance of formalized growth boundaries, or clear market and policy competition between the stark choices of urbanization and rural retention.

The impact of housing development in rural areas on landscapes and infrastructure has been evident for some decades. This has been reflected in planning policy and objectives, but nevertheless development has continued. Clearly there has been regulatory failure in this regard. There is evidence of specific impacts on individual farm activities, such as the creation and maintenance of buffer areas where land uses conflict, but the evidence of impacts to farming systems are less obvious at a landscape and regional scale.

## 29.7 Farm Industry and Structure in Melbourne's Peri-Urban Regions

As identified by Houston (2005), Buxton et al. (2007) and Buxton and Goodman (2008), peri-urban agriculture is a significant source of output and enterprise, despite long-term trends in land use transition, dilution, and competition. Melbourne and its outer peri-urban region produced 16% of the value of agricultural output in the state of Victoria in 2006, a slight increase over the preceding decade (ABS 1983–2008).

While the high-value production of irrigated agricultural areas along the River Murray and grains production in the state's far west remain the focus of high-value commodity production, the varied production and enterprise structure of Melbourne's peri-urban region still maintains a significant share of agricultural output. Overall, the numbers of farm business in the Melbourne Statistical Division has declined whilst outer peri-urban regions have not declined (see Table 29.1).

From this perspective, the impacts of increased peri-urban population and landscape change would not be considered to be problematic. However, a closer analysis of the structure of farm businesses in these regions suggests that patterns of structural change within agriculture are leading to a less resilient industry.

The characteristics of Melbourne's outer peri-urban area's agriculture differ from most other areas in south-eastern Australia in two ways: in the predominance of

**Table 29.1** Farm businesses 1997–2007[a]

| | 1997 | 2001 | 2007 |
|---|---|---|---|
| Melbourne Statistical Division[a] | 2,609 | 2,704 | 2,297 |
| Outer peri-urban | 3,613 | 3,414 | 3,617 |
| Victoria | 35,346 | 34,283 | 32,648 |
| Outer peri-urban (% of Victoria) | 10% | 10% | 11% |
| Melbourne Statistical Division (% of Victoria) | 7% | 8% | 7% |

ABS 1983–2008 (for Melbourne Statistical Division 1997, 2001, 2005)

[a]The Melbourne Statistical Division includes the metropolitan area and inner peri-urban

small-scale farm businesses and in the high levels of extensive grazing activities. Both of these factors typify the region and suggest responses to processes of rural dilution and the consequences of industry transference. In the outer peri-urban region, there has been growth in broadacre farming businesses. The result is a problem in terms of ongoing region-wide output and industry viability, despite the stability apparent in comparative production levels indicated in the data. For example, the proportion (when compared to state wide data) and overall number of beef cattle has increased in the outer peri-urban region, whilst other livestock industries have declined, in both absolute and comparative terms. The exception is that of the poultry meat industry. However, it has experienced a contraction in business numbers and a consequent increase in scale in those remaining.

In contrast, the immediate Melbourne fringe (inner peri-urban region) has diverged from the outer peri-urban region in regard to agricultural trends. In the outer peri-urban region small-scale farms continue to proliferate, whilst in the inner peri-urban region there has been a contraction to fewer large-scale and high-value industries. For example, on the metropolitan fringe the scale of vegetable growing has increased over the decade to 2009, while the number of broadacre farming businesses (cropping and grazing) has declined. In the immediate Melbourne fringe area, activity became concentrated in fewer enterprises between 1997 and 2009, including:

- An overall decline in farm numbers of 20%.
- A decline of 16% (or 144) in broadacre farm businesses.
- A decrease in piggery numbers, but those with output of over $1 million per annum did not decrease in number.
- An increase in poultry meat producers at the large-scale.

Agriculture is significant in a few localized peri-urban areas; in some instances, it is a product of transference from the metropolitan fringe. Further dilution of agricultural activities will increase the likelihood of increases in scale, and lead to the need for locations where security of surrounding land use is available—generally these locations will be further from the effects of ongoing peri-urban development where activities such as poultry farming can operate at scale.

In peri-urban regions, the predominance of small farm businesses (turnover of under $100,000 per year) is greater than in Victoria overall. Some areas, such as the Macedon Ranges, north-west of Melbourne, are dominated by these farm businesses in terms of land use and industry structure. Similar land use is apparent in other peri-urban regions in Australia. Farms at this scale are likely to require off-farm income (which is common in Australian agriculture, see Gleeson et al. 2003) to support families and farm operators are unlikely to pursue strategies of reinvestment and restructure from within farm budgets. Of course peri-urban regions are ideally suited for mixed-income arrangements due to proximity to urban labor markets and for more diverse forms of farm income (e.g., tourism).

Industries including beef production and viticulture are strongly evident among small farm businesses in the region, particularly in the outer peri-urban region. Conversely, large-scale operations such as poultry production and specialized high

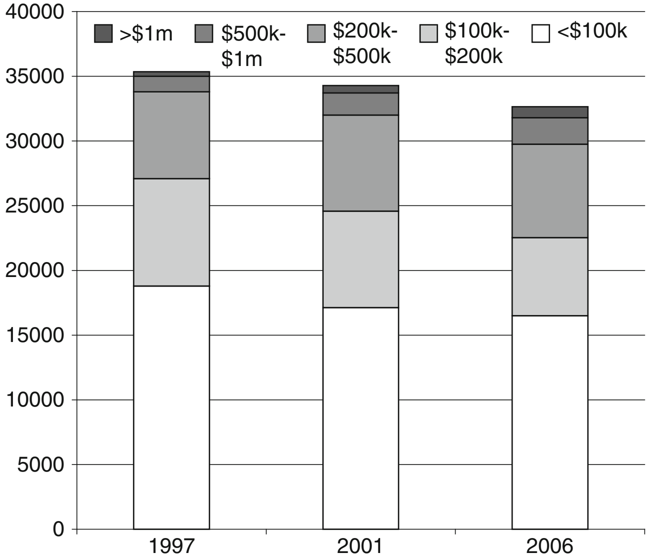



**Fig. 29.3** Farm businesses and annual farm turnover, Victoria, 1997–2007. Source: ABS (1983–2008)

value activities such as commercial flower-growing dominate turnover from relatively few businesses. Only dairying, particularly in outer peri-urban west Gippsland, offers an example of large numbers of high-turnover farm businesses in a single location. However, it is important in dairying to have clustering of activity and close proximity to processing facilities, and these characteristics contribute to the distinctiveness of regional dairying.

Although overall numbers of farm businesses have declined in Victoria since the 1990s, there has been a relative increase in the numbers operating at a larger scale (see Fig. 29.3). Conversely in Melbourne's outer peri-urban region, farm numbers have increased, as has the share of small-scale businesses (see Fig. 29.4).

In summary, the processes of restructure and change occurring elsewhere in agriculture are different to those occurring in peri-urban agriculture. The growing prevalence of small-scale farm businesses is consistent with the proximity of the region to off-farm income (and alternative on-farm income sources), and more competitive markets for land.

There are fewer large-scale businesses in the peri-urban region (in industries such as poultry, piggeries, and horticulture and to some extent dairying), but based on the 2006 Agricultural Census, these larger businesses have an average annual output up to ten times the average for the peri-urban region. Consequently, in Melbourne's outer peri-urban region close to 80% of all farm business contribute less than 40% of farm output, and a smaller number of businesses are involved in industries of comparatively high value, such as intensive animal industries including poultry and piggeries. Concurrently, agriculture in these landscapes is being

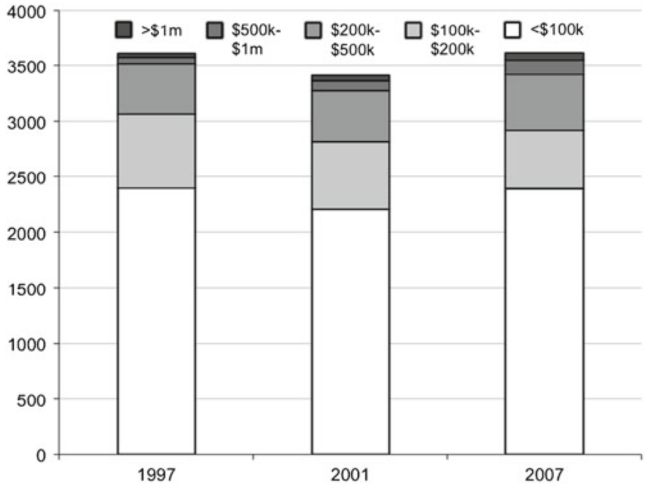



**Fig. 29.4** Farm businesses and annual farm turnover, outer peri-urban Melbourne, 1997–2007. Source: ABS Census of Agriculture (various)

marginalized by housing development on smaller lots (including on properties where some of this agriculture is occurring). Perhaps surprisingly, low-output agriculture includes both relatively low-investment activities (beef cattle grazing) and relatively high-investment activities (viticulture) that are potentially connected to local and regional processing, tourism, and other additional income streams.

In the inner peri-urban area, the process of change has resulted in fewer, but more concentrated activities, including locally economically valuable (and relatively high-output/employment) industries, such as vegetable growing and poultry meat. Dramatic reductions in extensive industries, including dairying, suggest a decline in landscape-scale activities and an increase in output from site-specific and individual intensive activities (both land-resource based such as horticulture and shed-based activities).

## 29.8 Dilution, Viability, and Risk

There are many potential meanings and consequences of the structures and trends in peri-urban agriculture. The continuation of agriculture, even with mostly small-scale activity, is broadly consistent with the planning objectives of maintaining rural land use in the region. Moreover, the capacity of small-scale farming to remain viable is enhanced in peri-urban regions, given potential access to urban employment and urban markets for on-farm diversification.

However, the fewer large-scale business remaining in outer peri-urban landscapes are in industry types where processes of rural dilution and land use change present potential for future conflict at the local level. This includes sites of activities such as shed-based poultry-raising and piggeries, and extensive dairying, which acts as an industry cluster and requires scope for further adjustment of farm holding to remain competitive at a national level.

What this perspective does indicate is that the future viability of peri-urban agriculture should be considered not only within the context of the overall production output and its value, but also as part of the pattern of agricultural activity, and the structure of industry and business. The emergence of a multifunctional rural landscape in Melbourne's peri-urban region has not, at this stage, resulted in a reduction of agricultural output; however, a structure has emerged that reveals a dilution of agricultural landscapes, and a reduction of opportunities for agricultural adjustment in many industries and locations.

At the fringe, urban expansion and the clear enunciation of boundaries (albeit with too-frequent amendment) appears to have provided an expectation of the retention of specific non-urban spaces, such as the Yarra Ranges, Werribee market-gardening areas, and (perhaps more tenuously) poultry meat production in the Mornington Peninsula and southeast. However, in the Mornington Peninsula and the southeast growth corridor, there are risks of future industry displacement, where land and buffers become difficult to retain and restructure. This contrasts with the trends evident in outer peri-urban areas, where the diffusion of small-scale enterprises within the landscape is a feature of dilution in a multifunctional region, and limits opportunities for industry restructure and wholesale industry relocation away from the immediate metropolitan fringe.

## 29.9 Implications for Landscape and Economic Change

There is no evidence of a decline in the net and relative agricultural output in the peri-urban areas. This is despite the long-term process of landscape change and settlement expansion at and beyond the metropolitan fringe. This is consistent with Houston's (2005) findings. However, the structure of agriculture is changing. The implications for production and for the scope for ongoing industry adjustment appear to include the concentration of production into fewer businesses at the inner peri-urban area and the dilution of agricultural activity within a multifunctional landscape in the extended outer peri-urban area. The consequences of these trends for food production in the city region are not immediately evident; however, there are long-term risks to farm viability for the extended area of the growing Melbourne metropolitan region, a region that has historically been a crucial food supply area. Land use planning in the peri-urban region has had limited success in offering certainty for ongoing commercial production. Although agricultural production remains, changing landholdings and activities across the region limit scope for industry relocation or expansion of individual businesses within the region. The proliferation of small commercial operations suggests only limited opportunities for production at a larger scale.

Maintaining rural landscapes and rural activities cannot, therefore, be considered as necessarily consistent with policy and strategy to maintain a regional agricultural (and food production) economy. Within contemporary agriculture, the flexibility required for effective adjustment and regionally competitive industry structure is fundamental, yet these are limited by the mosaic of smallholdings, non-farming housing development, and landscape (amenity) protection. These factors are critical areas of planning at the local level, in terms of policy responses and community decision-making. The tension between these factors suggests that we accept that future agricultural adaptability will be limited by competing values and land uses at the peri-urban interface.

Policy approaches to this dilemma should include either the retention of agricultural spaces, or the acceptance that opportunities for mixed-use agricultural economy that benefits from proximity to a growing city will have to be a trade-off with future flexibility for large-scale commercial producers. Alternatively, there may be a growing role for networks of small producers with access to off-farm opportunities in peri-urban agricultural production. Regardless of future directions for peri-urban regions, the lack of scope for adaptability created by the current diffusion of housing into rural landscapes raises critical concerns for the future food production capacity of the region. This introduces dilemmas for ongoing local food production in the peri-urban region, ongoing inter-regional dependence and exposure to environmental change and resource constraints in other regions of Australia. While the trajectory of food production and transport in recent decades has favored production at scale in more distant regions of Victoria, event such as prolonged drought and low irrigation water allocations, climate change risk, and future transport costs, suggest that scope for an adaptive and flexible production system within the broader metropolitan region (including the peri-urban region) should be maintained.

## References


ABARE. (2007). *Drivers of change in Australian agriculture*. Canberra: RIRDC (Publication No. 07/057).

ABS. (1983–2008). *Agriculture Census/Survey 1983–2008 (electronic database) Australian Bureau of Statistics*. Canberra.

ABS. (2007). *Census of population and housing 2006*. Canberra: Australian Bureau of Statistics.

ABS. (2010). *Agricultural commodities Australia 2008–09*. Canberra: Australian Bureau of Statistics.

Alexander, F., & Kokic, P. (2005). *Productivity in the Australian Grains Industry.* Report prepared for the Grains Research and Development Corporation. Canberra.

Argent, N., Smailes, P., & Griffin, T. (2007). The amenity complex: Towards a framework for analysing and predicting the emergence of a multifunctional countryside in Australia. *Geographical Research, 45*(3), 217–232.

Barlow, K., & Cocklin, C. (2003). Reconstructing rurality and community: Plantation forestry in Victoria, Australia. *Journal of Rural Studies, 19*(4), 503–519.

Barr, N. (2005). *The changing social landscapes of rural Victoria*. Tatura, Victoria, Australia: DPI.

Barr, N., & McKenzie, F. (2007). *Tree change in Victoria: Land Markets, Migration, Population, Non-Resident landowners and Farm business, presented at Managing Tree Change Conference, La Trobe University Beechworth. Australia, October 2007.*

Birrell, B., O'Connor, K., Rapson, V., & Healy, E. (2005). *Melbourne 2030: Planning rhetoric versus urban reality*. Melbourne: Monash University Press.
Bowie, I. (1993). Land lost from agriculture: A dubious basis for rural policy. *Urban Policy and Research, 11*, 217–229.
Brabec, E., & Smith, C. (2002). Agricultural land fragmentation: The spatial effects of three land protection strategies in the eastern United States. *Landscape and Urban Planning, 58*, 255–268.
Budge, T., Butt, A., Kennedy, M., & Buxton, M. (2012). *Does Australia need a policy to protect agricultural land?* Sydney: Australia Farm Institute.
Buxton, M. (2010). Land use planning and agriculture in Victoria. In T. Budge, et al. (Eds.), *The impacts of a localised food supply: What is the evidence?* Community Planning and Development Program La Trobe University. Bendigo, Australia.
Buxton, M., Alvarez, A., Butt, A., Farrell, S., & O'Neill, D. (2009). *Planning sustainable futures of Melbourne's peri-urban region*. Melbourne: School of Global Studies, Social Science and Planning, RMIT University Melbourne.
Buxton, M., & Goodman, R. (2008). Protecting Melbourne's green wedges—fate of a public policy. In M. Amati (Ed.), *Urban green belts in the twenty-first century*. Aldershot, UK: Ashgate.
Buxton, M., Tieman, G., Bekessy, S., Budge, T., Butt, A., Coote, M., et al. (2007). *Change and continuity in peri-urban Australia. Peri-urban case study: Bendigo corridor*. Melbourne: Land and Water Australia, Department of Environment and Heritage.
Champion, A., & Hugo, G. (2003). *New forms of urbanization: Beyond the urban–rural dichotomy*. Aldershot, UK: Ashgate.
Coggan, A., Harman, B., Langston, A., & Whitten, S. M. (2008). *Achieving sustainable land use on the sunshine coast former cane lands: Scoping solutions beyond planning*. A report for the Sunshine Coast Canelands Action Group Inc. CSIRO Sustainable Ecosystems. St Lucia, QLD.
Daniels, T. (1999). *When City and Country Collide: Managing growth in the metropolitan fringe*. Washington, DC: Island Press.
Department of Planning and Community Development [DPCD]. (2008). *Towns in time, department of planning and community development*. Melbourne: Victorian Government.
DPCD. (2009). *Victoria in future: Population projections 2006–2026*. Melbourne: Victorian Government.
Future Farming Rural Planning Group. (2009). *Improving rural land use: Independent report to the Minister for Planning*. Victoria: Department of Planning and Community Development.
Gleeson, T., Turner, C., & Douglas, R. (2003). *Beyond agriculture: Changing patterns of farm household income*. Canberra: RIRDC.
Gosnell, H., & Abrams, J. (2009). Amenity migration: Diverse conceptualizations of drivers, socioeconomic dimensions, and emerging challenges. *GeoJournal, 76*(4), 303–322.
Henderson, S. (2005). Managing land-use conflict around urban centres: Australian poultry farmer attitudes towards relocation. *Applied Geography, 25*(2), 97–119.
Holmes, J. (2002). Diversity and change in Australia's rangelands: A post-productivist transition with a difference? *Transactions of the Institute of British Geographers, 27*(3), 362–384.
Houston, P. (2005). Revaluing the fringe: Some findings on the value of agricultural production in Australia's peri-urban regions. *Geographical Research, 43*(2), 209–223.
Hugo, G. J., & Smailes, P. J. (1985). Urban–rural migration in Australia: A process view of the turnaround. *Journal of Rural Studies, 1*(1), 11–30.
Kirschenmann, F., Stevenson, G. W., Buttel, F., Lyson, T., & Duffy, M. (2008). Why worry about the agriculture of the middle? In T. Lyson, G. W. Stevenson, & R. Welsh (Eds.), *Food and the mid-level farm: Renewing an agriculture of the middle*. Cambridge, MA: MIT Press.
Low Choy, D., Sutherland, C., Scott, S. E., Rolley, K., Gleeson, B., Sipe, N., et al. (2007). *Change and continuity in peri-urban Australia: Peri-urban case study South East Queensland*. Nathan: Griffith University.
McCarthy, J. (2008). Rural geography: Globalizing the countryside. *Progress in Human Geography, 32*(1), 129–137.

McKenzie, F. (1996). *Beyond the suburbs: Population change in the major exurban regions of Australia, Bureau of Immigration Multicultural and Population Research*. Canberra: Australian Government Publishing Service.

Moss, L. (Ed.). (2006). *The amenity migrants*. Oxford: CABI.

Mullen, J. (2010). Agricultural productivity growth in Australia and New Zealand. In J. Alston, B. Babcock, & P. Pardey (Eds.), *The shifting patterns of agricultural production and productivity worldwide*. Ames, USA: Iowa State University.

Nelson, R., Brown, P. R., Darbas, T., Kokic, P., & Cody, K. (2007). *The Potential to Map the Adaptive Capacity of Australian Land Managers for NRM Policy using ABS Data*. CSIRO, Australian Bureau of Agricultural and Resource Economics, prepared for the National Land & Water Resources Audit.

Pritchard, B., Burch, D., & Lawrence, G. (2007). Neither 'family' nor 'corporate' farming: Australian tomato growers as farm family entrepreneurs. *Journal of Rural Studies, 23*(1), 75–87.

Smailes, P. (2002). From rural dilution to multifunctional countryside: Some pointers to the future from South Australia. *Australian Geographer, 33*(1), 79–95.

Vanclay, F. (2003). The impacts of deregulation and agricultural restructuring for rural Australia. *Australian Journal of Social Issues, 38*(1), 81–94.

Wills, I. (1992). Do our prime farmlands need saving? *Agricultural Science, 1992*, 25–27.

Wilson, G. (2001). From productivism to post-productivism and back again: Exploring the (un)changed natural and mental landscapes of European agriculture. *Transactions of the Institute of British Geographers, 26*(1), 77–102.

# Chapter 30
# Final Word: Australia's Food Security Challenges

**Quentin Farmar-Bowers, Vaughan Higgins, and Joanne Millar**

The problem of food insecurity within the Australian population, estimated at around 5%, appears relatively small. However, if we count in food related health problems, the reliance on fossil fuels, the progress of climate change, increasing population and urbanization, increasing globalization, the deterioration of agricultural land, as well as the decline of native biodiversity, the problem starts to look substantial. These issues are interrelated and constitute serious difficulties for what we can describe as Australia's social-ecological systems. Most countries have similar issues. Taking a systems approach in dealing with these problems would be helpful but people's different perspectives lead to different conclusions as to what represent 'good outcomes'. Perhaps a 'good outcome' would be improving inter- and intra-generational equity as this would lead to improving people's health across all communities in Australia, protecting natural capital and building the institutions that will secure all Australians' well-being in the coming decades. This book highlights some of the many issues as a 'starter' for further work, debate and action on food security and sovereignty in Australia, so the future will be measurably better than the present.

Australia, with its current surplus food production capacity, is very much a part of increasing globalization, trading about $28 billion in exports and $10 billion in imports in 2009/2010 (ABARES 2010). Australia also provides technical aid in agriculture for

Q. Farmar-Bowers (✉)
Deakin University, Geelong, Victoria, Australia
e-mail: quentin.farmarbowers@deakin.edu.au; q.farmarbowers@gmail.com

V. Higgins (✉)
School of Humanities and Social Sciences, Charles Sturt University,
Wagga Wagga, NSW, Australia
e-mail: vhiggins@csu.edu.au

J. Millar (✉)
School of Environmental Sciences, Charles Sturt University,
Albury, NSW, Australia
e-mail: jmillar@csu.edu.au

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8_30,

developing nations (ACIAR 2011). The challenge for Australia under globalization is twofold. First, to improve the efficiency in agriculture without reducing the resilience of food production in Australia and in its trading partners to shocks that may come from biophysical changes such as climate change and market changes such as increasing energy and fertilizer costs. Second, to use land and water in Australia for exports and home consumption in ways that maintain Australia's unique ecology for future generations (Brei 2012; Hamblin 2009; Whitney Sanford 2011).

Australia appears to have a relatively low level of food insecurity but the data are limited. There may be substantial food insecurity in particular groups within society (Radermacher et al. 2010; Russell et al. 2011; see also AIHW 2011 website). Improving information on food insecurity in Australia is essential for policy development and this ought to take into account the cultural diversity in Australia (ABS 2007) which Renzaho and Mellor (2010) have identified as a complicating factor. Australia also has a substantial level of food related health problems which appear to be getting worse (for preventable cancers see Baade et al. 2012). Given Australia's wealth and the skills of its people, the capacity to bring food insecurity levels in Australia to virtually zero exists, as does the ability to greatly improve food related health problems. As obligations under the social contract among Australians, these changes need to tackle the causes to ensure the improvements are self-sustaining. The challenges are to achieve food security in Australia, and start reducing food related health problems for all Australians within a set time frame.

Unfortunately, there are no easy answers and progress in food security and health-related problems in Australia require improvements across a wide range of issues including those identified in this book. Although many changes are taking place, it is not clear whether collectively these changes or "improvements" will meet the challenges involved in exporting agricultural products profitably and also effectively address food security and health-related food problems in Australia in a way that ensures important social and environmental values are maintained. What "improvements" are, depends on the perspective people have of these issues; different perspectives lead to different actions and eventually different outcomes. No single perspective is "right" as they all have value for different purposes.

A *financial or market based perspective* divides the different kinds of resources used in the supply chain for food production into those that operate in a market from those that do not operate in a market. This perspective has a profound effect on resource allocation decisions as it treats nonmarket issues such as biodiversity conservation, environmental protection, and social equity differently from issues related to trade and market development where financial values are more easily established. The market focus encourages an increase in the efficiency with which marketable goods and services are used. This can reduce the resilience of the food system. Resilience requires certain kinds of spare capacity, such as regulating and supporting ecosystem services in farming (Sandhu et al. 2012), to cater for adverse events. Various aspects of the supply chain such as agricultural production, international trade, and retailing are the major focus for decision making which leaves many of the nonmarkets aspects out of the decision process. Market focused decisions require the offsetting notion of fairness in order to be more inclusive of the range of people's interests.

A *fairness or egalitarian perspective* emphasizes conservation to protect the rights of future generations (inter-generational equity) and intra-generational equity to ensure all people have access to the food they need for health and well-being. Although many people, making their living in the food system, support nature conservation and social responsible activities to improve fairness in society, their actions are rarely seen as being sufficient by society (see Green 2010). Civil society interests range through every aspect of food, from animal welfare, providing food as emergency relief, to lobbying for healthier food products, content labelling and responsible marketing.

A *government perspective* is about creating order and control. Governments are active in providing regulations to make the market and the egalitarian approaches work. The government or hierarchical perspective provides the organizing and controlling aspect of social-ecological systems. Government actions are needed to facilitate the sustainability of markets and deal with food security and diet-related health issues within the frame of nature conservation and fairness.

Verweij et al. (2011 p. 20) suggest that the way forward requires the inclusion of these three perspectives (markets, fairness, and government) to develop "clumsy solutions" that cater for different perspectives and facilitate cooperation. They suggest that, *one simple measure of "success" (or lack thereof) is whether combinations of public policy, entrepreneurship, and citizens' activities have contribution to the alleviation of pressing, practical collective problems—without having caused the deterioration of any other such social ill.*

Cooperation between these three perspectives will be an ongoing struggle in which power and knowledge will be important. Looking forward, the changes that are occurring in the social-ecological systems indicate that "success" in this cooperative interaction is going to be important in preventing failures in the systems (Resilience Alliance 2010). Developing comprehensive mental models of the functioning of the social-ecological system would help provide an overview of the food supply situation in the coming decades and the points where it is most vulnerable to failure. These points may relate to climate change, climate change policies, (notably biofuels (Legge 2008)), population growth, increases in prices and reduced availability of resources, especially arable land, water, energy and fertilizers, and increasing inequity in society (ACOSS 2011; Godfray et al. 2010).

The mental models and scenarios can tell us about the changing issues but they do not provide a justification for change. People justify their actions (and non-action) in terms of ethics. Most people usually justify their action on the delivery of utilitarian value; people will approve action if the benefits are greater than the costs (greatest good for the greatest number) which leads to the creation of richer and poorer people in society. Alternative ethical systems of belief are used to justify actions on issues such as providing food aid to people and conserving biodiversity. These belief systems include human rights or rights based ethics (Brei 2012; Spash 1997) and care ethics (Held 2006).

Many individual solutions, although beneficial for the individual and often initially thought beneficial for everybody, have lead to changes in the larger systems that can have negative outcomes in the longer term. Irrigation in Australia, although greatly increasing agricultural production and being heralded as being thoroughly good for the nation, has degraded many natural systems and created salinity problems in some agricultural areas. Reducing the amount of water being used for irrigation from Australia's biggest river system, the Murray Darling Basin has become a substantial political problem (MDBA 2011). Expanding the frame of reference beyond the immediate concerns of the decision-makers in the food system is needed so that the various elements (such as biodiversity or poverty) relevant in the long term can be included in the decision process. The frame needs to be expanded in geographic scale and also in subject matter.

Literature about the need to expand the frame of reference in considering issues like the food supply system from technical or economic to include long-term social and environmental issues has been increasing over the years. The notion of sustainable development in the late 1980s provided a considerable and ongoing impetus to taking a longer term and wider view of development. Robertson (2000) highlighted the gap in the research between industrial agriculture and ecosystem ecology as a barrier to produce food and maintain biodiversity. He noted that interdisciplinary research work should aim to inform policy developers and also farmers with the aim of moving towards sustainable agricultural practices. Flora (2010) takes this further suggesting the importance of a systems approach that integrates ecological and production processes to create sustainable agriculture that supports local social and cultural relationships. Park et al. (2012) in their work in the Pacific Islands, note the value of context and local participation in developing ideas for regional level policy aimed at increasing the adaptive capacity of rural people in regard to climate change.

Food security is a quintessential transdisciplinary problem that, on a global scale, seems intractable despite international efforts. In Australia, changing the social-ecological systems to improve food security in ways that maintain biodiversity and improves equity will be a substantial task.

Progress on improving food security and related health issues is essential in terms of the social contract between government and people. Australians have a capacity to improve the outcomes for many of these issues in the next few years. Perhaps the immediate objective could be to improve food security not by using the single bureaucratic approach of welfare payments but by using approaches that will include other people's perspectives of the issues involved. It seems important to involve more people in resolving these issues and aim to do so in a way that enhances the dignity and well-being of those who currently, and are likely in the future, to experience food insecurity.

Ultimately the power to secure food security in the future resides in the ability of people to appreciate the problems and decide to collaborate. Unfortunately, there are no ready answers to apply. There are some good slogans such as "sustainable agriculture," "sustainable development," "soil health," "healthy foods," "food sovereignty," and "social equity," but what they mean in practice is very difficult to determine.

Debate is an important element in democracies, and the better all parties involved are informed the more likely the resulting decisions will lead to effective outcomes. A food literate population would likely provide the debating power necessary to alter all aspects of the food system. Increasing food education based on what people eat starting in primary school and continuing through to secondary school would be a good foundation (Weaver-Hightower 2011). Adults also need information on their current purchases which requires effectively food labelling and ongoing information and education.

In addition to influencing the food system through what people eat, many people have jobs that fall within or influence activities in the food system. The issues raised in this book provide an inkling of what people can do to help the food system develop in ways that overcome the health and security issues. For example, land use planners can work towards protecting quality agricultural land from development; people in the restaurant market can include healthy meals on their menus to stimulate the market for fruit and vegetables; retailers can reduce the relative prices of foods needed in a balanced diet; educators can teach healthy meal cooking and governments can give tax breaks for farmers' conservation efforts, support food sovereignty and mandate food labelling. Individuals can learn about good eating and vote for healthy foods by buying them and vote for politicians who support increasing equity in society. The list of what people can do immediately is endless and as people undertake more of these activities so they will generate more ideas of what further needs to be done. This book provides an indication of how wide and complex the issues around food security are; this is not an insurmountable difficulty but rather a call to food businesses, governments and civil society for action; an entrée so to speak.

## References

ABARES. (2010). *Australian Resource Statistics 2010.* Canberra, ACT: Australian Bureau of Agricultural and Resource Economics and Sciences. Retrieved April 10, 2012, from http://adl.brs.gov.au/data/warehouse/pe_abares99001762/ACS_2010.pdf

ABS. (2007). *2006 Census of population and housing, Catalogue No.2914.0.55.002*. Canberra, ACT: Australian Bureau of Statistics.

ACIAR. (2011). *Annual report*. Canberra, ACT: Australian Centre for International Agricultural Research. Retrieved April 10, 2012, from http://aciar.gov.au/files/node/14074/aciar_annual_report_2010_2011_full_version_pdf_21236.pdf

ACOSS. (2011). *ACOSS indicators of inequity, factsheet*. Australian Council of Social Services. Retrieved April 10, 2012, from http://www.acoss.org.au/images/uploads/ACOSS_Indicators_of_inequality_-_Media_Factsheet_28_March_2011.pdf

AIHW. (2011Website). *Health risk factors*. Australian Institute of Health and Welfare. Australian Government. Retrieved April 10, 2012, from http://www.aihw.gov.au/health-risk-factors-indigenous/

Baade, P. D., Meng, X., Sinclair, C., & Youl, P. (2012). Estimating the future burden of cancers preventable by better diet and physical activity in Australia. *Medical Journal of Australia, 196*(5), 337–340. Retrieved April 10, 2012, from https://www.mja.com.au/sites/default/files/issues/196_05_190312/baa11082_fm.pdf

Brei, A. T. (2012). Rights & nature; approaching environmental issues by way of human rights. *Journal of Agricultural Environmental Ethics,* First on line, published 11 March 2012. doi:10.1007/s10806-012-9385-z

Flora, C. B. (2010). Food security in the context of energy and resource depletion: Sustainable agriculture in developing countries. *Renewable Agriculture and Food Systems, 25*(2), 118–128.

Godfray, H. C., Beddington, J. R., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., et al. (2010). Food security: The challenge of feeding 9 billion people. *Science, 327*, 812–818.

Green, S. (2010). *Reap what you sow*: *Kellogg company global leader and ANU graduate John Bryant says the multinational corporation knows that what works in the fields also works for responsible management*. ANU Reporter, Winter 2010. Retrieved April 11, 2012, from http://news.anu.edu.au/?p=2117

Hamblin, A. (2009). Policy directions for agricultural land use in Australia and other post-industrial economies. *Land Use Policy, 26*, 1195–1204.

Held, V. (2006). *The ethics of care: Personal, political, global*. Oxford: Oxford University Press.

Legge, T. (2008). *The potential contribution of biofuels to sustainable development and a low-carbon future, Programme Paper*. London: Chatham House.

M-DBA, Murray–Darling Basin Authority. (2011). *Plain English summary of the proposed Basin Plan—including explanatory notes.* Canberra: Murray–Darling Basin Authority. Retrieved March 3, 2012, from http://download.mdba.gov.au/proposed/plain_english_summary.pdf

Park, S., Howden, M., & Crimp, S. (2012). Informing regional level policy development and actions for increased adaptive capacity in rural livelihoods. *Environmental Science and Policy, 15*, 23–37.

Radermacher, H., Feldman, S., & Bird, S. (2010). Food security in older Australians from different cultural backgrounds. *Journal of Nutrition Education and Behaviour, 42*(5), 328–336.

Renzaho, A. M. N., & Mellor, D. (2010). Food security measurement in cultural pluralism: Missing the point of conceptual misunderstanding? *Nutrition, 23*, 1–9.

Resilience Alliance. (2010). *Assessing resilience in social-ecological systems: Workbook for practitioners, Version 2.0*. Retrieved February 10, 2012, from http://www.resalliance.org/3871.php

Robertson, A. I. (2000). The gaps between ecosystem ecology and industrial agriculture. *Ecosystems, 3*, 413–418.

Russell, J., Flood, V., Yeatman, H., & Mitchell, P. (2011). Food security for older Australians. *Journal of Nutrition Education and Behaviour, 43*(2), e1.

Sandhu, H. S., Crossman, N. D., & Smith, F. P. (2012). Ecosystem services and Australian agricultural enterprises. *Ecological Economics, 74*, 19–26.

Spash, C. L. (1997). Ethics and environmental attitudes with implications for economic valuation. *Journal of Environmental Management, 50*, 403–416.

Verweij, M., Douglas, M., Ellis, R., Engel, C., Hendriks, F., Lohmann, S., et al. (2011). The case for clumsiness. In M. Verweij & M. Thompson (Eds.), *Clumsy solutions for a complex world, Governance, politics and plural perceptions* (pp. 1–27). London: Palgrave MacMillan.

Weaver-Hightower, M. B. (2011). Why education researchers should take school food seriously. *Educational Researcher, 40*, 15–21.

Whitney Sanford, A. (2011). Ethics, narrative, and agriculture: Transforming agricultural practices through ecological imagination. *Journal of Agricultural Environmental Ethics, 24*, 283–303.

# Index

**A**
Aboriginal
chronic illnesses, 347
land management practices, 206
Access to food
age-old connection, 370
loss of food lands, urban sprawl, 375
transport planning, 370
Adaptation
action cycles, 210, 211
agricultural activity, 427
carbon market, 356
climate change and mitigation, 180–181
incremental, 209
methods, 32
multifunctional rural landscape, 212
objectives, 359
possibilities and food security, 362
primary industries, 213
pro-active and re-active strategies, 206
season rainfall, 362
suburban, 318
yield reduction, 362
Adaptation action cycles action learning cycle, 211
Adapted species
Kangaroos, 353–354
landholders, 356
Adaptive capacity, 318
Ad-hoc
pattern, 406
rural/farming/conservation zones, 408
Advocacy
food security, human right, 114
networking/communication/education, 124–125
Agrarian question
contradictions, policy makers, 300–301
description, 299
food policy coalition project, 301
industrialization, 299–300
King Island, 302
measurable variables, 301
political economic tradition, 299
TNCs, 300
'wreckonomics', 299
Agribusiness development, outer suburban Melbourne, 416, 419, 420
Agricultural intensification, 208–209
Agriculturally Declining scenario, 402–403
Agricultural production, commodity
Australia, 175
climate change, 173, 178
Agricultural production/productivity
historical development, 206–207
using grains, 207–208
Agricultural Revival scenario, 402, 402–403
Agricultural subsidies
Australian farm prices, 238
macro-economic policies, 239
Agriculture, organic
conventionalization, 289
EU rural development programmes and funds, 289
food security, 288
legal requirements, 285
regulation, 290–291
Agri-food sustainability, King Island
agrarian question, 299–302
emancipatory question, 306–307
environmental question, 302–304
food question, 304–306

Q. Farmar-Bowers et al. (eds.), *Food Security in Australia: Challenges and Prospects for the Future*, DOI 10.1007/978-1-4614-4484-8,

Agri-food sustainability, King Island (*cont.*)
globalization and TNCs, 298–299
global value chain management, 297
Agro-ecology, 183
Agro-ecosystems
long-term sustainability, 190
natural capacity, 201
re-designing, 249–250
Agro-forestry
$CO_2$ sequestered, agro-forestry, 196
property and involved reforestation/afforestation, 196
AGTHE. *See* Australian Guide to Healthy Eating (AGTHE)
Allender, S., 71
Allen, P., 303
Allison, H., 302
Alternative agriculture, 252
Amenity
and heritage values, 419
tourism and values, 418
values and productive agricultural lands, 413
Amenity landscapes, 12, 325, 326, 401. *See also* Farming, rural amenity landscapes
Andersson, J., 421
Andrew, J., 250
Anthropocentrism
food security, 37
governments, 37
narrow world-view, 43
natural environment, 36
and steward-ship approach, 36
APPEA. *See* Australian Petroleum Production & Exploration Association (APPEA)
Appellation, 304
Arable land
developed countries, 189
non-food production, 189
in rainfall zones, 191
urban use, biofuel and forestry industries, 191, 192
ASFF. *See* Australian Stocks and Flows Framework (ASFF)
Asia, import *vs.* export, 174–175
Asner, G.P., 225
Associative economics, 133
Associativeness
multiple values and trade-offs, 135
and negotiation, 137
social learning and, 137
Attachment to occupation
and place, 211–212
primary industry stakeholders, 212
transformative change, 212
Attachment to place. *See* Attachment to occupation
Attencio, E., 300
Australia. *See also* Organic standards, EU and Australia
ACCC, 90
'efficiency logics', 89
food price inflation, 86
food security, 37
'Grocery Choice' web site, 90
Australian food exports. *See* Climate impacts, food production and export
Australian food producers
"adjustment", 180
broadacre farms, 180
climate change adaptation and mitigation, 180–181
energy industries, 181–182
open-market policies, 179
technological innovation, 179
Australian food security
descriptive scenarios to model simulations, 263–266
economic outcomes, 274–275
environmental and resource outcomes, 270–273
features, scenarios, 262–263
food availability (*see* Availability, food)
global and national context, 261–262
participatory stakeholder process, 260–261
sustainable and resilient food security, 275–278
Australian Food Sovereignty Alliance, 9
Australian Frontier and food security
coastal Aborigines, 159
indigenous people, 159,
pastoralism, 160
spearing cattle, 160
Australian Government
domestic food security response, 100
food security policy, 104–105
Food Security Strategy, 100
health and progress relationship, 99
nutritious foods, 100
Australian Grains Free Air CO2 Enrichment Experiment (AGFACE), 359–362
Australian Guide to Healthy Eating (AGTHE), 264–265
Australian Petroleum Production & Exploration Association (APPEA), 182
Australian remote indigenous communities
food security policy, 104–105
food supply, 101–104
health status, 98–99

population density, 97
remoteness, 98
strategic policy, 105–109
Australian Stocks and Flows Framework (ASFF)
economic outcomes, 274–275
fertilizer security, 273
food availability outcomes, 266, 269–270
fuel security, 272–273
modelling, 264
overarching indicators, 270–272
physical accounting relationships, 264
water security, 273
Availability, food
adjustment, control and DIY scenarios, 270
control, 266
domestic security, 270
drivers, 261
house-hold/population, 260
'net food availability', 266, 269
reduction, production, 270
Avery, A., 52, 53, 56

**B**

Bacchus Marsh (BM)
amenity values and tourism, 418
Avenue of honour, 418
'de-facto' food policy, 419
elms and 'rural landscape setting', 418
food-based tourism and off-farm income, 418
Moorabool, amenity and heritage values, 419
MSS, 416–417
PPV and REP, 417
sheer range, 417
Badgley, C., 288
Bailie, R.S., 98
Baker, D., 28
Baldacchino, G., 298, 301
Barling, D., 74
Barr, N., 326, 400, 401, 404
Batley, R., 64
Battisti, D.S., 225
Beef
cattle and meat sheep, 192
production, area grazed, 191
sheep meat, 187
weaner production, 198
Beef production, 435
Bernzen, A., 11
Berry, H., 56
Bertram, G., 301
Biodiversity
agricultural intensification, biodiversity and sustainable production, 208–209
impact of agriculture, 208
loss, 208
on-farm, 212
policy shift, 212
Biofuels
corn production, 181
'crime against humanity', 313
decentralized, 277
destruction, forests and conversion, farmland, 313
first-generation, 266, 270, 273
fossil fuels replacement, 181
increased production, 182
production, 313
second generation, 181–182
Biomass, 359–360, 361
Biotechnology, Australia, 179
Blay-Palmer, A., 117, 375
BM. *See* Bacchus Marsh (BM)
Boffa, J., 4
Bonanno, A., 298
Book-up systems, 102
Borras, S.M., 242
Broadacre
farms, 195
hypothetical mixed, 195
machinery and infrastructure, 196
productivity, 190
Brunckhorst, D., 50, 52, 57
Budge, T., 12, 13, 416
Bunce, M., 400
Burns, C., 24, 25
Burton, P., 13
Busicchia, B., 8
Butler, C., 54
Butler, C.D., 42
Butt, A., 14
Buxton, M., 13, 404–406, 434

**C**

Campbell, A., 326
Carbon
CFI, 194
climate change mitigation, 28
commercial and carbon forestry, 189
constrained environment, 188
dioxide equivalent, 196
greenhouse gas emissions, 193
low-carbon economy, 28
national/international trading scheme, 28
price/emissions trading, 196
Carbon economy, 181

Carbon emissions
  agriculture, 180
  CSG, 182
Carbon farming initiative (CFI), 180
Carson, R., 253
Center for Whole Communities, 300, 308
Certification system
  accredited, 283
  Australia, 293
  cost-intensive, 290
  logos, 292
  mandatory, 293
  schemes, 303, 308
  third party, 290
  value chain, 284
CFI. *See* Carbon farming initiative (CFI)
Change
  efficiency, substitution, re-design (ESR), 249
  impediments, 247
  incremental; transformative, 248
Change management, transformation
  barriers and facilitators, adaption, 212
  description, 211–212
  foreign sovereignty, food production, 212
  governance, 213
  local environmental knowledge, 213
Changing values
  biodiversity conservation, 1
  commodity markets and community expectations, 12
  globalization and people's, 6
  natural systems and biodiversity, 6
  social-ecological systems, 5
Chicago
  Cities, 374
  metropolitan planning strategies, 374
  sustainable local food, 375
Chiesura, A., 222
Chisolm, A.H., 238, 243
Choy, D.L., 13
Christopherson, S., 300
Cities
  commoditization of food and impacts on, 368–369
  and food, 367–368
  metropolitan planning, 373–376
Clancy, K., 370
Clapp, J., 298
Clark, J., 300
Clark, M., 315
Clay, E.J., 236
Climate change
  agricultural production, 1, 225
  anthropogenic, 188
  chronic food insecurity, 27–28
  domestic consumption, 208
  exotic species, 353
  food insecurity, 225
  and food production, 193–194
  food production, Australia, 209–211
  food system, 224
  freight logistics, disasters and transitory food insecurity, 30–31
  global population, 188
  greenhouse emissions, 26
  impacts, 9–10
  impacts food production, 32
  long-term trend downwards, 208
  mitigation food security, 28
  models, 359
  on native biodiversity, 1
  planning, South East Queensland, 420
  pressures, food production, 9
  rainfall, 224–225
  unabated pace, 205
  worst case, 420
Climate change adaptation and mitigation, Australia
  agriculture, 180
  CFI, 180–181
  "FarmReady" funds, 181
  Transitional Income Support Program, 181
Climate change strategy, 2009–2014, 390
'Climate change-taker', 236
Climate impacts, food production and export
  arable lands, 173
  Australian food producers (*see* Australian food producers)
  destinations, 174, 175
  farm and fish food production, 174
  farming and grazing expansion, 176
  fossil fuels, 177
  impacts, 177
  negative secondary effects, 177–178
  overview, Australian food industry, 175, 176
  PMSEIC, 175
  sustainable and resilient Australian food production, 182–183
  values, agricultural commodities, 174, 175
  wheat, beef, dairy and sugar production, 178
Climate security, 271–272
Climatic extremes, 239
Cline, W., 178
Coal seam gas (CSG)
  carbon emissions, 182
  climate change, 182
  production, 182
  underground, 182

Coast, Ord River Basin, 347
Coates, L., 11
Cocklin, C., 249
Collaborative supply program
 description, 149
 low cost innovation, 149
'Colonialism', 238
Colonization, Australia, 174
Common Agriculture Policy (CAP), 93
Common Fisheries Policy (CFP), 93
Communication, 90
Community empowerment, 162
Community engagement, 155
Community food sovereignty, 131
Community garden policies, 73
Community supported agriculture
 calculation, prices, 133
 CSA, produce box, 131
 depoliticization strategies, 130
 description, 130–131
 development, world capitalism, 129
 diversity, CSA, 132
 food sovereignty and sustainable agri-food systems, 131
 networks, 137–138
 privatization, 133
 producers and consumers, 132–133
 social and legal forms, CSA, 132
 socio-ecological systems, 129
 socio-ecological theory (*see* Socio-ecological theory)
 sustainable agri-food system, 130
Compact city, 320
Complex and non-linear food security, 53
Conacher, A., 255
Conacher, J., 255
Conflict
 ethical, 36
 human rights and ecological protection, 39–40
Consequentialist
 and deontological ethical approach, 42
 ethics, 44
 objections, judgments, 36
 theories, 35–36, 40–41
Constance, D., 11, 298, 302–304, 307
Consumer price index (CPI), 344–345
Consumers
 awareness, 292
 end, 292
 markets, 290
 trust, 284, 291, 292
Consumption
 goods and services, 272
 per capita food, 265
Continuous improvement cycle, 109
Cook, N., 13, 417
Cost, healthy diet
 basket cost, family types, 155–156, 158
 cross-sectional data, 158
 longitudinal data, LGA, 156
 median cost, 156
 VHFB, 155–158
Council diversity
 description, 69
 municipalities, 66–67, 69
Crespo, C., 241
Cribb, J., 247, 303, 305
Critical natural capital, 222
Crop models, 361–362
Cropping, 329
Crop yields, carbon dioxide ($CO_2$)
 adaptation, 359, 360
 adaptation possibilities and food security, 362
 AGFACE approach, 360
 crop modelling, 361–362
 FACE methodology, 360
 pests and diseases, 361
 temperatures and rainfall patterns, 361
 wheat and legume grain quality, 361
 wheat-field pea rotation, 361
CSG. *See* Coal seam gas (CSG)
Custers, M.H.G., 57

**D**

Dairy farmers
 land management, 330
 optimism, future, 330
 succession planning, 330
Davison, A., 319
Decision making
 adaptation actions, 211
 agricultural sector, 206
 broader community, 210
 'double-loop learning', 207
 primary producers, 208
 and risk management, 209–210
Declaration on future food
 NSW Parliament House, 119
 SFFA, state's food supply, 119
Declining production, 177, 178
Deficit, food, 277
de Groot, R., 222
Demand side, 103
Denis, E., 400

Densification
  inevitable, population growth, 322
  market driven compaction, 322
  urban, 320
Deontological
  and consequentialist ethical approach, 42
  ethics, 44
  objections, judgments, 36
  theories, 36, 40
DEOs. *See* Desired environmental outcomes (DEOs)
Depoliticization
  local production, 130
  motivation, 130
  socio-ecological systems, 130
  strategies, 130
Deregulation, 213
Desired environmental outcomes (DEOs)
  development approval process, 386
  Gold Coast development, 386
De Zeeuw, H., 393
Dibden, J., 288
Diet, nutritious
  per capita diet proportions, 265
  settings, 267–268
Diet related health problems
  in developed nations, 4
  personal concerns, community, 3
  unbalanced diet, 4
Disasters
  description, 28–29
  freight logistics and transitory food insecurity under climate change, 29–31
  human disease pandemic, 29
  market efficiency, 29
Disease pandemic. *See* Disasters
Diversification
  farm, 429–430
  on-farm, 437
Dixon, J., 54, 58
Domains
  compatible and incompatible land uses, 386
  controls, 387
  descriptions, 386
  land use, 386–387
  LAPs, 386
  maps, 387
  rural and park, 392
Donald, B., 117
Donated food
  ER sector, 147
  foodbank Victoria, 146
  percentage, 148
Double-loop learning, 207, 211
Doughton, J., 399
Drivers of change. *See* Social-ecological systems
Drought
  Moorabool, 416
  period, water scarcity and long-term, 420
  Pyke's Creek Reservoir, 421
Duchemin, E., 57
Dutreuil, L., 92

**E**
Earth rights, 39
Eco-civic regionalization, 57–58
Eco-efficiency, 207
Ecological
  damage, 39
  economics, 40
  obligations, 46
  per capita consumption, resources, 43
  protection, 39–40
  stewardship responsibilities, government, 45
  values, 40
Ecological values, 40
Economic neutralisation, 242
Economic role of food
  food's contribution, 371
  transport, 371
Economics
  commodity system, food production, 302
  ecological, 40
  'economic law', 299
  market-based, 40, 45
Ecosystem services, 222
E4H. *See* Victorian Environments for Health (E4H)
Eksvärd, K., 251, 256
Electric vehicles, 268, 272, 273
Elitism, 117
Emancipatory question, 306–307
Emergency relief (ER), 144
Emergency relief (ER) sector
  description, 143
  foodbank operations, 143–144
  food insecurity in Victoria, 147
  offered and accepted, 145
  poverty and emergency relief, 144–145
  role of organisations, 145
  source, food, 147–149
  use food, 146
Emissions
  agricultural greenhouse gas, 194
  and $CO_2$ sequestration, 196
  costs, price, 194
  global anthropogenic, 193

greenhouse gas, 188
nitrous oxide, 193–194
Engels, B., 145
Enteric fermentation
in sheep and cattle, 196
and waste management, 197
Enterprise-scale, land use
base-case farF/mixed farm 1, 197
changing enterprise mix effects, 196
climate and soil condition, 199
description, 195
FarmGAS calculator, 197
farm residence, 200
farm scenarios, 197
financial and greenhouse gas emissions, 199, 200
hypothetical mixed broadacre farm, 195
nutrient density/dietary requirements, 199
production and gross margin, 198
specialist livestock, 201
Entrepreneurship, 299, 301
Environment
and carbon-constrained, 188
damage, 38
degradation, 36, 38
ethicists, 36
ethics, 36
impacts and human nutrition needs, 188
justice issues, 39
obligations, 38, 43
philosophers, 36
Environmental degradation, 183
Environmental question, 302–304
Environmental/resource issues
climate change, 261, 262, 273
fertilizer, 273
greenhouse gas, 271–272
oil, 272–273
population growth, 261, 262
water, 273
Ericksen, P., 22, 23
Essential service, 101–102
Ethical dimensions
ecological protection, 39, 40
global biodiversity decline, 37
human right, 39, 40
market-based economics, 40
national food security, 37
proposed solutions, problem, 40–46
proximity, 38
standard minimalist ethical principle, 38
Ethical foodscapes, 58–59
Ethical value, 40
Ethics, food security
academic discipline, 35
anthropocentric and stewardship approach, 36
consequentialism and deontology, 35–36
EU. *See* European Union (EU)
European settlement, 206
European Union (EU)
accredited control bodies worldwide, 286
public funding, 293
regulation, organic farming, 283–285
rural development programmes, 289
Evaluation
deontological, 43
ethical, 35
External drivers
community-based initiatives, 133
food-related problems, 6
innovation trajectories, 225
External institutional context
council diversity, 66–67, 69
legislative context, 68–69

**F**

Farmar-Bowers, Q., 10
Farmers
agricultural production, raw materials, 289
associations, 284
food security and environmental sustainability, 116
networks, 114
organic, 284, 286, 287, 291
sheer inability, 115
smallholder, 290
training, 291
Farmers' markets
diversity, food production, 332
tourist trade, 329–330
Farm exit, 239
FarmGAS calculator
emissions factors, 197
and greenhouse gas emissions, 197
Farming, organic
Australia, 289
conventional land management, 289
environmental sustainability, 289
EU regulation, 283–285
food security, 288
Farming, rural amenity landscapes
Federal government, 335
food production, desired land use, 332–334
food-productive area, farmer, 329–331
food security, 334–335
land use policy and rural planning, 326
local government perspectives, 331–332
local produce and landscapes, 334

Farming, rural amenity landscapes (*cont.*)
  market demand, 325
  methodology
    farmer interviewees location, 328
    Indigo Shire location, 327
    interviewee sectors, 328
    qualitative case study approach, 327
  rural subdivision, 326
Farm viability
  industry sustainability, 430
  long-term risks, 438
  regional-system and farm-business scale, 427
Farrell, D., 106
Farrelly, E., 317
Fertilizer security, 273
Fischel, W.A., 399
Fitzgerald, G., 359
Fitzgerald, S.M., 254
Flora, C.B., 446
'Food 2030', 91
Food access
  Food Access and Security Policy Development project, 65–67
  mapping, 73
  security related principles, 68
Food accessibility, remote indigenous communities
  money management issues, 102
  roads, terrain and weather hinder food transportation, 102, 103
  socioeconomic status, 103
Food and Health
  London plan, 371
  and metropolitan strategic planning, 372–373
  sustainable supplies, 371
Foodbank
  concept, 143
  ER sector, 143
  food and material aid products, 143
  operators, 149
  Victoria, 144
Food business, 101–102
Food citizenship, 125
Food Connect
  AFSA, 137
  city cousins, 135
Food costs
  remote areas, 101
  remote northern Australia, 103
  transport logistics, 101
Food democracy
  food security, food sovereignty, 115–116
  in policy-making, 121
Food deserts, 224
Food equity and access
  Australian Frontier and food security, 159–161
  cost, healthy diet, 155–159
  CSA, 9
  description, 7
  E4H, 154
  ethical dimensions, food (in)security, 7
  grassroots movements, 8–9
  indigenous communities, 8
  local government involvement, security, 7
  MPHP, 154
  SecondBite, 167–169
  security (*see* Food security)
  SFFA, 8–9
  short-term nature, projects, 8
  TFARC(*see* Tasmanian Food Action Research Coalition (TFARC))
  VLGA, 154
Food insecurity, 52–53
  Australia, 444, 446
  Australian population, 443
  characteristics, 25
  chronic food insecurity under climate change, 27–28
  contextualization, 54–55
  description, 24
  disasters and transitory (*see* Disasters)
  freight logistics (*see* Freight logistics)
  interconnections, 52–53
  intergenerational implications, 56
  low level and data, 444
  mobility restrictions/physical infrastructure, 25
  NNS statistics, 24
  poverty, food insecurity and obesity, 25
  in remote indigenous communities, 25
  SecondBite, 168
  single parent households, 24
  substantial, 444
  urban development, 343
  in Victoria
    ER, 147
    shortage, reliable information, 147
    Victorian Health Departments annual heath survey, 147
Food movements
  atypical food movement, 126
  in civil society, 118
  country/state/city's food system, 122
  "umbrella" organization, 115
Food plants and food security
  aboriginal people, 357
  *Acacia* species, 358
  'bush tomato', 357

industries, 357–358
'industry goals', 358
*Macadamia* species, 357
native food industry, 358
quandong, 357
Food policies
description, 120
food policy-makers and institutions, 121–122
NSW food policy, essential elements, 121
Toronto food policy council, 121–122
Food policy council
description, 122
state-wide responsibility, 119
Food price inflation control
agricultural planning, 79
international food crises, developed economies, 82–88
international food price surge, 80–82
policy, 79
policy responses, developed economies, 88–93
Food prices
FAO index, 2
inflation, 8
volatility, 2
Food production
capacity, 375
climate change policies and, 193–194
description, 187–188
distribution and sale, 392
domestic consumption, 187
and export
Australian food industry, 175, 176
colonization, 174
commodity groups, 174
destination, agricultural exports, 174, 175
"peak oil", 177
soil erosion and salinization, 176
values, agricultural commodity, 174, 175
water extractions, 176
farm, 188
financial/market based perspective, 444
global context, 188–189
healthier, 445
land use(*see* Land use)
and marketing, 393
metropolitan-scale land use, 370
metropolitan-scale planning, 369
planning scheme, 390
policy and trade
adjustment and control, 11
animals in food production, 353–356
climate change, agriculture, 9–10
crop yields, $CO_2$, 359–362
food plants and food security (*see* Food plants and food security)
food security and health, 10–11
global food "shocks" and economic decisions, 11
"harvest of the suburbs", 12
research and development, 10
resilient and sustainable food systems, 11
social-ecological system, 10
urban food security, 12
in Western Australia, 12
productivity growth, Australia: (*see* Productivity)
prohibitive policies, 384
quality soil resources, 368
recycling and reuse, 390
resilience, 444
security, 188
self-reliance, 370
supply chain, 444
surplus, 443
Western Australia
boom draws and cost, 340
GFC and productive agricultural land, 343
horticultural production, 347, 348
hydrology and transport links, 343–344
metropolitan planning guidelines, 343
mineral resources, 348
mining and farming, 342
Perth urban fringes, 340
population growth and wealth, 347
potential consequences and scarce resources, 340
and security, 340–341
The State and Commonwealth governments, 348
transportation costs and adverse climatic conditions, 343
urban, 341–342
yield gap, regions and countries, 188
Food retail
distribution in light, 88
French approach, 80
industry-wide profit, 58
National Food Policy Working Group, 90
options, 73
Food scandals, 282, 290
Food security. *See also* Remote communities and food security
agricultural assets, 240
agricultural production, 2
agri-food business and privatization, 82
agro-climatic fundamentals, 236
agro-ecological conditions, 237

Food security. *See also* Remote communities and food security (*cont.*)
  Australian Frontier, 159–161
  Australian policy and legislative position, 235
  ‘capital-rich, natural resource-poor nations’, 238
  chronic famine and mal-nourishment, 2
  climate change, 59, 236, 315
  climate change and mitigation, 194
  climate change mitigation, 194
  Community Food Security Coalition, 300
  complex and non-linear, 53
  components, food system, 22, 23
  concept, 22
  cost, healthy diet, 155–159
  definitions, 22, 106–107, 221
  description, 1–2, 219, 235
  diet-related health, 445
  dispossession of agrarian lives, 239
  drought, flood and disease, 236
  employ professional practitioners, 220
  ‘environmental refugee’ crisis, 236
  environmental security and sustainability, 23
  ethical dimensions (*see* Ethical dimensions)
  ethics, 35–36
  farm land, 239–240
  food chain, 219
  food equity and access (*see* Food equity and access)
  food policy coalition project, 301
  food price volatility, hunger, 2
  and food production, 340–341
  food production, policy and trade (*see* Food production, policy and trade)
  food sovereignty, 307
  and food sovereignty (*see* Food sovereignty)
  foreign interests, 239
  global crisis, 236
  global scale, 446
  government policy
  growth and distribution of incomes, 238
  health-related problems, 444
  human needs, 221–222
  innovation trajectories, 227–228
  intervention, 108–109
  land use planning, 12–14
  model, 50–52
  national economy, 240
  national food plan, 229
  organic agriculture, 288
  peri-urban spaces, 422
  production and prices, 22
  productivity and sustainability, 311
  progress, 99–100
  public policy, 228–229
  quality of life and, 316
  research needs, 220–221
  small population, 238
  social-ecological system (*see* Social-ecological systems)
  social equity, 314
  systems approach, 223–224
  systems/resilience approach, 223
  technological sophistication, 237
  transnational investment, 240
  transnational purchase, 237
  UK, 81
  utilization, access and availability, 23
  value chain governance, 282
  volume/energy, 188
Food security and soil health
  global human population, 247
  government, 255
  hybrid possibility, 252–254
  multidisciplinary and trans-disciplinary thinking, 256
  pest/disease management, 255
  re-designing agroecosystems, 249–250
  substitution, 254–255
  sustainability, 248
  sustainable soil management (*see* Sustainable soil management)
Food security-determinants
  COAGs NRIFSS, 106
  food supply, 106
  model, 106, 107
  remote indigenous communities, Australia, 106–107
Food security model
  affordability, 51
  distribution, 50
  equitable access, 50, 51
  interconnected systems, 51, 52
  layers, 50
  production, 50
  seed, 50, 51
Food security policy
  Australian, 104–105
  Darebin City Council, 72
  government responses, 100
  health agencies, 99
  Maribyrnong City Council, 72
  principles, 68
  responsibility, 64
Food security principles
  community garden policies, 73
  council policies, 68

higher level support, 71
individual municipal policies, 65
local government, 65
MSS, 72
relationship building, council departments, 70
resources available, 71
sustainability, 74
timeframes, 70
Food security research
food security, 220
needs, 220–221
systems approach, 223–224
Food security responses, 72–73
Food sovereignty
Campestina movement definition, 5
consequence, natural forces, 5
definitions, 3
diet-related health problems, 3
financial wealth and a food-rich nation, 6
food-related health problems, 5
and food security sustainability, 6
morbidity and mortality, 4
obesity and diabetes, 4
ordinary citizens, 4
poverty and hunger, 4
social-ecological systems adjustment, 6
supply chains, 5
Food strategies
London Mayor's, 371
metropolitan planning strategies, 374
Food summit
debated proposals, 119
declaration proposals, 119–120
description, 118
SFFA, 119
time, action, 120
Food supply chain
description, 23–24
intermodal hubs, 24
tax income, groceries, 24
Food supply, remote communities
business/essential service, 101–102
capacity, access food, 102–103
demand side and supply, 103–104
transport, 101
Food supply system
social-ecological system, 445
technical/economic, 446
Foreign Investments Review Board, 235
Foreign ownership
description, 5
food supply chains, 5
Foreign surplus/debt, 264, 275
Forster, C., 317
Foskey, R., 7, 49, 52
Fossil fuels
Australian agriculture, 177
replacement, 181
Framing for research. *See* Food security
France
CAP and CFP, 93
food price inflation, 84, 87–88
market concentration, 92
Franco, J., 242
Freight logistics
description, 25–26
food supply chain, 26
heavy vehicle use, roads, 27
intermodal terminal infrastructure, 26
policy reform and investment, 26
road and rail pricing, 27
transport and logistics industry, 27
transport infrastructure, 26
Friedmann, H., 303, 304
Fuchs, D., 298
Fuel security, 272–273
Full cost recovery, 243
Future scenarios, 11, 398

**G**

Galland, L., 92
Gallent, N., 421
Gallico, T., 371
Gargan, J.J., 64
Garnaut, R., 1, 31
Gaynor, A., 311, 320, 370
Gazey, C., 250
GDP
marginal growth, 275
per capita, 274
General Agreement on Tariffs and Trade, 241
General Agreement on Trade in Services, 241
Ghosh, S., 319, 320
Girardet, H., 318
Gittens, R., 303, 304
Gleeson, B., 12, 420
Glipo, A., 5
Global environmental obligations, 38, 43
Global financial crisis (GFC), 343
Global food crisis, 173
Global food supply, 31
Globalization
Australia's agricultural production, 225
international markets, 220
resilience, food production, 444
and social values, 224

Globalization (*cont.*)
and TNCs, 298–299
use land and water, 444
Global justice, 7
Global value chain, 281, 282
Global warming
diabolical challenge, 314
and resource depletion, 316
and resource insecurity, 312
warming's scarifying capacity, 314
Gold Coast. *See also* Urban agriculture
climate change, 391–392
in South East Queensland, 391
Gold Coast City Council
strategies, plans and programs, 389
urban agriculture, 387, 389
Gold Coast planning system
agriculture-related land uses, 391
analysis, 394
described domains, 387
LAPs, 387
2003 scheme, 386
Goodenough, R., 400
Goodman, R., 434
Governance
City, 372–373
formal launch and activities, 117–118
management and organizational structure, 123
mechanisms, 372
metropolitan planning and infrastructure provision, 372
systems, 52
volunteers/leadership/management, 123–124
Graham, S., 419, 421
Greenhouse gas
carbon footprint, 196
emissions, 193
emissions and $CO_2$ sequestration, 196
Grindle, M., 64
Grocery Supplier Code of Practice (GSCOP), 91
Gross margin
description, 196
estimation, 198
Growth management strategies
paradigm, 409
planning policies, 402
sustainable landscape, 409

**H**

Hails, R.S., 253
Hall, T., 370
Halsey, L., 400
Harder, S., 13, 419, 420
Harmonization, 293–294
Hart, J., 399
Harvest, suburbs
Australian Greenhouse Office, 315
Australia's population growth, 316
climate heating, 315
compaction and resilience, 321–22
CSIRO, 316
description, 311
food vulnerability, 316
global warming, 314
heartlands (*see* Heartlands, suburbs)
heighten health morbidities, 315
potential food productivity, 312
traditional rural regions, 317
urban assessments, 316
urban food vulnerability, 313–314
urban World, 312–313
warming process, 315
world food production, 315–316
Haslam McKenzie, F., 341
Hassanein, N., 116
Head, L., 319, 320
Healey, P., 419, 421
Health promotion projects
demographic summary, municipalities, 66–67
*Food Access and Security Policy Development* project, 65
food security principles, 65
VicHealth *Food for All* program, 65
Heartlands, suburbs
ACF, 317
elite cultural circuits, 317
farming nuisances and private property rights, 321
food insecurity, 318
low-density urban development, 317
metropolitan commissions, 321
resource resilience, 320
social resources, 319
suburban agriculture, 321
suburban food production, 320
suburban soil, 320
suburbia, 318
sustainability and resilience, 318
urban water crises, 319
Henry, B., 9, 10
Hierarchy of needs
agency, 228
food security, 229
Higgins, V., 281, 287
High quality land, 429

Hilderbrand, M., 64
Hillel, D., 251, 255
Hillier, J., 417
Hill, S., 249, 250
Hirschhorn, J., 317
Hobbs, R., 302
Hollaway, G., 359
Holmgren, D., 319, 320
Horne, D., 317
Horticulture, 328, 330
Household self-provision, 319
Housing growth
  population, 425
  rural, 433
Houston, P., 341, 398, 405, 414, 434, 438
Howden, S.M., 210
Howe, J., 383
Human needs
  food security, 221–222
  social arrangements, 222
Human rights
  adequate food, 39
  earth rights, 39
  and ecological protection, 39–40
  economics, 40
  ethical claims, 39
  global, 38, 43, 46
  international obligations, 39
  reproductive freedom, 45
Hybrid approach
  agricultural sustainability, 253
  alternative and conventional agriculture, 252
  calcium and boron, 254
  EcoFINDERS, 254
  reliance, biocides, 254
  soil building, 252
  soil improvement practices, 252
  soil life, 253
Hybridity
  relations, co-dependency and co-constitution, 421
  rural, 416

**I**

Ikerd, J., 307
Imports
  lower consumption, goods, 275
  oil, 270
  organic product, 291
  phosphates, 270, 271
  regulations, organic produce, 291–292
  strategic resources, 274
Income inequity, 224
Income management
  disadvantages, 105
  food BasicsCard, 108
  NTRE evaluation, 105
Increasing rural population, 329, 335
Incremental housing development, 406, 408
Indigenous
  food insecurity, 25
  fruit and vegetables, 347
  health status, 98–99
  and non-indigenous Australians, 25
  remote community
Indigenous communities
  disadvantages, 4
  disproportionate burden, 8
Indigenous remote communities. *See* Australian remote indigenous communities
Infrastructure
  government emergency, 21
  network, intermodal hubs, 24
  transport, 25
  vulnerability to chronic food insecurity, 22
Innovation
  existence, 301
  RIS, 300
  wind energy, 304
Innovation trajectories, 227–28
Instrumental value, 35, 36
Integrated policy and planning controls, 408–409
Intensification
  expansion, production, 190
  pig and poultry production, 192
  of production, 190
Intensive agriculture, 427, 437
Interdisciplinary conversations, food in/security
  complex and non-linear food security, 53
  contextualization, 54–55
  dialogue, 52
  eco-civic regionalization, 57–58
  ethical foodscapes, 58–59
  food security model, 50–52
  interconnections, 52–53
  intergenerational implications, 56
  local food production benefits, 56–57
  production, marketing and food choice, 55
Intermodal terminals
  food supply chain, 24
  infrastructure and regulatory problems, 25
  terminals, 26–27
Internal institutional factors
  higher level support, 71
  relationship building, council departments, 70
  resources available, 71
  timeframes, 70

International Assessment of Agricultural Science and Technology Development (IAASTD), 182, 183
International food crises, developed economies
  Australian national food plan, 82
  corporate food regime, 82
  European Commission, 83
  food price inflation, 85
  indexes, 82–83
  local food production, 84
  price development, food supply chain, 83–84
  price transmission, 82
International food price surge
  Australia, 86
  FFPI, 80–81
  food regime analysis, 81
  France, 87–88
  'globalization project', 81
  inflationary trends, 82
  national food self-sufficiency loss, 82
  statistical data, 81
  United Kingdom, 86–87
Inter-sectoral approach, 64
Intervention
  ranking, 107, 108
  selection, 108
Intrinsic value, 35, 36
Irrigated agriculture, 434
Irrigation
  decrease of, 270
  reliability, 265
  water extraction, 273
Irrigation infrastructure, 239

**J**
JB swift, 304
'Just-in-time' logistics. *See also* Freight logistics
  description, 29
  logistics structures, 29
  movement of freight, 32

**K**
Kaufman, J., 370
Kaufman, J.L., 383
Kettings, C., 4
King Island. *See* Agri-food sustainability, King Island
Kirkpatrick, J.B., 248
Kirschenmann, F., 428
Koch, A., 251, 252
Koning, N.B.J., 188
Kraemer, C., 400

**L**
Labour
  casual and short-term, 343
  input, 57
  and land, 340
Landscape and institutional fragmentation, 403
Land-use
  change, 265
  description, 194–195
  enterprise-scale (*see* Enterprise-scale, Land use)
  food production, 270
Land use planning
  Australian metropolitan areas, 13
  description, 12–13
  and food production, 334
  and food system, 370–371
  government, industry and civil society, 14
  local planning scheme, 13
  needs, city, 368
  planning systems and food production, peri-urban regions, 13–14
  and strategic planning, 370
Land use planning framework. *See* Urban agriculture
Lang, T., 115, 116, 120, 126
LAPs. *See* Local Area Plans (LAPs)
Larbi, G., 64
Larsen, K., 199
Lavelle, P., 253
La Via Campesina, 115
Lawrence, G., 9, 10, 299, 305
Leadership, 71, 73, 75, 123–124, 164, 320
Legislative context
  Planning and Environment Act 1987, 69
  policy formulation, 68–69
  Public Health and Wellbeing Act 2008, 69
'Lifestyle' landowners, 326
Limitations, local government capacity, 73
Lindberg, R., 168
Livestock
  and crop production, 195
  industries, 192
  on natural grasses, 189
  products, 189
Lobell, B., 237
Lobell, D.B., 225
Local Area Plans (LAPs)
  analysis, 393
  desirable land use, 393

development, 387
domains, 386
Gold Coast City, 387
policies and local laws, 394
proportion, urban agriculture-related land use, 387, 389
Local Food for Local People (LFLP), 132
Local food production, 56–57, 326, 333, 334, 373
Local government capacity
'departmentalism', 74
diverse responses, food security incorporation, 72–73
environmental/sustainability departments, 75
external factors, policy development process, 68–69
*Food Access and Security Policy Development* project, 65
*Food For All* program, 65
food security principles, 65, 68
health promotion based food security projects, 65
internal factors, policy development process, 69–71
limitations, policy making, 73
municipalities in projects, 2009-2010, 66–67
project-oriented external short-term funding, 74
Local governments
agriculture, Shire, 331–332
food production, 333, 334
food security, 333
food security and supply, 332–333
municipal scanning, 154
Resource Manual, 155
staff, 333
Local Laws
Gold Coast City Council (*see* Gold Coast City Council)
No. 12 and 9, 393
urban farmers, 393
Local planning policy frameworks (LPPFs), 414, 416
Logistics of vulnerability
chronic food insecurity (*see* Food insecurity)
description, 21
disasters and transitory food insecurity (*see* Disasters)
food reserve stock levels, 21
food security (*see* Food security)
food supply chain, 23–24
food systems and security, 22
government emergency infrastructure, 21
hunger reduction, 21–22
Logos, organic, 292
London
adaptability, 376
healthy and sustainable food, 371
Mayor, 371
plan, 371
Loss of agricultural land, 399
Loss of farmland, 373
Lot and property sizes, 407
Lovelock, J., 314, 320
Low Choy, D., 316, 341
Low-emission meat
coverage, agriculture, 356
kangaroo production, 356
LPPFs. *See* Local planning policy frameworks (LPPFs)
Luck, J., 359
Lyson, T.A., 299

**M**

*Macadamia*, 357, 358
MacRae, R., 124
Maladaptive response, 238
Market-based economics
human rights and ecological protection, 39–40
modification, 40
Market basket, 104
Market gardening
resource extraction sites, 433
Werribee, 438
Marsden, T., 305, 307, 383
Martin, R., 383
Maslow, A., 222
Max-Neef, M., 221
Maxwell, S., 72
McBratney, A., 251, 252
McCarthy, J., 415
McDonald, D., 10, 11
McGregor, J., 236
McKenzie, F.H., 12, 404
McMahon, M., 306, 307
McMichael, A., 315
McMichael, P., 81, 82
McNair, A., 303, 304
Meat, 266, 273, 276
Meinzen-Dick, R., 242
Melbourne's outer peri-urban belt, 405
Melbourne's peri-urban region
annual average household change, 432–433
bush blocks, 433

Melbourne's peri-urban region (*cont.*)
creation and maintenance, buffer areas, 434
farm industry and structure
beef production and viticulture, 435–436
characteristics, 434–435
farm businesses and annual farm turnover, 436
high-value production and statistical division, 434
7inner peri-urban area and low-output agriculture, 437
large-scale businesses, 436–437
Melbourne fringe, 435
poultry and small farm businesses, 435
small-scale businesses, 436, 437
source, output and enterprise, 434
greenfield, 432
landscape-scale, 431–432
metropolitan, inner/outer, 432
metropolitan population, 432
policy level and Green Wedges, 433
rural lifestyle, 433
scattered nature, development, 433
Mellor, D., 444
Merson, J., 414
Methane, 356
Metropolitan governance, 321
Metropolitan Melbourne
peri-urban agricultural viability, 404
post-scenario planning, 398
SEQ, 398
Metropolitan Melbourne peri-urbanisation, 398
Metropolitan planning strategies
Australia's approach to food, 372–373
commoditization, food and impact on cities, 368–369
description, 367
development, 369–370
ecological footprint, 374
food and cities, 367–368
food production, 376
land use planning and food system, 370–371
local food production, 373
London plan (*see* London)
Portland plan, 376
selected cities, 374
Sydney (*see* Sydney)
Toronto official plan (*see* Toronto)
urban food strategies, 376
Vancouver and Portland, 375
Metropolitan regions, 320
Mitigation, 180–181
climate change, 194
food security, 194
measurement, 194
'Modernization', agriculture, 93
Modularity, 136
Mollah, M., 359
Morgan, E., 8
Morgan, K., 299, 307, 370, 376
MPHP. *See* Municipal Public Health Plan (MPHP)
MSS. *See* Municipal strategic statement (MSS)
Mubvami, T., 383
Mullins, P., 320
Multi-disciplinary research, 248, 255
Multi-functional landscape, 325, 438
Multi functional rural landscapes, 427
Municipal Public Health Plan (MPHP), 154
Municipal strategic statement (MSS), 413, 416–417
Murray river, 270, 272, 273

**N**
Nasr, J., 393
National Food Plan
Federal Government, 118
food manufacturing industry, 125
National Foods, 302
National interest
ethical imperative, government, 38
governments, 38
National Security Statement, 228
Native animals
climate change and carbon dioxide levels, 354
domestic herbivores, 356
fish and crustaceans, 353
grazing damage, 356
human health benefits, 356
kangaroo harvesters, 355
landholders, 354
landholders, landcare groups and governments, 356
meat production and wildlife management, 355
rangelands, 353–354
value chain, 355
variable and erratic climate, 354
Native food, 357–359
Naylor, R.L., 225
Needham, B., 400
Nelson, A., 399
Nestle, M., 304
Networks. *See* Community supported agriculture
Newman, P., 313
New settlement
evolving and maturing landscape, 403
peri-urbanization, 409

New social movement (NSMs)
Alliance's structure and activities, 114
description, 114
fair and sustainable food policies, 125
North east Victoria, 327, 334
Norton, R., 359
Nousiainen, M., 305
NSMs. *See* New social movement (NSMs)
Nutrient
limitations, 189
poor soils, 187
and water inputs, 192
Nutrition
human cycle, 196
production, 189
quality, meat, 192
Nutritious food
cost, 155, 156
food security, 155
municipalities, 154
quality and availability, 163
Nutritious production scenarios
descriptive scenarios to model simulations, 263–266
differentiation, 262, 263
economic outcomes, 274–275
environmental and resource outcomes, 270–273
features, 261
food availability outcomes, 266, 269–270
participatory stakeholder process, 260–261
sustainable and resilient food security (*see* Sustainable and resilient food security)

**O**
Obesity
in developed countries, 25
risk of, 25
Off-farm income
farms, 435
linkages, 428
small-scale farm businesses, 436
O'Leary, G., 359
Organic
certification, 180
farming, 183
"organic agriculture", 183
Organic farming
and Australian settings, 284–285
chemical-free and tasty food, 283
implementation, organic standards, 285, 286
Organic standards, EU and Australia
court case, mislabelling eggs, 287
environmental and social standards, 282, 286
food policies, 287
food security and value chain sustainability, 288–292
government, 287
heterogeneous setting, public and private, 286
regulation, farming, 283–285
turnover, 285
Organisational culture, 71
OSISDC. *See* Outer Suburban/Interface Services and Development Committee (OSISDC)
Outer Suburban/Interface Services and Development Committee (OSISDC), 416
Overseas aid, 2

**P**
Palermo, C., 155
Paradigm, 297, 305, 306
Parbery, P., 405
Parker, F., 8
Park, S., 446
Park, S.E., 10
Participatory stakeholder process, 260–261
Partnerships, 116, 125
Pascual, F.G. Jr., 5
Pastoralism, 160
Patel, R., 3
Paul, V., 341
Peak oil, 249
Peak phosphorus, 249
Per capita consumption, 43
Peri-urban
agriculture (*see* Peri-urban agriculture)
concurrent processes, 425
dilution, 437–438
economic and landscape change, 438–439
farm structure, viability and land use
agriculture, 427
Australia-wide, 427–428
off-farm income and linkages, 428
polarization and small-scale farms, 428
social preferences and settlement systems, 427
Victoria's rural landscapes, 428–429
land use and landscapes, 426
neoliberal policy, 425
processes, rural land, 426
region (*see* Peri-urban region)
structurally and functionally, 425
structure, agricultural industries, 426
viability and fringe, 438

Peri-urban agriculture
description, 398
dilution, 429
farmland, 400
fringe, 416
growth perspectives, 400–402
India's urban settlements, 400
institutional and policy fragmentation, 408
integrated regional planning, 408
loss, 429
Melbourne's green belt, 398
metropolitan regions, 397
national agricultural output, 407
planning approach, 402–403
policy and planning
Australia, 431
characteristics and prices, 431
farm viability and industry sustainability, 430
"free-market" objectives and land use conversion exhibits, 431
high-quality and industry adjustment, 430
productivist priorities, 430
rezoning and subdivision, 431
policy review post-scenario planning, 404–407
protection, 417
regional resources, 409
SEQ, 398
SEQs Lockyer Valley, 399
transference, 430
transition, 429–430
urban fringe land, 398
urban markets, 407
vegetable production rates, 399
Peri-urban distinguishing characteristics
description, 398
hallmark, 401
landscapes, 401
Melbourne's CBD, 404
'Victoria's peri-urban region, 398
Peri-urbanisation process. *See also* Peri-urban agriculture
landscape fragmentation, 403
land use planning, 398
pigs and beef, 407
planning and management arrangements, 403
Queensland's agricultural manufacturing and, 399
SEQ, 399
Peri-urban landholders
BM, 419
MSS, 416, 417
Peri-urban planning
BM, 416–419
food security, 422
suburbs in waiting, 413–416
water uncertainty and spaces, 419–422
Peri-urban region
agriculture, 426–427
Melbourne (*see* Melbourne's peri-urban region)
Permaculture
and environmentalist, 319
movement, 312
Perspectives
clumsy solutions, 445
fairness/egalitarian, 445
financial/market, 444
government, 445
Phillips, L., 305
Phosphorus
imported, 273
requirement, 273
Pinstrup-Andersen, P., 5, 106, 239
Pires, V., 13
Planning
food security, 120
future food, 119
local council and, 117
sustainable food systems, 118
urban areas and agricultural lands, 118
Planning. *See* Peri-urban planning
Planning Panels Victoria (PPV), 413, 417
Planning policies
and objectives, 434
peri-urban Australia, 431
problematize nonfarming communities and land use, 429
protect land, 431
Queensland State, 384
and Regional Plans, 385
spatial and practice, 425
Planning Scheme
description, 387
Gold Coast, 384
Gold Coast, 2003, 386
Planning Scheme Policies, 387
Gold Coast, 384
urban agriculture, 393
Planning Scheme Review Program, 390
Pluralism, 40
PMSEIC. *See* Prime Minister's Science, Engineering and Innovation Council (PMSEIC)
Policy
ethical, 40

government, 45
performance, 41
procedures, 40
representation, problem, 40
social solutions, 44
structure, 40
Policy future, 64
Policy responses, developed economies
Australia, 89–90
European Commission (EC), 88–89
France, 92–93
inflation rate, 88
liberal market economies, 89
United Kingdom, 91
Ponnampalam, E., 192
Population
and food security, 220
growth, 226
and well-nourished, 221
Population growth
broader process, restructure in Australian agriculture, 427
inner-urban areas, 432
peri-urban settlement, 426
Population increases
Australia, 179
world, 173, 179
Portland
food system strategies, 375
metropolitan areas, 374
plan, 376
selected cities, metropolitan planning strategies, 374
Pothukuchi, K., 370, 383
PPV. *See* Planning Panels Victoria (PPV)
Price increase
convergence of stressors, 21
cost of food, 26
food consumers, 25–26
food supply chain, 80
Prime farmland conversion, 400
Prime Minister's Science, Engineering and Innovation Council (PMSEIC), 175
Productive agricultural land
fresh healthy food, 373
metropolitan strategies, 373
transport access and costs, 370
in urban areas, 371
Productive capacity, 239
Productivity
agricultural, 180
animal, 177
consumption, meat products, 192, 193
description, 189–190
and efficiency, 180
farm production, major food commodities, 190
gains, food production, 303
genetic and technological advances, 190
industrial agriculture, 303
intensifcation of, 192
land use mapping, 191
major land uses, 191
marginal lands, 192
monogastric production, 192
plant, 177
total production and wheat, 191, 192
Promethean modernism, 321
Public governance, 138
Public interest
commercial trajectory, 227
governments, 219
Public policy, 228–229
Public procurement, 307

**R**

Raffarin, L., 92
Rail freight. *See* Road freight
Raja, S., 370
Re-designing agroecosystems
industrial agriculture critics, 250
policy settings, 249
scientific evidence, 249
soil health, 250
substitution, 249
Reeve, I., 250, 255
Regional environmental plan (REP), 417
Regulation, national, 283
Regulatory land use planning, 408
Reimagination of, 138
Relative poverty
description, 144
poverty in Australia, 144
Re-localization, 307, 308, 322
Remote communities and food security
Australia, 97–98
food supply (*see* Food supply, remote communities)
health status, indigenous Australians, 98–99
policy and Australian government, 104–105
progress and government, 99–100
strategic policy approach (*see* Strategic policy, food security improvement)
Renzaho, A.M.N., 444
REP. *See* Regional environmental plan (REP)
Repoliticisation
AFSA, 138
foundational ideals, 137
hypothesis, 130

Research and development (R&D)
Resilience
climate adaptation and social, 320
climate change, 181
and compaction, 321–322
and control, 276
disease or climate-related events, 270
ecological metaphor, 312
food, 312
food production system, 59
food security, 220, 223
and food security, 11
food system, 277
King Island's food systems, 11
metropolitan, 318
price volatility, 94
systems approach, 220
systems-based approach, 223
urban, 311
Resource availability, 225–226
Resource depletion, 311, 316
Resources
and carbon-constrained environment, 188
domestic population growth, 187
financial, 64
food security, 71
longer-term degradation, 190
long-term resource degradation, 199
and social data, 197
Strategic Resource Plan, 69
Resource security, 311
Resource use
"Caring for Our Country" program, 5
industries and price, 1
matching food production, 5
Retailers
audits, 290
'Big Four', 91
different logos, 292
suppliers, 293
Reynolds, B., 376
Rights
earth, 39
human (*see* Human rights)
Road freight
characterization, 29
food and agriculture businesses, 26
food and live animal transport, 26
in-house logistics, 29
Road pricing, 27
Robertson, A.I., 446
Robertson, B., 239
Roberts, P., 368
Roberts, W., 116, 122
Rochford, F., 10
Roetter, R.P., 221
Roots, J., 12
Rose, D., 53
Rosier, R., 4
Royer, L., 92
Ruminant
animals, 199
livestock frequently, 199
semi-arid rangelands, 189
Rutherford, J., 369
Ryde, M., 357

**S**
Scenario description
adjustment, 262
background settings, 264
control, 262–263
DIY, 263
drivers, 261
food requirements, nutritious diet, 264–265
settings, responses, 265–268
themes, 262
timeframe, 261, 273
Scenario planning
policy review approach
ariculturally declining and revival, 402
institutional fragmentation, 403
internal coordinating frameworks, 403
landscape fragmentation, 403
sustainable peri-urban landscapes, long-term, 402
policy review post
attractors, population, 405
extensive land fragmentation, 405
farming zone, 407
inner and outer peri-urban areas, 404
integrated policy and strategies, 407
Melbourne's outer peri-urban, 405
pattern of ad-hoc, 406
poultry numbers, horticultural production and grape, 405
systematic approach, 402
'wind tunnel'/'test bed', 402
Schmidhuber, J., 315
SecondBite
community demand, 167
description, 167–168
funding strategy, 168
pilot program, 168
SecondBite Community Connect™, 167
Securities
human needs, food security and, 221–222

people need, 220
satisfactory diet, 221
Seneweera, S., 359
Sequestration
annual carbon, 201
carbon, 272, 273
forests, 265, 267
in land sector, 194
Settlers
colonial authorities, 160
transgressions/guerilla-style actions, 160
white, 159
Shaw, D.J., 236
Shen, J., 4
Shingirayi, M., 383
Shuman, M., 299
Simms, A., 55
Sims, M., 50, 52
Slade, C., 416
Small farm businesses, 405
Small scale agricultural enterprises, 405, 407
Small to medium enterprises (SMEs), 300
Smit, J., 393
Social determinants of health, 165
Social-ecological systems
climate change, 224–225
globalisation, 225
operation, 220
opportunity, 227
people's interactions, 220
population growth, 226
resource availability, 225–226
social values, 226
Social equity, 11, 298, 314
Social inclusion
and economic, 145
strategy, Tasmania, 162
Social inequity, 150
Social learning
agri-food system, 135
and associativeness, 137
farmers and consumers, 132
socio-ecological system, 134
Social solution
collective level, 44, 45
food security, 43
individual level, 43
Social values, 40, 226
Socio-ecological theory
concept, networks and social learning, 135
description, 134
food security, 136–137
network definition, 136
re-politicization, 137
social learning, 134–135
trade-offs, 135
Socioeconomic disadvantage, 162
Socioeconomic status
chronic food insecurity, 31
and geographical remoteness, 31
Soil
ecosystem services, 254
fertility, 250
health (*see* Food security and soil health)
as a non-renewable resource, 248
security, 252
sustainable management (*see* Sustainable soil management)
*Solanum*
*Acacia*, 357
*centrale*, 357
Solution
social (*see* Social solution)
technological (*see* Technological solution)
Sonnino, R., 376, 383
South East Queensland (SEQ)
agricultural economic activity, 399
Lockyer Valley, 399
and Metropolitan Melbourne, 398
Sovereignty. *See also* Water sovereignty
of food production systems, 212
foreign, 211
global drivers, 212
Space, peri-urban food production
BMID and climate change, 420
conceptualization, urban–rural interactions, 421
economic and political processes, 419
low storage levels and parallel broader policy trajectories, 420
Pykes Creek Resevoir and Merrimu Dam, 420
reusing residential grey water, 421
Southern Rural Water, 420
and span, 419
transcripts and 'urban', 419
'unspoiled nature' and picturesque landscapes, 421
VEIL, 421–422
water supply, 419–420
SPPFs. *See* State planning policy frameworks (SPPFs)
Sprague, J., 237
Spronk, S., 241
Stakeholders
driven process, 114
in food system, 114
Standards. *See* Sustainable standards

Standards, organic
  Australia, 285–287
  EU regulation, organic farming, 283–285
  food security, and value chain sustainability, 288–292
Standards, voluntary and mandatory, 287, 293
State planning policy frameworks (SPPFs), 414
State provisions, 385
Stayner, R., 55
Steele, C., 367
Steele, W., 420
Stewardship
  description, 36
  ecological, 45, 46
  ethos, 37
  governments, 37
Stirzaker, R., 302, 303
Stocking, M., 251
Strategic policy, food security improvement
  appraising interventions, 108–109
  continuous improvement cycle, 109
  defining, problem, 106–107
  intervention, 107–108
  steps, systematic approach, 105
  system-wide approach, 105
Street harvest, 148–149
Streker, P., 154
Stretton, H., 319
Suburban regions, 'new urbanism', 317
Suburbia
  ACF, 317
  adaptive potential, 318
  diverse landscape, 318
  inhabit, 318
  metropolises, 319
  urban village, 312
Suburbs
  BM and surrounds, 415
  level and nature, community resistance, 413–414
  LPPF and OSISDC, 416
  MSS, 413–414, 416
  planning controls, 414
  PPV, 413
  protectionist impulses, 415
  resilience, urban expansion, 414
  SPPFs and LPPF, 414
  URC and UWS, 414
Succession planning, 330
Surplus, food, 270, 276–278
Sustainability. *See also* Food production
  agenda, 371
  consumer information and, 90
  CSA, 132
  environmental, 289
  food systems, 376
  individual and community levels, 242
  organic standards, food security, and value chain, 288–292
  social and political capita, 22
Sustainable
  agriculture, 303
  agri-food industries, 304
  food systems, 304
Sustainable agri-food system
  AFSA, 138
  and community food sovereignty, 131
  food security and food sovereignty, 130
  socio-ecological systems, 129
Sustainable and resilient food security
  adjustment, 276
  challenges and prospects, 277–278
  control, 276
  DIY, 276–277
  spider diagrams, 275–276
  vulnerability and resilience, food system, 277
Sustainable food system, 182–183
Sustainable productivity, 256
Sustainable soil management
  agricultural research, 248–249
  impediments, 250–252
  re-designing, 248
Sustainable standards
  accredited certification, 283
  environmental and social standards, food sector, 282
  independent control system, 283
  organic standards (*see* Organic standards, EU and Australia)
Sustainable use
  kangaroo skins, 354
  wildlife scientists, 355
Swaminathan, M.S., 252
Sydney
  food fairness alliance, 375
  hinterland, 369
  metropolitan planning strategy, 375
  'metropolitan plan, Sydney 2036', 375
  'sustainable Sydney 2030 the vision', 375
Sydney Food Fairness Alliance
  advocacy/networking/communication/education, 124–125
  Alliance's structure and activities, 114–115
  atypical food movement, 126
  context, food security, 125
  description, 113
  diversity, memberships and participants, 123
  domestic food security, 126
  food policy, 120–122
  food security, 114

food security, food sovereignty/food democracy, 115–116
food summit (*see* Food summit)
formal launch, governance and activities, 117–118
lack, funding, 124
state food policies, 114
strengths, weaknesses and achievements, 122
surge, public interest, 113
Sydney food fairness alliance, 116–117
"umbrella" organization, 115
volunteers/leadership/management/governance, 123–124
Synergy, 114
Systems approach
food security, 45
national self-sufficiency, 45
technological domination, 43
unintended consequences, 43

**T**

Tasmanian Food Action Research Coalition (TFARC)
aim, 163
coalitions, 162
communication process, 165
competing expectations, 165
description, 162
establishment and management, 162
flexibility and informality, 166
ground rules, 164
leadership, 164
monitoring and evaluation, 166
municipal areas, 163
Social Inclusion Strategy for Tasmania, 161
TFSC and TFSF, 162
Tasmanian Food Security Council (TFSC), 162, 163
Tasmanian Food Security Fund (TFSF), 162
Tausz, M., 359
Tausz-Posch, S., 359
Technological innovation, 179
Technological solution
application, new technologies, 42–43
ethical problems, 42
food security, 42
policy makers, 41
political use, 41
systems approaches, 43
trajectories, recent past, 42
TFARC. *See* Tasmanian Food Action Research Coalition (TFARC)
TFSF. *See* Tasmanian Food Security Fund (TFSF)
Third party certification, 283, 290, 293
Thompson, S., 371
Timms, P., 370
TNCs. *See* Trans-national corporations (TNCs)
Toronto
food policy council, 1999, 369
metropolitan-scale long-term strategic plans, 374
official plan, 375
TFPC, 375
Toronto Food Policy Council (TFPC), 375
Trade-off, 39
Transformation
agricultural intensification, biodiversity and sustainable production, 208–209
agricultural producers, 205
agricultural production, 206–207
agriculture using grains, 207–208
change management (*see* Change management, transformation)
climate change, 209–211
description, 205
*in situ* land-use change, 206
Trans-national corporations (TNCs)
agriculture structure, 299
agri-food sustainability, 304
globalization and rising power, 298–299
global value chain management, 297
innovative capacity, 300
Transport
food access, remote communities, 102
remote community, 101
subsidies, National Preventative Taskforce, 105
Troy, P.N., 318
Tubiello, F., 315
Turner, G., 11
Two-speed economy
agricultural production, 345
classic Dutch disease and domestic resources, 345
CPI, 344–345
disadvantages, 344
food production and affordability, 345–347
CPI data, 346
diabetes and heart disease, 347
export data, 345–346
international markets and peak planning agency, 346
poor nutrition, 347
housing pressures, 344
income polarity and resource curse, 345
Kimberley and Perth regions, 344

## U


Unemployment
  DIY, 275
  level, 274
University of Western Sydney (UWS), 414
Urban agriculture
  agriculture-related land uses, 13, 391
  analysis of LAPs, 393
  and cities (*see* Urban agriculture and cities)
  Community Gardening program, 57
  'composting station' and 'urban farmer's market', 391–392
  DEOS, 392
  domain analysis, 392
  domains, 392
  existence and expansion, 382
  food insecurity, 381
  food production land uses, 392
  food security/opportunities, 12–13
  gold coast planning scheme, 390
  impacts, climate change, 382
  innovation and civilization, 381
  landscape objectives, 14
  local law no. 12 and 9, 393
  metropolitan planning strategies, 371
  oxymoron, 382
  peri-urban agriculture, 13
  planning scheme policy 18, 393
  recommendations and envisaged outcomes, 391
  'semi-public' land, 393
Urban agriculture and cities
  definition, 382
  economic benefits, 383
  land use planning, 384
  low awareness and insufficient budgets, 383
  multifunctionality and sustainability, cities, 383
  planning departments, 383
  study approach, 384–385
  urban agriculture and planning on the gold coast (*see* Urban agriculture benefits)
  urban planning frameworks, 383
Urban agriculture benefits
  climate change strategy 2009–2014, 390
  DEOs, 386
  domains, 386–387
  gold coast city council local laws, 387–389
  gold coast city council strategies, plans and programs, 389
  gold coast planning scheme 2003, 386
  local area plans, 387
  permissibility, land uses, 386
  planning scheme policies, 387
  planning scheme review program, 390
  state and regional provisions, 385
Urban agriculture-related development, 388
Urban agriculture risks
  environmental, 383
  and operations, 391
  urban farmers and consumers, 383
Urban containment, 400
Urban dispersal, 400, 401
Urban encroachment, 415
Urban expansion, 265, 270
Urban growth
  adjacent rural areas, 401
  dispersal and containment, 400
  landscapes characteristics, 401
  state and local governments, 401
  'urban tidal wave', 401
  'wind tunnel'/'test bed', 402
Urbanisation, 219–220
Urbanization
  counter-urbanization, 425
  dilution, rural landscapes, 429
  peri, 426
  rural retention, 434
Urban Research Centre (URC), 414
Urban resilience
  food security, 316
  food systems and distorted preferences, 314
  human social ambition, 322
URC. *See* Urban Research Centre (URC)
User-pay, 242
UWS. *See* University of Western Sydney (UWS)


## V


Value
  ecological, 40
  ethical, 40
  instrumental, 35
  intrinsic, 35
  social, 40
Value chain
  governance, 282
  sustainability, 288–292
Van den Berg, A.E., 57
Van Keulen, H., 221
VEIL. *See* Victorian Eco-Innovation Lab (VEIL)
Verweij, M., 445
VHFB. *See* Victorian Healthy Food Basket (VHFB)
Victorian Eco-Innovation Lab (VEIL), 421–422
Victorian Environments for Health (E4H), 154
Victorian Healthy Food Basket (VHFB)

amount, food, 155, 157
basket cost, family types, 155, 158
median cost, 156
variation, cost, 159
Victorian Local Governance Association (VLGA), 154
"Virtual export", 10, 241
Viticulture
beef cattle, 428, 437
beef production, 435
VLGA. *See* Victorian Local Governance Association (VLGA)
Volunteerism, 149
Volunteers
food policy and movement, 122
leadership/management/governance, 123–124
Von Braun, J., 242
Vorley, B., 305

**W**
Walker, G., 400
Water
ground, 342
land, 444
supplies and vast distances, 340
Water integrated planning, 422
Water resource planning, 407
Water security, 273
Water sovereignty
conventional economic analyses, 241
description, 240–241
fresh water sovereignty, 241
infrastructure, 242
soft and hard law, 241
Water uncertainty and spaces, 419–422
Water use efficiency, 273, 361
Watts, R., 147
Wayte, K.J., 98
Weis, T., 306
Welfare agencies
Foodbank, 143–144
nation-wide, 143
Welsh, J., 124
Wildlife management
and decision-making capacity, 354
maintenance of habitats, 355
Wilson, G., 353
Wood, B., 154
Workshops, stakeholder process, 260–261
World capitalism, 129
World Trade Organisation (WTO)
and FSP, 297
liberalization and privatization, 81
'neoliberal-based insistence', 299
principles, 307
TNCs, 298
WTO. *See* World Trade Organisation (WTO)

**Y**
Yield
food crops and reducing waste, 188
gap, regions and countries, 188
genetic and technological advances, 190
per hectare, 191
of wheat, 195

**Z**
Zysman, J., 92