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ADB

IRRIGATION MANAGEMENT TRANSFER

Strategies and Best Practices

Irrigation Management Transfer

Asian Development Bank
India Resident Mission
4, San Martin Marg, Chanakyapuri
New Delhi 110021, India

This study was undertaken at the India Resident Mission Asian Development Bank (ADB), by a team comprising K.V. Raju,[1] Pratima Dayal[2] and Jaya Chatterji.[3]

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[1] Professor and Head, Ecological Economics Unit, Institute for Social and Economic Change, Bangalore.

[2] Principal Economist, India Resident Mission, ADB.

[3] Project Implementation Officer, India Resident Mission, ADB.

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The SAGE Team: Ashok R. Chandran, Abantika Banerjee, Sanjeev Kumar Sharma and Trinankur Banerjee

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List of Abbreviations

ADB	Asian Development Bank
AFPRO	Action for Food Production
AKRSP	Aga Khan Rural Support Programme
APERP	Andhra Pradesh Economic Restructuring Project
APFMIS Act	Andhra Pradesh Farmers' Management of Irrigation Systems Act
ARTI	Agrarian Research and Training Institute
ASA	Action for Social Advancement
ATMA	Agricultural Technology Management Agency
AWB	Area Water Boards
CAD	Command Area Development
CADA	Command Area Development Authority
CADP	Command Area Development Programme
CADWM	Command Area Development and Water Management
CASAD	Centre for Applied Systems Analysis in Development
CBP	Columbia Basin Project
CCA	Culturable Command Area
CIS	Communal Irrigation Systems
CRIDA	Central Research Institute for Dryland Agriculture
DC	Distributary Committee
DHAN	Development of Humane Action
DIRD	Directorate of Irrigation Research and Development
DSC	Development Support Centre
DWMA	District Water Management Agency
EIRR	Economic Internal Rate of Return
ERR	Economic Rate of Return
FAO	Food and Agriculture Organization
FAP	Fier Agricultural Programme
FAIA	Financially-Autonomous Irrigation Agency
FMIA	Farmer Managed Irrigated Agriculture
FNS	Fonds National de Solidarté
HYV	High-Yielding Variety
IAs	Irrigation Administrators
ICAR	Indian Council for Agricultural Research
ICEF	India Canada Environment Facility
IFAD	International Fund for Agriculture Development
IIMI	International Irrigation Management Institute, Colombia
IMT	Irrigation Management Transfer
IMTIs	Irrigation Management and Training Institutes
INPIM	International Network on Participatory Irrigation Management
IRDAS	Institute of Resource Development and Social Management
ISF	Irrigation Service Fee
ITDP	Integrated Tank Development Plan
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
JSYS	Jala Samvardhana Yojana Sangha
KBJNL	Krishna Bhagya Jal Nigam Limited
KDFS	Kalanjian Development Financial Services
KWDT	Krishna Waters Dispute Tribunal
LDCs	Less-Developed Countries
LID	Land Improvement District
MFGs	Micro-Finance Groups
mha	Million Hectare

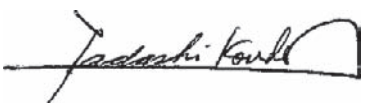
MOWR	Ministry of Water Resources
NIA	National Irrigation Administration
NGO	Non-Governmental Organization
NDP	National Drainage Programme
OECD	Organization for Economic Cooperation and Development
OECF	Overseas Economic Cooperation Fund
O&M	Operations and Maintenance
ORMVAT	Office Regional de Mise en Valeur Agricole du Tadla
PC	Project Committee
PDFC	Paliganj Distributary Farmers' Committee
PIDA	Provincial Irrigation and Drainage Authority
PIM	Participatory Irrigation Management
PRADAN	Professional Assistance for Development Action
PRIs	Panchayati Raj Institutions
SHG	Self-Help Group
SIDD	Self-financed Irrigation and Drainage Districts
SONEDE	Société Nationale d'Exploitation et de Distribution des Eaux
SOPPECOM	Society for People's Participation in Ecosystem Management
SPK	Samaj Parivartana Kendra
SPWD	Society for Promotion of Wastelands Development
SRIJAN	Self-Reliant Initiatives through Joint Action
SRSP	Sri Ram Sagar Project
SSNNL	Sardar Sarovar Narmada Nigam Limited
SWDF	Sadguru Water and Development Foundation
TCs	Territorial Committees
TE	Triennium Ending
TUAs	Tank Users' Associations
USAID	United States Agency for International Development
VASFA	Vaishali Area Small Farmers' Association
VICs	Village Irrigation Committees
VRTI	Vivekanand Research and Training Institute
WALMIs	Water and Land Management Institutes
WEs	Water Enterprises
WRCP	Water Resources Consolidation Project
WRD	Water Resources Department
WUA	Water User Association
WUASP	Water Users' Association Support Programme
WUOs	Water Users' Organizations

Foreword

The Asian Development Bank (ADB) commissioned this study in response to the keen interest shown in India on learning about irrigation management from national and international best practices.

This book is a synthesis of strategies and best practices adopted by various countries in irrigation management transfer. It identifies key concerns such as water user associations' structure and functions, financial mobilization and constraints, repair and maintenance of physical structures, operation of canal systems, capacity building and monitoring mechanisms. It also identifies enabling environments, including regulatory mechanisms, and the role of non-governmental organizations. It is largely based on secondary sources, with references to experiences across the world. It includes lessons on what not to do as well as positive experiences. Some field visits were carried out to substantiate the findings of the study.

I thank the team from ADB's India Resident Mission comprising Pratima Dayal, Principal Economist, and Jaya Chatterji, Project Implementation Officer, Agriculture and Natural Resources, who coordinated this study. The study was conducted under ADB's Technical Assistance (TA) for Knowledge Management and Capacity Building (TA 4780) funded by the Department of International Development (DIFD) Trust Fund of the United Kingdom. We gratefully acknowledge the support of DIFD.



Tadashi Kondo
Country Director
India Resident Mission, ADB

Executive Summary

This work, supported by the Asian Development Bank (ADB), New Delhi, is a synthesis of strategies and best practices adopted by various countries on irrigation management transfer (IMT). It identifies key concerns such as water user associations' (WUA) structure and functions, financial mobilization and constraints, repair and maintenance of physical structures, operation of canal systems, capacity building and monitoring mechanisms. It also identifies enabling environments, including regulatory mechanisms, and the role of non-governmental organizations (NGOs). Towards the end, this work distils critical issues and strategic options and suggests a way forward. It is largely based on secondary sources, field-based studies and visits carried out across various states in India.

Over the years, various factors have led to the devolution of irrigation management to users, like the Earth Summit, the Food and Agriculture Organization's predictions on salinity and waterlogging problems, the challenge of producing more food with less water, improving water efficiency, institutional improvements and the like. Similarly, IMT has been adopted in more than 25 countries across the world. Improving the performance of existing irrigation systems has been the central concern.

Participation in irrigation management has opened up a new arena which aims to make irrigation management more efficient. However, implementation and adaptation across and within countries has been varied and is at different stages of development. The process of bringing about a more participatory type of management system varies widely from the bottom–up approach used in the Philippines to the more top–down approach used in Turkey and Mexico. For instance, in promoting participatory irrigation management (PIM), Colombia invested much less time and effort than other countries. As a consequence, the process of transfer was very quick, but there have been second-generation problems. Users have been less well informed and have been uncertain about their rights with respect to ownership and changes in management practices. Argentina, on the other hand, has used information meetings and word-of-mouth to make a rapid transition to PIM, while Mexico and Turkey have used more structured informational meetings with users.

In India, PIM has evolved over time. The idea of involving farmers in the management process has cropped up several times. The National Water Policy of 1987 and of 2005 stressed on farmers' participation in irrigation management and guidelines were issued in 2005. Some NGOs and external donors also took keen interest in the formation of WUAs in certain parts of the country. Multilateral funding and donor agencies have taken up several initiatives in different states. Similarly, training institutions like the Water and Land Management Institutes and the Irrigation Management Training Institutes in several states have undertaken experiments in IMT.

Universities and research institutes have been involved in the planning, execution, monitoring and evaluation of PIM across the country.

Progress in PIM across states and across different types of systems (Major, Medium and Minor irrigation systems, including tanks) has been varied. However, a rapid assessment of WUAs across states indicates wide functional gaps between what has been proposed in the guidelines and how WUAs are functioning in reality. In spite of the absence of clear planning and ways to prioritize the concerns, WUAs are involved in resource sharing. The process towards transparent decision-making, planning and monitoring, and roles and responsibilities of different actors in WUAs have not evolved properly in the absence of group-building processes. Several process constraints have been identified.

Review across countries indicates several lessons. For instance, the case from Zimbabwe reveals that marketing skills are important in order to identify lucrative opportunities. Hama Mavhaire's case highlights that small-scale irrigation schemes can be economic and affordable. Experiences in South Asia clearly indicate that improved communication between farmers and water resources departments help in making the staff more responsive to farmers and in reducing the problems associated with arranging water deliveries and making payments of water charges. Similarly, in cases where more complete control over irrigation financing was devolved to the farmers' organizations (such as in Colombia), farmers' representatives tended to make a concerted effort to improve the cost efficiency of irrigation management through reductions in staff and other means. In Andhra Pradesh, the minimum rehabilitation programme was executed through WUAs. Maharashtra's initiative on water auditing is an important step that can be adopted in other states.

One of the key indicators for success of irrigation management is financial management and, in particular, the financial viability of WUAs. Experiences across various countries indicate important lessons: provision of temporary financial support and incentives to encourage user associations, potential ways to raise funds to ensure the sustainability of the operation and maintenance tasks, financial agreements related to water transfers, development of financial resources and raising funds to carry out all water management activities, a common platform to resolve payment issues and sort out ground-level problems and sharing costs and benefits.

NGOs have been playing a pivotal role in shaping WUAs in several states. The work done by some of the leading NGOs working on PIM in India, the approaches followed and the constraints faced are discussed in this work. Capacity building and the role of training institutions and efforts taken towards developing a database on WUAs across countries are highlighted. Also, an overview of institutional bodies set up for PIM and related issues is provided.

Institutional issues are discussed and specific institutional arrangements, which have been successful, are identified and analysed. For instance, the model evolved in Mali appears replicable in Africa because it matches the literacy levels and financial management capacity of the users, requires only limited training inputs, provides the government with some negotiated steering capacity through a performance contract and insures financial sustainability highlighting the suitability of the reform initiatives to the local context. Similarly, initiatives taken in the Gujarat project highlight ways of bringing about institutional reforms. Within every bureaucracy there are key

individuals who can become change agents if they are motivated and transformed. Exposure visits to successful areas and preferably to areas where similar types of individuals have transformed themselves can be invaluable for this transformation. NGOs can bring about macro-policy changes successfully provided there is a positive political acceptance of the role of NGOs in civil society. Financially-autonomous bodies for irrigation financing have been set-up (in Gujarat, Maharashtra, Karnataka and Andhra Pradesh) and have concentrated on mobilizing funds for the completion of physical works.

Creating an enabling environment should involve the interest and willingness of the stakeholders. At least three sections of the government must support PIM: political leadership, administrative leadership and irrigation agency leadership. A high level of political commitment for PIM is most important. This has been highlighted in Mexico, Indonesia and Montenegro where the WUAs have a well defined and strong legal status. An enabling environment and support leads to capable WUAs (as found in Mexico, Indonesia, Bihar, Gujarat and Andhra Pradesh) and WUAs without empowerment will not be productive or sustainable. Rehabilitation/construction activities will lead to incentives to form WUAs, but are risky.

This work concludes by indicating a way forward. This includes identifying potential roles for donors and new roles and responsibilities for water resources departments. Specific future investment options are discussed such as: (*a*) promoting project-level pilots, (*b*) setting up a full-fledged directorate at the state level to promote IMT, (*c*) facilitating the setting-up and strengthening of water regulatory authorities, (*d*) enabling the formation and functioning of robust WUAs, distributary committees and project committees and (*e*) trying out alternative models within a state in partnership or in collaboration with NGOs, professional bodies or developmental organizations.

Background

Chapter 1

WHY THIS REVIEW?

Public–private partnership in the irrigation sector has become a popular institutional approach, owing to fiscal constraints. Over the last decade and a half, a number of countries and different states in India have experimented with the paradigm and rich experiences have been captured. Large volumes of literature available on global experiences are relevant to India.

In this review, stress is on several key areas: (*a*) structure and functioning of water users' associations (WUAs), (*b*) financial viability of WUAs, (*c*) rehabilitation and maintenance of the distribution system, (*d*) water and land management practices, (*e*) capacity building and monitoring the mechanisms, (*f*) organizational composition of the water resources department handling WUAs, (*g*) enabling environment, including regulatory mechanisms and (*h*) strategic options for the future.

This review is mainly based on: (*a*) desk analysis of experiences in India, including those mentored by the government and by non-government or other organizations and self-initiated ones, if any, print and electronic documentation and verbal communication, (*b*) visits to three states—Rajasthan, Maharashtra and Madhya Pradesh—to verify some aspects that have emerged from the desk study and some significant developments that have either not been at all or properly documented,[1] (*c*) documentation of best practices and identification of weaknesses that need to be further strengthened/addressed and (*d*) desk analysis of international experiences using print, electronic documentation, or direct communication.

IRRIGATED AGRICULTURE

Irrigation provides around 40 per cent of the world's food from only 17 per cent of the global cropped area. Some 2,400 million people depend on irrigated agriculture for food and livelihood. Irrigation has stabilized food production and prices by enabling greater production control and scope for crop diversification. Irrigated agriculture is the dominant user of water accounting for 80 per cent of water consumption. Inappropriate management of irrigation has contributed to environmental problems including excessive water depletion, falling water tables owing to excessive mining and water quality reduction, waterlogging and salinization.

With the global population set to increase to 7.9 billion by 2025, approximately 80 per cent of the additional food supply needed to serve the growing requirement will have to be produced on land served by irrigation. This is expected to result in a 650 per cent increase in the demand for water. Furthermore, with the growing imbalances and conflicting situations, more challenges in sharing water can be foreseen. Growing industrialization and urbanization in developing countries will lead to reduction in the share of available fresh

water, which is allocated to agriculture. In developing countries, about 70 per cent of accessible fresh water is used for agriculture. Increasingly, local management solutions are being sought for the global problems of food and resource management.

IRRIGATION DEVELOPMENT IN INDIA

The history of irrigation development in India can be traced to prehistoric times. Irrigation has played a significant role in India's monsoon climate and its agrarian economy. After independence, the Government of India launched an ambitious programme to improve agricultural production through extensive development of the irrigation infrastructure. Development works in irrigation were taken up in all five-year and annual plans. Aside from China, the irrigation system in no other country is as extensive as in India.

Table 1.1 gives the number of Major and Medium projects introduced in each five-year plan. From the Sixth Five-Year Plan onwards, emphasis has been on completion of ongoing projects and consolidation of gains rather than on new starts. However, new projects continued to be undertaken. As shown in Table 1.1, the Seventh Five-Year Plan (1985–90) envisaged 12 Major and 33 Medium projects. The Eighth Plan (1992–97) emphasized the completion of ongoing projects rather than undertaking new ones (Planning Commission, 2001b). The Ninth Plan (1997–2002) had a comprehensive strategy regarding irrigation development and management. It stressed the promotion of a programme for participatory irrigation management (PIM), rational pricing of irrigation water, conjunctive use of surface water and groundwater and strengthening of the Command Area Development Programme (CADP). It lay particular stress on the improvement of water use efficiency by progressive reduction in conveyance and application losses (Planning Commission, 2001c). In the Tenth Five-Year Plan (2002–07), the Planning Commission recommended a major revival of public investment in irrigation capacity and water management and suggested the Accelerated Irrigation Benefit Programme as a potential means of providing resources to state governments to support ongoing projects (Planning Commission, 2001a).

The gross irrigated area of the country increased from about 23 million hectares (mha) in the triennium ending (TE) 1952–53 to about 72 mha in TE 1996–97, an increase of 2.62 per cent per annum. During the same period, the net irrigated area (NIA) increased from about 21 mha to nearly 54 mha, an increase of 2.16 per cent per annum.

Table 1.1 The Number of Major and Medium Projects Introduced in Each Plan

Plan Period	Major	Medium
First Plan (1951–56)	44	169
Second Plan (1956–61)	33	102
Third Plan (1961–66)	32	44
Annual Plan (1966–69)	11	30
Fourth Plan (1969–74)	32	73
Fifth Plan (1974–78)	70	300
Annual Plan (1978–80)	13	52
Sixth Plan (1980–85)	30	91
Seventh Plan (1985–90)	12	33
Annual (1990–92)	1	–
Eighth Plan (1992–97)	14	50
Total	292	944

Groundwater Irrigation

The importance of groundwater in national life is evident: around 56 per cent

of irrigated agriculture is based on groundwater and 85 per cent of rural drinking water comes from groundwater. Even after all the Major and Medium irrigation projects (under construction or contemplated) are implemented, a substantial part of irrigation (not far below 50 per cent) will still depend on groundwater.

One of the biggest developments that has taken place in Indian irrigation after independence is groundwater irrigation. This source is predominantly owned and managed by farmers (Shah, 1993). The share of groundwater-irrigated area has increased between 1952–53 and 1996–97 from about 30 per cent to about 55 per cent. Unlike tank and canal irrigation, area under groundwater irrigation grew at 3–5 per cent during different sub-periods from the 1960s onwards. The main factor in the growth of groundwater irrigation has been tubewell irrigation, which grew at an impressive rate of 9.9 per cent per annum during the period 1960–61 to 1996–97. Area under tubewell irrigation, which accounted for less than 1 per cent of the NIA up to 1960, increased to about 33 per cent in TE 1996–97. The rural electrification programme and availability of credit at highly subsidized rates have helped farmers increase area under groundwater irrigation significantly (Shah, 1993; Vaidyanathan, 1994a). The rapid development of groundwater irrigation not only helped well-owning farmers, but also farmers who did not own wells through water markets (Narayanamoorthy, 1994; Saleth, 1996; Shah, 1993; Shah and Raju, 1988). However, there are problems associated with tubewell/borewell irrigation and with water markets, which will be discussed later.

HIGH COST AND HIGH SUBSIDIES

The historical evolution of irrigation development from a community activity to a public activity has led to the construction of large irrigation systems which over time have become difficult to operate and maintain and are becoming less sustainable. The period 1950–70 saw the large-scale development of irrigation followed by a phase of irrigation improvement during the 1970s and 1980s. With the world food prices close to historic lows and underperforming irrigation systems, investment in the irrigation sector by the donor community gradually went down. With high costs of new investments (ranging from $8,000–$15,000 per ha) and delays in implementing projects because of social and environmental issues, growth of new irrigation projects is likely to be slow.

Irrigation and domestic water supply projects worldwide face serious underfunding. The World Water Commission (2000) reported that, worldwide, an additional investment of $100 billion per year is needed to meet the food and domestic needs of a growing population. At the same time, funding from traditional sources—government budgets and development assistance—is drying up. Alternative financing arrangements are needed even to sustain existing investments in water systems. This is not only a concern of governments, but also of the international community. For example, the World Water Council, the Third World Water Forum and the Global Water Partnership have formed a high-level panel to consider solutions to future global financial needs of the water sector. The panel has to identify

innovative approaches to mobilizing resources, as well as how financing arrangements can contribute to better water governance.

Much of the emphasis in global discussions, however, has been on international financial markets and particularly the role of multinational corporations in financing water-related infrastructure. Much less attention has been given to the potential of domestic financial markets to provide such funding. Even in developing countries, these may control substantial resources. Since the 1980s, the Indian capital markets have emerged as an important source of funds for corporates in private and public sectors. Primary capital mobilization by private sector companies in the form of equity and debt rose from less than Rs 2 billion in 1980 to over Rs 43 billion in 1990–91 and then recorded a quantum jump to over Rs 260 billion by the end of 1994–95 (GOI, 1996). During this period, several state governments also began to tap into the domestic financial market to finance irrigation development.

Management Problems in Irrigation

The Food and Agriculture Organization (FAO) has identified some problems that impede irrigation management reforms. These are: (*a*) top–down administration of water and agriculture programmes by government agencies, (*b*) large, overstaffed government bureaucracies with underpaid staff and little money for operating expenses, (*c*) dependence of less-developed countries on external loans, (*d*) prolonged low prices for basic cereal and grain crops, (*e*) dramatic expansion of irrigated area without a corresponding increase in funds available for irrigation system operations and maintenance (O&M), (*f*) rapid deterioration and declining productivity of irrigation systems and (*g*) weak civil society organizations.

This top–down, government-led development tradition in irrigation is the major culprit in management problems that involve inadequate water availability for farmers irrigating from the lowest outlets: inadequate distribution of water, especially in dry periods when irrigation is needed most; poor condition/maintenance of the irrigation systems in many places; lack of adequate systems and devices for performance measurement; inadequate provision of O&M resources; lack of incentives for consumers to conserve water resources and poor drainage and related problems of waterlogging and salinization, which ultimately impair production potential.

After independence, the major irrigated areas in the subcontinent remained with Pakistan. Shortage of foodgrains in India necessitated large-scale imports. Hence the focus was on increasing irrigation potential. This resulted in the government undertaking a large number of Major projects. Designing and constructing Major projects was new to Indian engineers. Publicity for achievements and honour in society became the focus, while promising new irrigation projects became a trump card for the political leaders to attract votes.

Comparatively less attention was paid to canal designs and construction. Low priority was given to funding. All these factors resulted in a lag in completing the canal works; some works were left incomplete and some small structures at remote locations were totally left out. The quality of canal works was generally poor

or substandard. The creation of O&M divisions and subdivisions was delayed and the management of irrigation was initiated through construction units. Since they had no experience in O&M, maintenance of the assets was not carried out. The canals were not tested after construction to ensure whether they could carry the designed discharge. Engineers who could not be accommodated in the design or construction divisions were posted to the O&M division. They generally were keen to go back to the construction division and therefore were not interested to learn, follow or introduce better practice.[2]

In most projects there is inadequate funding for O&M. Funds for new projects are provided from plan provisions. Plan funds are processed through the cost benefit ratio or internal rate of return screening, dialogue between irrigation/water resources department, state planning unit, finance department and later the Ministry of Water Resources (MOWR) and the Planning Commission. First bulk provisions are made in the plan period and annual funding is finalized after discussions between the deputy chairman of the Planning Commission and the chief minister of the state. Operations and maintenance funds are provided from non-plan sources. The demands are placed directly to the finance department of the state. The finance department allocates funds according to the resources of the state. As the demands from other sectors are now increasing, allocations are much less than the demand and are not need based. Actual funds are released later through monthly or quarterly issue of letters of credit by the finance department after verifying the balance with the state exchequer. The major portion of this is spent on payment to labour engaged by the construction divisions and handed over to the O&M divisions. Most of these are non-performing. Late releases, particularly at the end of the year, are spent on desilting or procuring materials. Thus, regular and periodical maintenance is generally neglected and the balance funds are required to be spent on force account or emergency repairs because of breaches in the main canals and other channels. Maintenance, therefore, gets restricted to crisis management.

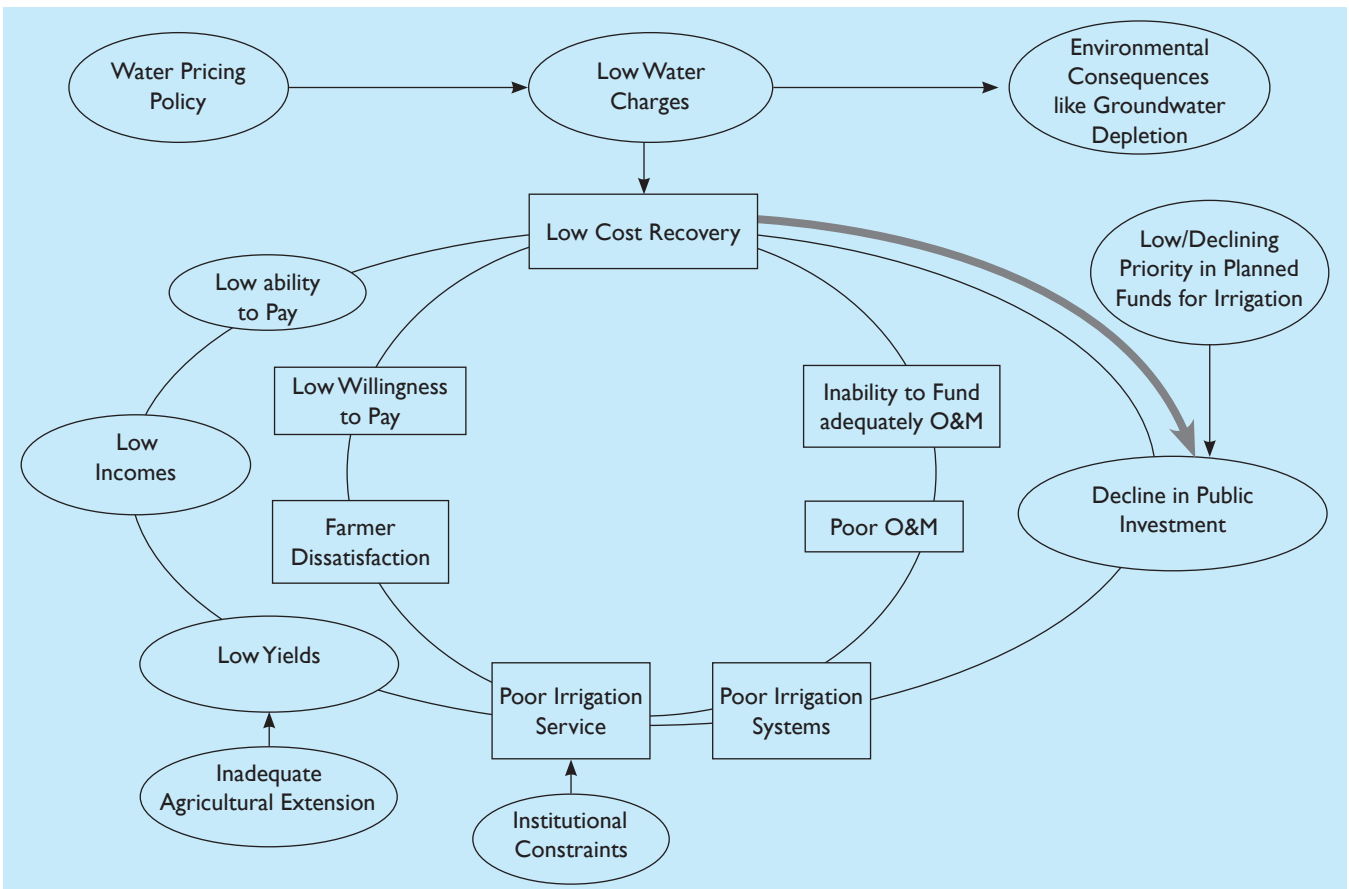
Neglect in operations is prominent. Practices evolved in the pre-independence period were not continued owing to political interference. No discipline was followed in distributing water. Later on, the political leaders started getting their work/services directly from the field functionaries who were close to them or could be subdued. The lower staff, thus, became powerful. The high-level officers had no control and became ineffective in introducing any changes. This led to inequitable distribution of water. The head reach and influential farmers started capturing more water, depriving the tailenders. The O&M division slowly became an organ for crisis management or for satisfying the political bosses. This led to further deterioration of the canal system. Later on, it was found that it was easier to get funds for rehabilitation/modernization rather than from the normal revenue budget, which led to further neglect of the assets. Shortage of manpower, particularly qualified and experienced engineers, was one of the serious lacunae.

The irrigation sector suffers from two distinct problems as pointed by Raju et al. (2003): low price of water and growing financial crunch. In turn, this has resulted in: (*a*) the funding for construction of ongoing or new canal networks has been shrinking, leading

to undue delay in completion of projects, which in turn raises costs and reduces benefits and (*b*) resources for normal O&M are also under severe pressure as cost recovery from canal irrigation is extremely low and the state budgets are unable to allocate more funds because of fiscal crunch. Unless urgent steps are taken to reverse this trend, such as through innovative institutional reforms, the Indian irrigation sector could be heading to a situation of near collapse, or at least would remain much below its potential for food production.

The consequences of irrigation subsidies form elements of a vicious circle (see Figure 1.1; World Bank, 1997). The water pricing policy in India is such that it does not even cover the cost of O&M of the irrigation systems, let alone the full capital cost including O&M. This leads to severe financial pressure on the states since they have to absorb the subsidies. Poor irrigation service is also caused by institutional constraints like lack of incentive and accountability on the part of the monopoly government agency to assure quality supply. There is no link between irrigation services provided, revenues generated and staff incentives. Further, there is lack of coordination among departments dealing with agriculture and those dealing with irrigation, within the irrigation department itself, and between agencies dealing with different types of irrigation like lift irrigation, canal projects, groundwater schemes and the like.

Figure 1.1 The Vicious Circle in Indian Irrigation



Source: World Bank (1999).
Note: ▬ Indicates weak link.

The irrigation departments are highly centralized and function with a top–down approach failing to establish any linkages with farmers. Lack of farmer involvement results in inappropriate design of irrigation systems and poor irrigation service. Farmers are, as a result, dissatisfied. Poor irrigation service also affects the farmers' ability to pay, since inadequate irrigation (combined with inefficient water use technologies) results in low yields and incomes. The water pricing policy impacts incomes in another way. Severe inefficiency and wastage in water use leads to environmental problems in the long run, which have an adverse impact on yields and incomes. The unwillingness of farmers to pay more for irrigation services coupled with the possible inability to do so precludes any change in the water policy in terms of raising water rates. No policy-maker would want to risk such an undertaking. Nor is it fair to increase water rates without a concomitant improvement in the quality of service. Improvements in quality, in turn, are constrained by funds and inefficiency of the input irrigation agency. Thus, the vicious circle perpetuates itself.

TOWARDS USERS' WATER MANAGEMENT

Over the years, various factors have led to the devolution of irrigation management to the users. Some of the key factors are as follows:

1. The guiding principles of the Earth Summit held in Rio de Janeiro in 1992 were the recommendations that water should be treated as an economic good, that water management should be decentralized and that farmers and other stakeholders should play a more important role in the management of natural resources including water.
2. The FAO had estimated (in 1993) that about 20–30 mha of irrigated land is severely affected by salinity. An additional 60–80 mha is affected to some extent by waterlogging and salinity. To tackle these problems, active users' role is essential.
3. The main challenge facing irrigated agriculture is to meet the increasing demand of producing more food with less water. Meeting the demands of the growing population will require better management of the limited resources.
4. Improving water use efficiency is shown to be an effective measure for increasing water productivity and these changes have to be made at the technical, managerial and institutional levels.
5. Institutional improvements include establishing WUAs, promoting multi-stakeholder platforms and water rights, introduction of water pricing and improvements in the legal environment for water allocation. Subject to the qualification that certain pre-conditions must exist, there is extensive literature about the socioeconomic prerequisites to viable local management of common pool resources.[3]
6. Largely driven by fiscal shortages and a common inability to raise sufficient revenues from the collection of water charges, an increasing number of governments have adopted programmes to devolve responsibility for irrigation management to WUAs.
7. Consistent with more general structural adjustment strategies adapted from the 1980s to the present, irrigation management transfer has been

supported by major international development banks.

8. Decentralization and devolution of water resources management will increase water users' participation in decision-making and investment and, in turn, will improve management incentives, accountability, agricultural and economic productivity and cost recovery (World Bank, 1993).
9. Devolution programmes are sometimes promoted in environments where prerequisites do not exist (World Bank, 1993). Partial or incremental attempts at devolution may not be effective and may strengthen resistance to reforms (Vermillion, 1995).

IRRIGATION MANAGEMENT TRANSFER

Vermillion and Sagardoy (1999) define irrigation management transfer (IMT) as relocation of responsibility and authority for irrigation management from government agencies to NGOs such as WUAs. It may include all or partial transfer of management functions. It may include full or only partial authority. It may be implemented at sub-system levels, such as distributary canal commands, or for entire irrigation systems or tubewell commands.

Irrigation Management Transfer across Countries

More than 25 countries in Asia, Africa and Latin America are working towards IMT. Improving the performance of the existing irrigation systems has been the central concern. There is a range of options before governments in transferring management to communities for private sector participation. In all these, the underlying expectation is to augment financial resources and advance resource efficiency (Parthasarathy, 2006).

Major PIM programmes were initiated as components of irrigation rehabilitation loans in Albania, Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Romania, Tajikistan and Uzbekistan, in some Asian countries and many countries of the Organization for Economic Cooperation and Development (OECD). China is piloting self-financed irrigation and drainage districts (SIDD), where the head works of the irrigation system are looked after by a company on corporate lines, which sells water in bulk to WUAs. Irrigation management companies in Vietnam are gradually converting to irrigation cooperatives and WUAs. A participatory irrigation management and development secretariat is under contemplation by the Government of Cambodia. Thailand is piloting a number of experiments with farmers' committees and federations. Pakistan federates WUAs in area water boards.

The Central Asian countries of the former Soviet Russia are faced with a new challenge of restoring highly-deteriorated irrigation systems following the collapse of the communist regimes and state farms. The collapse of the market and the economy leaves no better option than PIM to rehabilitate and restore the irrigation systems. Albania, Macedonia and Romania are pursuing vigorous PIM programmes through rehabilitation projects. Similarly, Kyrgyzstan, Armenia, Tajikistan, Georgia and Kazakhstan are pursuing programmes that give a central role to farmers.

Vermillion (2004) describes early reforms in the irrigation sector as modest with a primary focus on rehabilitation. The formation of small WUAs was often supplemental at the community or tertiary levels. Many of these were often created to satisfy donor requirement and did not have an appropriate legal framework or sufficient power to take action. Public irrigation agencies did not see WUAs as a threat as long as they cleaned canals, collected fees and were subordinate to irrigation agencies. These old paradigms have not dislodged the equilibrium of perverse, entrenched interests and hence are unable to overcome the key threats facing irrigation agriculture such as financial and physical non-sustainability of the irrigation system.

The new reform paradigm, in contrast, focuses on politically-driven reforms for the creation of large WUAs serviced by professional management and operating on economies of scale. Reforms in the late 1980s in Mexico, Turkey, Andhra Pradesh and Indonesia were part of a larger process of institutional reform through well-defined legal frameworks and substantive roles in O&M of the irrigation system, a federated WUA hierarchy, choice to raise resources, hire own staff in some cases and a new accountability between users and the agencies.

NOTES

1. Some of the recent works of K.V. Raju from which this study has largely benefited are: PIM in Andhra Pradesh, carried out in 2005 and supported by the Development Support Centre and PIM in Bihar in early 2006, supported by the World Bank (Raju, 2006; Raju et al., 2006)
2. This includes views and opinions expressed by several experienced and retired engineers, including S.N. Lele, Commissioner (retired), CAD, MOWR, Government of India.
3. The three most commonly identified factors are: (*a*) mutual strong and repeating dependence of users on the resource, (*b*) favourable benefit/cost ratio between the value of output from resource management and the cost to users of investing social capital through community resource management and (*c*) absence of severe social divisions among resource users, which would preclude communication and direct interaction among them.

Water Users' Associations in Major Canal Systems

Structure and Functions

Chapter 2

This chapter introduces the concept of participatory irrigation management (PIM) and is followed by a discussion on the coverage of PIM in India. The status of PIM and the structure and functions of water users' associations (WUAs) are dealt with in different sections. Two case studies capture positive results in their efforts towards management.

CONCEPT OF PIM

There are several definitions of PIM. According to one, PIM refers to programmes that seek to increase farmers' direct involvement in system management, either as a complement or substitute for the role of the state. Either approach generally leads to some form of *joint management* or *co-management* of irrigation systems, with the state being responsible for more tasks at higher levels of the system, and farmers' organizations being responsible for more tasks at the lower levels (Meinzen-Dick et al., 1997). Another definition, quoted in Hooja and Joshi (2000), is that PIM involves water-user farmers taking over at least one level of a canal above the outlet and managing that level and looking after all issues pertaining to that watercourse. This management should be through WUAs or related informal groups. The WUAs may assume various organizational forms and functions according to regional or local needs.

The Vermillion (1997) defines PIM as 'the involvement of irrigation users in all aspects and all levels of irrigation management'. 'Involvement' is flexible, ranging from light involvement like information sharing, consultation and joined assessment of problems to real involvement like shared decision-making, collaboration and full say by the water users. 'Users' refer to water users. The World Bank employs the word 'userism' to express the essence of PIM, because it is management of the users, by the users and for the users. The concept of PIM is then also related to the concept of WUAs. 'All aspects' include the initial planning and design of new irrigation projects or improvements, as well as the construction, supervision and financing, decision rules, operation, maintenance, monitoring and evaluation of the system. 'All levels' include the tertiary, secondary and main system levels as well as project and sector levels.

Participatory irrigation management may include the reordering of control over (claims to) water, the redefinition of boundaries and domains of governance and the construction of new entities (users, WUAs, etc.). There is, however, a large variety in the number of functions

that can be transferred, the degree of transfer of the different functions and the organizational set-up aimed at after transfer. This is because of the fact that participation in irrigation management by water users can take a wide variety of forms. Farmers can be involved in various system management functions, including planning, design, operation, maintenance, rehabilitation, resource mobilization and conflict resolution. Moreover, they can be involved in these functions at various system levels: from the field channel to the entire system. Almost all irrigation systems show some involvement of water users in system management. When people speak of introducing PIM, they are usually referring to a change in the level, mode, or intensity of user participation that would increase farmer responsibility and authority in management processes (Groenfeldt and Svendsen, 2000).

The concept of PIM is closely linked to the concept of irrigation management transfer (IMT). Indeed, IMT is a subset of PIM. Irrigation management transfer can be defined as the transfer of responsibility and authority for irrigation system management from government agencies to WUAs, or other private sector entities. This is a broad and rather vague definition. Irrigation management transfer may include transfer of decision-making authority (or governance). It may include transfer of ownership of scheme infrastructure (which is normally considered as privatization). It may include transfer of water rights from the government to WUAs. Or it may only include turning over to water users a part of the management responsibilities, such as water delivery, canal maintenance and fixing the water fees, while the final approval of operation and maintenance (O&M) plans and budgets are subject to government approval (FAO, 1999).

Participatory Irrigation Management (PIM)

Involving users in irrigation development to make irrigation systems sustainable became critical as governments the world over started facing several problems. This new paradigm, called PIM, came to be recognized as an important component of reforms in the irrigation sector. The expectation was that local farmer' groups and WUAs would assume responsibility for local irrigation and drainage management. Formation and transfer of responsibilities to WUAs has been vibrant and has obtained support all over the globe (Peter, 2004).

The impact of PIM has been mixed. Although the rationale for IMT has been the same across the globe, approaches are diverse; impacts across countries are varied and progress is indicative of different levels, as the situation and problems are contextual. But the overall trend is consistent with decentralization and devolution of powers to the lower levels (see Table 2.1).

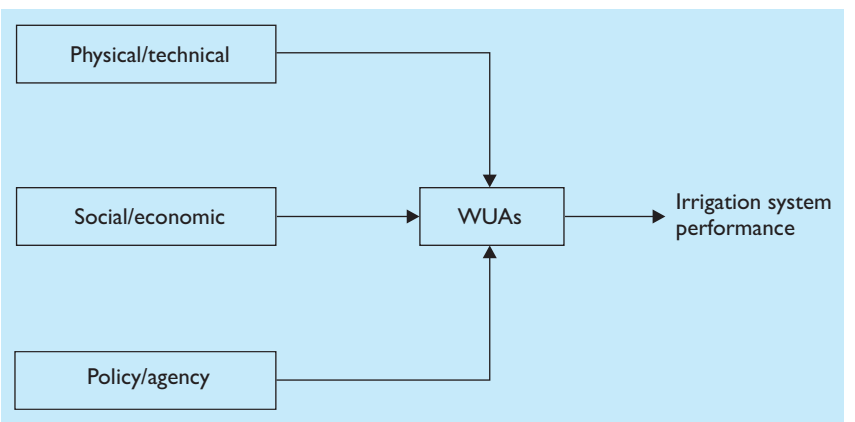
Water users' associations are envisaged as an intermediary between physical/technical, social/economic and public/agency aspects of water reform and actual irrigation performance (see Figure 2.1). The physical/technical aspects include environmental factors, such as availability of water, climate and infrastructure already in place. The social/economic considerations include whether farming communities are village based, ethnicity of the area, extent to which there are other long-standing conflicts in

Table 2.1 Water Sharing and Responsibilities

Source and Water Sharing	Responsibility Variations
Discreet situation—water used for irrigation is not connected to other water bodies or utilized by upstream or downstream users.	• Complete control of water management—distribution, allocation, management and maintenance. Local farmers will be part of decision-making and will pay fees for water that they receive and use for improving local operations and maintenance.
Multiple communities share a common water source for irrigation and other uses.	• WUA takes on the responsibility of local management, allocation, distribution and maintenance, but will do this in cooperation with a government water management authority or agency. • The government agency, or a combination of agencies, provides technical assistance to boost local management capacity, management of larger water basin (including construction, operations and maintenance of intra-basin infrastructure) and oversight and regulation where the services can be contracted out. • Some of the water basin management initiatives involve the government water management authority contracting out to management corporations to provide infrastructure that does not fall under the WUAs and technical assistance for operations and maintenance functions.

Source: Compiled from http://www.servicesforall.org/html/water/irrigation_management_C2_print.shtml (2 of 11) (6/4/03 10:04:14 AM) CNES: The Pros and Cons of Irrigation Management Reform01 (See Overview Paper, International E-mail-Conference, http://www.fao.org/ag/agl/aglw/waterinstitutions/overview.htm).

Figure 2.1 Functions of WUAs



Source: Water Policy Series C (2003).

the area, crops grown and access to domestic and international markets. The public/agency aspects include type of regulatory authority, extent to which agency involvement is key to upstream water system management, efficiency and professionalism of the existing agency and the extent to which agency functions are publicly accountable.

By devolving water management functions at the local level, WUAs will more naturally be able to balance these three types of considerations. Not coincidentally, the balance of these considerations also shapes the type of WUA that is likely to exist (see Table 2.2).

PROGRESS OF PIM

Participation in irrigation management has opened up a new arena that seeks to make irrigation management more efficient. However, implementation and adaptation across and within countries has been varied and is at different stages of development. A number of countries have adopted and implemented PIM. Important among them are Sri Lanka, Nepal, Bangladesh, the Philippines, Indonesia and India in South and South-east Asia; China, Taiwan and Korea in East Asia; Mexico, Brazil, Colombia and the Dominican Republic in Latin America and Madagascar, Morocco, Nigeria and Senegal in Africa. In accordance with local conditions, the programme was implemented by setting different objectives, but the ultimate aim was to improve irrigation performance. In all these settings, local-level institutions play a crucial role and invariably comprise water users in an association located in a specific basin, to manage the allocation of a key resource—water—effectively, equitably and sustainably.

The role of government institutions in the management of irrigation systems is changing, due to recent trends. Most governments around the world are confronted with the reality of a decline in fiscal capabilities. Within the

farming community, there is increasing experience, knowledge and initiative as literacy has increased and participation of stakeholders in management aspects has spread.

Participatory irrigation management in practice is complex. The devolution of irrigation management is not easy as the experience of many such programmes has shown. There is tension between traditions of farmers' involvement and traditions of depending on the state. For many farmers in irrigation systems, the government is responsible for providing water and any change requiring them to do more of system management constitutes a fundamental change in the social contract with the state. According to Ruth Meinzen-Dick (2000), success depends, in large part, on having strong WUAs to assume management; otherwise, any state withdrawal leaves behind a vacuum and amounts to a disinvestment in irrigation systems.

The Mode of Implementing PIM across Countries

1. The process of implementing a change to a more participatory type of management system varies widely from the bottom–up approach used in the Philippines to the more top–down approach used in Turkey and Mexico.
2. In promoting PIM, Colombia has invested much less time and effort than other countries. As a consequence, the process of transfer was very quick, but there have been second-generation problems. Users have been less well informed and have been uncertain about their rights with respect to ownership and changes in management practices. Since a number of the irrigation systems in Colombia are based on river pumping, some of the more recent cases of transfer have involved additional negotiations with respect to energy subsidies.
3. Argentina has used information meetings and word-of-mouth to

Table 2.2 Pros and Cons of Irrigation Management Structures

	Decentralized Proponents		Citizen Farmer Advocates	
Activity	**Pros**	**Cons**	**Pros**	**Cons**
Full agency control	This is the system currently in practice in many countries.	Has a track record of inefficiency and corruption.	Keeps water in public hands.	Has a track record of inefficiency, corruption, top–down decision-making.
Agency O&M (user input)	Allows for some level of user input, which can provide improved management.	Still maintains control in the hands of top government agency structures.	Keeps water in public hands.	Generally, involves required local action without empowerment.
Shared management	Provides greater level of farmer input and, therefore, potentially greater efficiency.	Tends to maintain government control over decision-making and water trading is limited.	Government maintains control, but there is some level of government decision-making.	May be an excuse for increased fees with little real opportunities for democratic management.
WUA O&M	Allows for some level of community/ WUA decision-making.	Agency regulation may hinder free trade and local autonomy in decision-making.	Local groups empowered to participate in better management of water systems.	May be an excuse for increased fees with little real opportunities for democratic management.
WUA owned (agency regulation)	Allows for local management and ownership. Tradable water rights allow for efficient use.	Agency regulation may hinder free trade and local autonomy in decision-making.	Gives the local groups autonomy in management while protecting downstream users.	May force local groups to absorb full cost of O&M. May allow for exploitation by local groups.
Full WUA control	Allows for local management and ownership. Tradable water rights allow for efficient use.	Lack of accountability for local actions, possible negative externalities.	Provides a wide range of options for water management.	Possibilities of use by local elites. Full cost recovery is a potential major issue.

Source: Water Policy Series C (2003).

make a rapid transition to PIM, while Mexico and Turkey have used more structured informational meetings with users. These two countries also invested heavily in training their own staff. In Mexico, audio-visual materials prepared by IMTA and outside firms were used to persuade users that IMT was a positive change.

4. The Philippines has used the slowest process with intensive use of institutional development officers and farmer organizers to serve as catalysts. These organizers lived in the villages and organized exchanges between the National Irrigation Administration (NIA) and the users. However, the NIA has now realized that too much dependence on the farmer organizers has slowed down the process and has now reduced significantly the number of farmer organizers.
5. In the Philippines, there has been more dialogue through the organizers, but given that only limited transfer of responsibility has taken place, this approach has not achieved rapid transfer of responsibility to users. In contrast, in both Turkey and Mexico there have been very active negotiations concerning transfer terms. As a result, irrigation administrations (IAs) have been able to exert some power and develop a partnership with the agency based on a meeting of equals. In a number of cases they have also been able to ensure that critical investments were made prior to the transfer.
6. In terms of transferring responsibility, most of the Colombian IAs appear to have had very little say in the process. However, this has changed somewhat as more recently IAs have been negotiating energy subsidies and insisting upon rehabilitation prior to the transfer.
7. As a key stage of the transfer process, Mexico, Colombia and Turkey have adopted a phase of shared management between the agency and IAs during the transition. The duration of this shared management phase varies by country and by district, but is usually between 6–12 months. In contrast, in Argentina the systems were transferred much more quickly, while in the Philippines there has been a very gradual shift in responsibility, in some cases over a period of many years.

Type/Nature of IAs

1. The type and nature of IAs is directly related to the structure of the economy as well as the type of irrigation found in the countries. In Mexico, Japan, Taiwan, Turkey, Argentina and Colombia, IAs are large (2,000–50,000 ha) and are organized more along the lines of commercial entities, reflecting the more commercial nature of the irrigated sector. Agriculture is developed on a cash basis and many of the staff are hired professionals paid in cash. Given their large size, IAs can afford to purchase and maintain their own transport and maintenance equipment.
2. In contrast, IAs in the Philippines are very small (100–300 ha) and are often organized based on the village structure. Most of the labour is voluntary labour provided by the users and very few, if any, of the irrigation staff are hired professionals. Given the small size of the IAs there are diseconomies of scale and hence the organizations cannot afford to own specialized maintenance equipment. In the Philippines, irrigation service fees (ISF) are usually paid in grain

and therefore are very awkward to store and transport and typically results in 10–15 per cent losses.

3. In Argentina, IAs are public NGOs with full legal authority, including the power to tax. In the other countries, IAs have limited power to establish and collect ISFs, but do not have local taxation powers and, therefore, the majority of their income is from ISFs.

EMERGENCE OF PIM IN INDIA

The idea of involving farmers in the management process has cropped up at different points of time. The Sixth Five-Year Plan had emphasized the need for the participation of farmers and the Seventh Five-Year Plan also indicated it. The National Water Policy in 1987 and in 2005 also stressed on farmers' participation in management and guidelines to that effect were issued in 2005. The Report (1992) of the Committee on the Pricing of Irrigation Water (the Vaidyanathan Committee) specifically focused on management through user groups. During the early 1990s, the need for introducing PIM came to be realized in India. Such a measure, it was felt, would go a long way in removing the deficiencies of the government-regulated irrigation system. In June 1994, a national seminar on PIM was organized in Aurangabad and a delegation from India participated at the international conference in Mexico in 1995. Another national conference in 1995 held in New Delhi adopted a national-level action plan. Fourteen state/regional-level conferences were organized during 1990–92 and again during 1995–96, where representatives of farmers, government officials and NGOs participated (see Box 2.1).

The initial success of the Mohini Water Cooperative Society established in 1978 in Gujarat raised expectations. The leadership role in this respect was assumed by the Command Area Development (CAD) wing of the Ministry of Water Resources, Government of India. Some NGOs and external donors also took keen interest in the formation of WUAs in certain parts of the country. As a result, several WUAs came to be established specially in Maharashtra, Gujarat, Tamil Nadu and Bihar. The experiments in farmers' participation in irrigation management, however, were very few by the end of 1998. There were several major states like Assam, West Bengal, Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Karnataka and Kerala where PIM had to take root. Even in other states, progress was not rapid. Andhra Pradesh was the only state that enacted a comprehensive law for the purpose.

There has been much debate about whether the 'big bang' approach with

Box 2.1 Objectives of PIM in India

- To create a sense of ownership of water resources and the irrigation system among the users, so as to promote economy in water use and preservation of the system.
- To improve service deliveries through better operation and maintenance.
- To achieve optimum utilization of available resources through sophisticated deliveries, precisely as per crop needs.
- To achieve equity in water distribution.
- To increase production per unit of water, where water is scarce and to increase production per unit of land where water is adequate.
- To make best use of natural precipitation and groundwater in conjunction with flow irrigation for increasing irrigation and cropping intensity.
- To facilitate the users to have a choice of crops, cropping sequence, timing of water supply, period of supply and also frequency of supply, depending on soils, climate and other infrastructure facilities available in the commands such as roads, markets, cold storages, etc., so as to maximize the incomes and returns.
- To encourage collective and community responsibility for the collection of water charges and payment to the irrigation agency.
- To create a healthy atmosphere between the irrigation agency personnel and the users.

uniform WUAs and PIM mechanisms should be adopted or whether a gradual, phase-wise approach should be adopted. Each approach requires pilot projects, which have been tried out and involves various aspects. The approaches adopted across the states are shown in Table 2.3. The intricacies and methods of implementation vary.

Table 2.3 Approaches Adopted across States

Approaches	States
Big bang	Andhra Pradesh, Madhya Pradesh
Phase-wise	Bihar, Gujarat, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka

Source: Review.

Box 2.2 Command Area Development and Water Management Programme—Current Status

'Physical performance has been undertaken with respect to various components, however; the progress has been slow.

- Response to renovation of Minor Irrigation Tanks has been poor as the funding pattern is 50:50 matching grant with a requirement of formation of PIM Act/Amendment of Irrigation Act. A similar scheme by the Ministry of Water Resources is providing funding pattern of 75:25.
- During the Ninth Five-Year Plan, actual expenditure was 96 per cent of the approved outlay on account of budgetary constraints of the state governments in providing matching share.
- In practice, there is scope to improve monitoring more aspects. States have been advised to constitute a Committee at State level having representation from all the state and central government departments, which is already completed in some and underway in most of the states.
- Evaluation studies conducted by the state and central governments have indicated that the programme has been useful to the farmers through better utilization of irrigation potential created, better efficiency of water use, increase in irrigation intensity, improvement in the package of agricultural practices, equity in distribution of water, increase in agricultural production and productivity, increase in farmers income, controlling the wasteful use of water and checking the incidence of waterlogging and soil salinity.
- Under the component of reclaiming waterlogged areas in the command areas, an area of 46,466 ha was reported to be reclaimed till March 2005.
- Under the restructured CADWM Programme implemented from the financial year 2004–05, the cost norm for reclamation of waterlogged area had increased from Rs12,000 per ha to Rs15,000 per ha (for execution of surface drainage, biodrainage, etc.) and to Rs 40,000 per ha (for sub surface drainage). A mandatory contribution of minimum 10 per cent of total cost in cash or labour was required to be made by the beneficiaries and the remaining cost would be borne by the State Government.'

Source: CAD, MOWR, 2006.

Mustering Support for PIM

The Government of India has supported PIM since the mid-1980s as reflected in its programmes and policies:

1. The centrally-sponsored Command Area Development (CAD) programme was started in 1974 with the objective of bridging the gap between irrigation potential created and utilized. In 1985, the CAD programme requested each Command Area Development Authority (CADA) to take up aspects of PIM in at least one small part of the command area as an experiment. In 1987, the CAD programme issued a series of guidelines to involve farmers. It covered ways to create WUAs and ways to transfer various irrigation management functions. Since then, the CAD programme has been subsidizing this effort. Specifically, CAD funds are made available to provide a 'management subsidy' to each WUA.
2. The Ministry of Water Resources, Government of India, circulated a model act on PIM in 1998 to facilitate action by the state governments. Subsequently, conferences on PIM were also organized by the ministry. National-level training programmes on PIM have been organized in various parts of the country for CAD functionaries. In addition, a grant is also provided to states for organizing state and project-level training programmes for farmers and field functionaries.
3. The Command Area Development and Water Management (CADWM) programme was a restructured programme of CAD that came to be implemented from April 2004 (see Box 2.2).

This programme covers mainly Major and Medium irrigation projects. Out of 37.1 mha of irrigation potential created under Major and Medium irrigation projects, field channels have been constructed in about 17 mha in the last 31 years. The pace of micro-channelization has been far lower than the pace of creation of irrigation potential.

National Water Policy

The National Water Policy (MOWR, 1987) lays down broad guidelines for water resources development in the country. It aims to give direction to efforts to improve the performance of water resources projects in general and irrigation projects in particular. The policy states: 'Efforts should be made to involve farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates'. Farmers are to be encouraged to assume management responsibility through their WUAs for as much of the irrigation system they can handle, improvements to tertiary system and phased turnover of the tertiary system management to WUAs.

Planning Commission

The report of the Committee on Pricing of Irrigation Water supports the idea of PIM as part of the strategy for improving irrigation management in India. Starting from the Sixth Five-Year Plan, all five-year plans have provided strategic support to promote PIM. Even the Eleventh Five-Year Plan is planning to further promote and strengthen PIM (see Box 2.3).

Box 2.3 Suggested Support for PIM in the Eleventh Five-Year Plan

The Working Group on water, constituted by the Planning Commission has stressed the need to strengthen and further promote PIM in India. The Working Group focused on: (*a*) reviewing the present status of farmers' participation programme including the existing legal, organizational and institutional arrangements for PIM, the physical and financial achievements, suggest strategy and action plan for the Eleventh Plan and (*b*) suggesting ways of sustaining PIM with special reference to the involvement of NGOs and self-help groups (SHGs).

Anil Shah, a member of this Working Group suggested the following:

- Empower the stakeholders groups to take the responsibility for: (*a*) efficiency, (*b*) equitable and sustainable management of canals transferred, (*c*) functioning with adequate authority and resources on which they can exercise command.

Principles of Sustainable Management of the Canal Systems

- Centrality of community-based organizations where farmers' organizations are the centre of planning, budgeting, implementation and management of canals transferred to them.
- Equity is of critical significance at all stages where sustainable mechanisms and safeguards must be incorporated into the design and execution of the programme to ensure participation of the disadvantaged.
- Decentralization of authority at the farmers' organization level and at the local officers' level in the irrigation department.
- Facilitation agencies that are skilled in motivating and organizing local groups to work for a common purpose should be initiated. Ten per cent of the project cost should be assigned as overheads to the NGOs to enable them to provide software support covering promotion of WUAs, rehabilitation of the canal system and water management for three irrigation seasons. Transparent processes to select them should be adopted.
- A participatory outcome/impact-oriented and user-focused monitoring and evaluation system should be put in place to obtain concurrent feedback and undertake mid-course corrections in the programme design and implementation systems.
- Training and software support: A structural strategy and operational guidelines have to be developed for the training required for the key functionaries of PIM. State governments implementing PIM have to develop a strategy to ensure that competent training organizations provide training to key functionaries in the farmers' organizations, irrigation department and the NGOs in each phase of PIM.
- Sustained momentum of development: Facilitating agencies should be mandated and supported to initiate productivity enhancement and value addition.
- Organizational restructuring of government agencies: Setting up of a national council for PIM with the secretary as chairman and a reputed and highly-respected leader well-versed in the requirements of promoting PIM to work as vice-chairman. The council is to have concerned senior officials of the Ministry of Water Resources, Ministry of Agriculture and the Planning Commission representatives from state government, eminent experts and leaders from academia and NGOs and leaders of FOs working at the distributory/project committee level.

Source: Paper by Anil C Shah on FOs' proposal for PIM.

Multilateral Funding and Donor Agencies

The World Bank has been promoting PIM through most of the water sector projects it has founded. In the early 1990s, the Water Resources Consolidation Project (WRCP) carried out in Haryana, Orissa and Tamil Nadu had a major component to promote farmers' organizations and turnover across these three states. Later the WRCP was extended to other states. The United States Agency for International Development (USAID) through 11 Water and Land Management Institutes (WALMIs) facilitated action research projects for WUA formation and functioning. In recent years, the Asian Development Bank (ADB) has been promoting PIM in Chhattisgarh and Orissa through its water sector projects. The Ford Foundation has been an active player in supporting a good number of research studies and pilot sites on PIM across several states. The Aga Khan Foundation has, in recent years, supported PIM studies in a few states through the Development Support Centre.

NGOs

Several NGOs involved in rural development have been playing a leading role in promoting and strengthening PIM across several states (they are discussed in detail in Chapter 11).

Training Institutions

The Water and Land Management Institutes or Irrigation Management Training Institutes in several states have undertaken experiments in IMT. WALMI has worked in Gujarat, Bihar, Tamil Nadu, Maharashtra, Madhya Pradesh, Rajasthan, Kerala, Andhra Pradesh and Karnataka with various WUAs.

Universities and Research Institutes

Over the years, several institutions have been working with government agencies and donor agencies in planning, executing, monitoring and evaluating PIM across the country. Some of the leading institutes are: (*a*) the Centre for Water Resources and Ocean Management at Anna University, (*b*) Administrative Staff College, Hyderabad, (*c*) Institute for Rural Management, Anand, (*d*) Indian Institute of Management, Ahmedabad, (*e*) Madras Institute of Development Studies, Chennai, (*f*) A.N. Sinha Institute of Social Sciences, Patna, (*g*) Institute for Social and Economic Change, Bangalore, (*h*) Institute of Development Studies, Jaipur, (*i*) Gujarat Institute for Development Research, Ahmedabad and (*j*) Centre for Economics and Social Studies, Hyderabad. Many of these institutions have been involved in assisting and documenting IMT efforts.

Progress across States in India

Progress in PIM across states has been varied. Table 2.4 indicates WUAs formed and area covered across states. In five states information was not available, in seven states the number of WUAs formed has been below 100, in eight other states the number of associations formed is above 100 but below 1,000 and in eight states the number of associations formed is more than 1,000. Significantly, high numbers are found in Orissa, Andhra Pradesh and Maharashtra. However, the area covered under irrigation varies and

is not proportionate to the number of WUAs formed. Andhra Pradesh stood first in area coverage and second in terms of formation of WUAs. Maharashtra was also one of the leading states to have taken PIM forward.

For example, Bihar has created an irrigation potential of 2.6 mha (Medium and Major irrigation schemes) (see Table 2.5). But the actual irrigated area was only 1.6 mha by January 2006. Till February 2006, nearly 150,000 ha was transferred to 34 WUAs under the PIM programme, spread over the Sone and Gandak command areas. By end 2006, the Water Resources Department (WRD) was planning to transfer another 160,000 ha by forming 47 WUAs. To bring 50 per cent of the created irrigation potential, that is, nearly 1.3 mha of command area under PIM in the next five years (2006–11), WALMI has estimated an expenditure of Rs 6,131 million (estimated for 1.2 mha), in which physical restoration systems alone will account for 98 per cent of the budget.

Bihar repaired the channels by end 2005. Now, the government has planned to provide minimum rehabilitation in all irrigation systems before transferring them to the WUAs. The state is making serious attempts to complete all these works by end 2012.[1] However, both at Paliganj and the remaining 11 WUAs, minimum rehabilitation works have not been carried out in spite of the farmers' demand for such repairs. Farmers have now agreed to take over the channels as they are, but with the proviso that the state will handle large-scale emergency repairs. In the case of two WUAs (Khajouri in the Sone system and Narayanpur in the Gandak system), the WUAs are stuck with high siltation levels,[2] leading to defunct organizations. But the secretary of the WRD has stressed that restoring the

Table 2.4 Number of WUAs and Area Covered by WUAs across States in India

State	Number of WUAs	Area Covered ('000 ha)	Net Irrigated Area ('000 ha)	Area Covered as % to Total Net Area
Andhra Pradesh	10,292	480.00	4,395	91.6
Assam	2	1.00	572	0.17
Bihar	1	12.20	3,624	0.34
Goa	39	4.59	23	19.96
Gujarat	476	19	3,042	0.62
Haryana	554	110.80	2,755	4.02
Himachal Pradesh	875	35	105	33.33
Jammu & Kashmir	1	1.00	313	0.32
Karnataka	193	138.38	2,325	5.95
Kerala	3,712	148.48	357	41.59
Madhya Pradesh*	1,470	1,495.00	6,399	23.36
Chhattisgarh*	946	1,135.00	–	–
Maharashtra	142	55.80	2,567	2.17
Manipur	62	49.27	65	75.80
Orissa	88	34.31	2,090	1.64
Rajasthan	35	15.93	5,588	0.29
Tamil Nadu	328	426.40	2,892	14.74
Uttar Pradesh	1	0.25	11,999	Negligible
West Bengal	10,000	37.00	1,911	1.94
Total*	29,217	8,519.41	Not Available	14.93

Source: Planning Commission (2000: 103); GOI (2000).
Note: *Revised figures for Madhya Pradesh, Chhattisgarh and total.

Table 2.5 Status of PIM in Bihar (till February 2006)

	MOU Signed and Transferred	By June 2006	July–Dec. 2006 (Planned)	During 2007 (Planned)	2008–12 (Planned)	Total by end 2012 (Planned)
Number of WUAs	34	12	47	–	–	562
Area in ha	150,000	35,000	160,000	455,000	800,000	1.6 million#
Number of farmers*	235,000	70,000	320,000	1 million	1.6 million	3.2 million
Projects covered	Sone, Gandak	Sone, Gandak	Sone, Gandak	All projects	All projects	All projects

Source: WRD, Patna, February 2006.
Notes: * Number of farmers is an estimated figure at the rate of 0.5 acre per farmer, as per the field staff observations.
By end 2012, the actual irrigated area may increase by another 20–30 per cent owing to planned investments.

system up to 80 per cent of the designed level and its certification by the WUA is going to be mandatory in the future.

In Bihar, an area can be authorized for irrigation water supplies for 10 years; for the same reason, the memorandum of understanding (MOU) between the WUA and WRD is for a period of 10 years. However, the state has the option of revising the agreement in case of non-performance or other constraints.

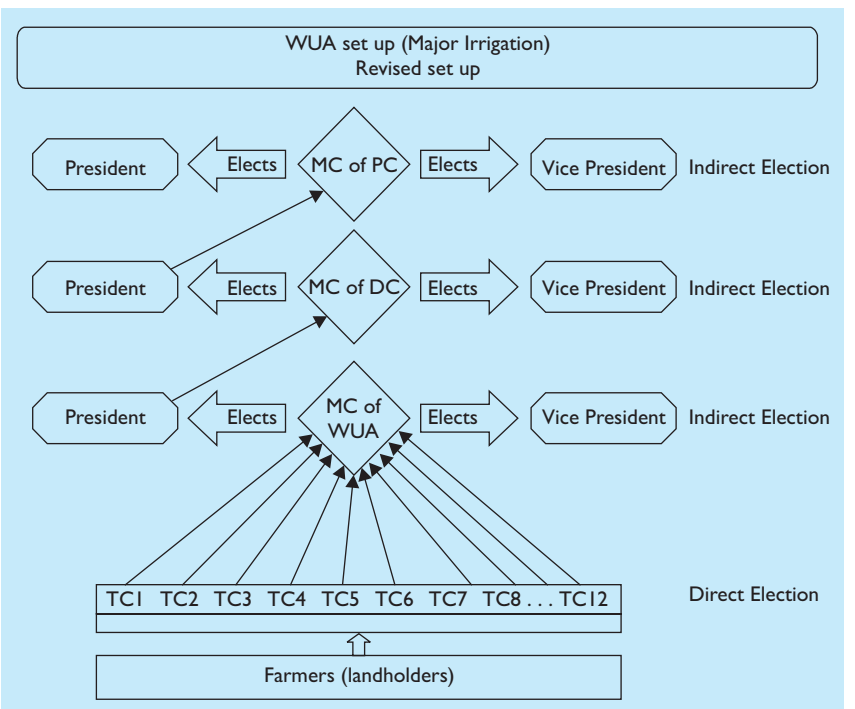
ORGANIZATIONAL STRUCTURE OF WUAs

Recognizing the need for a sound legal framework for PIM in the country, the Ministry of Water Resources brought out a model act to be adopted by state legislatures for enacting new irrigation acts/amending the existing irrigation acts for facilitating PIM (in 1998). Andhra Pradesh had already enacted the Andhra Pradesh Farmers' Management of Irrigation Systems (APFMIS) Act of 1997. The legal framework provides for the creation of farmers' organizations at different levels as discussed next:

1. Water users' associations will have a delineated command area on a hydraulic basis, which will be administratively viable. Generally, a WUA would cover a group of outlets or a Minor.
2. Distributary committee (DC) will comprise five or more WUAs. All the presidents of WUAs will comprise the general body of the distributary committee.
3. The project committee (PC) will be an apex committee of an irrigation system and presidents of the DCs in the project area will constitute the general body of this committee.

A commonly found organizational structure across states is a formal three-tier structure as shown in Figure 2.2, based on the Andhra Pradesh model. But, in Bihar, it is a two-tier structure starting from the DC level.

Figure 2.2 Structure of WUAs



FUNCTIONS OF WUAs

Water users' associations at different levels are mainly expected to be involved in:

1. Repair and maintenance of irrigation system in their area of operation.
2. Distribution of irrigation water to beneficiary farmers.
3. Assisting the irrigation department in the preparation of water demand and collection of water charges.
4. Resolving disputes among the members and the WUA.
5. Monitoring the flow of water in the irrigation system.

Functional Gaps

A rapid assessment of WUAs (in Andhra Pradesh, Bihar, Gujarat, Maharashtra, Madhya Pradesh, Rajasthan and Karnataka) indicates a wide gap between what has been proposed in the guidelines and how WUAs are functioning in reality.

1. Water users' associations are more a group of individuals representing irrigating farmers. It is expected to look after the maintenance of structures, water regulation, distribution and equity concerns, including tail-enders' needs. The meetings of the WUAs and the general body meetings are held to fulfil certain formalities.
2. In spite of the absence of clear planning and ways to prioritize the concerns, WUAs are not involved in resource sharing. The process towards transparent decision-making, planning and monitoring, and roles and responsibilities of different actors in the WUAs have not evolved properly in the absence of group-building processes.
3. Transaction cost: Whenever the WUA conducts a meeting it sends an agenda three days in advance to all members, mostly through a *laskar*. However, a number WUA presidents expressed concern about the costs involved in travel and in organizing meetings. One WUA president was forthright in asking who should bear expenses related to meetings, books, etc.
4. Regularity of meetings is considered as an important aspect, indicating the health of any SHG. However, WUAs generally meet as directed by the competent authority. A WUA president in the Telangana region stated that after the second term election, the WUA has met only once to endorse the government's decision to fill rain-fed tanks.[3]
5. The WUA is expected to maintain 13 books of records. A majority of WUAs found this difficult. There is a need to reduce the number of books of records.
6. The number of good NGOs with appropriate capacities to mobilize the communities is insufficient.
7. Participatory irrigation management is functioning as a water distributor and not as a water manager.
8. Lack of administrative and political support.
9. Participatory irrigation management is not being seen as a holistic shift in management, but is limited to passing on responsibilities to the Minor levels. There is no thinking regarding the role, structure and capacities of the WRD, no rethinking on institutional arrangement for capacity building, no incentives linked to responsibilities. Water use efficiency is not the focus.

Some key observations from the field (in Andhra Pradesh, Bihar, Madhya Pradesh and Maharashtra) are as follows:

Poor Participation of Farmers

1. The WUAs have not been functioning as a representative unit of all farmers. The responsibilities, decision-making and benefits, if any, are skewed towards the chairperson/vice chairperson. The role of the territorial committees (TCs) is marginal and limited to getting its share of work.

2. The WUA is considered a service provider rather than a representative body of farmers. People expect the WUA to fulfil their desires/aspirations. Farmers believe that the WUA has the responsibility to do everything.
3. Tenant farmers have not been involved in any way in the WUAs, which may have a negative effect insofar as collective action is concerned. This is happening in spite of a provision in the Act for inclusive membership for tenants in the WUAs and in the sub-committee to deal with such issues. This not only indicates the lack of understanding on such issues, but also the inability to translate concerns into action.
4. Participation of farmers in planning and chalking out the priorities is almost absent. No attempt is made (by the office bearers or departments) to provide the space for proactive action by farmers.
5. Farmers are used to doing certain things on their own. With the WUAs coming into the picture, much of this was expected to be done by the WUAs. Now there is no felt responsibility on the farmers' part to mobilize fellow farmers.
6. Earlier it was the farmers' responsibility to take care of field channels, but now the farmers expect the WUAs to take care of it. They intend to avoid responsibility.
7. The WUA president is ineffective in mustering the support of the members of the TCs.
8. Members of the TCs are interested in the contracts of the physical works rather than water management.
9. Meetings of WUAs and general body meetings cannot be effective since there is no financial allocation for such activities.
10. Inadequate efforts to facilitate the roles and responsibilities of the members is another factor contributing to poor participation of farmers in the WUAs.

Farmers' Views

In the past, farmers use to attend to repair works themselves or engage workers. But with the increase in tenant farmers (from crop to crop), farmers' participation has come down. For example, in Singavaram Village in Andhra Pradesh, 200 out of 300 farmers are tenant farmers. Now a majority of landowners have leased out land in small parcels. Tenants do not undertake any other work related to the repair and maintenance of field channels as they need to attend to wage work too.

1. Farmers will always look up to the WUA president as a responsible person. One WUA president said that farmers have no role in WUAs. They have no awareness and it may take another five years for them to get prepared for their role in the WUAs.
2. The performance of WUAs, particularly in organizing farmers, depends on the leadership capability of the executive committee members. The president plays a big role in organizing and assigning roles to farmers as per the needs of the concerned WUA.
3. Based on the experience of cooperative societies, a WUA president said, if WUAs have to be successful, farmers should be involved at all stages. Only 30–40 per cent of farmers preferred collective action, while others are either suspicious or reluctant to take part in collective action.

Conflict Resolution

Across WUAs it was felt that the *gram sarpanch* and village elders will play a larger role in conflict resolution. While resolving disputes, necessary information including land maps will be consulted. Conflicts will be discussed in the WUA only when water is available. In a few cases, though issues were taken up for discussion, it did not result in mutually agreed upon resolutions. For example, a TC reported encroachment of field channel by a socially-weak farmer (as it passed through his land). The WUA did not discuss the issue or pass a resolution on it. Instead, the TC was asked to find an alternative field channel to this farmer's field.

PROCESS CONSTRAINTS

1. Resolutions passed by the WUAs are submitted to the district collector and then move to the executive engineer.
2. Time taken to receive plough-back money is generally more than a year. This does not coincide with the time when the repair and maintenance need to be carried out, which should preferably take place before the kharif crop season. This has affected the functioning of the WUAs.
3. At least one-third of the farmers (quorum) under the WUA must attend the general body meeting.[4] In several cases, the WUAs have recorded two meetings of the general body; first, when quorum was not there, second, with quorum. It was felt across the WUAs that organizing general body meetings was the most difficult part of the WUA functions. It was found difficult to persuade farmers of different villages to meet in one village. Rather, they found it convenient to organize village-wise *gram sabhas* where the TC takes the lead and are attended by the WUA president.
4. Sub-committees are formed only in exceptional cases. This approach does not seem to be helpful in institutionalizing specific functions and functional responsibilities or in broad-basing participation.
5. There is also no upward linkage in decision-making in the absence of the DCs and PCs.

Monitoring

No system of monitoring is prevelant at the WUA level. There is no mechanism to observe regularly the quality of the work done by WUAs or to provide them support. The common indicators proposed by WUAs for assessing their performance are:

1. Water management (providing water to tail-enders).
2. Working with farmers and taking part in conflict resolutions.
3. Functional status of sub-committee and TC members.
4. Participation in the joint *ajmoish*[5] and revenue generated at the WUA level; and resources available and their utilization.
5. The role of WUAs in involving village leaders and farmers in planning.
6. The relations of the WUAs with officials.
7. Responsibility in understanding issues and facilitation of action (for example, closing crab holes in field channels).

WUA AND OTHER INSTITUTIONS

Irrigation Department

Officials of the irrigation department, being the competent authority, have been providing support to WUAs in implementing project activities. They continue to manage project activities, while WUAs provide support in implementing works. The officials continue to play a regulatory role and need skills of facilitation. Across WUAs, it was felt that people have improved relations with the irrigation department after the formation of WUAs. In the past, each farmer used to represent his/her problem directly to the officials. At present, the WUA president takes responsibility and provides support. While some WUAs have said that the frequency of visits by officials has increased in recent years, others felt that they are leaving most of the tasks to the WUA president. On the whole, people's ability to demand services from the irrigation department has improved considerably.

Agriculture Department

The support of the agriculture department in providing knowledge, technology and extension is critical to the efficient use of water. Farmers feel that the agriculture department generally provides inputs like seeds and subsidized inputs, but does not provide strategic interventions for the overall improvement of the agricultural system in irrigated areas. Farmers want agricultural officials to participate in WUAs and project-level meetings to help in crop planning. Farmers have felt the lack of relationship between the irrigation and agricultural departments. In several places they suggested that the WUAs should facilitate farmers' field schools[6] to build better relations between farmers and the agricultural department.

Gram Panchayat

A few experiences across states suggest that the *gram* panchayat (GP) can maximize the resource base of the WUAs. In this context different perceptions are presented:

Need to Improve Coordination between the GPs and WUAs

There is lack of trust between GPs and WUA members. In a majority of WUAs, there is suspicion regarding the role of the GP in WUAs. This is seen as interference rather than collaboration. There is a need for building trust between the two institutions. There are several examples of the GPs and the WUAs working together on issues such as seeking resources from food-for-work schemes, resolving conflicts, etc.

Institutional Changes

1. The *gram sarpanch* is involved whenever there is a conflict as of now. The *sarpanch* should be given an advisory role in the WUA in view of this position (authority on resources in the village). This will help information flow from one to other.
2. People see a role for the GP in providing linkages with different government programmes. Since plough back of tax takes time, the GP can

mediate with the *mandal* revenue officer or his equivalent. It can also play a role in case of disputes between two villages; or in decisions related to water allocation. At present there is no role for the GP in the WUAs. One suggestion was that co-opted members of the GP should be drawn from among farmers.

3. The GP has a role to play with respect to tanks with a command area of less than 100 acres. In this case with given functions, the gram panchayat may not be able to give so much time to larger irrigation systems.
4. There is also the relationship with the GP as the village assistant, a GP employee, is involved in the collection of water fees.
5. If a tank is drying up, the WUA has supported the release of water. Women are not allowed to wash clothes during periods of water scarcity. The GPs, though they do not play any role in the WUAs, can take initiatives to save water by reducing water wastage.

Redefining Rights

1. The GP continues to control grass and trees, though as per the Act, the WUAs are entitled to raise revenue from the sale of grass and trees. The GP has the right to auction trees and grass in its jurisdiction. There is usually no response from GPs to WUA resolutions asking them to handover these rights. The GPs also do not respond to notices issued by the irrigation department to give it its share from the sale of trees (a rule that existed before the formation of WUAs). Only a few GPs have responded to such notices. This could be one of the important sources of revenue for WUAs. One such coalition was worked out in Tamil Nadu between the GP, the SHG and the WUA.
2. *Gram* panchayats auction fish from drinking water tanks, but the WUAs have no rights on this.
3. There have been improvements in tanks due to the work undertaken in recent years. Earlier, a big farmer of the GP used to be partly involved, through water regulation. At present, there is a specific institution to look into water management. The relations with officers have also improved. *Gram* panchayats invite WUAs for review and other meetings.

Other Users

1. Members of the Legislative Assembly (MLAs) and other political leaders: Their role is also important as they can provide additional resources from the MLA/member of Parliament (MP) funds. They are important in the context of conflict resolution, negotiating with officials and setting priorities in the area.
2. Water for other use: The Major and Medium projects are meeting needs other than irrigation such as first charge on drinking water, lifting of water from canals and reservoirs by non-command area farmers, treatment of leakage water, etc. The role of WUAs in these is very important. In the absence of a project-level committee, decisions on other competitive uses are always interpreted as political. The intensity of the need and prioritization is not understood and decision-making is not seen in reality.

The first phase of PIM in any state is focused on maintenance and repair. Hence, funds handled by the WUAs were at a reasonably higher level in comparison with those handled by other elected local bodies like the GPs. This has created a rift between the panchayati raj institutions (PRIs) and the WUAs.

THE ROLE OF WUAs

The farming community, as well as the PRIs, appreciate the emergence of a dedicated institution for water management. But, at the same time, PRIs are threatened by the presence of WUAs. However, there are cases where there is congruence between PRIs and WUAs in accessing programmes such as food-for-work or to carry out repairs for system improvement.

While there seems to be some capacity building at the WUA functionaries' level, there is a gap at the farmers' level. Farmers seem to be gradually withdrawing from their traditional role in water management/O&M and are trying to shift the onus on to WUAs even for minor repairs/issues. For instance, field channels need to be maintained at the farmers' level, which hitherto was the practice; farmers are now demanding that WUAs do this work. The WUAs are in turn looking for a share of water fees to carry this out. The WUA functionaries are also looking for as much work as possible to handle.

> The role of the WUAs in joint *ajmoish* is limited to cases where there is a conflict. There is a huge gap between the claims made by WUAs and the actual revenue collection. This is because of the lack of a proper system, records and stakes of different actors involved in the entire process (village secretary, revenue department, WUA, pay and accounts, irrigation department and banks). In a majority of WUAs visited, the time taken to plough back[7] the WUA's share in water fees was exorbitantly high (up to two years). Reorganization of WUAs has further complicated the process and no systems have been established.

1. In almost all the cases the WUAs are left with no balance in their bank accounts. The WUAs are looking up to the government for funds and support rather than initiating the process of farmer participation in need assessment and decision-making to complete emergency/bare minimum works/maintenance at their level. Farmers also seem to be shrugging off their responsibility and hint at the WUAs (for example, in Andhra Pradesh) to mobilize resources and complete the work.
2. The role of WUAs in conflict resolution and better delivery systems to the tail-end has been improved as reported by farmers. One of the reasons could be the representation of tail-end farmers in the WUAs. There has also been substantial investment in improving the distributary system.
3. The WUAs have played an important role in curtailing illegal lifting of water from canals by upland farmers and often play a role in localizing the unauthorized command.
4. The role of the WUAs is not adequately defined on conjunctive use of groundwater. Indeed, no role was envisaged for WUAs in groundwater management. But there is a need to look beyond guidelines. Massive digging of open wells and also in some cases reaching down to borewells

have been observed, which is a matter of concern. But WUAs do not know how to handle this.

5. Farmers have no role in PIM in the absence of a mechanism to guide and involve them. It may be difficult for WUAs to organize farmers; even the coming together of farmers at the TC level will be not easy.
6. The role of the *sarpanch* is important in conflict resolution. Though the village secretary[8] takes part in tax collection, there is no link between the PRIs and the WUAs.

The Role of the President and the TC Members

It is evident that the role of TC members is negligible compared to that of the WUA president. In many villages, TC members had no idea of the work done by the president and funds received. Before taking any decision regarding water demand, distribution, cropping pattern and works to be carried out, the president should discuss these issues with the TC members, but this is rarely happens.

The president and TC members are expected to meet the farmers once a week. But in reality this does not happen in many WUAs. Since either the president or vice-president will come from the tail-end, s/he takes interest in the tail-end. The expected direction of information flow is from the farmers to the TC to the president to the *laskar* to the assistant engineer (AE)/executive engineer (EE). Information also flows back in the same way. The vice-president is also the joint account holder. Only the president and the competent authority take active part. Only farmers with problems meet the president or TC to find solutions for them.

Timely irrigation of any crop during its critical stages of growth has a substantial impact on productivity. Therefore, irrigation scheduling needs to be done for the entire command. For this, in the first instance, the physical system needs to be strengthened and made suitable with regulators at all required places. Though *warabandi* or the rotational system is being followed in some of the Major and Medium irrigation commands, it has not been done totally as per the farmers' proactive role, but as per the department's mandate. The WUAs in Maharashtra have demonstrated that volumetric supplies can make a positive difference to their livelihoods. The water audit system is being rapidly expanded to the entire state. Farmers would naturally opt for the free flow of water. Reorienting the farmers' perception and making PIM more effective through better water management needs the building of capacities through sensitization and demonstration.

Functions and Structures of WUAs—Positive Initiatives taken across States

Water users' associations, earlier known as farmers' organizations, with limited objectives, were started in the 1970s under the CAD programme. Owing to its top–down approach, the few farmers' organizations that were established could not function for long and gradually disappeared with change in field staff. In the 1980s and 1990s, several NGOs and the WALMIs initiated pilot WUAs. They undertook successful demonstrations in several states of India, for example, in Maharashtra (Ozar), Gujarat (Mohini), Andhra Pradesh (SRSP), Tamil Nadu (LBP), Bihar (Paliganj) and

Rajasthan (Chambal). The real push came in 1997, when the Andhra Pradesh government passed a separate law (the APFMIS Act, 1997) to promote WUAs. This led to the formation of 10,842 WUAs at the lower level and 172 DCs above them. The leadership provided by the elected leaders and the enormous efforts made by the staff at all levels of the WRD created a new wave of PIM in India. It made several other states consider PIM as a serious option for improved irrigation management. The Madhya Pradesh government followed the trend by passing a similar act and transferring canals to WUAs and to DCs.

Compared to the late 1980s, when WRDs were sceptical about any form of WUAs, after the 1990s several states have become proWUA. The state governments are in search of the right blend of strategies to transfer irrigated areas to user management. At least four states (Andhra Pradesh, Madhya Pradesh, Karnataka and Orissa) have now enacted legislation necessitating WUAs as a statutory requirement to get access to irrigation water. Maharashtra, Rajasthan and Gujarat are contemplating enacting similar legislation. Earlier, a review of policies and processes of IMT in six states of India clearly came out with value addition owing to PIM and related activities, based on detailed assessment of 21 cases (Brewer et al., 1999). Later, another study (Gulati et al., 2005) in Rajasthan and Karnataka covering 24 WUAs also analysed the positive benefits accruing from WUAs to users and to government agencies owing to collective efforts at the lower levels of irrigation systems. Now the question is not whether decentralized collective action in irrigation systems is necessary, but in understanding under what circumstances it can work more effectively and how the state government agencies can facilitate a better transfer process. Bihar, like many other states (including Andhra Pradesh and Madhya Pradesh), is searching for effective options.

Several states have been continuously revising or issuing enabling government orders to facilitate better processes towards PIM. Andhra Pradesh, after the promulgation of the APFMIS Act, 1997, issued more than 110 government orders to take care of new issues in the field. The Maharashtra government in its resolution (dated 23 July 2001) indicated that henceforth no permission would be given to individual farmers to take water; only registered societies are eligible for water entitlements. The Maharashtra government has circulated a draft version of its legislation to govern WUAs. In 1997, the Gujarat government had fixed a target of 1.5 mha (50 per cent of the total irrigated area) to be transferred to WUAs by 2003. However, the current figures indicate that some 150,000 ha have been transferred to 900 WUAs. Madhya Pradesh has formed 1,470 WUAs (includes 846 from Minor projects) to cover 149,500 ha. According to the Ministry of Water Resources, at the national level, nearly 5.8 mha is covered by WUAs, that is, nearly 17 per cent of the canal command area in India. Of this, Andhra Pradesh and Madhya Pradesh account for 15 per cent and the rest (2 per cent) is covered by other states. The restructured CAD programme of the Tenth Five-Year Plan (2002–07), now called the CADWM, has made PIM a pre-condition for availing central assistance from the Ministry of Water Resources. It is expected that by the end of the Tenth Plan period, around one-third of the command area would be under the management of WUAs; in

reality, these figures are quite far from the target.

Almost all functional WUAs across the states have clearly acknowledged: (*a*) the benefits to tail reaches, (*b*) access to increased number of irrigations, (*c*) enhanced crop productivity levels and (*d*) reduced water conflicts. While the additional irrigated area (particularly in tail reaches) is around 20 per cent, improved access to more number of irrigations has boosted crop yield levels by another 15–25 per cent. As a result, farmers are happy to pay water fees. Indeed, in many places, farmers are willing to pay more than the existing rates. This is true in Gujarat, Bihar, Andhra Pradesh, Karnataka and Maharashtra. The Paliganj WUA in Bihar is a prime example of the net savings of Rs 800,000 per year to the government in its expenditure on O&M and staff, owing to the transfer of irrigation management.

Some of the key lessons are listed next. Also, see Table 2.6.

In Andhra Pradesh

1. Permanency of WUAs: Amendments have been made to make WUAs continuously functional for a six-year term for each TC member of the WUA. One-third of the TC members would retire at the end of two years, the second one-third would retire after four years and the last batch would retire after six years. All the vacancies so caused will be filled regularly. Thereafter each member will serve a term of six years. The provision would bring permanency to the WUAs.
2. Tail-reach representation: The members of the TC elect a president and a vice-president. The elected person will have a two-year term. The command area of a WUA is broadly divided into an upper and lower half. If the president is from the upper half, then the vice-president will have to be from the lower half and vice versa.
3. Fixed size: The extent of the command area for a WUA in Major projects is limited to 1,600 ha. The WUAs have a fixed number of TCs—six in Minor projects and 12 in Medium and Major projects.
4. Keep MLAs/MPs away: There is a provision of disqualifying MLAs, MPs and members of constitutional committees from being elected members of WUAs. However, in the Act/draft bills of Maharashtra, Gujarat, Rajasthan and Madhya Pradesh, there is no such provision.
5. Co-opting members of PRI bodies: The government of Andhra Pradesh has recently (ordinance issued in 2002) decided to co-opt office bearers of panchayati raj bodies, MLAs and MPs into the managing committees of WUAs with no rights to vote.
6. System repairs by WUA with water fee retention funds: WUAs are permitted to take up O&M works only with the water fee retention amount, with the upper limit fixed at Rs 100,000 at a time. Works costing more and requiring higher technical know-how have to be done by the WRD.

In Maharashtra

1. The tenure of the president is by rotation from among the managing committee members representing the head, middle and tail reaches and women members.

Table 2.6 Key Features of WUAs across States

Parameters	Andhra Pradesh	Bihar	Gujarat	Karnataka	Madhya Pradesh	Maharashtra
Number of WUAs formed (Major, Medium and Minor projects)	10,892	32	900	193	1,470	533
Area covered (ha)	4,800,000	110,000	150,000	138,000	1,495,000	146,000
Year of initiation (from the government's side)	1997	1990	1984	1987	1987	1986
NGOs involved	IRDAS, Pragati	none	AKRSP, DSC	None	SRIJAN, BAIF, ASA, VIKALP	SOPPECOM and others
WUA level	Minor	Distributary	Minor	Minor	Minor	Minor
Role of WALMI in PIM	Active and initiated at Minor level	Active and initiated at distributary level	Active and initiated at Minor level	Active and initiated at Minor level	Active and initiated at Minor level	Active and initiated at Minor level
Capacity building of WUAs and WRD staff	Done regularly by WALMTARI and by NGOs	Done by WALMI	Done by WALMI and by NGOs	Done by WALMI	Done by WALMI and by NGOs	Done by WALMI and by NGOs
System rehabilitation as part of management transfer to WUAs	Done through WUAs	Not done by the WRD. In some cases, WUAs have partially done this on their own	Done through WUAs	Done by the WRD	Done through WUAs	Done with the WUAs' contribution
Records maintained on	Finances, meetings and physical activities	Finances, physical activities and meetings	Finances, meetings and physical activities	Finances, meetings and physical activities	Finances, meetings and physical activities	Finances, meetings and physical activities
Elections held	Regularly	Regularly	Regularly	Regularly	Regularly	Regularly
PIM cell in the state	Yes	Yes	Yes	No	Yes	Yes
Retention of water fees collected	50%	70%	50%	50%	50%	No provision in the Act
Water fees for WUAs	Area basis, fixed, last revision in 1997	Area basis, fixed, last revision in 1998	Area basis, fixed	Area basis, fixed, last revision in 2001	Area basis, fixed	Volumetric basis and WUAs are free to charge additional fees, annual 10% increase

2. The delineation of areas at all levels—WUA, DC, PC—shall be notified by canal officers, whereas in other states, the district collector makes this decision.
3. Election of office bearers of WUAs at all levels is conducted by the canal officer; in other states it is done by the district collector.

In Madhya Pradesh

1. In the case of Major and Medium irrigation projects, the presidents/chairmen of all WUAs and in the case of Minor irrigation projects all the presidents and TC members of all WUAs shall constitute the general body of the project committee.
2. The project committee shall have two nominated members, one each from the WRD and agriculture department, and they will not have any voting rights. One of them will coordinate with all related departments.
3. To increase women's participation, the wives (without land titles) of landholders are considered as members of WUAs. However, where both husband and wife are the landholders, only the wife will be considered as the landholder under the Act.
4. As an incentive package for farmers, the government gives an annual grant of Rs 100/ha for O&M to be shared in a defined ratio at different levels. Also, WUAs can retain 30 per cent as rebate on all outstanding recoveries of previous years, if collected by them and can also use this amount for O&M.
5. The constitution of sub-committees on following aspects in the WUAs is made compulsory: (*a*) water distribution, (*b*) system rehabilitation, (*c*) resolving canal disputes and offences, (*d*) resources, budget and social security, (*e*) collection of irrigation water charges and (*f*) women's participation.

In Gujarat

1. Canals have to be rehabilitated prior to transfer; the WUAs will contribute 10 per cent of the costs.
2. General order for such work has to be first offered to the WUAs, then to NGOs, and if both decline, it will be carried out by the government.
3. When irrigation management is entrusted to a WUA, one-third of the estimated cost is given as an advance.
4. The WRD has issued instructions simplifying the procedure for purchase of material and quality control when works are entrusted to WUAs.
5. Transfer of canal before rehabilitation to willing WUAs after signing an MOU, which shall include jointly agreed estimates for rehabilitation work to be done by the government and the physical and financial target of its completion.
6. The WUAs will collect water fees and retain 50 per cent. The WUAs are empowered to decide on water fees above the government rate and retain 100 per cent of the collection of excess charges.

In Karnataka

1. The weaker sections and women have reservations in the managing committee, whereas tail-enders have effective representation in the WUAs as per the model bye-laws. However, for federal societies, the Karnataka Cooperative Societies Act, 1959, does not allow such reservation.
2. For an irrigated area of 1.528 mha covered under the CAD and WM programmes (including a few projects which have subsequently been cancelled), the government is planning to organize 2,910 WUAs. Till November 2005 about 2,314 WUAs had been registered and 1,184 WUAs had taken over irrigation management.

The area managed by WUAs is about 573,000 ha.

3. The existing policy allows a WUA to retain 20 per cent of the volumetric water bill to meet the management cost plus maintenance grant at the rate of Rs 40 per ha. After retaining the set-off, the remaining amount has to be remitted to the government agency.

The budgetary allocation was Rs 12.3 million in 2003–04; Rs 18.131 million in 2004–05 and Rs 23.6 million in 2005–06.

NOTES

1. The government has proposed to fill the gap of nearly 1 mha between the created and utilized irrigation potential through system restoration by 2010. The Eastern Kosi Canal system has been restored with the help of NABARD for 324,000 ha and Eastern Gandak for 312,000 ha. Another 24 schemes are under preparation to restore 4.8 mha. For all these works, a total amount of Rs 70 billion is expected by 2012 from the Government of India under the CADWM programme.
2. The Naryanapur distributary in the Gandak system canals is silted up to 70 per cent, leading to its 4 km long canal being almost defunct. This is in spite of full supply levels in the parent canal.
3. The total number of tanks in the Sri Ram Sagar Project area is around 600, while under the Lower Maner Dam there are 172 tanks. Due to severe scarcity and low rainfall (80 per cent less than normal rainfall) supply to Minor and Sub-minor was stopped. The district administration has decided to replenish tanks with project water where there is severe drinking water scarcity.
4. The authority shall meet at least once in three months at such place and time as the president may decide.
5. Joint *ajmoish* (Arabic word, first used during the Moghul rule in India) is the process of assessing land by the village secretary, accompanied by the WUA president, TC members and the village panchayat members.
6. A group of 15–20 small and marginal farmers come together to meet and participate in interactive learning at regular intervals during the crop season. They select one acre of land (of one of the group's members) for a controlled application of organic farming and to learn to identify pests and predators. The weekly sessions will make the farmers well versed in seed treatment, soil fertility management and pest and disease management. In short they will learn by doing integrated crop management.
7. The process involved in plough back starts with joint *ajmoish* and farmers pay their cess as per *ajmoish* records; some amount of cess again comes back to the WUA of that area. The government has provided such an option essentially to strengthen the WUAs. This is dealt with in detail later.
8. The village secretary is appointed by the state government for monitoring and evaluating the revenue details of the villages he is in-charge of; he works under the *mandal* revenue officer. Generally, a village secretary looks after a cluster of villages in a *mandal*/*taluk*.

Water Users' Associations in Tank Systems

Chapter 3

This chapter provides an overall picture of the significance of tanks, their status and decline over time. As tanks are mainly concentrated in the south Indian states, issues and constraints encountered there are discussed in detail. In the context of the problem, policy issues and emerging approaches are discussed. This is followed by a discussion of the way forward.

TANKS IN INDIA

Historically, water management in the southern states has taken place through a large network of tanks. These tanks were managed largely following the principles of equity and justice. According to the Minor irrigation census conducted in 1986–87, the country had over 750,000 Minor irrigation structures using surface water. Approximately 700,000 of these were found to be in use. In terms of numbers, a large majority of them (68 per cent) consisted of small-scale local diversion of water or lifting from streams and rivers. Tanks, which are relatively small, shallow storages, constitute about a third of all Minor works in use. In terms of area irrigated, however, they are far more important, accounting for nearly 80 per cent of the net area irrigated by all minor surface water resources (see Table 3.1). The country has an estimated 208,000 tanks irrigating 3.5 mha of land. Andhra Pradesh, Karnataka and Tamil Nadu account for 60 per cent of tank irrigation in the country. Together they have nearly 120,000 tanks irrigating 1.8 mha of land. In eight districts of Andhra Pradesh and Tamil Nadu, over a fifth of the sown area depends on tank irrigation (Vaidyanathan, 2001). In addition, village tanks, apart from having various other uses, play a significant role in supporting the livelihoods of marginalized groups in rural areas.

Tank irrigation enabled the development of appropriate institutions, which strengthened the social fabric. The construction of irrigation tanks was considered a sacred act that conferred religious merit. Further, the construction and maintenance of tanks were vital for the prosperity of society and considered to be one of the seven meritorious acts a person could perform in his lifetime (Chandrakanth and Romm, 1990). The Hoysala kings built more than half the tanks and most of the *kolas* (small tanks) between the eleventh and thirteenth centuries. The presence of 40,000 tanks in around 26,000 villages shows the ingenuity of the past rulers

Table 3.1 Irrigated Area and Number of Tanks in South India

State	Number of Tanks	Actual Area Irrigated (ha)
Karnataka	36,672	299,800
Andhra Pradesh	80,000	909,000
Tamil Nadu	39,200	690,000
Total	155,872	1,898,800

Source: Compiled from reports of the governments of Andhra Pradesh, Karnataka and Tamil Nadu; Vaidyanathan (2001).

and their prominence in recharging groundwater in the hard rock aquifers. Tank maintenance such as desilting and repairing was performed through gifts of land. Individuals and temples contributed bullock carts, funds and leased out land to encourage the construction of tanks and their maintenance. The farmers who did not maintain tanks would lose their right to two-thirds of the land leased to them in favour of farmers who maintained tanks at their own expense. A portion of crop production was also earmarked for tank maintenance. A committee for 'supervision of tanks' consisting of six members of the village assembly was established in some villages to invest endowments received from religious people for the periodical removal of silt and for repairs. Notwithstanding the efforts of kings and well-meaning local chieftains in the past, tanks have lost their sheen in recent times owing to many social and economic factors.

Over time, there was mismanagement and decline in tank management that could be attributed to factors like interference of the government, which disturbed the community institutions. The degree of involvement of farmers reduced further leading to poor resource allocation, encroachments and siltation. Reasons for the decline/degradation of this time-tested system are the absence of local management and encroachments resulting in dilapidated and weak or cut down tank bunds, choked sluices and damaged weirs, sluices with missing shutters, large-scale infestation of weeds and siltation in tank and channels (see Table 3.2).

Table 3.2 Social and Economic Factors Responsible for the Decline in the Role of Tanks

Social	Economic
• Though the tanks exist geographically in the village vicinity, its control and administration has moved to a distant place. For those who control them from a distance, the tank is merely a physical object and a source of revenue.	• Changed user expectations from tanks owing to the emphasis on increased food production, high yields supported by Major irrigation projects and regular canal water supplies, and better controlled tubewell water use.
• There has been a shift of authority from the visible local community to the invisible government.	• State's shift in emphasis (in terms of financial investments and agricultural production) to Major and Medium irrigation.
• Emergence of livelihood patterns that are increasingly independent of tank-based occupations.	• Heavy subsidies in power supply for irrigation pumpsets and discounted loans to install tubewells have nearly killed community initiatives and indigenous knowledge while increasing farmers' dependence on government support.
• Siltation and encroachment of the tanks and their neglect by local communities and authorities located at a distance.	• Inadequate financial allocation for the operation and maintenance of tank projects.
• Commodification of water has increased owing to less and difficult access to tank water as common property. Now individuals, who own water extraction mechanisms (like tubewells, diesel engines) have greater control over water.	• Declining attention and investment on tanks owing to little scope for rent.
• Decline of community interest in maintaining tanks.	

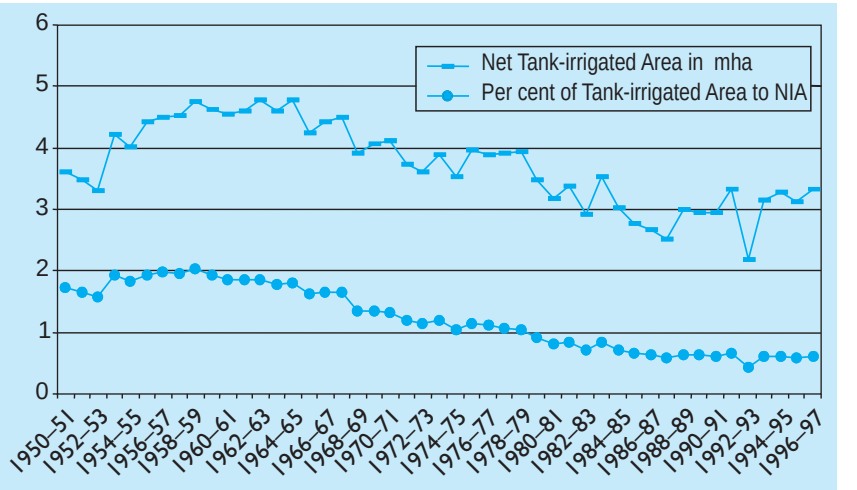
Tank Irrigation

Tank irrigation has gradually declined over the last 50 years in absolute terms and also in relation to net irrigated area (Figure 3.1). Among the three major sources (Major and Medium irrigation projects, tanks, groundwater) of irrigation, tanks are the only source where a decline in importance is observed. Tank-irrigated areas started declining continuously from the 1960s onwards though some improvements have been noticed during the 1990s (see Figure 3.1). Interestingly, this reduction in area under tank irrigation happened despite the construction of thousands of new tanks during this period (Vaidyanathan, 1994a, 1994b, 2001). Tanks are mostly concentrated in areas where other sources

of irrigation are limited or absent. The worst affected group, because of the continuous decline of tank irrigation, is the poor farmers (small and marginal) for whom an alternative source of irrigation is costly or not available.[1]

Several studies (Dhawan, 2000; Janakarajan, 1993; Narayanamoorthy, 1993; Palanisami and Easter, 2000; Palanisami et al., 1997; Raju et al., 2001; Sivasubramaniyan, 1997; Vaidyanathan, 2001) have identified many reasons for the decline in tank irrigation. There has been a breakdown in village institutions because of caste and other conflicts, while community participation, which was part and parcel of tank irrigation development, has declined drastically. Finally (but importantly), there has been inadequate attention on the part of the government.

Figure 3.1 Tank-irrigated Area in India



Source: MOWR, GOI (2001).

Maintenance of Tank Systems

Declining trend in tank management: The Planning Commission has estimated the loss of tank infrastructure owing to reduction in irrigated area as Rs 51 billion. This estimate itself is very conservative by assuming a very low cost of creating such irrigation infrastructure.

While in 1962–63, the area under tank irrigation was 4.78 mha, it came down to only 3.07 mha in 1985–86, in spite of thousands of new tanks being constructed during the intervening two decades. In the last 25 years, about 1.7 mha of net area under tank irrigation has been lost, amounting to a capital loss of about Rs 51 billion. The Planning Commission attributes the reasons for the decline of tank irrigation in India to ageing infrastructure—some of them centuries old—and to inadequate and indifferent maintenance. The common features noticed in the tank system, which impair their services, include large-scale encroachments, weed infestation and structural decay (see Chapter 6 for more details).

These findings pertain mainly to the deficiencies in the physical system of tank irrigation. The DHAN Foundation's analysis of the present status of tank irrigation reveals that besides structural deficiencies, the following inadequacies of mainstream institutions (government agencies) owning and maintaining tank systems have also contributed to the decline: (*a*) mainstream institutions are operating in 'isolation' without the involvement of farmers, (*b*) they practice the welfare (delivery) approach instead of enabling (development) approach, (*c*) they are not quite sensitive to alternate perspectives of the others, (*d*) allocation of funds has been woefully inadequate to undertake rehabilitation of thousands of existing tanks, (*e*) absence of integration at different levels of administration and the panchayat has hampered tank development work, (*f*) tank farmers are interested in 'owning' and managing tanks with state support

or even without it, but the government has not responded.

Maintenance problems are cropping up owing to control of tanks by different agencies based on size. Tanks are divided into three categories based on their command area: (*a*) those having a command area below 4 ha are controlled by the *taluk* panchayat, (*b*) those having a command area between 4–40 ha are controlled by the *zilla* panchayat and (*c*) those having a command area between 40–2,000 ha are controlled by the Minor irrigation department. Tanks with a command area of more than 2,000 ha fall under the Medium irrigation category and are taken care of by the department of Medium and Major irrigation. Nearly 78 per cent of tanks in Tamil Nadu and 92 per cent in Karnataka are under the control of panchayati raj bodies and have a command area of less than 40 ha. Unfortunately, manpower in these agencies have very little tank-specific skills, owing to their frequent transfer from Major irrigation works to Minor irrigation or vice-versa and lack of any specific orientation of the personnel. The panchayati raj bodies are worse off. They lack skilled manpower and have to rely on the irrigation department engineers when there is work to be undertaken on the tanks. Local engineers (meant for all civil works) have to take care of tanks whenever a crisis arises.

Box 3.1 The City of Madurai and the Vanishing Tanks

'Madurai is a historical city in South Tamil Nadu located on the banks of the River Vaigai. The place was declared as a municipal town in the year 1857 with an aerial extent of 6.73 sq. km and a population of 41,600. Currently (2001), the aerial extent has increased to around 51.82 sq. km with a population of more than one million. During this urbanization process around 13 adjoining revenue villages have become part of Madurai city. As the place was known for its prospering agriculture, there were large networks of channels taking off from the Vaigai and Gridumal rivers and feeding several tanks in and around the city.

While the river Vaigai has now become a major drainage channel for the city, minor rivers like Gundar have been encroached upon for urban settlements. Barring a single major channel, all the feeder channels leading to several tanks in Madurai city are extinct. In the last fifty years of urban growth, around 12 tanks have vanished and numerous channels have become dysfunctional. The estimated area of such vanished tanks is around 16.5 sq. km. An equal extent of tank command area has been converted as settlements by the public. All these tank lands, including tank beds, channels, and bunds have been converted into housing colonies, industrial estates, and government buildings.

In the last fifty years all the general administration departments such as city corporation, judicial buildings such as courts and advocate chambers, major urban colonies, All India Radio, public utilities like central bus stands and major colleges and educational institutions are located on tank beds. At present five major tanks face threat owing to urban growth. The extinction of these tanks has resulted not only in loss of agriculture but also in serious drainage problems within the city, forcing the government to spend several lakhs of rupees to ameliorate the situation every year. To worsen the water scarcity, groundwater levels are going down year after year, forcing the city administration to provide more water through piped supplies causing severe strain on the funds of the local government.'

Source: Shanmugam and Vasimalai (2004)

Types and Size of Tanks

Most tanks are rain-fed, while some have a supplemental source of a feeder channel or stream. In the southern state of Tamil Nadu and the adjoining state of Andhra Pradesh, a stream is often diverted to feed a few isolated tanks or a cascade of say 20–30 tanks in a sequence. As this chain of tanks, called the 'system tanks', is served by the stream collecting water over a large catchment in addition to the rain water run-off from their own small catchment, it is traditionally considered much more dependable than a tank with a single small catchment. Because of the wide variability in rainfall over both space and time, agricultural lands served by system tanks have always been more valuable and prized than lands served by stand-alone tanks. The Palar *Anicut* (diversion weir) system, for example, supplies water to 317 tanks, irrigating about 32,000 ha in Vellore and Chengalpattu districts of Tamil Nadu. Some tanks are supplied water directly by channels coming from

the Palar River, but several others depend mainly on the surplus flows of upstream tanks. The profusion of tanks in the various districts of the state can even be seen from a satellite imagery of the National Remote Sensing Agency.[2]

CURRENT STATUS

Positive Impact on Groundwater Recharge

A large number of field studies (Gireesh et al., 1997; Reddy and Reddy, 2002; Shah and Raju, 2002) have proved that restoration of tanks would boost groundwater recharge. This has been emphasized by local farmers from Rajasthan to Tamil Nadu based upon their centuries-old observations. The impact on the groundwater level is one of the major positive externalities of tank restoration. The impact would be more conspicuous in the case of percolation tanks (for example, in Chittoor and Anantapur districts of Andhra Pradesh). Improvement in groundwater levels will reduce drinking water problems (through open wells, borewells and hand pumps). Field studies in Anantapur District (Reddy and Reddy, 2002) have shown that the depth of groundwater has reduced by 22–32 per cent and has influenced 50–400 wells around the tanks. The depth has come down from 220–260 ft to 165–190 ft (Gireesh et al., 1997). The steep reduction in the recharge capacity of tanks is seen as boomeranging on the prospects of well irrigation. Most of the open wells in the south Indian states have dried up and have been reduced to dead capital investment. Now it may be the turn of borewells to dry up. No less than 25 per cent of the suicides that took place in Warangal District in the recent past can be related to this (MARI, 2001). Based on three years of rejuvenation efforts made through the Jala Samvardhana Yojana Sanga in Karnataka, through World Bank support, there has been a considerable increase in groundwater levels. The increase was a maximum of 12 m over a period of three months due to the rehabilitation of tanks between 2002 and 2003. The extent of groundwater-irrigated area within the tank command area ranged from 28 per cent in Haveri District to 52 per cent in Bidar District; both districts are located in a semi-arid region. Groundwater use in tank command areas of Karnataka during the rabi/summer season of 2005 is shown in Table 3.3.

STATUS OF TANKS ACROSS STATES

Some of the problems observed with respect to tanks are common in all three states with marginal variations. As already mentioned, the physical status of the tanks has deteriorated and various studies have indicated the problems as siltation of tank beds and sluices, encroachment of foreshore lands, poor functioning

Table 3.3 Extent of Groundwater Use in Tank Command Areas of Karnataka

District	Number of Tanks	Number of Tubewells in the Tank Command Area	Groundwater-irrigated Area (ha) within the Command Area	Groundwater-irrigated area as % to Total Command Area
Bidar	1	14	25	52.00
Bagalkot	1	15	18	31.00
Bellary	2	9	21.72	41.00
Chitradurga	16	120	228	31.60
Haveri	5	31	32.30	28.00
Kolar	121	553	920	45.00
Raichur	4	27	51.37	30.60
Tumkur	66	595	708	30.10

Source: Based on 'Status Report for Mid-Term Review', June 2006, Jala Samvardhana Yojana Sanga office, Department of Water Resources, Government of Karnataka, Bangalore.

of sluices, inadequate surplus weirs/supply channels/field channels, poorly designed and maintained distributaries, seepage and drainage problems and poor allotment on repairs. This in turn has led to serious implications on the socioeconomic conditions of the rural people, particularly the poor. Some of the common problems encountered are drinking water crisis, migration, distress sale of livestock, vulnerable livelihoods, unemployment, dwindling household economy and reduced usufruct revenues. Apart from these, the ecological impacts have been many and serious: groundwater depletion, forest encroachment, decrease in flora and fauna and effects on avifauna habitats.

There have been numerous suggestions to restore the tank system through regular maintenance and repair of tanks as per standards specified; raising of bunds and waste weirs to recover the capacity lost due to silting; desilting and reclamation to reduce the area of submergence and evaporation losses; checking of weed growth in the tank bed to reduce transpiration losses; regulation of foreshore and tank bed cultivations; and afforestation and soil conservation of foreshore areas to minimize silting. The extent to which these measures can be effectively implemented will depend upon the level of resources provided and the appropriateness of the local institutions. History shows that tanks are a product of local initiative. It is, therefore, necessary to understand the conditions under which indigenous institutions disappeared and the need to evolve appropriate contemporary institutions.

In Tamil Nadu

The DHAN Foundation's study of Minor irrigation tanks in Tamil Nadu finds it important to deal with panchayat tanks separately and strengthening the farmers by creating awareness about rehabilitating tank command areas, involving people in identifying and constructing community wells in suitable places, conjunctive use of surface and groundwater and conducting field trainings in adopting water management practices to economize water use with improved agricultural techniques. Strengthening institutions through mobilization of regular flow of funds, generation of adequate funds, providing loans to poor farmers, gearing up regular tank-based agricultural activities like supply of quality seeds and facilitating these institutions by training, monitoring and social auditing are also recommended.

Several studies (Doherty, 1982; Palaniswami and Easter, 1983) indicate the negative impact owing to lack of farmers' participation in tank systems. These studies focus on the pattern of landownership in the tank command areas where upper-caste groups owning a major part of the fertile land could harvest two crops with maximum access to water compared to other sections of society. Lack of cooperation between various caste groups led to poor collective action. These studies also highlight the complexities that could arise in the process of strengthening institutions. Absence of participation by the farmers in maintenance accounted for substantial difference in water availability between head and tail locations. Further, tank operation and water distribution were efficient through WUAs.

Policy Suggestions

A study on the rehabilitation of tanks (*oranis*) (Shanmugam and Vasimalai, 2004) for providing drinking water in the

drought-prone Ramanathapuram District of Tamil Nadu highlights the need for community involvement. The DHAN Foundation suggested that the Planning Commission undertake a major programme, based on its experience of reviving 26 tanks, with the assistance of engineers and villagers while keeping contractors at bay. In the meanwhile, DHAN would take up the responsibility of organizing the villagers through simplified procedures.

The following suggestions were made: Tank development programmes based on perspective plans are to be on a long-term basis (10–15 years) and tank cascade levels are to be on a medium-term basis (3–5 years), linking user groups with NGOs. Planning and execution is to be done by the user groups. The role of government line departments is limited to facilitating and enabling. The state government should undertake the overall development of tank irrigation systems, while both rain-fed and system tanks are to be the responsibility of the panchayats. Concerned government agencies like the forest and fisheries departments are to hand over legal rights to the panchayats and WUAs, and usufructs from the tank system should be transferred to WUAs and village panchayats through appropriate rules and other recommendations.

A study by Brewer et al. (1999) suggests policy changes on irrigation management transfer in tank systems. They have addressed different methods followed in the states of Gujarat, Maharashtra and Tamil Nadu. Policies and programmes for management transfer in tank and other small gravity systems are not as well defined as those for canal systems because a system already exists in O&M in all the states. The programme between the states, however, differs. There are common features like transfer to a WUA where all farmers organize themselves into a single WUA inclusive of O&M, total system transfer where complete responsibility of O&M is taken over, including head works, and minimal change in responsibilities since all farmers are involved already.

In Andhra Pradesh

Andhra Pradesh has 82,500 tanks irrigating more than 4.8 mha directly. At the end of the First Five-Year Plan, the area irrigated by tanks had reduced to 1.07 mha, which was about two-fifths of the irrigated area of the state. Eight districts of the state were declared drought-prone and tanks were the main source of water supply in these districts historically. Many tanks were built in a series to avoid wastage. Apart from enriching the water table, an institutional system evolved and enabled the tanks to be the major source of irrigation in these districts.

Tanks are classified into various categories for administrative purposes. In Andhra Pradesh, the Minor irrigation department is responsible for the maintenance, repair and water regulation of tanks with *ayacuts* exceeding 400 ha and for the maintenance and repairs only for tanks with *ayacuts* between 80–400 ha, (40 ha in Telangana), while PRIs maintain smaller tanks.

Water Users' Associations are not Very Effective

A large number of WUAs, which were created under the Andhra Pradesh Farmers' Management of Irrigation Systems Act, 1997, are responsible for Minor irrigation tanks. Historically, tank irrigation has been a part of the village

polity and hence there has been no major change in the way tanks are managed (Hooja, 2002). Till 1999, tank WUAs constituted 81 per cent of the total WUAs in the state.

Informal arrangements are prevalent and practiced on the use made of tanks. One arrangement is to use tanks as percolation tanks. In the Rayalaseema region, 23 tank WUAs have not used tank water for irrigation and farmers use their own wells that have been recharged from tank storage. Similarly, in Chandurti *Mandal*, a few tanks have closed their canals to recharge wells during two-crop seasons. These WUAs just maintain the tanks and not the distribution network. In the Chittoor Division, some 80 per cent of tanks have been used as percolation tanks for the last 10–15 years. Gradually, farmers have shifted to groundwater from the earlier practice of tank irrigation. For the last eight years, the sluices have been completely closed for continuous recharge of groundwater. Farmers argue that water in the tanks would get drained within a span of three months while groundwater usage would last 10 months. This was evident mainly because these tank command areas were under sugarcane crop (Hooja, 2002).

Practical Constraints

Tank management can be divided into three categories: formal, informal and NGO-facilitated. Formal WUAs face a number of constraints like political interventions, lack of women's participation and absence of Neerugattis. They are dominated by the local elite and are political-party based. There is high dependence on government grants and the focus is more on maintenance than on distribution. However, it has brought positive effects in terms of enthusiasm, activity, discussions and funds in the rural areas. Decline in the effectiveness in management compared to older times is seen. However, the informal arrangements are still working effectively on equity issues, but maintenance has been a problem. The NGO-facilitated WUAs are more motivated and have shown positive results. They have missed out on certain issues like women's participation and catchment area treatment.

In Karnataka

The maintenance and management practices introduced by the Karnataka government in recent years have undermined the importance of community participation. Karnataka has 36,672 minor tanks with a command area of around 690,000 ha distributed across the state. Ninety per cent of these tanks have a command area of less than 40 ha. The actual irrigated area is estimated to be more than 240,000 ha. Over the years, there has been a decrease in the net irrigated area (NIA) through tanks compared to other sources of irrigation.

In Karnataka, Minor irrigation activities are handled by the department of Minor irrigation, which came into existence in April 1997; before that they were under the department of Major and Medium irrigation. The Jala Samvardhana Yojana Sangha (JSYS) has been formed as a special unit to promote and implement demand-driven community-based approaches for sustainable management of the proposed Housing and Urban Development Corporation (HUDCO) and World Bank supported projects to rehabilitate 5,000 tanks during the next

five years. Under these projects, new tanks will not be constructed, but the existing tanks of all sizes controlled both by the *zilla* panchayat and the Minor irrigation department would be taken up for rehabilitation.

KEY ISSUES

Overlap of Jurisdictions

A problem connected with the community-based management of village-level water bodies is that the jurisdictions of WUAs and local governments quite often overlap. Under the present Tamil Nadu law, small tank systems (under 40 ha) are the responsibility of panchayat unions, although the law does not give the panchayat unions sufficient authority to manage the tanks (Vani, 1992). The 1993 amendment to the Indian Constitution that strengthens panchayati raj also gives responsibility for management of local resources, including water, to local panchayats. This overlap of jurisdiction needs to be resolved.

Lack of Suitable Policy and Legal Framework

Several states, which are bestowed with a large number of tanks, do not have clear policy and legal framework to support community-based rejuvenation of tanks. There needs to be policy resolution on (*a*) community-based rehabilitation issues, involving all stakeholders from the planning stage to execution, monitoring, maintenance and operation of the tank system, (*b*) method of water tax collection, level of retention by the tank-based user organization, necessary policy and legal clauses to empower the local user groups to collect and retain the water fee, and if required, tank user organization need to be empowered to levy additional funds (see Table 3.4).

Management Transfer to User Organizations

The states need to make policy and legal provisions for management transfer of tank systems to user organizations.

Conflicting Legal Acts Govern Multiple Uses of Tank Resources

The revenue generated from tank resources goes to different agencies and the legal framework and state policies

Table 3.4 Policy and Legal Framework

State	Policy Focus	Legal Framework
Andhra Pradesh	• Setting up WUAs and management transfer to WUAs. • Integrated water resources development through the 'Neeru–Meeru' programme. • Promote water conservation, tree cover and regulate the exploitation and use of ground and surface water.	• Andhra Pradesh Farmers Managed Irrigation Systems Act, 1997. • Andhra Pradesh Water, Land and Trees Act, 2002.
Karnataka	• Setting up WUAs and transfer of management responsibilities. • Community-based rejuvenation of tanks and management transfer. • Improve rural livelihoods and reduce poverty by developing and strengthening community-based approaches to managing tank systems.	• Karnataka State Irrigation Act, 2000 (with amendments to promote participatory irrigation management). • Community-based Integrated Tank Management Act (under preparation).
Tamil Nadu	• Participatory irrigation management through WUAs and move towards management turnover (which includes both canal and tank command areas). • Empowered the public works department staff to administer the tank systems (under the earlier Tank Act).	• Tamil Nadu Farmers' Managed Irrigation Systems Act, 2001. • Tamil Nadu Tank Act.*

Note: * As quoted in Shanmugam and Vasimalai (2004).

(in all three southern states) are not clear (see Table 3.5). Owing to this paucity, both users and agencies get into conflict situations. Some legal conflicts, which apply to Karnataka (and to some extent also to Tamil Nadu and Andhra Pradesh) are discussed next. Because of these conflicts, tank users' associations (TUAs) (both formal and informal) are facing constraints in mobilizing resources, thereby affecting the very survival of the TUAs.

Because of the conflicting rights on the resources, TUAs are in a dilemma in several places. This is even after the states have come up with a clear policy to support TUAs and transfer management of tanks to user groups. But these states did not focus adequately on the legal implications. For example, in Andhra Pradesh, some TUAs have been drawn into court cases by local *gram* panchayats owing to claims made on fishing rights. This is also true in the emerging TUAs in Karnataka. While Andhra Pradesh has issued an order making provision for TUA rights on fishing, in practice it did not fructify. Karnataka is drafting a comprehensive act exclusively for tank rehabilitation. This would be the first comprehensive act in south India.

Table 3.5 Source of Income and Agencies Responsible

Use and Source of Income	Agency Responsible and Focus of the Conflict
Water fee	Imposed by irrigation department and collection by revenue department.
Fishing	Fisheries department auctions and generally a trader sub-leases it at a much higher amount to a fishing group. No preference given to TUAs.
Silt	The mines and geology department has control and ownership.
Nursery and plantation in the tank bed in the catchment area	Forest department claims its rights.
Ownership and management of all water bodies in the village revenue boundary.	According to the Seventy-third Amendment of the Indian Constitution, *gram* panchayats have rights.

Inadequate Management Information System for Decision-making

Official documents in south India record 140,000 tanks. This is based on tank memoirs (old records of tank details maintained in most districts) available at the *taluk* or *mandal* levels. These records do not indicate small ponds (known by different names, for example, *gokatte, katte* in Karnataka; *kunta, vanka* in Andhra Pradesh). In effect, a large number of water bodies, hydrologically linked to tanks, are neglected and are not considered for any developmental programme. Worse still is that many tanks of various sizes have completely silted up and turned into cultivated areas and are encroached upon (particularly in urban agglomeration areas[3]) permanently. Yet, there is hardly any reduction in the number of tanks over time. But the decline in the tank-irrigated area is a clear testimony to the decline of tanks.

Declining Investments

Though tanks serve many purposes, their prime use is for irrigation in many parts of the country. Since independence, the government has invested considerable sums of money through various tank development programmes as part of its overall irrigation development work. Yet, the role of tanks as a source of irrigation is getting reduced continuously—the net tank-irrigated area has declined from 18.6 per cent in 1950–60 to 7 per cent in 1980–90 (Vaidyanathan, 2001).

This is perhaps because the concerned authorities consider tanks as minor sources with low importance compared to canals and dams.

Investment in irrigation by the Indian government is very high and has always been on the rise ever since the First Plan though it is not commensurate with the requirement (see Table 3.6). The bulk of the investments under Minor irrigation is meant for development of groundwater wells and lift irrigation. Rehabilitation of tanks has received least priority (Vaidyanathan, 2001).

SOME CONSTRAINTS

Dwindling Usufruct Revenues

Tanks have been sustainable sources of revenue generation from time immemorial in the villages. Such revenue was used for village functions, festivals and other common expenses of a village collective. Tank silt, trees on the bund, fuelwood trees on the tank bed, sand in the channels and fish from the tank water are common usufructs from the tank complex. In recent years, revenue from usufructs has been coming down for want of useful entrepreneurial activities in the villages. In most of the Indian states, the existing government powers regarding generation of usufruct revenue through the activities mentioned earlier lie with government departments and panchayats. The local villagers and their collective bodies are not allowed to raise such revenue from tanks. However, most of the revenue coming from jungles of prosophis juliflora is unaccounted for and used by the villagers for communal purposes and for festivals. Since there is no accountability, most of such revenue is misused and tanks are not cared for.

Multiple Uses of Tanks

Over the years, even though tanks have been increasingly considered as a source of irrigation, their multiple use at the village level still remains. The average preference score for multiple tank uses indicated by the farmers in Tamil Nadu (Palanisami et al., 1997) are: (*a*) irrigation (8.79), (*b*) livestock grazing (6.28), (*c*) washing and drinking (5.01), (*d*) fishing (4.69), (*e*) livestock (4.50), (*f*) bathing (4.43), (*g*) drinking (4.28), (*h*) trees (2.09), (*i*) social (1.55), (*j*) silt (1.18), (*k*) rearing ducks (1.16) and (*l*) bricks and forestry (0.66). The drinking water problem in Ramnad can be eliminated if efforts are made for renovating all the *oranis*. But the government continues to invest in desalination plants costing a hundred times the investment needed to renovate the *oranis*. The voice of the people and NGOs is yet to be heard to save the wasteful expenditure (Shanmugam and Vasimalai, 2004).

Village-level Institutions

The construction of tanks was carried out by the villagers, who also developed

Table 3.6 Investment in Irrigation through Various Five-Year Plans—All India (in Rs billion)

Plan Period	Total Irrigation Investments	Major and Medium Irrigation	Minor Irrigation	
			In Rs billion	% to Total
First Plan	4.60	3.80	0.66	0.1434
Second Plan	5.90	3.80	1.42	0.2406
Third Plan	11.10	5.81	3.28	0.5645
Annual Plan, 1966–69	10.39	4.34	3.26	0.7511
Fourth Plan	25.83	1,237	5.13	0.4147
Fifth Plan	42.74	24.42	6.31	0.2583
Annual Plan, 1978–80	33.59	20.56	4.97	0.2417
Sixth Plan, 1980–95	118.73	75.16	18.02	0.2397
Seventh Plan, 1985–90	202.53	113.43	32.28	0.2845
Annual Plan, 1990–92	82.62	53.20	18.09	0.3400
Eighth Plan, 1992–97	325.25	224.15	59.77	0.2666
Total (1951–97)	863.28	541.04	153.19	0.2831

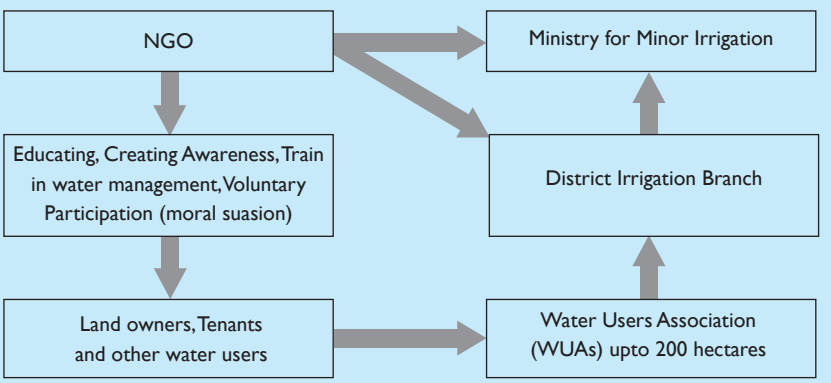
Box 3.2 The Need for Modifying WUA Structures

'The decreasing trend observed in the area irrigated by traditional water harvesting structures, mainly irrigation tanks in the last four decades is quite opposite to the trend shown by the area under bore well irrigation, which is expanding radically and is comparable with area covered under major and medium irrigation projects. This shift in usage pattern of irrigation water is mainly attributed to the state interference in operation and maintenance of traditional irrigation structures and the biased provision of the share of the state irrigation budget to major and medium projects. The development of new technologies for groundwater pumping added woes to it.

Recently some state governments of India are implementing the policy of free electricity for agricultural purposes to retain their vote bank in rural areas where majority of voters are farmers. This in turn causes a decrease in stabilisation value leading to over exploitation of groundwater resource. In such situations managing the common property resources like irrigation tanks is a difficult task exacerbated with the present political oriented Water Users Associations (WUA's) structure. So under these present circumstances, a study attempted to find a solution by employing moral suasion (creating awareness, training, educating and voluntary compliance), which can be an effective alternative approach to combat this problem and to encourage the farmers to operate and maintain common property resources. As a part of this a case study was carried out in Nalgonda district of Andhra Pradesh, India for comparing the modus operandi of formal and informal WUAs, which is a part of Participatory Irrigation Management (PIM). The results show that the area commanded by tank irrigation has substantially increased under the informal WUA due to rehabilitation of their irrigation tanks and developing them into a cascade. This, in turn, had an influence on yield of groundwater pumps in the area as well. The formal one is unable to manage this for long term due to lack of funds and bureaucratic supervision of Irrigation department. This paper also suggests a modified structure of WUA's for better managerial efforts.

Based on the above discussion regarding the non-cooperation and cooperation and the empirical results, it concludes that there is a need in the modification of WUA structure and an organization to bridge the gap in collective action for the better managerial efforts and water productivity. The NGO has to be involved in the structure to aware, educate and train the stakeholders through moral suasion. In the next step to deviate it from its political structure the land owners,

Figure 1 Modified Structure of Participatory Irrigation Management for Minor Irrigation in Andhra Pradesh



(*Box 3.2 continued*)

their own institutions for maintaining and operating the systems as common property resources. In many intensively-developed areas, they appear to have been supra-village organizations with powers to arbitrate any inter-tank water disputes that arose. These ancient bodies at the local level were empowered to both own and manage irrigation tanks. They also had the powers to raise income from various components of tanks like fishery from tank water, silt from tank waterspread and usufructs from trees raised on tank bunds and tank beds. Even so, they were constantly supported and patronized by the state for the upkeep and restoration of Minor irrigation tanks. The picture has thus been of a society with considerable technical sophistication, decentralized approach to water management and a well-defined sense of local water rights and responsibilities. Developed piecemeal through the gradual accretion of multiple smaller projects, day-to-day management of tanks was the responsibility of local user groups.

Water Sharing and Management

Village-level water bodies are fragile structures. They have to be continuously maintained, repaired and monitored. Even more difficult is sharing the scarce water among its consumers, particularly farmers. And yet, people across the country have devised a variety of property right mechanisms to share water and maintain their water bodies. To ensure equity in the distribution of tank water, villagers in some tank commands elect one among themselves or appoint a landless person as a water guide known locally as the *neerkatti*. The *neerkatti*

ensures that each farmer receives tank water in proportion to the area of land he/she owns. Therefore, conflicts over the sharing of water are rare. When the *neerkatti* is elected from among the local farming households, the office held is on a rotational basis to ensure that no household monopolizes this critical post. Feeder channels to tank and water distribution channels from sluice outlets are desilted and restructured by community effort, locally known as *kudimaramathu*. In a few other tanks, farmers have formed informal organizations of their own with specific roles and responsibilities allocated to each member through consensus, so that water distribution is equitable and tank maintenance effective. The organizations have evolved effective management principles through years of experience and conflict resolution. It decides, among others, when to open sluice outlets, which sluices to operate, for how long and in what sequence and when to close them. It has also evolved contingency plans to irrigate land during years of scanty rainfall, to decide upon the extent of land that can be irrigated and crops that farmers should cultivate in periods of scarcity. While everyone has the right to take water from the tank, no one can take more than his allocated share.

(*Box 3.2 continued*)

tenants and other water users have to participate voluntarily and select the president of the WUA or giving position to the highly contributed stakeholder for the rehabilitation of tank. The Irrigation Branch or department will be over the head of WUA excluding the DCs and PCs in the case of minor irrigation. Over the Irrigation Branch ministry for Minor irrigation will be located to guide and formulate the policies. The Irrigation department and the NGO will formulate the schedule in training and educating the farmers. The revenue generated from the water charges will be utilized back for the maintenance of the tank to sustain the system by avoiding the other share holders in the system.'

Source: Kakumanu et al. (2006).

Box 3.3 Critical Constraints at the Field Level—DHAN Foundation

Non-inclusion of tanks in watersheds: Even though water harvesting is one of the components in watershed development programmes the major focus is on to constructing new structures rather than rehabilitating existing structures, mainly tanks and ponds.

Overlapping of schemes: Overlapping of various schemes with different guidelines will affect the community organizations and lead to malpractices.

Usage of machinery: It is well demonstrated in many projects that appropriate use of machine and manpower will be effective in tank rehabilitation rather than using manpower alone. Works like bund strengthening or desiltation cannot be done using man-power alone because it affects time, cost, and quality of work.

No rights on usufructs: Even though the primary stakeholders, namely, tank user groups are contributing for and implementing the tank rehabilitation works for future maintenance they have to depend on external sources because they are not in a stage to utilize the income out of the tank system. Transfer of rights over the usufructs in tanks will greatly help those groups maintain the rehabilitated works in good shape year after year.

No collaboration between local panchayats and tank associations: Lack of collaboration among tank users and local panchayats has created a gap which in turn affects the overall development of tank systems or village development.

Limited coordination between tank associations and line departments: This is a major issue from the time of implementation to management of tanks. This needs to be improved for effective rehabilitation and the sustainability of these small-scale water resources—lifeline for the livelihood of the people.

Encroachments and Eviction: Different Approaches

In south India, like elsewhere in the country, encroachments of tank beds, catchment areas, tank bunds and feeder channels are not unusual. All categories of farmers and landless people have encroached upon these lands wherever they have found them convenient. Farmers have extended their fields into tank bed areas; in command areas they have extended into field channels; the poor and even the rich have encroached tank bunds for temporary, and in some cases, permanent houses or farm houses; they have got tenancy rights for cultivation on feeder channels; the government has allotted land to the landless and vulnerable sections in the catchment areas and feeder channel areas.

Non-governmental organizations (like DHAN in Madurai and Gram Vikas in Kolar) adopted pursuasive methods wherever possible, but restrained from using force. But under the Neeru–Meeru programme, the Andhra Pradesh government has gone ahead with demarcating the designed tank-bed areas and feeder channels and all encroachments have been officially evicted under the existing rules. This process has not faced any opposition so far in the districts we visited (for example, Chittoor, Anantapur, Warangal and Mehaboobnagar). On the other hand, the World Bank-supported tank rehabilitation projects (for example, in Karnataka and Andhra Pradesh) have ensured that project implementation takes care of identifying project-affected persons and as per the safeguard policies of the Bank, compensation is provided. In practice, this has sent confusing signals to tank users. In some *taluks*/*mandals*, while some tank encroachments are evicted as per the official procedure and without compensation, the donor-supported (mainly the World Bank) projects insisted on following safeguard policies, including compensation according to the loss. Again, not all donors (for example, the European Economic Commission and Ford Foundation) have insisted on ensuring compensation to project-affected persons in Tamil Nadu. Even in Karnataka, an earlier project (in the early 1980s) funded by the World Bank did not insist on following these safeguard policies. Karnataka also does not provide any compensation if the tanks are rehabilitated under the state-funded programme (for example, the Raitha Kayaka Kere Scheme of the Karnataka Minor Irrigation Department).

Table 3.7 Level of Users' Contribution

Scheme/Project	Users' Share in %	Project Supported by
Karnataka Community-based Tank Rehabilitation Project	12% (6% cash and 6% labour)	The World Bank
Raitha Kayaka Kere (one tank per *hobli*)	7%	Minor Irrigation Department of Karnataka
Neeru–Meeru Programme	10%	Andhra Pradesh government
PIM through WUAs	15%	Andhra Pradesh Economic Restructuring-Minimum Rehabilitation – Programme (APERP)supported by the World Bank in Andhra Pradesh
Tank rehabilitation	30%	DHAN (NGO) Tamil Nadu
Tank rehabilitation	25%	FERAL (NGO) in Pondicherry

Users' Contribution

The state governments and the central government have no single policy to suggest a single level of users' share for all developmental programmes. The shares oscillate based on (mainly donor insistence) type of programme and level of funding (see Table 3.7). In the case of tanks, it differs from zero in the case of state-funded projects to 12 per cent in the case of World Bank-funded projects (in Karnataka) to 30 per cent in DHAN Foundation-supported projects. In many projects/schemes, entirely funded by the state budget, the Minor irrigation department does not even envisage users' contribution as it is absent in the project design itself.

POLICY FOCUS

Policy and Legal Environment

While the programmes in the states differ, there are three common features:

Transfer to a WUA

All states propose that farmers in each small gravity system be organized into a single WUA that will take irrigation and maintenance responsibility for the whole system, including headworks.

Total System Transfer

The body to take responsibility following transfer is to be responsible for the O&M of the whole system including small and large water bodies at the village level, although the state may retain ownership of some or all of the system.

Minimal Changes in Responsibilities

The change in responsibilities will be minimal because in all states farmers are already heavily involved in system management. For example, in Tamil Nadu, the tank systems are already operated and maintained, except for some headworks, by local farmers. In Maharashtra, joint management committees manage the headworks even in non-transferred tank systems.

Motivations for Community-based Management

Internal Motivations

The internal motivations for handing over the management of village-level water bodies are basically somewhat similar to PIM in major canal systems. In fact, these policies should be looked upon as extensions of PIM policies for canal systems. In most discussions, they are treated as variants of canal system policies. In all three southern states, as elsewhere in the country, the primary concerns are finances and improving water use efficiency. In Tamil Nadu, the identified benefit is the revival of older local institutions (particularly, *kudimaramathu*) to improve the management of small water bodies. Most irrigation officials in Tamil Nadu see no major benefits and, not surprisingly, have been rather lukewarm in carrying out the policy even under the tank modernization project.

Influences from Outside the States

As with policies in canal systems, outside influences have been of major importance in the adoption of these policies in all three states. In Andhra Pradesh the APERP project, in Karnataka the community-based tank improvement project and in Tamil Nadu, earlier the European Union project and in recent years the Water Resources Consolidation Project—all funded by the World Bank—had a major influence in pushing the states into adopting community-based management of tank systems. However, outside these specific project areas user participation is not considered relevant, particularly in Karnataka and Tamil Nadu.

The Andhra Pradesh government has a legislation making WUAs mandatory for managing irrigation water, canals as well as tanks. In June 1997, elections to WUAs were conducted for all Major, Medium and Minor schemes. In November 1997, elections to the distributary committees (DCs) were completed. Project-level committees will also be constituted soon in order to effect total transfer of management to farmer's organizations. Eighty-one per cent of the WUAs in Andhra Pradesh are for Minor irrigation

(mostly tanks). The government of Andhra Pradesh has launched the Water Conservation Mission (WCM) to evolve concrete measures on water conservation and utilization on a sustainable basis. The programme has brought in convergence of efforts made by different departments (Government of Andhra Pradesh, 2002).

In the course of initiating reforms in tank management, the government of Karnataka has taken a bold decision to transfer management of all tanks to communities in a phased manner. To facilitate this process, the government of Karnataka created the JSYS as an autonomous and independent society with the following major objectives: (*a*) to develop, conserve and strengthen the water sector through a participatory system of management of tanks and groundwater to improve livelihoods of the rural people, (*b*) facilitate a community-driven approach in all aspects from project preparation to implementation, (*c*) promote and undertake efforts for integrated interventions and operational convergence in related sectors, namely, agriculture, horticulture, sericulture, forestry, animal husbandry, fisheries, groundwater management, watershed development and other related departments, (*d*) plan, promote and organize activities of capacity building, including awareness campaigns, *kalajathas*, farmers *melas* and other programme and (*e*) to develop guidelines for planning, implementation monitoring and evaluation.

The primary objective of the pilot project is to develop a process whereby NGOs can work effectively with the government to promote the revival of village-level water bodies and farmers' management within the sub-basin context (see Table 3.8).

EMERGING APPROACHES

Reviving Community Participation and Collective Action

Every study quoted earlier has stressed the need for local participation and management of tanks. Approaches have been varied across states in involving the community and developing a sense of ownership, but governments have felt the need for local participation for sustainability of tanks and rural livelihoods.

Percolation Tanks

One of the key approaches advocated on hydrological grounds is to convert irrigation tanks to percolation tanks, especially in low-rainfall areas (for example, in the Chittoor and Anantapur districts). Percolation tanks are like irrigation tanks, but they have no sluice gate. Water escapes from the tank by seeping, or percolating, into the ground to augment groundwater aquifers. In recent years, hydrologists have advocated establishing new percolation structures (including percolation tanks and check dams) in semi-arid regions and many have been constructed under watershed projects. Palanisami et al. (1994), in a socioeconomic study of tank management in Tamil Nadu, concluded that poor performing tanks with high-density wells in the command area should be converted into percolation tanks. To their knowledge, no one had acted on this recommendation in Tamil Nadu. Meanwhile, farmers in southern Andhra Pradesh and perhaps elsewhere have initiated the process of converting existing irrigation tanks to

Table 3.8 Field Experiments and Lessons Learnt

Organization	Focus	Constraint	Lessons Learnt
Ford Foundation and Centre for Water Resources, Anna University, Pillaipakkam Tank, Kancheepuram District.	Rehabilitation with equity as the focus. Distribution of water by dividing the channel flow.	In the pre-project period, farmers damaged the channel lining with impunity to access the water that they needed.	Formal WUA formation and involving them at all facets of rehabilitation—planning, design, execution, maintenance and management.
Centre for Water Resources—PWD, AED Anna University, European Economic Community (EEC), Ford Foundation and farmers' associations. 12 districts of Tamil Nadu.	Placing catalysts in the village to motivate the farmers for better irrigation management—the Philippines model.	• Increased costs as materials had to be brought from longer distance, as the identified markets did not exist. • Prolonged time duration. • Cost of materials and labour increased considerably.	• People's cooperation was good as they were involved at all stages and the catalysts had created the rapport. • Important to involve farmers with prior communication and involvement. Farmers proved themselves by completing the entrusted work on time. • Farmers can anticipate local problems. Suggestions by farmers were well taken in changing designs as they identified the problems rightly. These could have been overlooked by others. • Collective action was invoked. It broke the barriers to cooperation between castes. Good financial management with new ideas from farmers. • Generated rural employment.
Centre for Water Resources	Kedar Farmers' Association (FA) through the Centre for Water Resources (CWR), Anna University requested the government of Tamil Nadu to hand over the tank system to the user community for sustained maintenance.	• Many departments exercise their control over tanks. Welfare of farmers as end users is of less concern to departments. • Fisheries department contested with FA and obtained an order from the High Court depriving reliable income to FA in Pagadaikulam FA.	• Kedar FA built up resources by (*a*) allowing people to cut bricks using tank silt, (*b*)laying roads and (*c*) constructing school building, etc. • Proving that the sustainability of FA is fully dependent on its capacity to mobilize resources. • If the government wants to turn over the irrigation systems to the FA, it should first ensure a reliable source of income through usufructs rights and fishing rights.
EEC and GOI	150 tanks in Tamil Nadu.	To increase food production, rural incomes and improved water management.	• Database on hydrology of tanks is important. • Involving farmers to understand local conditions was important. • Communication between farmers and the department staff taking their opinions into account is important. • Evaluating the situation is important before taking decisions on physical works. • Selection of tanks by social screening to assess collective action. • Plans to be need based and must involve the farmers. • Yield from catchment and inflows from supply channels should be assessed more accurately. • Strengthening WUAs. • Increase investment on tanks.

(*Table 3.8 continued*)

(*Table 3.8 continued*)

Organization	Focus	Constraint	Lessons Learnt
Gram Vikas	Desiltation and amendment in farmers' fields by identifying villages based on its assessment of participation, good SHGs and representation of all groups.		• Women's SHG implements the project. • Only a 10 per cent contribution is feasible.
Palmyra (an NGO) and India Canada Environment Facility (ICEF)		• Accountability problems when contractors from the same village are engaged.	• More emphasis in institution building. • Farmer involvement with contribution. • Accountability should be emphasized.

percolation tanks. In this way, scientists and farmers have advocated the same basic technology, but developed the idea independently of one another and proceeded in a different manner.

Converting a tank from surface irrigation to percolation requires merely closing the sluice gate. The percolated water flows underground below the command area, where it is lifted by motorized pumps through irrigation wells. The advantage of this system is that a percolation tank can increase the supply of irrigation water even when it does not fill, whereas irrigation tanks can provide surface water only in those years when they fill completely. Another advantage is that by increasing the efficiency of well irrigation, percolation supports the irrigation method that is increasingly favoured by farmers.

The potential drawback of percolation tanks is that the immediate beneficiaries are those farmers who own wells, who are the wealthy minority. It is not guaranteed that the benefits of percolation tanks will spread equitably through the community. Experience shows, however, that through a process of community organization supported by some favourable aspects of the percolation tank system, it is possible to manage them in a way that all the people in a village are made better off than they were previously under the tank surface irrigation system. In Anantapur District, villagers have initiated the work, but it has drawn the interest and stimulated collaboration of four NGOs—Oxfam India, Action for Food Production (AFPRO), Society for Promotion of Wastelands Development (SPWD) and Action for Social Advancement (ASW)—and two government organizations—the Central Research Institute for Dryland Agriculture (CRIDA) and the Indian Council for Agricultural Research (ICAR), Transfer of Technology Department.

Tank conversion affects different people**:** (*a*) farmers with well-irrigated land in the tank command area, (*b*) farmers with land in the tank command area, but no well, (*c*) farmers who own land in the tank bed area, (*d*) farmers who cultivate land in the tank bed illegally, (*e*) the 'water man' who manages the sluice gate in the tank irrigation system, (*f*) fishermen who raise fish in the tank and (*g*) other farmers and other landless people.

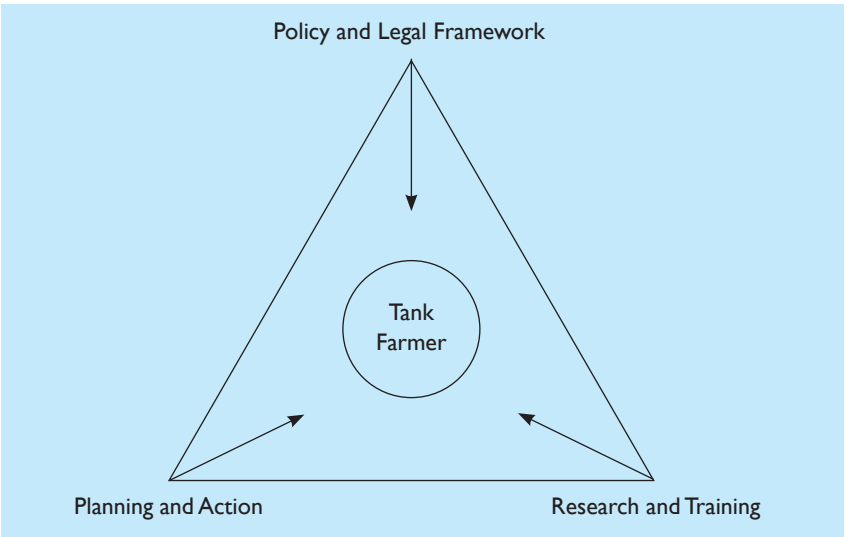
TANKS: A WAY FORWARD

1. For the selected tanks, an *integrated tank development plan* (ITDP) needs to be prepared by the local farmers

with the assistance of NGOs. The ITDP (as demonstrated by the JSYS in Karnataka) provides scope for local users to understand the tank system and design what is required and what kind of action plan (including work prioritization) would be helpful. The ITDP has to cover various aspects to evolve an integrated approach.

2. It is necessary to *encourage only community-based initiatives* in all tank-related work. Legal and policy changes are required to support this.
3. Stakeholders (all types) require *widespread awareness* and channels to provide information on a regular basis; especially on current policies, their potential role, available technology, NGO activities and fund availability.
4. Based on the points discussed here, *massive capacity-building* exercises are necessary for government agencies, NGOs and user groups. More important is skill upgradation for all these groups on a regular basis. Capacity-building exercises have to be in the local language (that is, the discussions and the written material must be in the local language) and have to be held at easily accessible local places. Separate materials and focused discussions need to be arranged for various levels of participants (from policy-makers to field staff, and user group presidents to ordinary members). Existing training institutes (like WALMI, Dharwad, Irrigation Management and Training Institute in Tiruchi, WALAMTRI in Hyderabad) research bodies (like the Institute for Social and Economic Change, Bangalore, Water Technology Centre, TNAU, Coimbatore, Centre for Water Resources, Chennai, Madras Institute for Development Studies in Chennai, Centre for Social and Economic Studies in Hyderabad) management institutes (like the Indian Institute of Management, Bangalore) and NGOs may be actively involved. A network of small local NGOs and community-based organizations can have greater impact than large NGOs.
5. There is need to *scale-up successful demonstrations*[4] of rejuvenation of village-level water bodies (for example, the Tarun Bharat Sangh in Rajasthan, DHAN in Tamil Nadu). State agencies and donor agencies have to provide opportunities for experienced NGOs (for example, DHAN, FERAL, Gram Vikas, Oxfam-India, Prerana and Chaitanya) to scale-up their activities on a larger scale, preferably on a micro-river basin level. This would help move towards integrated water resources development. The efforts of JSYS in Karnataka, through donor support may set the trend for other states.
6. Any long-term plan has to take care of (*a*) policy and legal framework, (*b*) proper planning and implementation and (*c*) need-based research and training (see Figure 3.2).
7. *Develop a manual for tank development.* A manual on tank development is essential for all NGOs and user groups, and governmental agencies need to initiate action at the field level. Besides following the points covered under the ITDP, the manual has to encompass technical, social, economic and ecological aspects. It should provide current policy and legal framework and all necessary information. Appropriate formats have to be designed for initial meetings, handling funds, conflict resolution, training requirements, staff,

Figure 3.2 Linkages to Tank Farmers



mobilization of funds, primary and secondary activities and performance measurement. Also crucial is what process should be followed to select a good NGO to assist the tank user group. These manuals should be available in the local language and in English. The network of NGOs and government agencies may create a website to update their coverage and performance. It should be possible to download all formats from this website and provide a link to the parent organization.

8. An all-India *network for the revival of water bodies* should be established.
9. *Conservation councils* at the state level and also at the all-India level comprising high-profile persons from the water resources and environment sectors can effectively work towards lobbying and championing the cause of small-scale water resources. The functions of the conservation councils as a third force should include interacting periodically with policy-makers, planners, administrators and bureaucrats. They should voice their opinion and reflect the opinion of the people on matters relating to small-scale irrigation systems through press, radio and television. The councils can critique and attempt to shape government policies related to this sector. Various meets including policy discussions can be organized apart from establishing a platform to work for the phased improvement of these water bodies.
10. *Convergence with other projects in the area.* The southern states, owing to their topographical features, provide a good opportunity for a large number of watershed development projects. On the other hand, owing to the lack of perennial drinking water supplies, these states have also started or already have in place a good number of rural water supply and environmental sanitation projects. Most of these projects are independently designed and funded partly or fully by the central government or/and the state government or donor agencies. In effect, these isolation efforts have implications on tank system development. Farmers feel that projects implemented in the same geographical area should be designed in an integrated manner. For example, Andhra Pradesh has taken a bold step in developing tanks, ponds and feeder channels in an integrated manner under the Neeru–Meeru programme, while Karnataka and Tamil Nadu have to focus on similar grounds. These convergence efforts have to be evolved through mutual understanding among government agencies, NGOs and donor agencies with the active participation of local users.

11. *Prioritization of works* (see Figure 3.3).
12. *Boost groundwater levels.* A large number of studies have shown that restoration of tanks would boost groundwater recharge levels. The steep reduction in the recharge capacity of tanks is seen as boomeranging on the prospects of well irrigation.
13. *Collaboration between government and non-governmental agencies.* There are many areas where the NGO-government partnership could be effectively utilized (see Table 3.9).
14. *Rethink on local institutions.* Many forms of local institutions, formal and informal, are in existence managing village-level water bodies. Yet, so many small structures are without local institutions. Hence, a range of actions has to be initiated or evolved to redefine the role of stakeholders (also see Table 3.10): (*a*) regeneration of local institutions, (*b*) formation of new local

Figure 3.3 Prioritization of Works

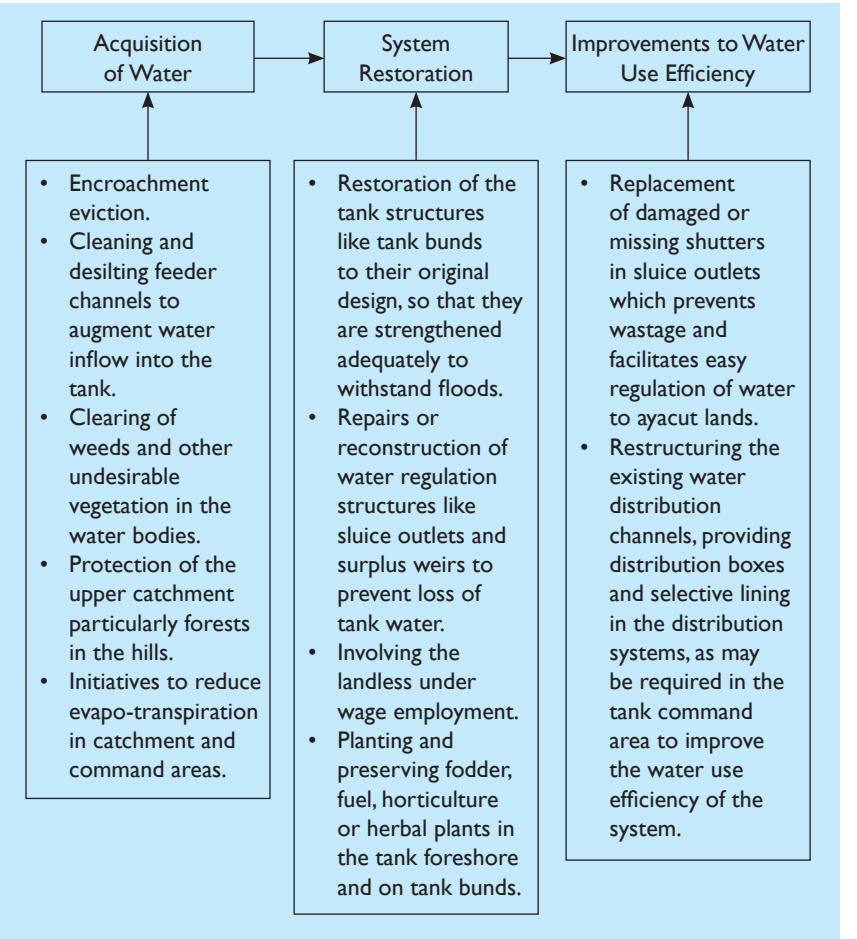


Table 3.9 Collaboration between Government and Non-governmental Agencies

Benefits	Disadvantages
From the Government's Perspective	
• Better delivery facilities for government services. • More information available from the grass roots. • More interaction with target groups. • Enhanced cost-effectiveness. • Field-testing facilities for new technologies. • Appropriate training inputs available from NGO specialists. • More coordination of government–NGO activities possible; more control of NGOs in general.	• Government's services shown to be inefficient by NGOs' presence and actions. • NGO mobilization work promotes social instability. • Demand for government services may increase beyond the capacity to meet it. • NGOs compete with the government for donor's funds. • Weakening of the government's mandate and credibility. • The unaccountability of NGOs.
From the NGO's Perspective	
• Improved access to policy formulation. • Access to specialist research facilities and expertise. • Opportunity to improve government services 'from within by training'. • Access to new technologies 'from above'. • Opportunities for passing on technologies and models for replication or 'scaling up'.	• Co-option by government and greater bureaucratic controls. • The NGO grows to assume a more bureaucratic character. • Loss of NGO autonomy and independence. • Relegation to mere delivery activities to the detriment of the NGO's wider programme. • 'Substitution' by the NGO for government services affects government efficiency.

Source: Shanmugam and Vasimalai (2004).

Table 3.10 Redefining the Role of Stakeholders

Institutions	New Role	Role to be Dropped
State	• Rigorous regulation and enabling policy and empowerment of people's institutions. • Encouraging market investments. • Technical and managerial support. • Resource augmentation. • Transfer ownership over tanks to gram sabhas at the village level.	• Implementation role and implementation staff. • Outdated legal framework. • Control perspective.
Research and resource institutions	• Study and documentation of existing practices. • Experimentation. • Opening new frontiers. • Outreach and field-oriented research and studies.	• Conventional outlook. • Outdated curriculum and policies. • Exclusive reliance on campus-based activities.
NGOs	• Understanding people's needs and aspirations through committed work and pilot field works. • Enlarging into research and resource institutional areas. • Liaisoning with government research and resource institutions and people's organizations.	• Conventional 'social' outlook. • Ordinary quality staff and programme. • Conventional 'institutional' view.
People institutions/ community institutions	• Internal regulation and management of resources. • Managing interference and conflicts. • Distribution of benefits to marginal sections. • Vibrant civil society—sharing governance. • Nurturing leadership with vision on a long-term basis. • Setting agenda for mainstream institutions and social auditing of those institutions.	• Expectations of 'doles' and subsidies. • Divisive parochial views and 'tokenism'.

Source: Shanmugam and Vasimalai (2004).
Note: Based on deliberations in the 'South Asia Workshop on Tanks Rehabilitation' held on 6–8 March 2002 at Madurai.

institutions, (*c*) development of nested institutions on horizontal and vertical lines to build the sector, (*d*) integration of local institutions with panchayat and other mainstream institutions, (*e*) development of good governance at all levels of these institutions by systematic capacity building programmes and (*f*) creating a new generation of local leaders through systematic training.

NOTES

1. According to the estimates of the All India Report on Agricultural Census of 1990–91 (GOI, 1990–91), tank-irrigated area accounted for nearly 10 per cent of the net irrigated area among marginal farmers, whereas it accounted for only 3.6 per cent among large farmers.
2. The National Remote Sensing Agency (NRSA) is an autonomous operational centre under the Department of Space (DOS), Government of India.
3. For example, Bangalore City with its 600 sq. km area with good topography has swallowed up some 130 tanks out of the total 282 tanks in the area for its urban development over the last four decades. Another 60 tanks have permanently lost their catchment area owing to unregulated urban development (personal communication with officials of the Minor Irrigation Department, Government of Karnataka).
4. Some NGOs question successful intervention. Can we call some things successful if equity issues are grossly neglected? The focus should not be on physical aspects except in exceptional situations. Focus should be broad-basing stakeholders and addressing equity and sustainability.

Participatory Irrigation Management
National and International Experiences

Chapter 4

This chapter broadly outlines certain common features observed across irrigation management practices abroad and in India and specific variations. The experiences of water users' associations (WUAs) in water regulation, water use efficiency and water allocation are captured across different locales. This chapter also covers performance of non-WUA areas.

IRRIGATION MANAGEMENT PRACTICES AROUND THE WORLD

Water Boards and the Involvement of Farmers in the Netherlands

Water boards in the Netherlands trace their origins to the initiatives of farmers and landowners who worked together to build *spolders*, low-lying land reclaimed from the sea and surrounded by dykes, in the fourteenth century. The farmers were actively involved in managing the supply and drainage of water. Because of the importance of water management to agriculture, farmers have always been actively involved in water boards. Recent environmental concerns about biodiversity have changed the focus of water boards because, historically, farm interests have dominated water management concerns. In the last few years, the interests of water boards have been broadened to include environmental and non-agricultural issues. The emphasis of management is on the multi-functionality of water use. Strategies adopted for the improvement of the system include: (*a*) engineering measures, (*b*) agronomic measures, (*c*) management measures, (*d*) public awareness and involvement and (*e*) engineering measures.

Repairs of the Canal System

Repairs of the canal system were carried out systematically according to priority, availability of funds and the requirements of the beneficiaries. First, the bottlenecks were removed, important canal structures such as siphons and structures with big leaks were repaired, the canal was lined selectively for short lengths and service roads were repaired for better transportation.

Scheduling of Irrigation

Earlier, there was no control on irrigation rotation; farmers at the head of the canal used to take water as and when required and tail-enders had to suffer. This practice led to improper distribution, waste of water and disharmony among farmers.

Irrigation scheduling was devised such that tail-enders were to receive water first and the head reach farmers at the end. The scheduling has been followed strictly. Scheduling was prepared by considering water requirements and soil type. This practice enabled farmers to have an assured, adequate and timely supply of water. Earlier, beneficiaries were not drawing water at night, leading to heavy wastage of water. Now night irrigation has been made compulsory and is practiced strictly due to which a large quantity of water is saved.

Volumetric Measurement of Water

Earlier, water rates were charged on an area basis. Thus, there was no tendency as well as no incentive for the farmers to use water efficiently. Now, flow-measuring devices have been installed at the head of the canal for measurement of the canal discharge. The supply of water to WUAs is made on a volumetric basis, with a subsidized water rate structure, which has resulted in efficient, effective and economic use of water.

Improved Surface Irrigation Methods

Considerable wastage of water occurs due to wild flooding and other uncontrolled surface methods of irrigation. On-farm irrigation efficiency could be as low as 40–50 per cent. In such cases, the use of proper irrigation layouts is essential. Farmers are trained about the efficiency of layouts such as borders, furrows, basins, etc. As a result, farmers in the command areas have started adopting improved surface irrigation methods.

Smallholder Irrigation is Viable: The Zimbabwe Experience

Experiences in Zimbabwe have shown that smallholder irrigation can be viable and can be used as a key drought mitigation measure. The high yields obtained through irrigation coupled with other benefits such as increased incomes, food security, employment creation and drought relief savings are an indication that smallholder irrigation can be a vehicle for the long-term agricultural and macroeconomic development of Zimbabwe. There has been tremendous progress in Zimbabwe since its independence in 1980.

Half the schemes are managed by the farmers themselves, but the government also manages schemes either directly (32 per cent) or jointly with farmers (18 per cent). Most schemes (70 per cent) use surface irrigation, but some 30 per cent utilize sprinkler technologies. There are now over 180 operational smallholder schemes covering an area of 12,000 ha and serving over 15,000 smallholders. Although with double cropping the actual area can increase to 18,000 ha, it still only represents 10 per cent of Zimbabwe's total irrigated area. The potential for further irrigation based on available water resources is estimated to be 240,000 ha of which 90,000 ha is expected to be cultivated by smallholders.

The impacts include:[1] (*a*) manifold increase in crop yields, (*b*) cultivation of new crops, (*c*) improved employment opportunities, (*d*) reduced urban migration, (*e*) development of farmers' skills, (*f*) development of farmers' entrepreneurial skills, (*g*) acquisition of assets

by farmers and (*h*) reduced government expenditure on drought relief.

Hama Mavhaire, Zimbabwe: An Innovative and Highly Successful Scheme

Responding to the expensive and non-sustainable outcomes of previous top–down irrigation schemes, Agritex decided to fully involve farmers right from the beginning. The farmers were able to select the engineering design based on discussions on two or three options. They selected a drag-hose system in which each farmer has his own set of six sprinklers and hose. The government supplied these on the understanding that the farmers would be responsible for their maintenance and renewal. This system was easy to use and manage and resulted in highly-efficient irrigation. Seventy per cent of the smallholders are women. While the farmers manage the scheme, the government manages the dam and pumping plant.

The Hama Mavhaire scheme was an instant success. It has sustained right from its first year (1992) when the country was afflicted by a very severe drought. The scheme's new dam was fortuitously filled by a local flash flood. This permitted a crop to be grown during the drought, which stood out spectacularly from the surrounding area.

The scheme's impacts include: (*a*) empowering women as 70 per cent of the smallholders are women, (*b*) sustainance of crops, (*c*) produce is sold to distant towns too, (*d*) an increase in income levels as two crops are grown annually and (*e*) improvement in the quality of life—the smallholders now have brick houses and there are savings clubs, maintenance classes and facilities around the scheme.

Collective Action: Chitora—Zimbabwe's Top Small-scale Irrigation Scheme

The Chitora farmer-managed irrigation scheme (120 km north-east of Harare) was established in 1994 with support from Agritex and DANIDA. The 9-ha project utilizes a drag-hose sprinkler system, with water being pumped from a weir on the Chitora River. The 18 plot holders take care of the entire operation and maintenance (O&M) of the scheme. Agritex provides agricultural extension services and advice. Young, inexperienced, but enthusiastic farmers contributed their labour to building the scheme infrastructure. They have now set up an irrigation management committee that manages the scheme and collects maintenance dues and each farmer's share of utility costs. Sprinkler irrigation is arranged to give just enough water based upon visual inspection of the crops. Farmers receive help from Agritex on matters related to crop–water management.

The impacts of the scheme include: (*a*) a 90 per cent economic internal rate of return (EIRR) for the scheme, (*b*) crop yields are good—groundnut yields average four times the yield that can be achieved on nearby unirrigated areas where a good harvest is only possible one year in five, (*c*) many high-value horticultural crops are now grown and farmers stagger plantings and grow a mix of crops so as to get a steady cash flow, (*d*) most farmers have achieved

a 300 per cent cropping intensity and (*e*) the farmers' annual net income per plot (0.5 ha), which is an average US$ 2,500, is twice as much as that of unskilled workers in Harare.

Water Users' Associations in Tajikistan

Farmers in Tajikistan, as in much of Central Asia, typically encounter water management problems that can be resolved best with the formation of WUAs. Problems range from lack of funds to properly operating and maintaining the irrigation systems to conflicts arising from unfair distribution of water. Under the USAID-funded Water Users Association Support Programme (WUASP), farmers were initially sceptical, unsure of the meaning of WUAs and even resistant to the concept. However, through WUASP training, farmers gradually came to understand what a WUA could do for them and the advantages of working as an organized association. Seeing the tangible benefits of forming WUAs has even given them confidence to take the initiative to resolve their own problems and be reliable WUA members.

One member from a WUA in Rudaki District says, 'I used to have conflicts with my neighbour over water as he tried to block water flowing to my garden. But after we became WUA members and took part in the trainings, I no longer have this problem with my neighbour. We understand how water can be effectively distributed to the benefit of everyone.' Another WUA member says, 'The association united individual farmers who had initially tried to resolve their [water management] problems on their own, but to no avail. Currently, we have a real opportunity to resolve our problems together, not only those related to irrigation, but also other agriculture and community-related issues. Farmers are optimistic as they have benefited tremendously from WUASP training and now have concrete plans and proposals to resolve their own problems.' In addition to solving water management problems, farmers have learned financial management, organizational development, leadership and conflict resolution skills through the many training programmes the WUASP offers, all aimed at increasing the capacity of WUAs. Members of the 26 pilot WUAs in Tajikistan now realize that an individual farmer cannot solve his/her irrigation problems alone. Working together through WUAs is an effective means of resolving many of their water management problems.

Improving Local Participation: Experiences from Sri Lanka, Indonesia and the Philippines

In Sri Lanka, farmers are organized into legally recognized autonomous organizations. Participatory management in Sri Lanka has made great progress since the adoption of the policy in 1988. Farmers' organizations have been created in about 85 per cent of all major schemes. Operation and maintenance responsibilities have been informally handed over to a large majority of farmers' organizations. There has been improved water distribution in most schemes. While the schemes have elicited greater contribution of farmers toward maintenance, they may not

have improved overall maintenance. They have had no significant effect on agricultural production and have been accompanied by reduced government allocations (in real terms) for O&M of Major irrigation schemes. However, the impacts of participatory management are controversial. One study (Brewer et al., 1996) concluded that there is no evidence that handing over has affected the rate of deterioration of channels, but that there are clear problems with understanding the responsibilities handed over. The IIMI's 1994 (IIMI/ARTI, 1995) study showed that farmers' organizations vary widely in their performance. Many of the problems result from incomplete and unclear handing over of responsibilities. Although handing over is supposed to mean that farmers' organizations have full O&M responsibility for their channels, both the irrigation department and the Mahaweli Economic Agency provide government funds to the farmers' organizations.

Participatory irrigation management (PIM) in the Philippines is today synonymous with what is known as the 'learning process approach'. Resulting from a history of community participation in the management of irrigation activities culminating in the systematic implementation of certain processes in the communal irrigation systems (CIS), the characteristics of this approach can be defined as gradual, progressive, small scale and intensive management. In the Philippines, this process is characterized by the formation of irrigators' associations to jointly manage irrigation related activities (with the NIA), and in the long term, the secondary levels of the national irrigation systems (NIS).

In Indonesia, participatory programmes have helped to improve water distribution and system maintenance, but these impacts have been inadequately emphasized. Participation has improved planning, helping to provide valuable local information, prevent problems and optimize use of local resources. Local cost sharing has increased benefits. Institutional reforms promoted by participatory programmes, such as irrigation service fees (ISF) and turnover, have often helped highlight problems and support changes, such as more equitable block-level water distribution. Training programmes have helped improve capacity to carry out participatory programmes. Training has helped to orient staff in taking up new responsibilities. Monitoring information and WUAs' requests have aided in more efficiently targeting training at sites with priority being given to problems and opportunities. A legal framework has been established for WUAs and policies now support participation. Detailed regulations, guidelines and training materials are now available. There has been a tendency to make participatory approaches excessively complicated. Simpler, more focused approaches to PIM are likely to be more effective.

Multipurpose WUAs in Albania—the Fier Agricultural Programme

The main objectives of the Fier[2] Agricultural Programme (FAP) are: (*a*) to rehabilitate the infrastructure for irrigation and drainage at the secondary level and (*b*) strengthen the O&M of the system at the tertiary and secondary level by facilitating the functioning of WUAs. The area of operation is the Fier District, a farming community of over 30,000 families, with an average

holding of 1.5 ha of land and one or two cows. The two pilot districts under the project are Dermenas and Frakull. The main crops are wheat, maize, alfalfa and vegetables. There is also fodder and dairy production.

The FAP Approach to WUA Development

The FAP started the project with the idea of establishing multipurpose WUAs. This included WUAs that not only would be established and trained to take over the O&M of the tertiary and secondary irrigation canals, but would also be, among other things, in charge of providing small credit to member farmers for agricultural inputs funded by the project. In addition, the WUAs would be trained in marketing and be assisted in marketing agricultural products.

To further the broad goals mentioned here, the annual plan for 1996 included the following activities: (*a*) rehabilitating secondary canals in two pilot areas, (*b*) involving WUAs in planning the rehabilitation, (*c*) handing over rehabilitated areas to the WUAs, (*d*) reorganizing the WUA in Frakull by hydraulic units, (*e*) assessing the training needs of the WUA board members, (*f*) preparing and conducting training for WUAs, (*g*) introducing new materials, (*h*) recommending water management improvements in the pilot areas, (*i*) land-levelling on 10 ha of farm land, (j) conducting a trial on field application on the newly levelled land and (*k*) preparing leaflets on improved irrigated agricultural practices.

Issues

1. Problems with delivery of water on time and insufficient quantity of water caused by the water enterprise in the Fier District, which considered its position weakened.
2. It became obvious that multipurpose WUAs were difficult to establish at this point.
3. Using WUAs as an agent for providing credit to farmers was especially problematic. For instance, there was a possibility that temporary investment of money into pyramid funds was more attractive than providing farmers with small credit. Moreover, it was felt that WUAs should first concentrate on the job that they were created for and prove that they can be organizations that function well and are able to operate and maintain irrigation systems before they branch out into other activities and risk losing credibility.

To avoid this risk, the FAP has decided, at least for the time being, to abandon the provision of credit and focus on rehabilitating canals and training the established WUAs about the O&M of the irrigation system.

Second Generation Problems: The Experiences of Turkey and Mexico

The term 'second generation' requires some explanation. Transferring substantial management authority to a locally-based organization is a complicated undertaking and may involve changes in national policy, regulations and organizational structures; creation of new organizations at the local level; transference of equipment ownership; and changes in personnel, in addition to the shifting of management functions to the new managers. Anyone undertaking

this complex task, in addition to solving problems, will almost certainly create new problems, which did not exist before or were not previously evident. An example might be the inadequate technical capability of new irrigation field personnel. These problems are here termed 'second-generation problems'. In addition, there may be situations, such as low agricultural productivity, which were present prior to the transfer, but which were not acute when irrigation fees were low or non-existent. Hence, these are also included in the category of second-generation problems. Some second-generation problems may be a result of faulty processes used to introduce the new management system. Some may be a result of conscious choices during implementation to defer the consideration of certain potential problems in the interests of accelerating programme coverage. Others may be virtually unavoidable, though the ability to anticipate major problems in advance should allow corrective measures to be put into place earlier than would be otherwise possible. At times, second-generation problems and challenges emerge in the wake of early successes of PIM initiatives.

Problems are analysed from several different perspectives—that of the water user, the irrigation association, the irrigation agency and the government. In terms of these perspectives, a change, such as increased irrigation service fees may constitute a problem for water users, but a benefit for the irrigation association and perhaps the government if it reduces government subsidies. The term 'impacts' also requires some explanation. In general, impacts can be either positive or negative. When they are positive, they are 'benefits', or 'positive benefits'. When they are negative, they are similar to what are called second-generation problems.

Turkey

The second-generation problems can be categorized in terms of the agency/group on whom they have primary effect. The challenges faced are:

1. The difficulty in reducing overall staff levels in general, and O&M staff levels in particular, in the wake of transfer of management.
2. The absence of a charging mechanism for bulk water supply to irrigators' associations, and the consequent absence of an economic restraint on demands for water.
3. The indistinct vision of a new role for the agency in supporting existing irrigation in the post-transfer era.

Nascent problems for irrigators' associations include:

1. Undefined nature of water rights in Turkey and the consequent insecurity of claim on irrigation water.
2. Restricted options for obtaining heavy maintenance equipment.
3. Lack of a legal basis for forming federations of irrigators' associations for joint purchasing and supplying 'lumpy' services such as equipment maintenance'.
4. Lack of a clear policy on capital cost sharing for rehabilitation (and new system construction).
5. Need to increase direct farmer participation in the governance of irrigators' associations and reduce dependence on village and municipal leaders in filling leadership roles in the irrigators' associations.

6. Weak support service systems for irrigators' associations in some areas and regions.

The flexible and pragmatic conduct of the transfer programme to date and the enthusiasm and capability apparent in many association leaders offers reason for confidence that problems will be met and addressed. In some areas, action is already under way. A World Bank loan currently being appraised will help ease the equipment constraint with subsidized purchase arrangements for irrigators' associations. The water rights situation, on the other hand, presents a potential problem of major dimensions which will require upper-level action and time to remedy. Other constraints will require concerted action by the DSI (Department of State Hydraulic Works, Ankara, Turkey), irrigators associations and other organizations. The real danger is that of complacency, in which the government washes its hands of irrigation management entirely and fails to apprehend its ongoing role in monitoring and addressing emerging problems in the area of policy, finance, regulation, oversight and supporting services.

Mexico

In Mexico, since the districts, divided into modules, were transferred to their corresponding associations of users, a new group of problems have appeared. Of course, some problems of the second generation are related to the first ones and it is important to point out that they are also related to the socioeconomic problems that burden the agricultural sector in general, mainly because of the crisis that the whole country is going through. Among the problems faced by user organizations, the following can be pointed out as the most important: (*a*) legal problems, (*b*) financial self-sufficiency and investment financing, (*c*) water management, (*d*) maintenance and repairs, (*e*) inter-institutional coordination, (*f*) environmental impacts, (*g*) leadership, management and support of WUAs and (*h*) water rights and other legal issues.

The New National Water Law

The new national water law provides a suitable framework to solve most of the problems related to the use, exploitation and management of hydraulic resources. Water rights are generally defined, a registry for water rights is being established and the outlines of a market for water rights are given. However, although implementing regulations for this bill already exist, there are many legal gaps. What is required is guidance on ways to solve specific problems at the level of the basin, irrigation district and user organization.

The most important legal deficiency is the lack of definition about what rights to water are—rights that the WUA should have. A volumetric right of water was not given in the concession title given to the modules. Titles only indicate that the CNA (Mexico's International Water Commission) will annually define the supply of water in order for the irrigation districts and the corresponding modules to make their plans. In this respect, there is great confusion because neither the law nor their regulations explains the difference between water rights and water allocation.

It is supposed that rights to surface water flows relate to the average water run-off that a particular water user is entitled to use, whether by concession (for individuals or civil associations) or

by appropriation (for government institutions). This is the value considered in the REPDA (the Public Register for Water Rights). Each year, according to the supply of water, the CNA will authorize water supply, which should be proportional to the right that was assigned or granted.

This lack of definition about volumetric amounts of water granted to the modules is a cause of many problems and conflicts among the water users. An example is the conflict between the users of Irrigation District Number 26 and Monterrey City over use of water from the Río San Juan. Other conflicts include those in the Las Lajas River in Guanajuato, the Atoyac River in Puebla and others where construction work in the upper parts of the basin has been undertaken, even though water supply was already assigned to the lower area. The lack of regulations at the basin, district and association levels leaves the solution of problems and conflicts to the CNA, creating problems that could be prevented if regulations existed. Among the present problems, the ones generated by lack of water in the north tend to get worse with the increase of urban and industrial demand, as is the case in the Rio Bravo basin.

Other legal issues that must be clarified through the issuance of new regulations are:

1. Priority to be given to the use of water for human consumption in the districts, since there is confusion about what domestic, human and urban uses are and how the priority rights for these uses should be established over the agricultural use of water, mainly in the times of shortage of water.
2. The need to include certain amounts of water for ecological purposes in the irrigation plans of districts and modules so that the pollution problems of surface water flows are reduced.
3. Definition of rights to water at the users' level. Irrigation district hydraulic committees should clearly propose such definitions in accordance with Article 26 of the law.

Considering the similarity of many problems whose solutions relate to new regulations, ANUR (Natural Users Federation Mexico, Diagnostics de las Associaciones de Usuarios Informe Tecnico) should participate. It is already working with CNA personnel in the development of new regulations at the district and user organization levels.

Financial Requirements

1. Two-thirds of the directive board members in surveyed modules indicated that funds obtained through water charges were insufficient to cover operation, maintenance and management costs (CP, 1994). They also confirmed that maintenance is reduced when there is lack of money. In most cases, fee levels had been raised, but at a rate less than inflation because it was felt that water users were facing economic difficulties.
2. At the same time, more than half of the directors acknowledged that they have not been able to get a satisfactory agreement concerning payment of fees to the CNA for bulk water supply. The study concluded that regulations on quantifying such fees were inadequate (CP, 1994). This is because the methodology proposed

in the instructions attached to the concession titles is not followed and those fees are often charged as part of the quotas, but not in volumetric terms as established by the law. The percentage has generally been negotiated with the CNA by the directors of the individual modules and, therefore, there is variability in the amounts, even in similar conditions of operation.

3. Because there are no regulations about reporting expenses and keeping books, considerable differences are found in the way accounts are kept among modules. This makes auditing accounts, and comparisons among the modules, difficult.

Fixed and Volumetric Tariffs

There are many ways to charge for irrigation services—from the simplest using annual hectarage irrigated to the more complicated volumetric methods. When charges are levied volumetrically, associations risk not being able to recover costs in years of water shortage. Because of this, mixed methods are recommended that contain both a fixed fee, which helps cover the associations' fixed expenses, and a volumetric component linked to the amount of water delivered, which makes the user conscious of economy in water use.

Sinking Funds and Reserves

Most associations establish neither a sinking fund that would enable them to replace equipment, nor a financial reserve that could be used for emergencies. Enquiries carried out among module directors indicate that they do not think it advisable to save money given the current high inflation rate and the risk of a new devaluation and a consequent loss in the value of the reserve.

Water Management, Maintenance and Repairs

Problems have arisen in irrigation and maintenance services since WUAs have come to be in charge of operating the irrigation systems. These problems have arisen due to the lack of adequate training of the operational staff, lack of operational regulations at the association level and poor conditions of the irrigation infrastructure.

Operational Problems

1. A problem that has become general in many modules is that the amounts of water that were considered in the irrigation plans were not sufficient to satisfy the water demands of the established crops. This situation can be because of irrigation of a larger-than-planned area, or because the users are using more water than the amount considered in the plan, or a combination of both conditions.
2. In either case, if water is available in other modules, the deficit module could buy water from those that have a surplus. However, when there is no such supply, the modules lacking it will repeatedly request it from the CNA, which will eventually yield because there are crops that cannot be lost according to Article 68 of the law. As a consequence, a larger amount of water than that authorized is extracted from supplying resources. This, in turn, reduces the water supply for other modules and districts.
3. If water were delivered to users by volumetric allocation, its management could be significantly improved,

the marketing of water and water rights would be facilitated and many problems would diminish. However, in many cases, the infrastructure to measure water at the users' level does not exist. This is considered the main obstacle to establishing a system of delivery by volumetric allocation in the districts. Actually, the will to deliver the water in such a way does exist and in some districts in the north of Mexico water is delivered volumetrically. This is a solvable problem and efforts should be made to implement volumetric deliveries.

Infrastructure

1. Much of the irrigation and drainage infrastructure as well as the maintenance machinery was transferred to the modules without being repaired. Most of the facilities and equipment is still in bad condition not only because of its antiquity, but also for lack of adequate maintenance. In some districts, some repairs to facilities were made as part of the transfer process. However, in most cases, the CNA did not have enough funds at its disposal to complete that task. When the transfer process started, the CNA promised that at least the most damaged infrastructure would be repaired. However, this was not done. As a result, modules have problems in providing adequate irrigation service. In some cases, there are specific complaints about the impossibility of providing water in the amounts and at the times required by users because of the poor condition of the infrastructure. In other cases, there are problems of soil salinization because drains do not function properly.
2. There have also been complaints about the lack of machinery for maintenance. Since repair costs are high, it is sometimes more economical to buy new equipment and some modules have done this with their own funds. There is discontent in some modules because they feel that the distribution of available equipment was not fair.
3. The problem of deferred maintenance has been exacerbated in many cases because service fees have not been raised to keep pace with inflation, making fewer resources available for maintenance and to preserve infrastructure works.

Coordination

According to a survey carried out by the Colegio de Postgrduados (CP), in many cases, there is a lack of coordination between the activities of WUAs and the CNA, resulting in duplication of effort and inefficiency (CP, 1994). The CNA's functions in the irrigation districts are now supervisory rather than operational where *sociedad de responsabilidad limitada* (SRLs, that is, federations of WUAs) have been created.

Environmental Effects

Irrigated agriculture has the potential to cause serious negative effects on the natural environment. Incorrect handling of water for irrigation tends to raise the water table, causing waterlogging and salinization of the soil. This is very common in irrigation districts. Agrochemical residues pollute drainage water, which eventually moves into streams and water bodies.

1. Irrigated agriculture is also seriously affected by environmental effects

created elsewhere. Significant damage is caused in upper basins by deforestation, which affects irrigation systems downstream with changed hydrographs and increased silt loads. Moreover, other water users, such as those from the neighbouring towns and industries, pollute water that is withdrawn lower down by irrigation systems, restricting its use. Complaints to this effect by WUAs deserve consideration.

Leadership, Management and Support

1. The directive board elections in the associations have been the key to their effective functioning. Directors with strong managerial skills achieved sound management of the transferred infrastructure and provided good irrigation service to association members. Where directors lacked managerial skills, modules faced managerial, financial and operational problems.
2. Many financial and operational variations in module management exist. A great part of the success in achieving good O&M in the modules depends on the skills of the hired staff and, particularly, of the technical manager. In this regard, the lack of a national or regional system of training and continuous assistance for the technical and managerial staff of the modules is noteworthy. That system should also provide assistance and training to the directors who request it, taking into account the frequency with which they are changed.
3. Another important human resource problem is the frequent change in operational staff as membership of the boards change. Often, a number of the new personnel are not even technicians, but are the new director's relatives or friends. This situation, common in the government sector, and sharply criticized because of its negative effects, has also become common in WUAs in the private sector. Of course, it is definitely legal and advisable to replace personnel not adequately fulfilling their duties. But the unjustified replacement of technical staff and the waste of expensive training must be stopped.
4. Another problem, which requires attention, relates to the power acquired by directors, since they control a resource of such importance in the agricultural sector. In some cases, directive posts in associations are used as springboards to political positions. There has been at least one case (in Nayarit) where, according to representatives of these associations, association funds have been used for a political campaign. Such actions disrupt O&M and threaten the very existence of the association.

Problems and Solutions in Turkey, Mexico and Colombia

Problems and solutions in a particular location will differ, depending on the perspective of the observer. The discussion that follows addresses problems from the perspectives of: (*a*) the irrigation association, (*b*) farmers, (*c*) the irrigation agency and (*d*) the government.

Solving these problems can involve a variety of steps including revision of laws or implementing regulations and changes in organizational structure, organizational rules and processes and funding mechanisms. In addition,

associations will require supporting services. Support services are services which come from outside the association itself, but which are necessary for it to carry out its mission. They include such things as financing for equipment purchases, legal advice, computer programming assistance and financial auditing services. Such services may be difficult for an association to generate internally (for example, financing for heavy equipment) or may be used only infrequently (for example, specialized maintenance equipment) and hence be too expensive for an association to maintain on a full-time basis.

Support services can be procured by associations from a variety of sources—private firms, public agencies, universities and institutes, NGOs and regional or national federations of associations. In the past, it has usually been assumed that any such services must come from government agencies. Today, it is recognized that higher quality and less expensive services may often be obtained from other sources and that the government should generally serve as only one of several alternatives rather than the sole source.

Irrigation Associations

Insecurity of water rights was identified as the most serious second-generation problem affecting irrigation associations in a number of countries. Water rights which are often absent, poorly-defined, or insecure, can (*a*) inhibit investment in new system facilities or rehabilitation, (*b*) encourage short-term thinking and behaviour on the part of association managers and farmers, (*c*) result in heavy expenditures in legal costs to defend a poorly-defined water rights and, ultimately (*d*) lead to a reduction in water supply and even collapse of the system.

An effective water right should provide security to the association, but must, at the same time, be adaptable so that water can be diverted to other more productive or higher priority uses as economic and demographic conditions change. In this event, there must be a provision for appropriate compensation to those who are giving up the water right by those who gain it. In Mexico, for example, an association's irrigation water right is always subservient to present and future municipal demands. This creates considerable insecurity for associations that share water sources with growing municipalities and violates both the principles of security and that of just compensation. An effective water right should be specified in both quantitative and qualitative terms. Water quality degradation by upstream effluent discharges, as from a factory or an inadequate municipal sewage treatment plant, can render the water unusable by downstream irrigators. It can also make the water suitable only for lower-value crops, since biologically- or chemically-contaminated water may not be permitted for the production of higher-value fresh fruits and vegetables. This will become an increasingly serious problem as water reuse increases in response to growing demand from all sectors.

Establishing a water rights system where it is lacking, as in Turkey, or clarifying water rights where they are weak, ineffective, or inequitable, as in Mexico, will usually require action from the national legislative body or from top-level executive leadership, or both. It is thus extremely important for WUAs

to have adequate representation of their interests when these issues are taken up.

Two different types of support services are identified as being crucial for associations in attempting to establish or clarify their water rights. The first of these is legal advice and representation when the association faces challenges to its rights. Such representation is best secured from private law firms, if available, since services secured from government sources may be of lower quality and may be subject to political pressures, which would compromise their objectivity. Legal representation is also important during the formative stage of an association, when negotiations with the government irrigation agency will establish the contract or concession that will control the relationship of the association and the government. Unfortunately, associations that are just forming may be unaware of the importance of high-quality legal advice during the stage of their formation or may be unable to afford it. A national federation of associations can play a valuable role as a source of legal advice and assistance to newly forming associations.

The other type of support service required by associations is lobbying on their behalf in government policy-making councils. Since other interest groups, such as municipalities and industrial water users, are usually larger than individual associations and are likely to be more powerful politically, it is important for associations to establish regional or national federations representing several such associations and a large number of farmers. This will give them political influence with which to counter the competing interests. A federation would also be able to represent irrigation associations on the board of directors of the national irrigation agency as is currently the case in Colombia.

Financial shortfalls comprise another high priority second-generation problem affecting associations. A central feature of the PIM programmes undertaken in all of the case study countries is financial autonomy. Financial autonomy is the condition where an organization generates all of the revenue it needs to support itself and to perform its primary functions. It implies that the association is not directly subsidized by the government or that if it is subsidized, that the subsidy is a fixed amount which does not vary according to the condition of the association's balance sheet. The principal source of revenue for most associations is irrigation service fee (ISF) collections. Financial shortfalls affect a number of associations in Colombia and in Argentina and has been a concern in Mexico since the 1995 economic crisis.

Financial shortfalls are a function of several factors, including ISF rates, ISF collection effectiveness, the contribution of other sources of revenue and expenditure patterns. One important factor is the structure of the ISF. Fees can be levied on flat rate or volumetric bases. A recommended structure for fees is a two-part one comprising both fixed and volumetric components. The flat portion would constitute a 'connection charge', a charge for simply being within the boundaries of the system's service area whether or not water was actually taken from the system. This would reimburse the association for expenses incurred in maintaining the physical and administrative capacity to deliver water to the farm. The absence of this component in the fee structure of Mexican

associations has created severe problems during years when drought has greatly reduced the available water supply to the system's water users. The other portion of the fee would be based on the volume of water actually delivered during a cropping season, or some proxy for this amount, such as area irrigated and number of irrigations given. This would cover the costs incurred by the association, which are related to the amount of water given, and would serve to limit excessive demand for water.

Revenue from ISFs is also dependent on the percentage of the fees assessed that are actually collected, though associations in many countries do a reasonably good job in this regard. An exception is the Philippines where low collection rates have been a persistent problem for the irrigation associations.

Solving problems of revenue shortfalls that relate to fee levels and collection efficiency are largely an internal association responsibility. Outside assistance may be useful, in some cases, in estimating farmers' ability to pay particular ISF levels and in analysing management systems set up for collecting revenue. This is discussed further in a following section.

The underlying difficulties in generating sufficient ISF revenue to sustain system operations, in many cases, is the low productivity of irrigated agriculture in system command areas. Low productivity can result from a large number of factors, but is often associated with small farm size, a subsistence orientation, production of low-value crops such as grains, inappropriate agricultural policies, a poor natural resource base and inadequate agricultural support services. In such cases, a solution to the association's financial problems may be possible only if the underlying problems in the agricultural sector are addressed. If these problems cannot be solved, then the options are for the government to (*a*) have other agencies provide technical assistance to increase production, or (*b*) provide the association with special subsidies. As a last resort, the government may have to consider taking back the responsibility of system management and financing. However, as ISFs typically constitute only 3–10 per cent of total production costs, reducing them generally does not solve underlying problems of high agricultural production costs and low productivity.

Rehabilitation is identified as a third important second-generation problem for irrigation associations. All irrigation systems require periodic rehabilitation and modernization. While usually less expensive, in real terms, than the original construction, rehabilitation is a costly undertaking and is usually beyond the financial and technical means of an association to undertake. Seldom is there a clear and consistent government policy on responsibility for rehabilitation. In the absence of such a policy, the tendency is for associations to defer needed rehabilitation in the hope that the government will step in and take responsibility for it. In this case, irrigators' associations usually underinvest in improvements of the irrigation systems between rehabilitations. This tendency is reinforced by the government retaining ownership of physical facilities of the irrigation systems, while transferring to associations only the use rights of the facilities. Associations may thus regard the responsibility to rehabilitate those facilities as belonging to the government unless a different policy is clearly stated in the agreement between the government and the associations.

Cost sharing between the government and the association for rehabilitation is a related problem. Because irrigated agriculture benefits people beyond the ranks of system irrigators, and because full coverage of rehabilitation costs is usually beyond the means of the irrigators themselves, a sharing of costs is appropriate. Responsibility for even a share of the costs involved will tend to counteract the tendency of an association to defer maintenance, as noted earlier.

To cover its share of future rehabilitation costs, associations usually need to accumulate a capital replacement fund over a number of years and there needs to be a legal basis for establishing such a fund. There should also be incentives for establishing and contributing to such a fund. Unfortunately, fiscal and monetary policies in many countries such as Turkey and Mexico, have led to high rates of inflation and low or negative real interest rates on savings, which acts as a powerful deterrent to fund accumulation. Governments may need to create special investment opportunities for associations that allow them to earn reasonable rates of return on accumulated funds. Likewise, there should be incentives for associations to make improvements in physical infrastructure. One way to do this is to establish a trust fund, perhaps with donor financing, from which associations could request funds to complement their own investment funds. The matching ratio for such a funding facility should be established and made known in advance.

A number of support services are required specifically to support system rehabilitation. These include (*a*) assessments of system facilities, (*b*) credit and (*c*) design and construction assistance. Regular assessments of the condition of system facilities can be done jointly by the association and the government agency, as in Turkey, or may be contracted out to an engineering consulting firm acceptable to both the association and the agency. Such assessments can be used as a basis for annual maintenance planning, to suggest the need for selective improvements in system facilities and for planning rehabilitation of the whole system.

If an association is unable to accumulate its share of rehabilitation costs prior to rehabilitation and does not have the ability to assess a special charge on its members, it will need a source of credit. Credit can come from private banks, government banks or other lending facilities, or from insurance pools in the case of rehabilitation induced by natural disasters such as floods, typhoons or volcanic eruptions. Such a credit facility could also be used as a source of financing the capital equipment needed for system maintenance.

Rehabilitation also requires external technical services for design and construction. Because of the sharing of costs, both the association and the government should be involved in decision-making relating to the selection of consultants and contractors and monitoring their performance. Useful advice and guidance may be given to the association with regard to handing these tasks by a federation of associations since rehabilitation occurs only infrequently in any one association.

Lack of financial and administrative management expertise is a high-priority second-generation problem. There are several possible responses to this problem. One would be skill enhancement through staff training programmes. Skills can also be enhanced by replacing less skilled people with more capable ones. Contracting out for specialized services is another important way of

addressing management deficiencies in associations.

One extremely important step in improving the quality of association management is to increase the transparency of management processes. This has a number of positive effects. It can (*a*) reduce the potential for misappropriation of funds, (*b*) help insure that salary levels and benefits are realistic, (*c*) help insure that maintenance allocations are appropriately targeted, (*d*) reduce favouritism in making personnel appointments and (*e*) improve responsiveness of association staff to users.

A number of steps can be taken to increase transparency in association management. These include:

1. Regular external audits of financial accounts.
2. Use of standardized budgeting and accounting frameworks.
3. Wide dissemination of simplified budgets, plans and financial statements.
4. Active involvement of the board of directors in forward planning, budgeting and auditing.
5. Broad representation from among users on the association board of directors.

There is broad scope for employing external support services to improve the management of associations. Services that may be required include:

1. Advice on establishing and revising management systems and procedures.
2. Advice on establishing financial budgeting and accounting systems, including software.
3. Establishment of standard budgeting and accounting formats.
4. Standards and requirements for regular external audits.
5. Management training.

These services can be obtained by an association from a variety of sources, including private firms, a national or regional federation of associations, NGOs, government agencies, and universities and training institutes. The government is the logical party to establish mandatory standards and requirements for external audits, but the audits themselves could be done by a private firm of chartered accountants. Other services, such as management and accounting system advice could come from a variety of sources, with private sources being generally preferred.

One argument in favour of the provision of these services by government agencies is often that they can be obtained at no or low cost. What makes this lower cost provision possible, however, generally is implicit government subsidies to the service providers. A preferred alternative would be to provide the funds supporting these subsidies instead to the associations as grants to be used for obtaining management support services. This would allow the associations to contract for these services among alternative providers. The demand-driven competition thus induced would be a very healthy force acting to hold down service prices and improve quality of services delivered. Provision of such grants during the transition phase from government agency to association management could be a very useful institution-strengthening activity.

Irrigation Agencies

Dislocation of staff is the most prominent problem experienced by agencies

following irrigation management transfer to users. This problem is typically dealt with in several ways. First, O&M staff levels are reduced by attrition. When positions become vacant due to retirement or resignation, they are left vacant or filled by internal transfers rather than new hiring. Second, financial incentives are often provided for early retirement of older staff. Third, existing staff are transferred to other positions that become vacant rather than filling them from outside the agency. In some countries such as China, where it is difficult to lay off staff, sideline enterprises have been created that can generate income for the irrigation district and cover the salary costs of the involved personnel. In the Philippines, this has taken the form of an irrigation consulting company, NIA Consult, which was created as a subsidiary of the National Irrigation Administration to provide irrigation advisory and design services within the Philippines and abroad. In some cases, redundant agency staff may also be re-employed by the newly created associations that take up management responsibility for the schemes. Such employment should be at the discretion of the association.

Loss of technical capacity in the national irrigation agency is a common problem faced by agencies that transfer management of significant irrigated areas to associations and experience loss of technical staff. To address this problem, agencies can obtain specialized expertise from outside consulting firms as needed, increase salaries to attract and retain high-quality staff, provide in-service training opportunities for staff and revise job descriptions to bring in new staff with the desired qualifications. Defining a new role for the agency is another important challenge. With their operational responsibilities transferred to associations, the agencies need to design a new role to address emerging problems. Doing this requires discussion among staff within the agency and also at higher levels of the government, with broad participation by all involved parties. The aim should be to build broad consensus and political commitment for the new role. In some cases, changes in legislation may be required to enable the assumption of new responsibilities.

The new mandate should contain a clear definition of roles and responsibilities and should define skill requirements to carry out the new responsibilities. It should also contain a timetable for accomplishing the shift to the new mandate. Support services that could be useful in this process include: (*a*) comprehensive diagnosis of the agency/association relationship and the associations' support needs, (*b*) professional assistance with the agency's strategic planning process and (*c*) consulting services to design new management information systems for the agency. In Colombia, the national agency, the Instituto Naciolde Adecucion de Tierias (INAT) (National Institute for Land Reclamation), is employing professional consultants to help them define a new role for themselves under an Inter-American Development Bank credit.

Farmers

Second-generation problems experienced by individual farmers relate mainly to the need to increase farm productivity to pay higher irrigation fees and to take advantage of possible improvements in irrigation service quality.

Support services required may include: production credit, extension advice, new technologies, markets and market information, access to inputs and post-harvest services. Although government agencies are the traditional source of many of these services, in many countries, private or other organizations are playing an expanding role in supplying some or all of these services. There is also the question of the potential role of the association itself in providing other agricultural services, in addition to irrigation service. As a general rule, the association should demonstrate competence in its core activity of irrigation management before considering such ancillary activities as providing other agricultural inputs.

Government

The principal second-generation problem for the government, beyond those already identified for the irrigation agency, is the reduced control that it will have over irrigation activities at the system level and a diminished ability to use irrigation as a tool to implement other national policies and priorities. An example might be the government's wish to promote cultivation of upland crops rather than rice during a particular season. In the past it could work through the national irrigation agency to adjust water delivery schedules and volumes to try to achieve this end. Following transfer, this becomes more difficult. However, there are other tools, such as support prices and subsidies, to achieve the same ends so losing control of irrigation system management does not pose a significant problem for agricultural policy-makers.

INDIAN EXPERIENCES

Positive Effects of Formation of WUAs—Bihar's Experience

The Manjauli WUA: Farmers' Initiative of Collective Action

The Manjauli WUA is the last distributary committee (DC) on the Patna Canal of the Sone command area in Bihar. In 1992, the members collected Rs 150,000 on a voluntary basis for canal repairs and the committee carried out the work to the local water users' satisfaction. Encouraged by these efforts of the DC, several villages made further contributions to the DC kitty. In 1995, the DC collected Rs 1 million for the construction of a bridge across the Patna Canal at a cost of Rs 70 per acre. The construction of this bridge was crucial for the local farmers as it helped to cut down the distance to Patna City. The DC had also got a no objection certificate from the WRD for the construction of the bridge. In 1997, WALMI invited the DC and WUA members for training and several farmers attended it. In November 2002, a memorandum of understanding (MOU) was signed and the distributary was officially transferred. In 2003, the WRD stopped water supplies without prior intimation to the farmers or the WUA. This resulted in 75 per cent loss in the standing wheat crop.

After that the WUA focused on inputs, in terms of both quantity and quality. It also worked with village-level committees and the agriculture, technology and management project of the Indian Council for Agricultural Research (ICAR). But, the availability of water both in terms of quantity and

timeliness was always problematic, particularly for tail-end areas. Pressures were mounted on the water resources bureaucracy and the discharge was raised to 1,165 cusecs, up by 30–40 per cent.

Table 4.1 Difference between WUA and Non-WUA Areas in Administration and Costs in Bihar

Focus Areas	WUA Areas	Non-WUA Areas	Remarks
1. Operation and maintenance expenditure by government	Nil	Yes	The WUAs mobilize their own funds or from retention money out of water fee collection
2. Cost of hiring temporary staff during the irrigation season	Yes	Nil	One person is hired for every 3 km of the branch canal and one person for every 5 km of the distributary or Minor channels at the rate of Rs 2,000 per month
3. Expenditure for collection of water fee	Nil	Yes (by revenue staff)	
4. Earnings to the government through water fees	Yes (30% of the collection)	Less or not guaranteed	In WUA areas, water fee collection levels have gone up in some cases from 10% to 70%, while in non-WUA areas it is around 20%
5. WRD staff size	Reduced	Remains the same	
6. Obstruction to water flows in canals	Reduced by 90%	Quite regular and tail-end areas face constraints	Lack of collective action and decision-making process in non-WUA areas
7. Benefit to tail reach farmers	More and hence willing to pay water fee and for collective action efforts	None	
8. Damages to canal system	Largely reduced and WUAs monitor and warn those causing damage, if found	Frequent and affects the flows Nobody takes care	

In 2004–05, water fee collection was Rs 35,000, and this went up to Rs 200,000 by 2005. All this money was deposited in the bank. Water fee collectors get a 10 per cent commission on actual collection. Currently the WUA irrigates 3,500 acres and another 200 acres are unirrigated. The tail reach has remained problematic owing to low water flow.

The success of the WUA is attributed to three aspects: (*a*) 300–400 farmers attend the general body meeting where the water resources situation and river systems are discussed and problems of logging and leakages are debated, (*b*) it practised the *tatil*[3] system (currently on a three-day cycle, earlier on a 10 or five-day cycle), (*c*) it provided paddy collection centres and (*d*) it encouraged more groundwater use for conjunctive use. Some 650 tubewells extract water for preparing rice nursery beds. Women are encouraged to cultivate mushrooms. In addition, the WUA has signed an agreement with the Agricultural Technology Management Agency (ATMA), Government of India, to cultivate cash-rich crops on 80 acres of land.

In the future, the president of the WUA would like to see the WUA as a modern DC. There is a difference (of 1,500 acres) between WRD and WUA area figures. Here, water inadequacy and scarcity has brought in more collective action. The WUA would like to promote lining of canals in certain places to avoid seepage losses. The WUA introduced the system of giving public honour to the highest rice producer in the village.

An overview of the experience in Bihar in the WUA areas and in the non-WUA areas highlights the positive impacts of WUAs as shown in Table 4.1.

Water Use Efficiency—Andhra Pradesh's Initiatives

After a water budget is prepared, the farmers' organizations draw up a plan of water regulation (as shown in Table 4.2) and actual practice at field level (as shown in Table 4.3).

The understanding of water use efficiency seems to be limited to acres per million cubic feet (mcft) of water (which has been a fixed one for ages and is mentioned only in records in most of the cases) in general, keeping in dark other critical aspects. Water use efficiency includes any measure that reduces the amount of water used per unit of any given activity, consistent with the maintenance or enhancement of water quality.

In the present context, efficiency can be explained as output per unit of water. However, computation of output is complex as it depends on the cropping pattern, physical yields and crop prices, which vary at different rates for different crops. A simpler index is area irrigated per unit of water. No doubt, this is also a rough index, given the differential demand of water by different crops. However, abstracting from short-term changes in cropping practices, it can constitute a first-level indication of the efficiency of water use.

Water use efficiency can be achieved with crops consuming less water and bringing down conveyance and field application losses through better water distribution. A majority of Minor irrigation tanks are used for growing water-intensive crops like rice and sugarcane. Irrigated dry crops are rare and the standard reason quoted by farmers is that the soils will not permit other crops. How far this view can be technically upheld is difficult to judge. The market forces are extremely important in deciding the cropping pattern.

Table 4.2 Functions of WUAs and Practice of Water Regulation in Andhra Pradesh

Functions of WUAs as Specified in the APFMIS Act	Actual Practice till 2005 (as Observed in the Field)
• The dates of release and closure shall be informed to all members well in advance.	• Information on water release passes from officials to farmers.
• Equitable distribution of water amongst all users shall be the main principle in water regulation.	• Head-end farmers continue to have an upper hand compared to tail-end farmers. Only in the Sri Ram Sagar Project (SRSP) command 8 per cent WUAs said water was reaching the tail-end.
• The WUA shall draw water and monitor flows based on the operational plan prepared.	• In the Krishna and Godavari system, water is abundantly available and hence WUAs/department never felt the need to regulate its flow.
• *Warabandi* schedule (turn schedule) shall be prepared for each outlet in a farmers' organization.	• In Thandava medium irrigation *warabandi* is decided by the department.
• The WUA shall carry out *ajmoish* of the *ayacut* with the assistance of the competent authority along with agriculture and revenue personnel.	• Only WUAs in the SRSP command area are aware of joint *ajmoish*.
• The WUA may, for the purpose of monitoring, install such devices as may be required within its jurisdiction.	• No such practice by WUAs.

Table 4.3 Actual Practices in the Field Regarding Water Distribution in Andhra Pradesh (As Observed in the Field)

Functions	Telangana	Coastal AP	Rayalaseema
Canal structures.	Lined and working condition is good.	Unlined and poor working condition.	Unlined and poor working condition.
Quantity of water demanded.	By WUA members/farmer representatives.	Water is abundant and hence there is continuous flow.	Water is available till water in the tank drops to dead storage level.
Control regulator and gauging.	Available till inlet of Minor.	Not available at Minors.	Available till sluice level.
Water availability.	Only for particular season.	Throughout the year.	Till water level falls below dead storage.

Box 4.1 Extent of Deprivation of Tail-enders

A study of representative parts of the command area of 11 Major/Medium projects coordinated by the Development Support Centre brought out the extent of deprivation of tail-enders:

State	*Extent of Deprivation*
Gujarat	7% to 37%
Haryana	56% to 84%
Maharashtra	24% to 80%
Karnataka	40% to 91%
Orissa	65% to 82%
Tamil Nadu	15% to 100%

Source: Proceedings of the National Workshop on Tail-enders, Development Support Centre, Ahmedabad, 2003.

Water Use Efficiency in Andhra Pradesh

1. In SRSP and the Krishna Delta, official data show an increase in acreage by adopting the *warabandi* system. The duty of 70 acres per cusec has been raised to 110–130 acres in recent years in the Krishna Delta because of less water inflow.
2. Duty is perceived by engineers in terms of release of water and capacity of the canals rather than requirement.
3. In 50 per cent of WUAs visited, farmers felt that water was flowing till the tail-end owing to activities carried out by the WUAs. Many tail-end farmers in Telangana said that they had never seen water flowing to their fields, but after the formation of WUAs and due to the work done by them, they are now receiving water.
4. There is control over unauthorized use of water and theft of water as farmers along with WUA members guard the tank/canal.
5. Conflicts over water distribution have to a large extent been reduced. Still, a few farmers within the jurisdiction of WUAs are tampering with the irrigation system. Yet, no cases have been booked by WUAs for causing damage to the irrigation systems.
6. About 96 per cent of the WUAs do not have measuring devices.
7. Crop yield levels have increased by 15–25 per cent, particularly in tail-end areas.

Table 4.4 Designed and Actual Water Allocation in Andhra Pradesh

Projects	Allocation Quantity	
	Standard Design Allocation	Actual Allotted in the Year 2001–02
Kakatiya Main Canal, SRSP	@ 146 km, 9,000 c/s @ 234 km, 6,000 c/s	5,400 c/s 1,100 c/s
Krishna Delta	165 TMC	1.25 TMC
Godavari Delta	—	—
Thandava Reservoir	4.4 TMC	4.4 TMC
Vamsamdhara (left main canal)	2,259 cusecs	1,900 cusecs

Source: Survey and data collected from the Andhra Pradesh Irrigation Department.

Water Allocation—Constraints Encountered in Andhra Pradesh

An attempt was made to look into the role of WUAs in water allocation. Usually allocation of water is based on available water in the catchment area and land available for irrigation. Generally, designed discharge is rarely delivered at the regulation points. In turn, this has affected the lower-level distribution system. A large number of WUAs have pointed out that there is inadequate availability of water at their canal regulation points. Table 4.4 shows the water allocation made for various projects in Andhra Pradesh.

As per the rules of the APFMIS Act, 1997, the managing committee of the respective farmers' organization shall, along with the assistance of the competent authority, prepare a water budget for the area of operation under its control (as detailed in Table 4.5). Thus preparing water budgets for the area of operation constitutes the operational plan for that respective WUA.

Table 4.5 Operational Plan and Water Budgeting in Andhra Pradesh

Promised by WUAs	Actual Practice as Observed till 2005	Reason for Gap
One month before the onset of the kharif season, the project committee shall, subject to such directions as may be given by the government from time to time, work out the anticipated inflows and existing availability in the reservoir and work out the water allocation to all the distributary committees; the distributary committee shall allocate water to the WUAs in its jurisdiction: Provided that in the case of medium irrigation projects, the project committee shall allocate to the WUAs.	*SRSP* Before beginning of the season, water availability is made clear to farmers through WUA presidents or through AEs/work inspectors. *Krishna and Godavari Deltas* In the beginning of the season, irrigation department officials conduct walk-through survey. Needs are prioritized and water is released on a 50–50 basis.	The WUAs are not aware of their roles and responsibilities. Many WUA members are disinterested.
A farmers' organization in distributing water to its member constituents shall have regard to allocations meant for drinking water, or for any specified purpose as may be decided by the government from time to time.	*SRSP* Canal water is not provided for drinking water purposes. The WUAs of Tadikal and Jagityal were opposed to the government's decision of providing drinking water to Warangal City. *Krishna, Godavari Delta and Vamsadhara* Canal water is the main source of drinking water. There is no WUA intervention in this region.	
For the rabi season, the project committee will determine the area to be thrown open for irrigation based upon the actual availability of water at the beginning of the rabi season. The water so available shall be allocated equitably among the distributary committees and WUAs. In the case of Medium or Minor irrigation systems, equitable distribution shall be achieved by adopting circular rotation over a period of time.		
Each of the farmers' organizations shall draw up an operational plan which shall specify the quantity of water to be drawn on a fortnightly basis.	No WUA out of 57 visited has maintained such an operational plan.	They were never asked to maintain such a plan.
The withdrawal of water shall be monitored each day at specified gauge points as decided by the farmers' organization.	*SRSP* Gauges are available only at the outlets of the distributary. *Krishna, Godavari, Vamsadhara* No such practice.	The WUAs are not interested in maintaining such records.
Review of the withdrawals and distribution shall be done by each of the farmers' organizations at the end of each fortnight and corrective measures taken.		
At the end of each season, the respective farmers' organizations shall prepare a report of water received and utilized along with the area irrigated, quantity of water supply and extent of crops.	Only 5 per cent of the WUAs visited maintain this record.	The WUAs are not accountable.
The farmers' organization shall analyse the shortcomings and deviations in the water budget and report it to the next higher tier.	Chamanapally II WUA of SRSP is maintaining this.	The WUA members do not have any motivation to do so.
In respect of a Minor irrigation system, the WUA shall decide the operational plan, the date of release of water depending upon the storage/ inflows into the tank.	Role of WUA in Minor irrigation is limited only for works, not for the release of water or its distribution.	Dependents believe in age-old traditions.

Though WUA members have received a copy of the APFMIS Act which clearly mentioned their roles and responsibilities, they hardly go through it. They are not motivated in following the roles as given in the Act. Out of 57 WUAs visited (in Andhra Pradesh), no WUA has asked for its share of water from the distributary/project-level committee. The upper tier, which can monitor these duties of the WUAs, does not exist and hence the WUAs are not performing their duties as responsibly as they should. Table 4.6 shows the method followed in allocating water.

Water Distribution—Moving Towards Betterment

After water is discharged in distributaries, the irrigation department notifies WUAs of the respective areas about the discharge. The WUA members conduct a quick meeting with the villagers representing the tail-end and head-end command in the presence of a competent authority and decide the quantity of water available and discuss crop rotation.

In the meetings of WUA members, officials and farmers take important decisions about water regulation and allocation, but from the field visits we found that only 19 per cent of WUAs conduct meetings and take decisions regarding crops to be grown, actual water available for irrigation, etc. It is the duty of WUAs to receive water from the distributary and rotate water among Minors, but in practice only 10 per cent of WUAs take care of distribution, canal operation and regulation, resulting in non-equity and tail-enders being deprived of irrigation water as usual. Only 8 per cent of WUAs could provide water to the tail-end.

At the project level, water distribution mainly depends on the quantity available in the project and each distributary channel would get an equal share. From distributaries water is allowed into Minors through gauged outlets. Till this point, water can be measured and distributed evenly. Hereafter, water distribution depends on farmers, user associations and

Table 4.6 Allocating Water in Andhra Pradesh (As Observed in the Field)

Telangana	Coastal AP	Rayalaseema
Project level: Water available in the project is monitored and distributed accordingly to distributaries.	Project level: No method followed in allocation.	Project level: No allocation method is followed.
Distributary level: Water is allocated to each Minor on a rotation basis. In the SRSP region, it is on a nine days on, six days off cycle.	Distributary level: Water flow is continuous in these canals. In some part of the Krishna Delta, it is four days on, three days off. In Bheemadolu, West Godavari canals are closed for two months in a year.	
WUA level: Members of WUA of SRSP and Vamsadhara, compare the water level in minors to the graduations marked on the slopes of the Minors. If water released flows at the level of graduation then they say water could reach the tail-end.	WUA level: No method is followed in allocation.	WUA level: No method is followed in allocation.

laskars. Water distribution also depends on the condition of the canal.

In Andhra Pradesh there is no process followed by WUA members in the process of planning crops and timely submission of consolidated application on behalf of irrigators. No measures were taken to prevent waterlogging and salinity control.

Ground verification indicates that works carried out by WUAs are much better in quality and are according to the requirements of local farmers.

Conjunctive Use of Groundwater

The statistics given here show details of the Telangana region:

1. Till 2003 there were only 3,521 wells (3,015 open wells and 506 borewells); owing to drought conditions, 3,628 wells were dug (2,516 open wells and 1,112 borewells).
2. Rs 145 million were spent by farmers of the representative WUAs in 2003–04.
3. No attempt was made by WUAs in regulating the digging of wells for irrigation. The president of WUA-6 of the Jagityal region said he had attempted 12 times to dig a well, but only two were successful (see Figures 4.1–4.3).

Performance of Non-WUA Areas in Bihar—Significant Impacts in WUA Areas

Owing to the benefits and demonstrated effects of WUAs, nearby non-WUA areas also have started demanding support for the formation and functioning of WUAs. The difference between WUA areas and

Figure 4.1 Command Area Irrigated in the Krishna Delta (Vijayawada)

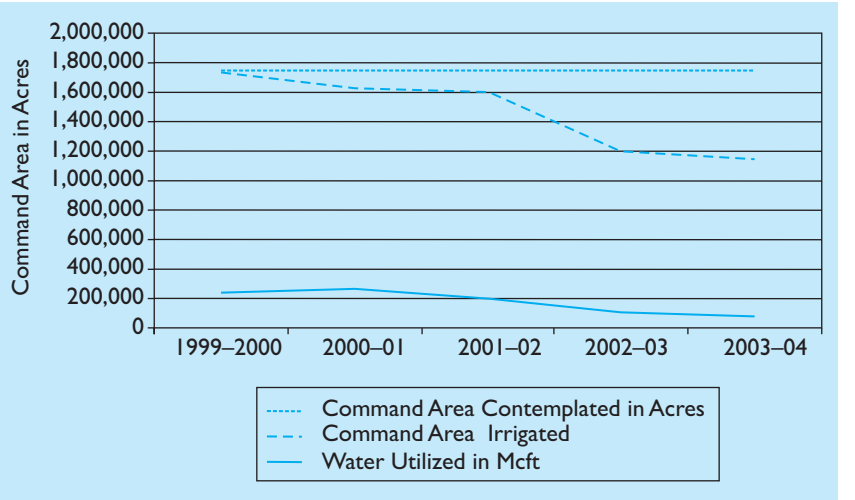


Figure 4.2 Command Area Irrigated—Vamsadhara Project

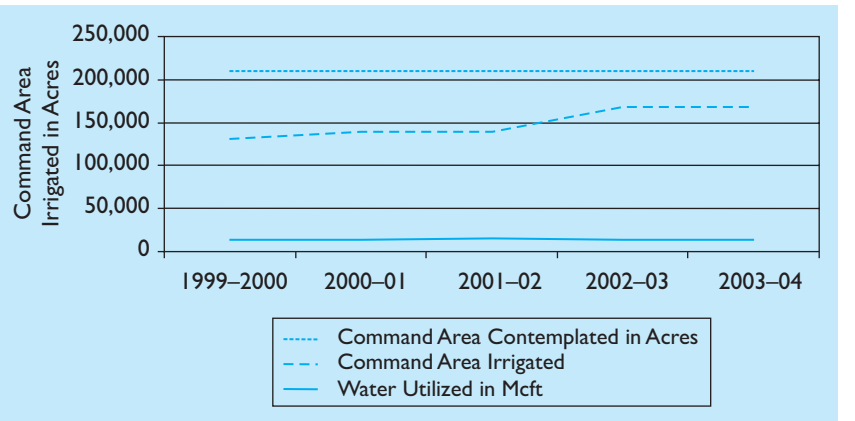
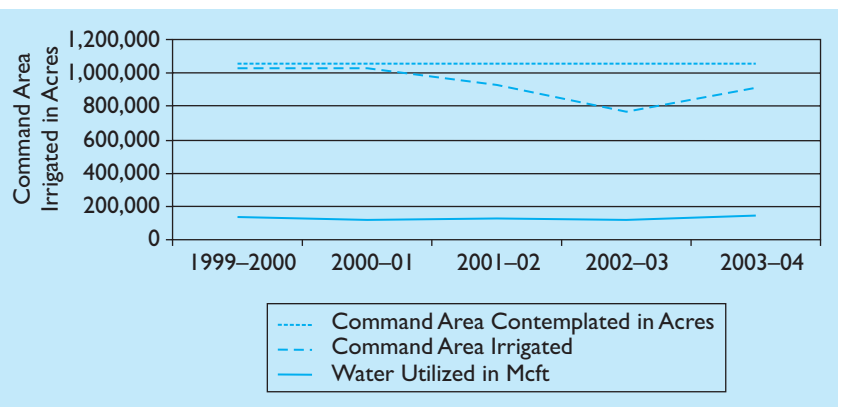


Figure 4.3 Command Area Irrigated—GDS (SE/Eluru)



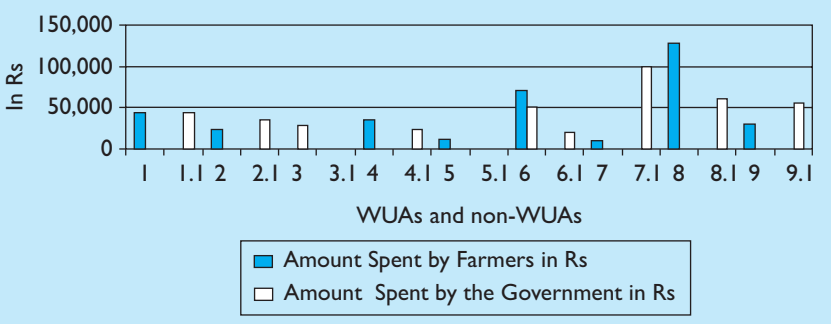
Box 4.2 Uttar Pradesh Water Sector Reforms Programme (UPWSRP): Relevant Key Features

'Holistic water resource management through creation of apex water institutions and strengthening socially and environmentally sustainable through sectored water resources planning, allocation and management capacity.

- State Water Tariff Regulatory Commission (SWATREC) will review and monitor sector costs and revenues and to set user fees that would enable the systems to be financially self-sustaining.
- Irrigation Department Reform, Capacity Building and Business Process Re-Engineering: This sects translate to action the Government of U.P. for the irrigation and drainage sub section to have modern, lean, finical, sustainable institutions with appropriate human resources and skills-mix, knowledge base and analytical tolls to deliver efficient, environmentally and socially sustainable and cost effective irrigation and drainage services to farmers via water users association and/or other public private partnerships.
- Baseline Irrigation System: Redesign of branch and distributaries of JBs and IBs in consultation with stakeholders. Redesign of minors and outlets would be carried out with full participation of WUA concerned.
- World Bank guidelines with participation of farmer organization at Minor level will be adhered to and include volumetric sale of water to WUAs and other private sector entities. Construction works will be packaged in hydraulic boundary units.
- Management of small Minors and small drains: Once the rehabilitation/modernization in completed, the Minors will be handed over to WUAs and drains of less than 5 cumecs to Panchayat Raj Institutions.
- Management of Distributaries: Alternative management mechanism would be piloted, including such models as (i) a distributory level, corporate entity (ii) a self sustaining operational entity (iii) leasing management to private sector enterprise in participation with WUAs (iv) federated Water Users Association starting from Minor.'

Source: Water Resources Department, Lucknow, 2005.

Figure 4.4 Amount Spent on Maintenance and Repair by WUAs and the Government



Note: In this figure, WUA numbers 1.1, 2.1, 3.1…9.1 refer to non-WUAs selected near WUA sites (shown as 1, 2, 3…9).

non-WUA areas are summarized based on the observation of nine non-WUA areas. All of them are in the Sone command area.

1. A majority of non-WUA areas get water to irrigate half to less than one-third of their area irrigated during the rabi season. In the WUA areas, the situation improved after WUAs were formed and repair works carried out.
2. Most significant is that all WUAs have mobilized funds through their water fee collection (and 70 per cent of it is retained) for the maintenance and repairs of canals. Non-WUA areas had no access to such funds and had to wait for long to get government funds. Most of the times, non-WUA areas got no funds. So, in the case of WUA areas, it is a huge saving to the government, and in the case of non-WUA areas, the government has to incur expenditure, ranging from more than Rs 100,000 to Rs 35,000 (see Figure 4.4).
3. The WUAs could hire persons for water regulation and distribution and could pay their salaries from water fee collection. The amount ranged from Rs 36,000 (Paliganj WUA, Raghupur WUA) to Rs 12,000 (Adampur WUA and GC-6 WUA). In the case of non-WUA areas, similar costs have to be incurred by local users in addition to water fees (see Figure 4.5).
4. Water fee collection levels have gone up in all WUA areas compared to non-WUA areas. Discussions with WUA members revealed that increasingly members are realizing that water fee collection is being spent within their command area benefiting all of them. Water fee collection levels in WUA areas range

from 32–75 per cent and in non-WUA areas this is 20–35 per cent.

5. In the absence of gauged records at water regulation points, it was not possible to record actual discharge compared to designed discharge levels. However, visual observations show that owing to canal repairs and proper maintenance in the post-WUA scenario, water flow levels have increased by 15–25 per cent compared to previous levels.
6. Water is reaching the tail-end areas in many cases for the first time and in most cases providing for more number of irrigations. This is a major gain owing to the efforts of WUAs in canal repairs and maintenance. Around 20–30 per cent of the command of each WUA has received such benefits. In the case of non-WUA areas, tail-end areas have remained deprived of water owing to lack of efforts. Indeed, the big push for WUA formation is coming from tail-end areas in non-WUA sites.
7. Gains from improved water flows have also resulted in enhanced crop productivity levels in rice and wheat. Yield levels (compared to non-WUA areas) in WUA areas are higher by 10–20 per cent. It is this additional gain which has motivated the water users' to pay the water fee and co-operate with the WUAs. Several users have shown willingness to pay more, if required, owing to these gains (see Figure 4.6).
8. Non-WUA areas now want WUAs. A rapid survey of a few aspects of both WUA and non-WUA areas allow us to understand the gains of WUAs and how non-WUA areas are in a disadvantaged position (see Figure 4.7). Non-WUA areas or its users are deprived of (*a*) collective action efforts among users for canal repairs and maintenance, (*b*) better water distribution, (*c*) regular and improved levels of water fee collection, (*d*) protection of canal systems from frequent damages, hence leakages and (*e*) prevention of obstruction to water flows in canal systems, which primarily affect tail-enders.
9. There is lack of collective action, but there has been use of pressure tactics. Non-WUA areas, in the absence of any collective action and conflict resolution mechanism, have evolved or follow their earlier 'tricks of trade' to achieve their goals. Farmers in the Maner area use political pressure to get adequate water supply. They forcibly enter the engineer-in-chief

Figure 4.5 Amount Spent by WUAs on Persons Hired for Water Distribution

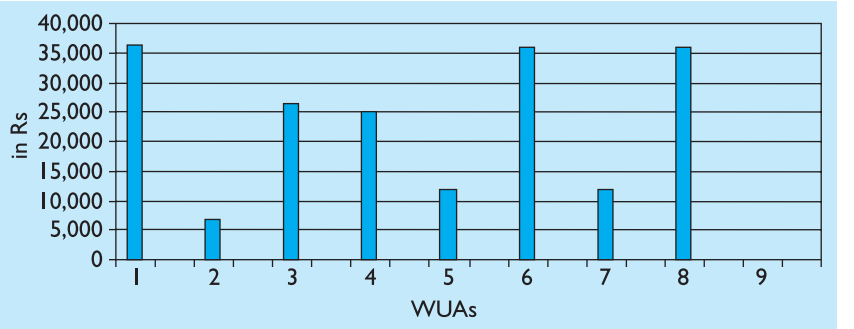
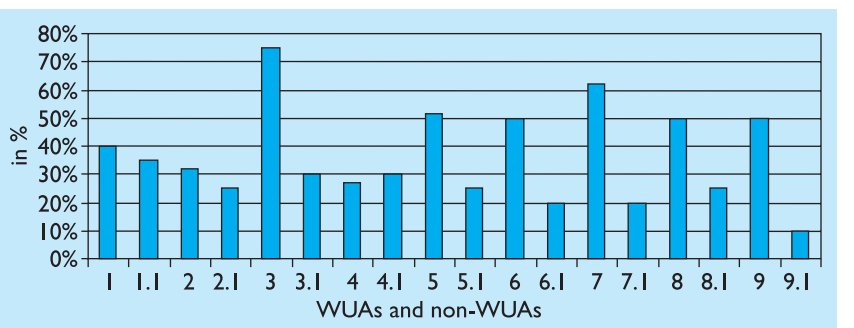
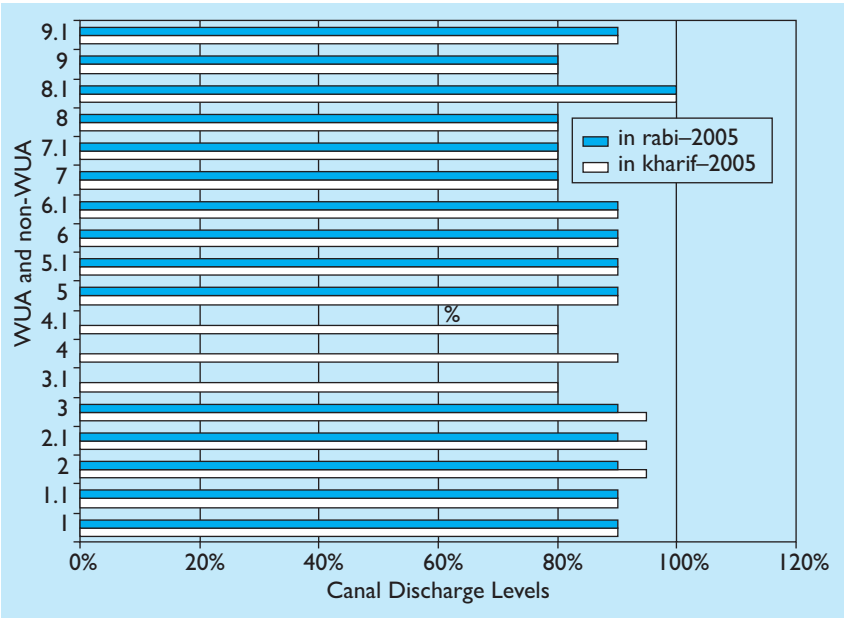


Figure 4.6 Percentage of Farmers Who Paid the Water Fee



Note: In this figure, WUA numbers 1.1, 2.1, 3.1…9.1 refer to non-WUAs selected near WUA sites (shown as 1, 2, 3…9).

Figure 4.7 Percentage of Designed Discharge of Water Received



Note: In this figure, WUA numbers 1.1, 2.1, 3.1…9.1 refer to non-WUAs selected near WUA sites (shown as 1, 2, 3…9).

or chief engineer's office or ask the MLA to help them. The field staff has to yield to the pressure from the top, irrespective of the field situation. In spite of all these efforts, water reached 23 km out of its total length of 36 km. These pressure tactics helped it get at least 280 cusecs of the designed discharge of 400 cusecs and in the rabi season the discharge is reduced to just one-fourth of the designed level. The Dana canal system, located at the 53rd mile of the Patna branch canal, has only 200 ha of culturable command area (CCA) covering two villages, uses group pressure in the night to block the entire flow and turn water towards its fields. The entire area spread across 2.4 km is fully irrigated in both the kharif and rabi seasons owing to this unauthorized diversion of water. Since it takes off from the main branch canal, it blocks the flows and diverts water, thus depriving the downstream canals. This leads to frequent quarrels with downstream farmers.

10. Urbanization is affecting nearby canal systems. Two out of nine non-WUA areas are affected by urbanization. The Danapur distributary's original design area of 1000 ha has been squeezed to 400 ha and even its discharges have been lowered to 50 per cent (in the kharif season) and 20 per cent (in the rabi season). The Patna (right) canal command area (located at the 76th mile of the branch canal) has been reduced to 300 ha from its designed area of 1,000 ha. Owing to urbanization and to cash in on increased land value, water users hardly worry about canal O&M and adequate water supplies. The discharge levels are also down to 35 per cent (in the kharif season) and 20 per cent (in the rabi season).
11. There is higher inequity in non-WUA areas. In the absence of any collective action and any users' organization to take care of water-deprived farmers, inequity has increased over the years. Inadequate help from the irrigation staff has further intensified this problem in non-WUA areas. Most of the tail reach areas can get just one irrigation in the rabi season. In the case of the Naryanpur and Danapur distributary areas, even during the kharif season, 50 per cent of their lower areas are unable to get any supplies. Even in a Maner distributary, only the upper-reach farmers get water, since only 280 cusecs of water is received in the kharif season and just 100 cusecs in the rabi season as against the designed discharge of 400 cusecs at the off-take point. On the other hand, the upper-reach farmers in the

name of caste conflicts also deprive the downstream farmers (Danapur farmers) of water.

12. During the irrigation season, temporary staff is hired by the WRD in non-WUA areas. Owing to the shortage of regular staff at the field level, the WRD hires local people on daily wage basis for canal maintenance and water distribution. This has become an annual feature in all sub-divisions. Wage labourers are hired for almost eight months in a year (five months in the kharif season and three months in the rabi season), at a rate of Rs 2,000 per person per month. These labourers are hired at the rate of one person for every 3 km length of the branch canal and for every 5 km of the distributary or Minor canals. This is eating away a major part of the O&M costs allocated to the sub-divisions, as several sub-divisional officers (SDOs) complained. In the case of WUA areas, officials hire labourers on a need basis at a much lower cost. The WRD used to hire 10 labourers in the Paliganj distributary in the pre-WUA period. Now the Paliganj WUA hires only three people.
13. Poor performance of irrigation systems. Adding to misery, nearly 50 per cent of the lower level posts are vacant in Bihar. At the state level, overall vacant positions are around 60 per cent in the water resources sector alone. Most of the systems are unable to carry the designed discharge at the main and distributary canals. These technical deficiencies impact ultimately on access and adequacy of water at the farm level at all reaches, except the head reach. Impact is more so in tail reaches. Since, take-off points are unable to handle the designed discharge, water cannot run till the tail-end. In some cases, like the Gandak system, WUAs-assigned distributaries are silted more than 50 per cent right at the entry level. In these cases, water is unable to flow to even 20 per cent of the designed length of the canal. The western main canal of the Gandak system, designed for a discharge of 8,560 cusecs, is unable to take more than 6,000 cusecs, even during a situation of water surplus. The Gandak system is also faced with accumulating waterlogged area of 52,000 ha and low duty of 30 acres/cusec. The Naryanpur sub-distributary, which has been transferred to the WUA, receives only 5 out of the designed 42 cusecs. Water flows to a length of only 400 ft of the designed 14,000 ft length of the canal.

Conflict Resolution

Resource Sharing—Fishing Should be Open for Auction

The WUAs were given the right to auction the fish from their tanks, to raise resources. But later, the fisherman societies lobbied around and got the government order changed to authorize only fisherman societies to catch fish without any open auction. Open bidding for fish could have fetched easily five times more, ranging from Rs 50,000–110,000 per tank. But the fisherman societies are linked to the fish traders lobby, which in turn controls the fish catch in the entire region. While natural resources like tanks were transferred

to the local WUAs, its resources are not fully under their control. While the responsibility to protect the resources and its augmentation is taken care of by the WUA, it is the traders who control the local fishermen societies who harvest the dividends.

The conflict between irrigation and fish culture requirements is increasing. Inflows into tank have decreased owing to overexploitation of groundwater and expansion of agriculture in catchment areas as well as construction of new water harvesting structures in the catchment areas. Owing to conflicting rights to the resources, TUAs are in a dilemma in several places. This occurs even after the states have come up with a clear policy to support TUAs and transfer management of tanks to user groups. In Mustabad, initially the fisheries department paid only Rs 500 to the local WUA, but the WUA president took this issue to the higher authorities and this WUA today fetches Rs 17,000 from fishery activities. In the Rayalaseema region, the fishing community is very strong and each *mandal* has a fishing cooperative society with an average of a 100 members. Hence, they pay the WUA whenever they want, as we were told by a Dharmavaram WUA member. If in the Dharmavaram Tank fishing is kept open for auction, it can fetch more than Rs 1 million every year, which could then be used for carrying out necessary works without depending on government funds.

Table 4.7 Joint *Ajmoish* in Various Parts of Andhra Pradesh

Telangana	Coastal Andhra Pradesh	Rayalaseema
Joint *ajmoish* is performed regularly The WUA president and assistant engineer are present during the *ajmoish*. Plough-back amount takes six months–two years to reach the WUA. There is a lot of misunderstanding with the revenue department.	Joint *ajmoish* is done without the presence of the WUA members.	No joint *ajmoish*.

Conflicts with the Revenue Department

The revenue department carries out joint *ajmoish* in the presence of the WUA president and farmers. This verifies the area belonging to each farmer as per the records, and this is then used to assess the cess to be paid. In the Telangana region, owing to the active participation of WUAs in water distribution, the area irrigated is increasing and joint *ajmoish* is thus helpful in tracking the area irrigated. But in the Krishna and Godavari deltas, there is no change in the land. Hence, the revenue department officials are careless and have never performed joint *ajmoish* in this region. The WUA members of these deltas said that they had never heard of it.

Out of the 57 WUAs visited, 16 WUAs (28 per cent) were not satisfied with the revenue records and all of these are in the Sri Ram Sagar Project (SRSP)[4] command. The village secretary collects the water fee. The amount that is returned from the cess paid by farmers to the WUA is called the plough-back amount. Table 4.7 gives the details of joint *ajmoish* performed in the coastal regions and in the Rayalaseema region of Andhra Pradesh. Many of these issues arise mainly because of inter-departmental functions as given in Table 4.7.

There is no institution that can monitor the activities of WUAs and make them accountable for specific activities. The irrigation department officials are the ones who are available at the site all the time, but they have not been given the power to control the WUAs and collect cess. Every work inspector or

laskar is given the charge of 12–20 villages and he cannot monitor them all the time. Many WUA members have complained against the revenue department. The following are the common reasons:

1. Village inspectors are misusing the amount paid to them as cess.
2. Many farmers pay only one or half acre cess instead of paying full.
3. In Rayalaseema and coastal Andhra Pradesh, the revenue department carried out joint *ajmoish* in the absence of the WUA president and official of the irrigation department.
4. Receipts issued by the village secretary did not have numbers and sometimes the previous year's receipts were issued.
5. There is no transparency in the revenue department with regard to cess collected and amount ploughed back to WUAs.

MISSING LINKS

Some of the links, listed next, though promised in the Act at the state level, are hardly delivered in practice. This has hampered the improved functioning of WUAs and DCs.

Joint Walk-through Survey at the WUA Level

One of the key constraints faced by all WUAs is lack of information on actual area under their jurisdiction and a map with clear survey numbers. Its absence has affected water distribution to all plots (including encroached plots), water fee assessment and penalizing defaulters.

Water Fee Collection and Retention by the WUAs

Discussions with both field staff and WUA leaders indicate that 70 per cent of the total water fee collection, if retained by the WUAs, would be adequate for their operation and maintenance and other related expenditure. If required, they can always levy additional fees on a per acre basis. This would also enable the WUAs to strictly collect water fees and use it for required purposes. At present, only Bihar has facilitated the retention of 70 per cent of the water fee collection. In 2005, Andhra Pradesh initiated steps to return 50 per cent of water fee collection. However, the collection will be made by the revenue department.

Awareness and Capacity Building

Except for WUAs facilitated by NGOs, generally WUAs promoted by the government agencies get one-time training in WALMI or the local training centre. Even after eight months of election, WUA presidents in many WUAs are unaware of their operational area, water fee levels, their rights and responsibilities. Many states count the number of training programmes and amount spent, rather than the process followed and its impact. Rarely do the state agencies have indicators to measure the impact of training and awareness building. On the other hand, NGOs or cooperatives have established time-tested practices to create awareness and capacity building (for example, Self-Reliant Initiatives through Joint Action [SRIJAN], Action for Social Advancement [ASA] in Madhya Pradesh, Institute of Resource Development and

Social Management [IRDAS] and Jalaspandana in Andhra Pradesh, Development Support Centre [DSC] and Aga Khan Rural Support Programme [AKRSP] in Gujarat). A summary of the factors inhibiting or contributing to learning is shown in Table 4.8.

Table 4.8 Inhibitors and Contributors to Learning

Factors inhibiting learning in WUAs	• Inability to ensure adequate intensity of change efforts due to limited availability of resources that can be set aside by farmers to build a collective organization. • Difficulty in achieving reasonable consensus in decision-making due to high level of heterogeneity in the community. • High psychological (and also sometime physical) distance between communities of water users and officials of the WRD. • The problem confronting the community is perceived to be too large or complex with no feasible solution in sight.
Factors contributing to learning in WUAs	• New and challenging goals/directions for WUAs. • Processes and mechanisms for improvement/innovation, such as common platforms for raising issues and developing solutions, monitoring mechanisms, visits (learning by example), etc. • Catalytic agents functioning as facilitators of the learning process. • Reasonable expectation and assurance that the system will respond and solutions will emerge.

Source: Based on IIMA–IWMI study of six states by Brewer et al. (1999).

POSITIVE INITIATIVES

Water Auditing in Maharashtra

Maharashtra appears to be the only state, which has made innovations in water management. The attempt, called water auditing, started in 2003–04, is a systematic and scientific estimation of water accounts of the irrigation projects. Water auditing is checking sector-wise water use against planning, water use efficiency in irrigation and losses. As far as the irrigation sector is concerned, water audit should yield comparisons of planned water use efficiency (ha/Mcum) versus actual water use efficiency. This will provide information about loss of water in the system. Efforts should be made to identify the causes and initiate action to minimize the losses to improve water use efficiency. Broadly, water auditing involves checking the following parameters:

1. Actual water use against the planning.
2. Whether water use for irrigation in every season is as per planning and checking water use efficiency (ha/Mcum).
3. Checking whether the prescribed procedure for irrigation management is followed or not.
4. Whether records as per requirements are maintained or not.

Though this water auditing is planned to be carried out by a third party, currently it is handled by the investigation, research and development wing (DIRD) of the WRD, based in Pune. It has identified several benefits owing to water auditing such as: (*a*) efficient use of available water resources, (*b*) reduced water losses, (*c*) transparency in overall process, (*d*) increased accountability of field officers, (*e*) enhanced knowledge of the distribution system, (*f*) improved financial performance and (*g*) improved level of service to customers.

Equally important is water saved in the kharif and rabi seasons that can be used for the summer season or for perennial crops. This is a clear incentive to WUAs to save water. Since the government has taken a policy decision to supply water for irrigation through WUAs only, water acquisition and distribution is the responsibility of WUAs.

Drawing from the experiences of various states, it is obvious that there is a long way to go in managing water systems

with the existing complexities. However, efforts taken by states like Andhra Pradesh and Maharashtra can be replicated in other states, particularly through new interventions like water auditing, which would probably help in managing water allocation and distribution in a better manner.

Katepurna Project in Eastern Maharashtra—Agronomic Measures

In this project, an integrated approach was adopted by the irrigation and agricultural department at the field and administrative level, which helped in saving water.

Applying Water at Critical Growth Stages of Crops

With the support of the agricultural department, farmers were educated in the application of the right amount of water at the right time. This has reduced the number of rotations and ultimately minimized the application of irrigation water, which was further found useful for maintaining the proper drainage of the land under command.

Crop Diversification

The Katepurna command produces around 39 per cent of cotton crop, but the farmers here were reluctant to apply irrigation for cotton. With the support of the agricultural university, the agriculture and irrigation department encouraged farmers to grow pre-monsoon cotton. It gave a 1.5–2 times higher yield than traditional cotton. Now, there is trend for framers to grow pre-monsoon cotton. Demonstration and guidance was delivered to the farmers through NGO and departmental meetings, which resulted in better response for pre-monsoon cotton. The area sown under pre-monsoon cotton during 1998–99 was 352 ha. By 1999–2000, it had increased to 474 ha—a 74 per cent increase.

Soil-Testing Laboratory

The Akola irrigation division has a soil testing laboratory sub-division with ISO-9002 certification for quality testing system. It was the first and unique attempt in the state. The laboratory provides soil-testing facilities for farmers. It helps them know soil properties so as to plan the cropping system and water management practices scientifically. Table 4.9 shows the improvements in the irrigated area, water use and average water saving achieved during the year 1998–2000.

Lessons Learnt

1. As the Zimbabwe case reveals, farmers should be fully involved in the planning and construction of irrigation systems. Farmer-managed schemes do well owing to the sense of self-ownership. Efficient technology

Table 4.9 Details on Improvement—Irrigated Area, Water Use and Average Water Saving

Particulars	Average Irrigated Area (in ha)	Average Duty (in ha/Mm^3)
During 1976–97	2,027	75.20
During 1998–2000	3,646	117.20
Net increase in average irrigation = 1,619 ha		
Water requirement with previous duty = 21.53 Mm^3		
Water requirement with improved duty = 13.82 Mm^3		
Yearly average saving of water = 7.71 Mm^3		

Source: Based on discussions and inputs provided by the Water Resources Department, Government of Maharashtra in 2006.

saves on labour and energy costs. Marketing skills are important in order to identify lucrative opportunities.

2. The Hama Mavhaire case highlights that small-scale irrigation schemes can be economic and affordable. Efficient irrigation resulting from the use of drag-hose sprinklers has benefited smallholders.
3. As the Zimbabwe's experience reveals, improved water distribution and simple but effective technical interventions can solve problems. Water saving, aid and communication and advice on crop and water management are important.
4. Andhra Pradesh's water use efficiency includes any measure that reduces the amount of water used per unit of any given activity, consistent with the maintenance or enhancement of water quality in Andhra Pradesh.
5. Eastern Maharashtra's experiences in Katepurna on agronomic measures in water management can be replicated.
6. Maharashtra's initiative on water auditing is an important step that can be adopted in other states.

An overview of the efforts made under irrigation management highlights the fact that attempts have been made in various countries to address the problems of water allocation and distribution largely through the adoption of technical know-how for water use efficiency and regulations for better management. The common thread that binds the success of these cases is farmers' participation and their involvement in all the stages, significance of technical interventions, need for policy changes for better monitoring and accounting systems and better outreach. These interventions have had significant and positive impacts. Positive impacts have been significant in terms of saving on labour and energy costs, high yields, equitable distribution, water saving, optimum utilization of water, lucrative opportunities for better marketing, better income, better quality of life and the like. In short, it has triggered off the positive impacts. It is important that successful initiatives taken up are replicated across the states, for instance, Maharashtra's water auditing mechanisms can be of great help to other states, technical interventions in Zimbabwe have solved the problems of sharing water equitably across farmers. However, in Andhra Pradesh's case, the need for the actual strengthening of WUAs have proved to be important given the reality checks made as there seem to be gaps in the rules in the Act and actual implementation. But the situation in Bihar highlights the difference between WUA and non-WUA areas where the advantages of WUA areas are clearly visible.

NOTES

1. Based on reports from the Department of Agricultural Technical and Extension Services (Agritex), Harare, Zimbabwe.
2. Fier is a district in Albania. The area of operation is the Fier District, a farming community of over 30,000 families, with an average holding of 1.5 ha of land and one or two cows. The Fier Agricultural Programme (FAP) is a joint activity of the Dutch and Albanian governments. It started in April 1993. The programme is an integrated agricultural development project under the umbrella of the Ministry of Agriculture and Food.
3. The *tatil* system is a local method of field canal rotation.
4. The SRSP is the first project built on the Godavari in Andhra Pradesh. It was designed to store 120 TMC of water.

Rehabilitation and Maintenance

Chapter 5

Rehabilitation and maintenance is a critical aspect of irrigation management. During the process of irrigation management transfer, various issues in rehabilitation and maintenance have emerged and while some of them have been tackled, others are being addressed. Some of the good international experiments are discussed here from which other countries can draw lessons.

POSITIVE STEPS

Columbia's Experience—A Success Story

The Columbia Basin experience differs in many respects from the conditions prevalent in less-developed countries (LDCs). Some of these differences can stimulate a broader range of options for possible adoption in LDCs. Water rights, organizational models for larger-scale management, mechanisms for mutual accountability between government and water users' associations (WUAs) and financing arrangements are all aspects of particular interest to LDCs.

The Columbia Basin Project

The Columbia Basin Project (CBP) is located in central Washington State in the north-western part of the United States of America. The CBP is a multi-purpose project consisting of the massive Grand Coulee Dam, a reservoir, hydropower facility and a network of irrigation and drainage canals.

Water is distributed to farmers according to a 'modified' demand system: (*a*) farmers must request water deliveries at least one day prior to the day on which they wish to receive water, (*b*) all orders must be received by 4 p.m. in order for water to be delivered the following day, (*c*) it is the responsibility of individual farmers to estimate how much water their crops need and when they need it and they may request up to their normal base allotment amount, assuming there are no scheduling or supply constraints, (*d*) additional water may be requested if available, but is paid at a higher rate, (*e*) no water is delivered to a farm until the farmer has paid the basic allotment charge for the season, (*f*) the districts keep monthly water and irrigation fee balance statements for each farm, (*g*) each district has water masters who supervise ditch riders (Each water master is responsible for approximately 20,000–24,000 ha. There are between five and ten ditch riders per water master. Each ditch rider must inspect between 100–120 farm turnouts daily.) (*h*) lateral gates and turnouts must be adjusted in accordance with changes in water deliveries.

A series of physical developments, land tenure regulations, water rights, repayment agreements and transfer process involving capturing perspective of farmers and the US Bureau of Reclamation led to specific process negotiations, transfer agreements determining

rights and responsibilities of both the irrigation department and associations. Irrigation management transfer in the CBP was successful in shifting responsibility for irrigation management from the government to water users' organizations.

Outcomes and Impacts

The outcomes and impacts are: (*a*) reductions in government staff and the cost of irrigation to the government, (*b*) stable operation and maintenance (O&M) expenditure levels, but reduction in cost of irrigation to farmers, (*c*) increasing irrigation management intensity owing to on-demand system adapting to increased crop diversification, (*d*) no substantial changes in water delivery adequacy, timeliness or equity, (*e*) gradual trends of decreasing conveyance efficiency and increasing occurrence of maintenance problems, (*f*) crop diversification and long-term increasing trend in gross value of production and (*g*) no environmental problems.

The only possible negative outcome appears to be the tendency of the farmer-elected boards of directors for the districts to keep the irrigation fees so low that it appears that there is a degree of under-investment in maintenance. This can be a threat to the long-term sustainability of the irrigation system. However, each of the three districts is raising a capital reserve fund at a rate of annual payment into the fund of 30 per cent equivalent of the total cost of irrigation O&M.

As is the case in most developing countries, farmers generally had no background in engineering or hydraulics. Their role was not to *manage* the system (that is, to provide the O&M services), but to *govern* it (that is, to define the services and determine how they should be paid for). Governance was done through farmer-elected boards of directors. Members of the board of directors were farmer members of the districts. The boards recruited and gave policy direction to professional staff who did have the education, training and experience to provide technical services.

Management transfer for this large-scale system was made possible by the following key factors: (*a*) clear policy and high-level political commitment to transfer, (*b*) strong legal institutions (especially the irrigation districts), (*c*) clear system of water use rights to the districts and individual water users, (*d*) experienced management staff recruited by districts, (*e*) legally-binding construction repayment and O&M payment agreements, which were made with farmers prior to project construction and were strongly enforced thereafter, (*f*) reasonably good design and construction of the infrastructure, (*g*) flexible on demand water management, which promoted crop diversification, (*h*) transfer agreement, which clearly specified essential authority and responsibility of the government and water users' irrigation districts, (*i*) full decision-making authority transferred to the districts, (*j*) recurring irrigation management audits by the government and districts, to encourage compliance with agreed O&M service standards and (*k*) adequate information system for water deliveries, fee payments, budgets and O&M plans (Quintero-Pinto, n.d.).

The Columbia case covers various aspects that are more defined in terms of rights, role clarity and processes for management. In terms of simple techniques and measures adopted, it can set an example to many countries.

Turkey's Success Story: Water Savings

In Turkey, water scarcity has been a major concern since the 1960s. Agriculture is the major water-consuming sector (on average over 70 per cent of the country's total water consumption). Efforts have been made to ensure more efficient use of water for sustainable agricultural development through better management of the irrigation schemes, which are either managed by the central government, or by the local authorities and water users' organizations (WUOs).

Transfer of irrigation systems to users began in the early 1950s. In 1986, the World Bank initiated the participatory process and the establishment of WUOs was accepted as a prerequisite for loan allocation. Four provinces (Antalya, Adana, Konya and Izmir) were more receptive to the new techniques and were selected for a pilot programme of accelerated transfer. The transfer was supported with enhanced internal training. The DSI Antalya Regional Directorate carried out a comparative study showing that transfer of O&M services to the WUOs had significant and quantifiable positive impacts on water savings and O&M issues, both from technical and financial points of view.

The observed impacts included: increased sense of responsibility, more reliable and equitable water supply, improved irrigation efficiency resulting from the use of modern techniques (drip irrigation, sprinklers and the California system), a collection rate increase from 42 to 80 per cent and a saving in energy cost of approximately 25 per cent.

Sri Lanka, Colombia, Indonesia and India's Experiences

1. Irrigation management transfer (IMT) reduced government expenditure for O&M. Irrigation management transfer was part of an overall policy of reducing government expenditure on recurring costs of irrigation in Sri Lanka, Colombia, Indonesia and India.
2. There was no significant change in irrigation service. With reference to improved quality of irrigation service to farmers, in the four sample countries, IMT did not cause dramatic changes in irrigation intensity or in the adequacy or equity of water distribution during the first three–five years after IMT. There is evidence from the Colombian case that in pump schemes, irrigation delivery efficiency did improve after IMT. Farmers in all four countries reported improvements in communications and responsiveness to farmer needs by management staff after IMT, but this was not clearly reflected in increased productivity.
3. There have been mixed results on irrigation infrastructure improvement. Regarding maintenance of irrigation infrastructure improvement, after IMT, results are mixed. In India and in run-of-river schemes in Colombia, maintenance has improved. But in Sri Lanka, Indonesia and for the expensive lift schemes in Colombia, it is apparent that some continuation of government subsidy or a more clear policy about rehabilitation is needed.
4. There have been mixed results on higher economic productivity. It is

evident that IMT has not undercut the profitability of irrigated agriculture (which is affected by many factors). Indeed, in the long run, it is likely that IMT can stimulate cost savings and new technologies, which can indirectly have a positive effect on the economic productivity of irrigated agriculture.

5. Farmers' payment increases, but cost of irrigation to farmers will increase. Farmers pay more for irrigation after IMT, initially, but the cost of irrigation to farmers relative to the gross value of the output of irrigated agriculture declines over time after IMT. This is due to more cost-efficient management techniques and an overall increase in economic productivity. However, within the five-year post-IMT time frame examined in this study, in the four countries studied, such improvements did not result in enough gains in efficiency relative to economic productivity to bring about a significant decline in cost of irrigation relative to gross value of output.

The research results suggest that management transfer by itself can have measurable impacts on management procedures, cost of irrigation to government and farmers, cost efficiency and financial viability of irrigation management and quality of O&M. However, IMT by itself tends to have little direct impact on agricultural and economic productivity, which are more affected by other factors (such as use of inputs, labour constraints and soil and water conditions). A more comprehensive study with a much longer time series than five years (for example, 10–20 years) would be required to establish impacts of IMT on agricultural and economic productivity.

Financial Incentives in Madhya Pradesh

In Madhya Pradesh, few financial incentives were given to WUAs. This did help in some of the grass-roots problems encountered.

1. As financial incentive, Rs 50 per ha was provided to all WUAs as O&M grant to carry out annual maintenance works.
2. Daily wage staff was allocated at the rate of one person per 200 ha to all WUAs to assist in minor maintenance and canal regulation.
3. An O&M grant of Rs 100 per ha was provided from 2004–05.
4. The executive committee of the WUA will prioritize the civil works to be carried out in the canal system.

The Samarkandi WUA in Tajikistan

Makhadali Khuramov, who leases 2 ha of land in Rudaki District, Tajikistan, had struggled for years to obtain water to irrigate his fields. Taking matters into his own hands, Khuramov decided to create a WUA to resolve his and his neighbours' irrigation problems. Although he submitted all the necessary documents to the Union of Dekhkan Farms, the WUA registration process was never completed as he had difficulties convincing his neighbours that they could collectively resolve their own water management problems and form a WUA.

In February 2005, representatives from the USAID-funded Water User Association Support Programme (WUASP) came to his community to discuss the assistance they could offer in establishing a WUA. At first, the local farmers, including Khuramov, were suspicious of their intentions. But, after several discussions and consultations between the WUASP team and members of the community, the local farmers willingly agreed to work alongside the WUASP to establish a registered WUA. Khuramov was again very active in organizing the local farmers to successfully complete the WUA registration process, eventually becoming the chairman of the board of directors of the Samarkandi WUA.

As a result, the Samarkandi WUA members have worked together to successfully rehabilitate their irrigation/drainage system and put in place a management system to ensure fair delivery of water. The WUA members have come to see the advantages of working together to manage the irrigation system for the economic benefit of not only the farmers, but the community as a whole. Throughout the WUA area, farmers have reaped good harvests that have improved their standards of living, which is testimony to the positive impact the WUASP has had on the lives of the Tajik people. For instance, in 2005, Khuramov could only grow a few strawberries, resulting in only TJS 200 (US$ 60) worth of agricultural products; but by 2006, he could grow melons, eggplants, peppers, cucumbers, tomatoes and pumpkins, increasing his profits to TJS 4,000 (US$ 1,200). This was a 20-fold increase—a real indication of the success and effectiveness a viable WUA can have.

Perhaps the most significant outcome of the project has been the change in farmers' attitudes and the sense of empowerment they have gained in working collectively to improve their lives. According to Khuramov, 'Now we have a real opportunity to solve our problems together, not only those concerned with irrigation and water management, but also other issues related to agriculture and community problems. Farmers are now optimistic, since they have received huge benefits from the teamwork with the WUASP; now they have concrete plans and proposals of how to solve their own problems.'

Tunisian WUAs

Water users' associations have a long history in Tunisia, and they were first created during the early 1900s. These organizations were charged with solving water management problems and ensuring efficient water distribution. In 1987, the mandate of WUAs was redefined to include the implementation, operation and maintenance of irrigation, drainage and potable water supply infrastructures. The WUAs are financially autonomous and managed by a governing council that includes a president, a treasurer and elected members. The WUAs are responsible for more than half of the public irrigation schemes in the country. In 2001, water access and distribution in rural areas was increased by 90 per cent through the efforts of WUAs and the Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE), a government agency. There are 2,470 WUAs operating in Tunisia—63 per cent are responsible for providing drinking water, 34 per cent are responsible for irrigation and 3 per cent are responsible for both. By improving the access of water

resources to the poor, poverty alleviation has been a benefit of the policy. The government's policy of transferring water services to WUAs has been highly successful because of the introduction the Fonds National de Solidarté (FNS). This government programme was created in 1992 and its aim was to provide infrastructure to rural areas. The skills of WUAs in the financial and technical management of water services were reinforced by this programme. The FNS is funded through voluntary contributions by public and private enterprises, international development agencies, private individuals and the national government.

The Paliganj WUA[1] in Bihar: A Trendsetter

The Paliganj distributary originates from the Patna Canal—the main canal of the Eastern Sone System—about 74 km from its head. The command of the distributary is about 12,000 ha. Outlets from the distributary and its two sub-distributaries serve 76 villages. In 1989, the Water and Land Management Institute (WALMI), under the Indo-US Water Resources Management and Training Project supported by the United States Agency for International Development (USAID), began an action research activity to improve the performance of the Paliganj distributary. The WALMI team organized the Paliganj Distributary Farmers' Committee (PDFC). This was, initially, a committee of representatives from 20 villages whose members were notorious for taking more than their share of the water. To select and support the representatives, the WALMI team also persuaded farmers in these 20 villages to form village irrigation committees (VICs). Over time, more villages joined and today all villages served by the distributary are members.

The advice and assistance given by WALMI and an agreement with the WRD brokered by the WALMI helped improve water distribution along the distributary and the sub–distributaries. The WALMI team then tried to get the government to take up essential repairs, but when it became apparent that the WRD could not do so because of lack of funds and rent seeking, the PFDC and VICs undertook various maintenance tasks. To mobilize resources for maintenance, the PDFC also began to collect paddy from farmers. With WALMI's help, the PDFC was registered as a legal society in 1994.

The distributary committee began a process of organizing village-level irrigation committees. The initial focus was on 20 villages traversed by the canal. Each village committee had five–nine members representing different tenures and caste groups. One person from each village committee was on the PDFC, which had 35 members. It met every fortnight and forged a new communication link between villages. The meetings mostly focused on distribution of water and agricultural activities around the canal command. During an especially dry kharif season in 1989, the upper-end farmers agreed to close breaches and remove stop logs and set up a rotational arrangement along the canal. It has been reported that this set up a precedent which has continued, with the village-level committees acting as a conduit of information about crop conditions, crop plans, water shortages and interferences with the canal. In the kharif season of 1990, an operational plan was discussed and approved by the distributary committee. A group of 20 representatives of farmers monitored

operations along the canal, which helped in modifying the plan. A joint inspection was undertaken to identify needs for repairs. A maintenance plan, based on priorities decided in the committee, was made. The farmers' committee also decided to collect water rates from the members, giving 30 per cent to the WRD and keeping 70 per cent for O&M costs.

An earlier study (Srivastava and Brewer, 1994) on the impact of the Paliganj Action Research Programme revealed that the physical condition of the canal had improved, increasing its conveyance capacity and availability of water to farmers in the lower reaches, resulting in better crop yields (see Table 5.1).

In recent years, the Paliganj WUA has been constrained by three factors:

1. Owing to financial constraints WALMI has withdrawn its role of guidance in technical and organizational aspects, which has affected WUA functions, as several members of the WUA complained.
2. Even field staff of the WRD do not regularly visit this WUA to provide any help. The reason given by the WRD staff for this is shortage of staff, time and funds.
3. Lack of attention both by the WRD and WALMI has further reduced accountability of the new set up of the WUA. After the election, the new set of office bearers has not received any training from WALMI. This was the complaint from office bearers of other WUAs as well.

Achievements of the Paliganj WUA

The International Water Management Institute (IWMI, earlier IIMI) Review in November 1992 had commended the experiment of turnover in the Paliganj distributary in the Sone command. The experiment was taken up in an area where the atmosphere was least conducive for its success. The system had deteriorated considerably. Upper-end farmers commonly breached the canal and blocked it with stop logs. There were pronounced social tensions arising from caste and land-tenure related issues. The officials of the WRD did not visit the command area because of attacks by angry farmers. The Action Research Team, supported by USAID funding, spent the first six months initiating a dialogue with the farmers, which culminated in what is described as a

Table 5.1 Performance of the Paliganj WUA

Particulars	Before (Pre-1995)	At Present (Dec. 2005)
Water received in canal	130 cusec	180 cusec
Water received during the month of July	20 days	30 days
Area irrigated	9,500 acre	12,500 acre
Water received by tail-end for irrigation from canal	0–2 times	5–6 times
Government expenditure on irrigation and revenue department	Rs 800,000	No expenditure
Value of tail-end land per *bigha*	Rs 20,000–40,000	Rs 50,000–120,000
Production of grains per *kattha*	40 kg	80–100 kg
Quality of seeds used for sowing	Re-use of own seeds	Hybrid seeds
Technology in practice	Old	New
Quantity of seeds sown/acre	65 kg	12 kg (under SRI paddy, only 2 kg)
Paddy yield/acre	1,000 kg	2,000 kg
Wheat yield/acre	400 kg	1,300 kg
WUA meeting	Regularly	Irregular
Members attending meeting	Village-level committee and a few members	Few village-level committees
Involvement of WALMI	Yes	No
Involvement of technical experts	Yes	No

Note: Information is based on discussions with farmers and local engineers of the WRD.

'landmark meeting' between the farmers and the team on 17 March 1989. The farmers agreed to distribution of water along the canal.

The Paliganj WUA command has around 9,000 farmers; by December 2005, some 5,000 farmers became members by paying a membership fee of Rs 11 per member. The rest of the farmers got less/no water. The membership drive was initially carried out for four years, but not afterwards. Any farmer with a legal title to a plot within the WUA boundary is eligible to become a member of WUA; however there are constraints related to share-croppers. A good number of the cultivators are share-croppers (local estimates indicate around 30–40 per cent) and not interested in becoming members. The real land owners also do not agree to such arrangement. In fact, none of the WUAs has taken up this issue seriously in the general body meetings.

1. In the Paliganj distributary, the designed water discharge is 180 cusecs. After IMT and physical restoration work, peak discharge reached up to 165 cusecs for about 30 days (during the rainy season in July), while the lowest is around 110 cusec. The irrigated area under the distributary had reached 9,500 acres in mid-1990s and by December 2005, it had gone up to 12,500 acres. This includes an unauthorized area of 500 acres. The main canals run on a 10 days on and five days off mode.
2. Initially, WALMI provided help in dividing distributary canals into five parts and area-wise water allocations. The WUA endorsed this action as really useful.
3. In terms of number of irrigations, tail-enders are able to get five irrigations, head reach plots get eight–10 irrigations. Owing to the WUA's efforts, tail-enders gained a lot from the 1990s onwards. Owing to all these efforts of the WUA, land prices in the tail-end area have shot up to Rs 120,000 per acre from a mere Rs 40,000 a few years ago.
4. There have been several benefits to government. The government used to spend Rs 800,000 for O&M, which is now completely saved after the formation of the WUA. The WUA pays the government Rs 150,000–200,000 per year as a share of the water fee collection. The Paliganj WUA alone has helped the government save a total of Rs 1 million per year.
5. Water fee collectors are paid weekly. They are given a 5 per cent commission on a regular basis and an additional 3 per cent bonus if collections are more than 80 per cent of the current year's balance. The total water fee collection for the period 1997–2005 was Rs 2.3 million and around Rs 1 million has been paid to the government. However, if proper restoration had taken place in the very first year and irrigated area had gone up to 12,000 acres in the kharif season and up to 2,700 acres (as designed) in the rabi season, the water fee alone could have gone up to Rs 9.6 million for the eight years, according to WUA estimates.
6. On payment of arrears, the WUA had sent legal notices to some 25 farmers. Yet, some 10–15 per cent farmers never pay and the WUA is finding it difficult to enforce any legal measures against them.
7. Water fee payment by farmers has increased owing to high cost of groundwater extraction. The rate of buying water pumped by diesel

engines has gone up to Rs 60/hour (since rural areas in Bihar rarely or never get electricity), which works out to Rs 500/bigha per irrigation from groundwater and Rs 750/acre per irrigation. In Paliganj area, a tubewell with a depth of 240 ft, costs Rs 50,000.

8. To meet the growing demands of member-farmers, the Paliganj WUA has initiated several activities: (*a*) seeds production society, to provide inputs supply to its farmers, (*b*) technical support to promote SRI (system of rice intensification) method of rice cultivation. Local SRI cultivators acknowledged that productivity levels have gone up by 30–50 per cent; this has boosted area under SRI from 40 acres[2] in kharif 2005 to 100 acres in kharif 2006 (planned).
9. Constraints mainly pertain to (*a*) no storage for the Patna Canal, (*b*) improper allocation across distribution, (*c*) only leftout water comes to Paliganj and (*d*) Paliganj is located 72 km from the head reach of the main canal.
10. In some parts of the command area, even after formation of the WUA, farmers find it difficult to get water largely owing to repair works being carried out by non-WUA agencies. For example, in one of the tail-reach areas, the Bhimani Chowk area, the Sone command area agency had incurred a cost of Rs 365,000 on canal repairs. But in spite of that these farmers find it difficult to get water. Owing to the WUA's efforts, in recent years, these fields get three irrigations during the kharif season for rice crops and all five irrigations for wheat crops during the rabi season.
11. Organizational elections are held regularly. The first elections were held on 30 January 1997, the second on 20 November 2000 and the third on 26 January 2003.
12. The future plans of the Paliganj WUA include: (*a*) renovation of canals (restoration of the right bund will help 2,000 users), (*b*) construction of a guesthouse for visitors, (*c*) providing backward and forward linkages for agricultural produce, (*d*) establishing multi–purpose agricultural cooperatives, (*e*) mobilizing revolving fund, (*f*) establishing telephonic linkages along the canal to transmit information to all WUA and local field staff and (*g*) establishing regular information on water availability and flow levels.

A plan to form a project-level committee for 850,000 ha of the Sone command failed owing to poor response from the WRD. The proposed project committee aims at: proper allocation of available water and regulation; proper control and improvement in quality of works; pressure on the government to focus on canals and its O&M; reduce exploitation of small and marginal farmers and reduce water conflicts.

System Maintenance

1. Given the choice, WUAs would like to invest a major part of their funds on canal system repairs and maintenance. But, so far, their experience has not been very encouraging as discussed in the previous chapter. Across the states, starting from Andhra Pradesh, where systematic efforts were carried out to route the funds through WUAs for physical works improvement

to Bihar where no funds were provided, funds are mainly linked to civil works. That summarizes the pathetic condition of the canal distribution network with which WUAs have to work. The picture hardly differs from the systems of a few years ago (for example, Upper Krishna Project in Karnataka) to the centuries-old system (for example, the Krishna Delta in Andhra Pradesh and Sone system in Bihar). To a large extent, except for the systems in north-west India, irrigation systems are unable to deliver the designed discharge of water at the canal regulation points. Below these regulation points (mostly installed at distributary heads and in some places at Minor take-off points) rarely are systems installed to measure water supplies or gauge-records maintained.

This has resulted in either inadequate or no information about water supplied to an outlet or to a particular farmer. Below the regulation points, owing to poor quality of construction, in several places, owing to inadequate alignment, water is unable to traverse till its dead-end. In most of these places, siltation, leakage, breach of canals, unauthorized outlets and damage to canal structures are quite common. Indeed, this is an accepted phenomenon in most of the command areas.

A rapid review of different command areas indicates some commonalities as reasons for inadequacies in the canal distribution system. These are: (*a*) gap between the design and execution of the civil works, (*b*) poor quality of construction and incomplete construction in several places, (*c*) non-completion of field channels, even after several years of main system completion, (*d*) inability of lower canals to carry the designed discharge (even main branch canals carry much less water than the designed discharge), (*e*) canals are designed to operate at full supply level, (*f*) unreliability in water supplies in terms of quantity and timeliness, (*g*) water charges levied has poor link to quantity and timeliness of water supply, (*h*) mismatch between designed and actual cropping pattern in the command areas, (*i*) inadequate monitoring on quality of structures and their maintenance and (*j*) low financial allocation for system maintenance.

Farmers' Involvement in Andhra Pradesh

The WUA Support Programmes—APERP Works Programme

The Andhra Pradesh Economic Restructuring Project (APERP) (Irrigation Component) is basically designed as a WUA support programme. The farmers' organizations themselves undertook the minimum rehabilitation works and O&M works in respect of irrigation schemes. This process enabled the farmers to acquire experience in undertaking maintenance works and also to understand the complexity of maintaining and operating the irrigation systems. This involved executing maintenance works as per the prioritization of the works after a walk-through survey. In order to rehabilitate and modernize the existing irrigation systems, the government has obtained financial assistance from the World Bank under APERP (Irrigation Component) with a project cost of Rs 9,622.4 million for achieving the following objectives: (*a*) place the irrigation sector on a sustainable basis

through involvement of farmers in irrigation management and effecting cost recovery, (*b*) reverse the decline in irrigated area, (*c*) improve the productivity of irrigated agriculture, (*d*) strengthen cost recovery for O&M and (*e*) expansion of effectively irrigated areas in existing systems.

Operation and Maintenance Costs

Expenditure incurred under APERP till March 2004 was Rs 7,697.5 million. Figures 5.1, 5.2 and 5.3 show the O&M work done by farmers' organizations, O&M work done and amounts received by WUAs at the state level.

Minimum Rehabilitation

The minimum rehabilitation programme was executed through farmers' organizations. Farmers were exposed to a new working environment—they had to negotiate for machinery at cheaper rates, persuade the village to take up maintenance works and maintain records to enable payment. A mobilization advance was made available for farmers to start the work. Subsequent payments were given on actual taking up of work. Maintenance works have been taken up by the WUAs since 1998.

SOME CRITICAL ISSUES

Bihar

Investments on Maintenance is Poor and Inadequate

After paying most of the collected water charges to the government, WUAs ended up investing as little as 3 per cent on O&M (during 2000–01 in Paliganj), and

Figure 5.1 Operation and Maintenance Work by Farmers' Organizations and Amount Spent

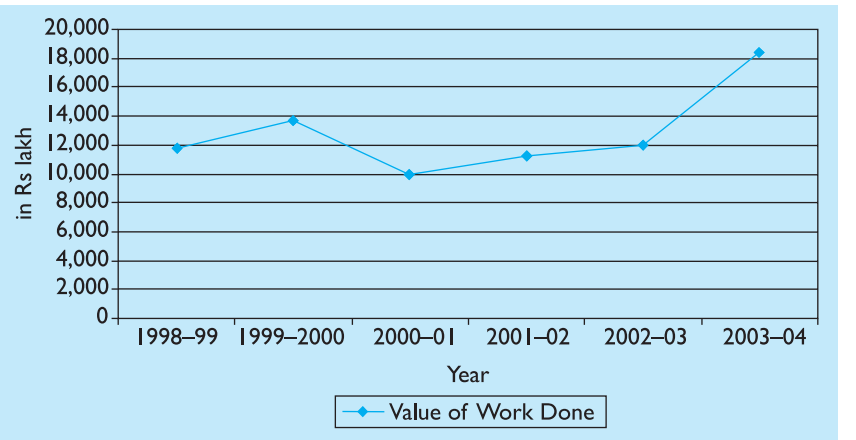


Figure 5.2 Operation and Maintenance Work by Farmers' Organizations

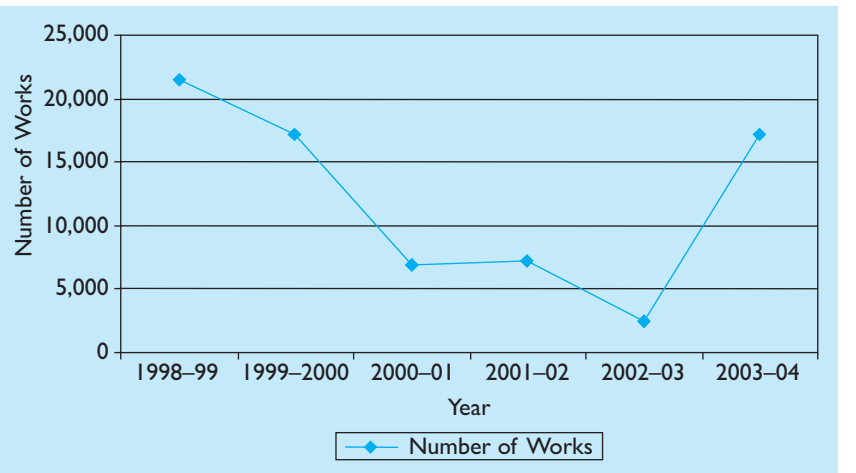
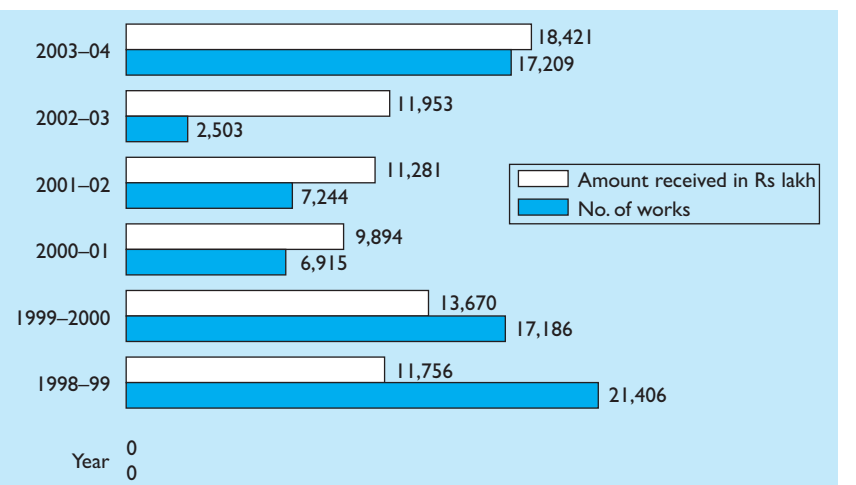


Figure 5.3 Operation and Maintenance Works and Amount Received by WUAs at the State Level



9 per cent (during 2003–04 in Adampur and during 2001–02 in Paliganj). The highest investment in recent years was during 2003–04 by RPC-5 in the Sone command area. The WUAs in Gandak had not spent anything till 2004 (see Table 5.2). But in late 2005, the Khajipur WUA in the Gandak command area began major desiltation work in its distributary canal by investing Rs 20,000 in 2006, while the actual collection was only Rs 10,000. The office bearers argued that unless desiltation was carried out in the canal system, water could not reach even the middle reach of the command area. They hoped to mobilize the required funds from among their members.

High Establishment Costs during the Infancy Stage

Interestingly, the WUAs are also not free from a high percentage of establishment costs in their infancy stage. It does vary between WUAs, but still it indicates high costs. While some WUAs have paid 86 per cent of their actual collections on establishment, the RPC-3 WUA has spent 48 per cent and the Paliganj WUA has spent 47 per cent, while the Khajipur WUA was forced to spend 129 per cent owing to other works (see Table 5.2). But most of the WUAs are hopeful that in the future the share of establishment expenditure will come down as their collection levels are likely to improve. However, all of them very vehemently argue for adequate powers and rights in enforcing water fee collection from their members. They need support from the WRD. All this has left very little for system maintenance and repairs by WUAs. Only three of 12 WUAs were able to spend above 20 per cent of their collection on maintenance and repairs while the others were able to spend less than that and seven WUAs have not reported any expenditure on maintenance and repairs during 2004–05.

The WUA President as the Civil Contractor

The Focus is Largely on Civil Works

A rapid review of WUAs across the states indicates that both government agencies and WUAs have focused largely on civil works. Over the years, this has led to a belief that the powers of the WUAs come from the funds they handle to do physical works in their jurisdiction. No funds means no power, according to several WUA presidents. If they have funds, they provide lining works, outlets, desiltation, etc. Then farmers feel that the WUA presidents have some capacity. When we asked, 'Let us say, you got enough funds to complete all required works in one year, what will you do the next year? Does it mean no power next year?' All of them found no answer for this. Then, to defend themselves, after some time, they started saying, 'the civil works will naturally collapse, and then we need to redo them'. For our follow-up question 'Does it mean that your work quality will be so poor that it requires redoing in the second and third year?' they found themselves without an answer. The operation of WUAs for seven years in Andhra Pradesh and Bihar, and a few years in Madhya Pradesh, Maharashtra and Rajasthan have changed the mindset of WUA presidents and of farmers. What is worse is that farmers are asking the government for funds even for the

Table 5.2 Amount Spent on Maintenance and Repairs and Establishment Costs out of WUA Funds in Bihar (in percentage)

WUA	Year	Paliganj	RPC-3	RPC-5	Manjauli	Khajuri	Adampur	GC-3	GC-6	Raghupur	Badhupar	Khajipur
Project		Sone	Sone	Sone	Sone	Sone Defunct	Sone	Sone	Sone	Sone	Sone	Gandak
Percentage of actual collection spent on maintenance and repairs	1997–98	27										
	1998–99	35										
	1999–2000	16										
	2000–01	3										
	2001–02	9										
	2002–03	12		Rs 10,000		Rs 40,000		Nil		17	NA	
	2003–04	19	16	36	Nil		9	14	11	20	NA	Nil
	2004–05		15	22	Nil		22	18		29	NA	Nil
Percentage of actual collection spent on establishment	1997–98	5										
	1998–99	37										
	1999–2000	28										
	2000–01	46										
	2001–02	29										
	2002–03	29			Rs 14,400			31	4	35	NA	
	2003–04	47	21	20	42		43	42	13	31	NA	
	2004–05		48	26	25		86	37		25	NA	129

creation of field channels and their repair. Increasingly, the feeling is growing that WUAs are a means of getting funds from the government.

At the sites visited it was observed that most of the WUA presidents have engaged themselves in construction activities and show least interest in water management activities. Many WUA presidents presume that they are elected only to carry out construction work. During an interaction with a group of WUA presidents in WALMI, Bhopal, WALMI, Patna and WALMTARI, Hyderabad, they were quite open about seeking funds for civil works at the earliest from the government. All of them had won in the recent second round of elections. The roles and responsibilities of a WUA president are not known to them barring a few. Each WUA has undertaken many works like construction of retaining walls, construction of aprons, channel deepening, desilting, weed removal and sluice repairs. These works are carried out to improve the irrigation structures, which ease the flow of water in the system, but our field observation shows that the new structures' efficiency is the same as that of the old structures.

LESSONS DERIVED

Technical and Institutional Issues

Conditions of Structures—Canals/ Distributaries Cannot Withstand the Quantity of Water for which it is Designed

In many places, we observed that most of the canals were unlined and could not withstand the designed capacity of the flow. In Kesarapalli, the WUA members said that distributaries and Minors always breach. Many times land adjacent to these is flooded by canal water. In Gudlacheruvu, the WUA members complained that they never got water in excess—the canal structures are so weak that they cannot withstand the full load. The WUAs should mobilize funds with which they can line Minors at critical points where breaching usually occurs. They can achieve this by prioritizing their needs and money received can be properly utilized.

Uncertainty of Water Availability

This is another important aspect, as farmers will understandably be reluctant to take on the responsibility for managing the system unless deliveries of water are made reliable, flexible, practical and responsive to their needs. The engineers on their part may not be confident about ensuring supply of the requisite quantity of water to the WUAs, as would be obligatory in terms of the memorandum of understanding (MOU) signed between the irrigation agency and the WUAs.

Further, farmers who have their holdings at the head of the canal tend to appropriate more water than required, whereas farmers at the tail-end often fail to get their apportioned share of water. Head-enders, therefore, have a vested interest in continuing the existing arrangements. Tail-enders may not be keen to form WUAs as water supply in such areas remains inadequate and erratic and they remain apprehensive that the situation will not be materially altered if an association is formed. These differences in perceptions and conflicts of interests inhibit the coming together of head-end and tail-end farmers.

Gauge Records at Water Supply Regulation Points

Another major bone of contention is lack of gauge records at most of the water supply regulation points. In their absence, WUA leaders face the wrath of members for inadequate supplies. Even after the rehabilitation of Minors/Sub-minors in several states following the formation of WUAs, gauge records have not been installed. Installation of gauge records at all WUA and DC levels (in their jurisdictional area), will enable them to understand volumetric supplies and make them more accountable in understanding the changes, if any, in water use efficiency.

Technical Help on Demand

The WUAs require technical help in estimating the works, costs and their execution when required. But the WRD assigns one junior engineer or sub-engineer (called the competitive authority to approve estimates) for a group of eight–15 WUAs. In practice, he/she finds it impossible to travel to all the WUAs even once in two–three months. Both distance and time (WUA work is only a small part of their workload) limit their mobility. In turn, this has led to poor quality work, adding further to the existing woes of the WUAs.

Lack of Technical Knowledge

Apart from financial uncertainty, lack of technical input is one of the inhibiting factors to taking over the system. The farmers are not skilled to take up or understand the technicalities of managing the whole system and feel ill-equipped to do so.

Operation and Maintenance Issues

Some of the problems faced during O&M arise when the amount of water considered in the irrigation plans proves to be insufficient to satisfy the water demand of established crops. Another problem was that there was no infrastructure to measure water at the users' level. A risky approach adopted by them was to downsize their technical staff or dismiss qualified personnel and replace them with inexperienced, but less expensive personnel. This had a grave impact on the structures. Many a times, the existing infrastructure was underused and had undergone progressive deterioration because of inadequate maintenance. Inadequate budgets led to lagging maintenance programmes.

Illegal Utilization—Water Provided for Drinking Purpose is being Utilized for Irrigation (System Fed)

In the Krishna and Godavari deltas, it is common to find tanks filled with canal water. During the summer season water is provided. There are 665 tanks in the Krishna Delta that are system fed. During field visits it was observed that tank water is being used for irrigation in Gudlacheruvu and in the Mustabad Tank command area. The deputy executive engineer said that although water was being provided for drinking purposes, farmers everywhere were using it to irrigate the second crop. Water is abundant in this part of Andhra Pradesh and irrigation activity is 140 years old

and hence people hardly think about water management.

In the Telangana region, currently water is available only in one season and it is provided for one crop. Water scarcity is a new word for farmers in these deltas. They have traditionally cultivated two wet crops, that is, paddy, per year. However, the drought conditions of the last three years have made the farmers cultivate a single crop in the kharif season. They grow black gram or green gram, which require practically no water, as a second crop.

In all the interactions held with villagers and WUA members, one general question that was asked was, 'What is the role of the WUA in water distribution and allocation?' In most of the sites visited, WUA members said they did not look after water distribution. Instead, these members are more interested in taking up construction work. Every individual WUA is spending millions of rupees on the maintenance and repairs of channels, but these works are not ensuring better water management. One exception was the work carried out in the Mustabad Tank. Here Rs 900,000 was spent to divert water from a distributary 11 km away to the tank.

In the Srikakulam Division, there are 1,239 tanks, which are system fed. Irrigation is provided to the entire *ayacut* for only the kharif crops. Depending on the availability of water, tanks are provided water for drinking water purposes. This water was also reported to be used for irrigation (unauthorized). There is no regulation of water as there is no felt need. At every branch and major there is a cross regulator. At every Minor there is an off-take with a shutter. On the whole there is a regulating device for an area up to 100 acres. A strict monitoring unit should operate for 24 hours a day, seven days a week. The WUAs should strictly penalize the unauthorized use of water.

Constraints of the WUAs

The WUAs face constraints beyond their capacities. When there is poor infrastructure transfer to WUAs, it is very difficult for them to operate. Lack of funds to complete tasks immobilizes WUAs. At times, the structures are in a state where it is impossible to repair them.

Environmental Issues

Identifying the environmental problems and their impact are in the process of gaining momentum. Incorrect handling of water for irrigation tends to raise the water table, causing waterlogging and salinization of the soil. Agrochemical residues pollute drainage water, which eventually moves into streams and water bodies with resultant pollution. Environmental effects created elsewhere also seriously affect irrigated agriculture. Significant damage is caused in upper basins by deforestation, which affects irrigation systems downstream with changed hydrographs and increased silt loads. A majority of countries have witnessed pollution from agrochemical residues. Water users, such as those from neighbouring towns and industries, pollute water that is withdrawn lower down by irrigation systems, restricting its use. Environmental issues need further documentation and regulation in not only developed countries, but also in developing countries. Lack of documentation is no indication that problems do not exist.

Leadership, Management and Support Issues

Strengthening the implementation process is important. Lacunae observed have been lack of a national or regional system of training and continuous assistance for the technical and managerial staff.

Backward and Forward Linkages

Unfortunately, in practice this is the last priority in the participatory irrigation management (PIM). Across states, members of WUAs complained about the severe shortage of timely inputs for agriculture and horticulture production and their storage and marketing. This has also affected the income levels of farmers in spite of enhanced water supplies resulting from the efforts of WUAs. In Bihar, the Paliganj WUA has initiated efforts to procure foodgrains from member-farmers and market them. The DHAN Foundation-initiated tank WUAs in Tamil Nadu have also started providing agriculture implements on hire, threshing floors and storage facilities.

Records to be Maintained

Each of the farmers' organizations shall maintain the following records, other than the records specifically mentioned in the APFMIS Act and the rules (for example, in Andhra Pradesh, Madhya Pradesh, Rajasthan), including an update on legal framework and any government orders. Table 5.3 gives the records to be maintained by WUAs as per the APFMIS Act and as practiced in 2005.

A record is an important indicator, which could be useful in assessing WUAs. Maps are essential because they show the boundary of a WUA. Only 5 per cent of WUAs have maintained this. All WUAs maintain a cash-book, as it is required for transactions, but the WUAs of Chittoor District till now have not received bank accounts and account books from the irrigation department. The irrigation department in Chittoor had conducted training for WUA members after one-and-a-half years of the second formation of WUAs. In this, WUA members were taught their roles and responsibilities. Department members who trained WUA members were asked to write minutes of the general body meetings, even though no WUA has conducted a general body meeting in the last two years. They were asked to write it as if they conducted two meetings every month. One of the WUA president asked, 'As president of the WUA, I have already completed 16 months, why should I write minutes of 32 meetings?' This WUA president has given a written complaint to the collector against the irrigation department.

Table 5.3 Record Maintenance Practice in Andhra Pradesh

Records to be Maintained by WUAs as per the APFMIS Act	Practice Observed in 2005	Remark
The following maps shall be maintained by each WUA, namely: Map showing the boundaries and jurisdiction of the association and water conveyance system within the boundaries of the association. Map showing the localized/notified command area with survey number (form AA). Map showing the areas under irrigation not falling within notified *ayacut*.	5 per cent of WUAs are maintaining maps in the SRSP command.	The WUAs are not interested and they are not accountable.
Property register and records. Water flows register and records. Area and crops register and records. Cash register and records. Minutes register and records.	Cash books are available with all WUAs of Major and Medium irrigation in the SRSP command and coastal Andhra Pradesh.	

Lack of Leadership

On account of limited exposure of farmers to the rest of the world and PIM in particular, potent leadership is lacking. At times, so-called local leaders give a negative or unclear version, which creates misunderstanding among farmers.

Lack of Publicity and Training

Farmers lack access to information and to training and are conscious of lacking skill and knowledge. Unless publicity and training are more intensive, implementation of PIM at a faster pace will remain a problem.

For Farmers

Improvement in Communication between Farmers and Department Staff

In the four case studies (Sri Lanka, Colombia, Indonesia and India), the most common ways in which IMT had changed management performance were in improving communications between farmers and management staff, in making the staff more responsive to farmers and in reducing the difficulties of arranging water deliveries and making payments of water charges.

Efforts to Reduce Costs Attempted by Farmers

In cases where more complete control over irrigation financing was devolved to the farmers' organizations (such as in Colombia), farmer representatives tended to make a concerted effort to improve the cost efficiency of irrigation management through reductions in staff and other means.

Farmers May Face the Burden of Increased Costs in the Long Run

If farmers have paid for nearly the full cost of routine O&M before transfer, IMT is likely to lead to moderately increasing trends in the cost of irrigation to farmers over time in real terms.

Legal Recognition of WUAs is needed to Motivate Farmers

To motivate farmers to invest in the long-term maintenance of their irrigation scheme, strong legal recognition of the WUAs is needed: a water right contract defining the irrigation service between the agency and farmers is a must.

Irrigation Management Transfer Promotes Flexible Management

Irrigation management transfer can provide more flexible management of water and an enhanced capacity of farmers to change their cropping patterns. In order to take full advantage of the opportunities to increase the economic value of irrigated agriculture, farmers will need to move into new, higher value crops. As an alternative to conventional agricultural extension, a WUA could hire its own agricultural expert or networker to obtain information about production practices of new crops, markets and prices, etc., as well as facilitate group business transactions such as bulk purchasing and cooperative marketing (Vermillion, 2004).

Allocations with Holistic Perspective on Investment Needed

Experience on this front has not been very encouraging. Across states, starting from Andhra Pradesh, where systematic efforts were carried out to route the funds through WUAs for physical works improvement to Bihar, where no funds were provided, funds are mainly linked to civil works. That summarizes the pathetic condition of the canal distribution network.

Farmers' Positive Involvement in O&M

Under APERP (Irrigation Component) the farmers' organizations themselves undertook minimum rehabilitation works and O&M works in respect of irrigation schemes. This process enabled the farmers to acquire experience in undertaking maintenance works and to understand the complexity of maintaining and operating irrigation systems. This involved executing maintenance works according to prioritization of the works after a walk-through survey. This, however, led to a disproportionate focus on civil works and may have contributed to the WUA office bearers turning into contractors rather than showing interest in water management.

NOTES

1. The discussions on the Paliganj and Manjauli WUAs in Bihar are based on the author's visit to Bihar in December 2005.
2. Local units of land measurement are 1.5 *bigha* per acre, 32 *kattas* per *bigha*.

Financial Viability of Water Users' Associations

Chapter 6

One of the key indicators for success of irrigation management is financial management and, in particular, the financial viability of water users' associations (WUAs). There is growing interest amongst governments worldwide to decentralize water management, to exercise water demand management and to reduce costs. Typically, government agencies have assumed the responsibility of investing funds in installing and implementing large irrigation projects such as dams and canals. The costs for operation, maintenance and rehabilitation of such systems are extremely high and pose a heavy burden on governments, especially those with limited financial and institutional capabilities. Under decentralization, cost recovery may consist of contributions (fees) from users/farmers or government agencies (subsidies). Collection of user fees can cover part of the total costs. It is unlikely that full cost recovery will be reached without formal and effective participation of all users in the management of irrigation projects. This may be done involving individual farmer families, user associations, small non-governmental organizations (NGOs) and large-scale corporations.

Financial constraints have been one of the reasons for introducing participatory irrigation management (PIM). In practice, the problems or constraints faced by the irrigation departments have trickled down to WUAs and at times with some complexities as well. Basically, huge investments have been made in the irrigation sector, but the benefits have not been commensurate, which has been a problem worldwide. This is because of various reasons like poor pricing mechanisms, low water charges and poor recoveries. As PIM is being adopted in various countries and at different levels, the problems and constraints have been varied and an attempt is made to understand how WUAs have managed financial management and best practices so far.

WATER PRICING

Principles of Pricing

Theoretical and practical considerations in the pricing of canal water are more complex than in the case of power. This is chiefly because of the essential character of irrigation water as a commodity. There has been a debate as to whether it is a public good or a private good or it lies somewhere in between. Water is often regarded as a private good with some characteristics of a public good (GOI, 1992). On a practical plane, it is pointed out that the actual costs incurred on public irrigation, whether capital or recurring, are invariably much higher than warranted on account of the defective designing of projects, time

over-runs, over-staffing and deficiencies in management. It would be unfair to place the financial burden arising from such inefficiencies on user-farmers.

Normally when one talks of marginal cost in canal irrigation, it indicates basically operation and maintenance (O&M) expenses alone (excluding capital costs). If one then adopts the marginal cost pricing rule, it raises an important question: how is one to recover the fixed capital cost of canal irrigation, which is often substantial? Theoretically, the charges for capital cost recovery can be separated and recovered through some other instruments like land revenue or levy while using the marginal cost principle for pricing water.[1]

The guiding principles of water pricing from public sources are: (*a*) resource generation for better maintenance of irrigation structures and further investment through cost recovery, (*b*) inducing efficient use of water, (*c*) ensuring inter-regional and inter-personal equity and (*d*) protection of the environment through sustainable use of water resources (Rao et al., 1999).

These objectives are interrelated and generally reinforce each other. Rational pricing of water would generate sufficient resources for the maintenance of projects, discourage wasteful use of water and prevent environmental degradation in the form of waterlogging and salinity. It would also ensure equity between irrigated and unirrigated regions as well as between farmers benefiting from irrigation and consumers at large. The relative importance of these objectives may, however, vary between sources of irrigation and also from project to project within a single source. For example, although the failure to recover costs is a problem of equal magnitude in Major and Minor irrigation projects and groundwater irrigation, the impact of underpricing of electricity on water use efficiency is more adverse in the case of the latter than the former.[2]

INTERNATIONAL CASES: FINANCIAL STREAMLINING

Reforms in China

China is experimenting with alternative models for managing its small-scale groundwater-based irrigation systems as well as large irrigation projects. The country experimented with a variety of models of 'irrigation service providers' who are incentivized for better service delivery, improved water use efficiency and better performance in water fee collection. In the case of small-scale systems, they are certainly promoting financial sustainability; in large systems, indications are that incentivized service providers promote efficient water use, besides improving fee collection.

North China's agrarian economy is as precariously dependent upon high energy use in pumping groundwater as South Asia's is. However, the huge transaction costs of metering a large number of scattered tubewells has forced South Asia to adopt flat electricity pricing, which is more prone to subsidization while China, in a similar situation, has struggled to make metered electricity supply and full cost recovery work in agricultural power supply. This has not been easy, but significant gains seem to have been achieved by incentivizing village electricians to operate as commission agents of the township electricity bureau.

More recently, many Chinese provinces have been experimenting with smart pre-paid cards for agricultural electricity supply. Many Indian states—where subsidized flat electricity tariff is wrecking groundwater as well as power economies—are struggling to reintroduce metering. China's experience can provide useful guidance in this direction.

North China has made considerable progress in getting some control over runaway groundwater overdraft by using a combination of direct as well as indirect instruments of demand management such as promotion of water-saving approaches and technologies, implementation of withdrawal permits, pricing of water resource as well as services, enforcement of water withdrawal quotas and crowding out urban tubewells by surface water imports. These measures have been more effective in urban areas than in the agricultural sector and in the economically more dynamic eastern provinces than in the agricultural western provinces. However, after years of regulatory activism, there is growing confidence amongst the country's water professionals that they can achieve their own version of integrated water resource management (IWRM) at the ground level by: (*a*) bringing all water management roles under water resource bureau structures, (*b*) broadening the role of the water resource bureau by rechristening them water affairs bureaus, (*c*) instituting a system of water withdrawal permits, (*d*) imposing and levying a water resource fee in addition to water service charges, (*e*) countering urban groundwater depletion through import of surface water from distant projects and (*f*) reorienting its massive water bureaucracy from water development to resource management mode rather than shrinking it.

Japan's Experiences: Monetary Burden Policy for O&M

The costs incurred in the O&M of the irrigation systems have been considered as something that should be borne by the cultivating farmers who benefit from the systems. The dues to be paid by the beneficiary farmers are determined according to the area of farmland under cultivation or the volume of irrigation water they use. The farmers are given the power to enforce compulsory collection of these dues.

In recent years, however, owing to socioeconomic changes in rural regions, proper O&M of the systems has been bringing great benefit not only to farmers, but also to local communities. For this reason, although a considerable portion of the cost incurred in the O&M of these systems falls upon farmers, more and more local governments and municipalities are bearing at least part of the monetary burden. Furthermore, there are systems by which the national government subsidizes part of the cost necessary for the periodic repair and management of facilities that meet certain criteria. In recent years, the aim has been to gradually expand these government subsidy systems.

In Japan, where water supply is generally adequate and secure, land tenure is relatively homogeneous. There are many small farmers and livelihoods are secured through a mixed strategy of profitable agriculture and off-farm employment (part-time farmers). Water fees are charged on acreage basis (US$ 435/ha/year). In Japan, this is equivalent to 0.25–0.30 tons of paddy or 3 per cent of paddy yield. In general, the level of expenditure assumed by farmers for money invested in O&M of irrigation systems is under 5 per cent of the income generated by the

cultivation of farmlands. By comparison, in Mexico it is sometimes up to 8 per cent of total production costs. In addition to the 'service' fees, farmers in Japan are also required to share a part of the monetary burden of facility construction costs and land improvement districts' (LID) operational expenses. The LIDs are farmers' associations based on communal and territorial boundaries and established with the approval of the prefectural governor in accordance with the Land Improvement Act of 1949. The purpose of LIDs is to execute within a specified region land improvement works such as the construction, improvement, operation and maintenance of irrigation/drainage systems, as well as land consolidation.

In the case of Mexico, the IMT programme was part of a series of changes in the economy including reductions in subsidies for agricultural credit and inputs, elimination of guaranteed support prices for the major agricultural crops and increases in energy and fuel prices. Transfer of O&M responsibility for the irrigation districts, leading to users paying the real cost of irrigation water, was seen as just another step in the liberalization of the economy.

Mexico's Dramatic Results

In Mexico, which had success in implementing IMT, the most dramatic results of transfer have been financial. In the early 1980s, the government was providing about 80 per cent of the funds needed for system O&M, but today the figure is about 25 per cent. At the same time, irrigation fees increased more than four-fold. Many associations were branching out into other economic ventures, including credit provision, joint input purchase and farm equipment rental to members.

Farmers in Tajikistan Solve their Debt Problem and Receive Irrigation Water

For the past two years, three villages in Rohati District, Tajikistan—Okchakman, Mehtari and Nilkon, with a total population of 13,100—lacked a continuous supply of irrigation water. The Dushanbe Department of Irrigation Machinery (DUMO), a state entity that owns all irrigation structures and pump stations in the districts surrounding Dushanbe, stopped delivering irrigation water to these villages after farmers failed to pay electricity and water delivery costs amounting to over 11,000 Somoni (approximately US$ 3,400). As a result, farmers were unable to produce sufficient quantities of wheat, cotton, vegetables and strawberries for subsistence and cash.

The USAID-funded Water Users' Associations Support Programme (WUASP) worked alongside farmers in these villages to establish WUAs and to present their debt problem to the DUMO. The WUA members concluded that they could, in fact, pay 40 per cent of their debts back to the DUMO. In July 2005, the director of the DUMO agreed to resume water delivery to these villages upon receiving partial payment of the debt. The farmers would not be obligated to pay the remaining 60 per cent of their dues. Through similar institutional development experiences of the associations, WUA members of these three villages are gaining confidence in their ability to work together to solve their own water management problems.

Dekhan Farms Receive Water Once Again

Several *dekhan* farms (small private farms) and WUAs obtain their irrigation water supply from the Big Gissar Canal (BGK) in Rudaki and Gissar districts of Tajikistan. In order to obtain adequate amounts of water, farmers were told to make payments to the water authority in Rudaki District. The Rudaki District would then transfer a certain percentage of this payment to the State Land Reclamation, Production, Repair and Exploitation Association for Land Reclamation (GMPREOM), a state institution. GMPREOM would then ensure that the canal was periodically cleaned and would regulate the level of water allocated to each farm. However, the Rudaki District had been slow to transfer payments to GMPREOM. As a result, there had been a shortage of water to farms, especially critical during the irrigation season.

On 28 May 2005, through the USAID-funded WUASP, Winrock International convened a meeting with Deputy Minister M. Hamidov of the Ministry of Land Reclamation and Water Industry and key stakeholders to discuss the issue of transferring water payments. Representatives from GMPREOM, Gissar, Shahrinau, the BGK, and directors and members of the Abdulojoni Sarkor, Majro and Shainaki Gado WUAs were also present. In the meeting, a consensus was reached and the Ministry of Land Reclamation and Water Industry signed a memorandum of understanding (MOU) allowing the WUAs to make irrigation service fee payments directly to GMPREOM in exchange for reliable supply of water for their farms.

Presently, WUAs in Rudaki and Gissar districts make timely payments to GMPREOM and receive adequate amounts of water from BGK. In turn, agricultural production and the livelihoods of the local population have improved.

Pakistan's Experience

In Pakistan, the process of institutional reforms began in 1993. Even after the government raised water rates, there was no improvement in water distribution and no benefit for farmers resulting from the higher rates. Farmers are now afraid that the new organization called the Provincial Irrigation and Drainage Authority (PIDA) will become a utility company, and the rates will start rising further like those of other utilities. In fact, water rates will have to be corrected to balance with O&M expenditures for the irrigation system, and the rates are expected to increase. The farmers understand they have to pay only the O&M cost, since the investment costs were already recovered in the past 100 years of operation. The farmers will undoubtedly show resistance when the government tries to raise water rates. The water rate has been eroded by inflation by more than 20 times since then. There were more negative reactions than positive ones, which probably originated from the 'fear of the unknown'. Landholding pattern is a factor that affects the performance of the participatory approach.

In Pakistan, the landholding pattern is uneven and large landholders own much of the farmlands. Large landholders may not care much about land productivity, since they produce enough output for their own living, while tenant farmers also may not take good care of the land as it is not their property. Moreover, tenant farmers can easily be ousted

and replaced by other tenants. These are the reasons why agricultural productivity is low in Pakistan compared to India and other countries. A negative fact is that beneficiary farmers were not asked whether they wanted the reform. There has not been significant farmers' participation in preparation of the National Drainage Programme (NDP) (launched by the Pakistan government at a total cost of US$ 785 million with the financial assistance of the World Bank, Asian Development Bank and the Overseas Economic Cooperation Fund of the Japanese government), except for the Farmers Associates Pakistan and the Kissan Board. This seems to be rather self-contradictory since the NDP requires PIM. Non-governmental organizations could be involved in disseminating the idea of reform, since farmers are suspicious of the government. Well-informed small landholding farmers are keen to promote the reform, since they are not receiving water at all or just about receiving enough water. The small landholders are voicing their anger and opinions, since people are now more aware of their rights than before. The world is changing in this respect, and Pakistani society is changing likewise, owing to advances in communication.

Albania: Managing Tariffs

In Albania, the results have been positive in managing tariffs resulting in positive impacts: increased cost recovery (45–50 per cent), consolidating public role in irrigation and decreasing expenditure. The WUAs pay charges based on different tariffs set by the council of ministers each year at the beginning of the irrigation season. The tariffs for 1996 were set as follows:

1. The WUAs that have not accepted or not handed over the responsibility of O&M pay at the rate of 1,800 lek/ha to the water enterprises (WEs) (90 per cent of the amount that the government asks from farmers).
2. The WUAs that have accepted the responsibility for secondary units pay at the rate of 500 lek/ha to the WEs.
3. The WUAs that have accepted responsibility for operating the entire system (including the reservoir or pumping station) do not pay any charge to the WEs.

Water charges to farmers from the WUA depend largely on the WUA budget. The O&M costs of a water management system (irrigation and drainage) should not be carried only by members that irrigate.

Fee Collection in the Philippines

In the Philippines, a 1974 presidential decree authorized the National Irrigation Administration (NIA) to delegate partial or full management of irrigation systems to duly organized associations. Under this decree, the NIA was allowed to keep all irrigation service fees (ISF), with government subsidies for O&M expenses being gradually phased out over five years. Thus, at the end of this period, the NIA was to be directly dependent on ISF collections from farmers for O&M expenses.

Turkey's User Charges

The financial aspects of IMT in Turkey are similar to those in Mexico in that the policy is designed to shift the burden of O&M costs to users. However, the government continues to subsidize

maintenance, which is not the case in Mexico and the Philippines. Colombia has also shifted the financial burden of O&M to users, while irrigation schemes in Argentina are under joint management with fee collection being done by both the government and the irrigation associations.

PRICING IN PRACTICE IN INDIA

Pricing of canal waters is a state subject in India (like power) and hence tends to differ widely across states. In addition, prices also vary across crops within the same state and across seasons for the same crop. Pricing can also differ across different regions or projects within the same state. Although there are some states like Punjab, which give free irrigation water from canals, in most states, pricing is based on crop area and season. Since technically it is difficult and expensive to measure water supplies on a volumetric basis to millions of small cultivators, volumetric pricing seems to be a far cry at least in the foreseeable future.

The debate on the principles underlying the pricing of irrigation water has for long veered round to the view that the farmers must pay at least the short-run marginal cost of providing water comprising O&M charges and a small part of the interest on capital invested. Earlier, the Fifth, Sixth and the Seventh Finance Commissions in agreement with the Jakhade Committee, had recommended that pricing of canal irrigation water should recover 2.5 per cent of the capital invested besides working expenses. But given the poor financial performance of canal irrigation, the Eighth and the Ninth Finance Commissions recommended only the recovery of O&M expenses. However, the Tenth Finance Commission did reiterate the need to recover at least 1 per cent of the capital cost besides working expenses. The Vaidyanathan Committee (GOI, 1992) gave a unanimous report suggesting the following:

1. 'A revision in the level and structure of water rates is thus necessary in the interest of both efficiency and equity. The revision should be such as to achieve full cost recovery in due course and in the process promote saving, create disincentives for waste and thereby enable the service area to be expanded and a more reliable service assured' (GOI, 1992: vi–vii).
2. '[R]evision of water rates should go hand in hand with measures to improve the quality of service and to keep a check on costs' (GOI, 1992: vii).
3. '[C]ost recovery should be the main consideration governing rate determination. We recommend that rates should be based on O&M norms and capital charges (interest and depreciation). The government must ensure that the actual O&M outlays more or less correspond to norms which should be revised once every five years' (GOI, 1992: vii).
4. 'State irrigation agencies undertake analyses to arrive at a well-grounded estimate of the capital investment attributable to the irrigation service' (GOI, 1992: vii).
5. '[S]ome sort of averaging of rates by region and/or category of projects as is already being done by several states is desirable' (GOI, 1992: vii).
6. 'There is a strong case for applying a two-part tariff. All lands included in the command should pay a flat annual fee on per hectare basis for

membership of the system which entitles them to claim water ... and a variable fee linked to the actual extent of the service (volume or area) used by each member ... of major/medium irrigation schemes' (GOI, 1992: ix).

7. 'The proposed rationalization of water pricing will have to be accomplished in a phased manner.... The level of cost recovery to be aimed at in the first phase should at least cover the O&M costs and 1% interest on capital employed' (GOI, 1992: xxi).
8. 'In phase-II, the basic flat rate per hectare of CCA will continue but should be related to an obligation on the part of the system to provide a minimum level of service defined in terms of volume of water for the staple crop seasonal.... Full cost recovery should be the goal for phase-III' (GOI, 1992: xxvi).

In practice, however, the pricing of canal waters did not cover more than 20 per cent of the O&M expenses in the mid-1990s. It is well known that over the years, the capacity of farmers to pay for higher irrigation charges has increased owing to the spread of high-yielding variety seeds, commercial and high-value crops being grown in the command areas of canals and higher productivity through better cropping operations.[3] As far as farmers' ability to pay for irrigation charges is concerned, it has not gone down during the last three decades or so. Besides, despite overstaffing, the actual expenditure on O&M per ha of irrigated area is considerably below the accepted norms. As against the generally accepted principle of appropriating between 25–40 per cent of the additional net income generated per ha on account of irrigation as water charges, only about 2–5 per cent of the income is being collected as water rates. It appears therefore that political resistance notwithstanding, at least a five-fold increase in the existing water rates may be necessary, both theoretically speaking and from a practical viewpoint of managing the projects. In fact, field visits to Madhya Pradesh, Bihar, Maharashtra and Andhra Pradesh and interactions with the bureaucracy, farmers and political leaders in these states reveal that charging full O&M costs and 1 per cent of capital costs, as suggested by the Vaidyanathan Committee for phase I reforms, may take a few more years, if at all farmers appreciate potential gains from reforms.

Common Financial Constraints at the WUA Level

1. Water service fees were set at levels just high enough to offset immediate expenses only and in some cases fees were insufficient to cover operation, maintenance and management costs.
2. Fee levels have been raised, but at a rate less than inflation because it was felt that water users were facing economic difficulties.
3. Regulations on quantifying fees were inadequate as the methodology proposed in the instructions attached to the concession titles have not been followed and fees were often charged as part of the quotas, but not in volumetric terms as established by law.
4. There is lack of reserve or emergency funds. No provision has been made for a capital fund for rehabilitation of the systems.
5. Investments made by taking loans from banks and high rates of

interest have made it tougher for repayment.
6. Cost of gravity irrigation service was relatively low as water was generally not charged by volume and as a result the cost was smaller.
7. Resources for administering, operating and maintaining remain a problem.
8. Low levels of fee collection arose because the general registry of users has not been kept up to date. Users have difficulty in paying and water supply service was deficient.
9. The increasing accumulation of users' debts is a cause of concern. The problem is not resolved owing to complex bureaucratic procedure and users use these difficulties to their advantage—delaying payments while retaining irrigation service.

In Bihar, there is discrepancy in estimating the water demand as per the designed area and as per the MOU signed between the WUAs and the WRD; water fee demand is estimated based on area irrigated, as assessed by the revenue department. The revenue department, in the case of Paliganj in Bihar, has been reporting increased water fee demand over the years. This has resulted in widening the gap between figures reported by water demand and MOU figures (see Table 6.4). The MOU-reported revenue figures were up by 18 per cent in 1997–98 and jumped to 61 per cent by 2003–04. Similar trends are true in several WUAs. For example, in the case of Raghupur in Sone (the revenue figures jumped from 75 per cent in 2002–03 to 98 per cent in 2004–05) and Badhupur in Sone (the revenue figures jumped from 105 per cent in 2002–03 to 204 per cent in 2004–05).

Constraints in Collection of Water Charges in Bihar

1. Collections remain extremely poor in Bihar so much so that the cost of collection is more than the sum collected (Bhatia, 1989). That speaks volumes in terms of the urgent need to usher in institutional reforms in these irrigation agencies/departments that are saddled with enormous staff.
2. There is a widespread feeling of large-scale corruption in these agencies, the effects of which must not be imposed on farmers who happen to be users of canal water.
3. Corruption and high costs of these agencies result from their monopolistic status, typically top–down bureaucratic structures and lack of accountability to consumers of their products. In such a situation, just raising the price of canal water for irrigation is not likely to solve the problem. In fact, it may invite strong opposition from farmers and boomerang on the state government.

Price reforms in Indian irrigation, if they were so simple, would have been carried out long back. The fact that the subsidy situation has worsened over time should compel us to recognize the situation as far from simple. It is so intertwined with the state and nature of politics that it suffers from a lack of understanding of who is being subsidized and by how much. As a result, reforming the regime of subsidies is often divorced from ground reality and, therefore, remains a non-starter.

A major problem is that revenues from irrigation fees are far less than the O&M expenses. Water fee recovery

varies across the states, in spite of the formation of WUAs. Over the years, owing to continuous efforts by NGOs (for example, Development Support Centre [DSC] and Aga Khan Rural Support Programme [AKRSP] in Gujarat, Institute of Resource Development and Social Management [IRDAS] and Pragati in Andhra Pradesh) some WUAs have been collecting close to 100 per cent of the fees. In some cases, where there are good WUA leaders as well as good local revenue and irrigation officials, they were able to collect above 70 per cent of the fees. Interestingly, in most cases, owing to the formation of WUAs, water fee collection levels have gone up and have been increasing over the years. In Bihar, collection levels have gone up from less than 10 per cent to nearly 60 per cent in some cases. But a majority of the WUAs across the states complain that they need good and logistical support in understanding and streamlining the water fee collection mechanism. It includes getting a good map of the actual designed area of their command, support to penalize unauthorized irrigation and joint survey (with support from the irrigation and revenue departments) of actual area under irrigation across crop seasons. Unfortunately, this is not a priority in most states.

Results of Implementing PIM

Some of the key aspects related to financial aspects are presented in Table 6.1, which indicates the current status across the states of India. Other important factors that have led to the current situations are:

1. Enormous investment of more than Rs 900 billion in the irrigation sector, but without commensurate benefits.
2. Irrigation water rates are very low in most states.
3. Recoveries are very poor.
4. Huge loss, worsening financial situation with poor water pricing mechanisms and poor recovery for O&M costs.

Table 6.1 Financial Situation

States	Revenues from Irrigation Fees are Far Less than O&M Costs	Lower Efforts Made by Revenue Establishment	Increased Operational Subsidies over the Years	Reduced Capital Expenditure in the Irrigation Sector	Declining Financial Allocations	Water Fee Revisions Low Compared to Other States	Shortage of Funds	Revenue Sharing with the Government is Difficult as Collection is Very Low
Andhra Pradesh	X	X	X				X	
Bihar	X	X	X	X	X	X	X	X
Chhattisgarh	X				X			
Gujarat	X	X	X			X	X	
Karnataka	X		X		X		X	
Kerala	X	X		X				
Maharashtra	X	X		X	X			
Madhya Pradesh	X	X	X	X	X	X	X	
Rajasthan	X	X	X	X	X	X	X	
Tamil Nadu	X	X		X	X	X	X	
Uttar Pradesh	X		X		X	X	X	

Source: Based on different state-level reports.

Figure 6.1 Expenditure on Irrigation O&M, Engineering and Revenue Establishment, and Water Fee Collected in Bihar

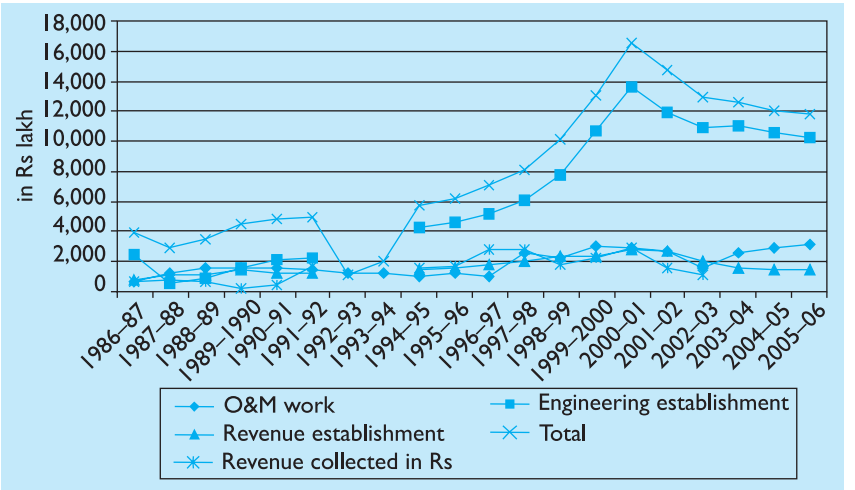
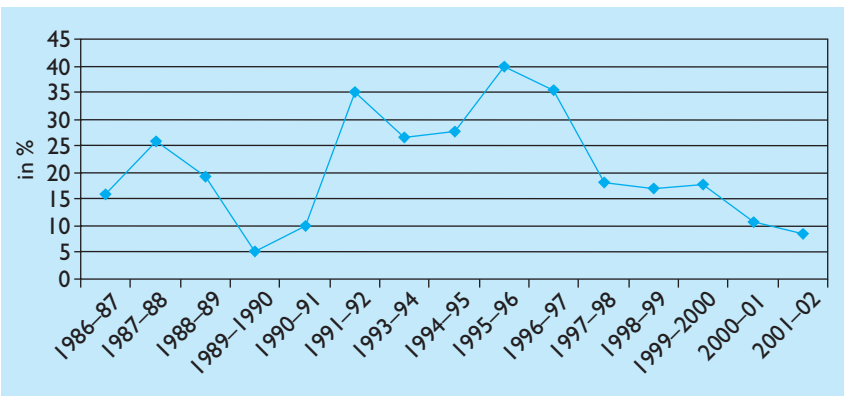


Figure 6.2 Total Water Fee Collection as a Percentage of Total Operational Expenditure



5. Investment in irrigation infrastructure in the five-year plans has come down.

In the case of Bihar, between 1986 and 2002, revenue collected in any one year was far below the cost of collecting the revenue, to say nothing of the actual O&M expenditures (see Figure 6.1). In 1991–92, for the first time in many years, the amount collected was greater than the cost of collection, but still far below the O&M expenditures. Over the years, expenditure on engineering establishment has increased up to three times, while the actual expenditure on O&M has increased marginally. Figure 6.1 indicates lower collection levels of revenue and lower efforts made by the revenue establishment. Figure 6.2 shows further declining trends in irrigation revenue as a percentage of irrigation expenditure. Over the years (1996–2002), this has enormously increased the subsidies for the operation of the irrigation sector. These subsidies from the state budgetary support have reduced the availability of funds for capital expenditure in the irrigation sector.

The irrigation sector has been facing declining financial allocations over the years. It is reaching its nadir in many cases. For example, the chief engineer's office at Siwan (with a CCA of 240,000 ha) is part of the Gandak command area. Its total expenditure[4] was Rs 247 million (during 2004–05), while revenue collection was just Rs 0.8 million. The backlog has gone up to Rs 117 million and its current year demand estimate is around Rs 9 million. In another case, the executive engineer of a division (including the Gara Choube Canal with a CCA of 59,000 ha) in the Sone command area based in Dehri has reported that only 20 per cent of the annual demand (Rs 20 million) gets collected. The executive engineer is clearly in favour of transferring irrigation systems to WUAs. This would save Rs 9.5 million for the department; this includes Rs 3.5 million spent annually on maintenance and expenditure, Rs 5 million on establishment and another Rs 1 million on other items. Thus, a rupee saved is a rupee earned for the department. One has to wait and watch the impact of transferring revenue collection responsibilities (along with revenue field staff) to the water resources department from 2005–06.

In spite of low water fees (Rs 88/acre in the kharif season and Rs 75/acre in

the rabi season) users refuse to pay and the administration is unable to collect it owing to various deficiencies in the system. On the other hand, the same farmers are buying water at Rs 500/acre per season from tubewell owners. Across the state, tubewell owners sell water at Rs 65–75/hour from 5 hp diesel pumps. The rate in 1992 was Rs 22/hour. Elsewhere in India, it is Rs 25/hour from an electric pump. Many rural areas do not even have an adequate supply of electricity.

At the global level, initially payment by farmers increased, but the cost of irrigation to farmers relative to the gross value of the output of irrigated agriculture declined over time after IMT. This was due to more cost-efficient management techniques and an overall increase in economic productivity. Research in a five-year post-IMT time frame (by IWMI) in four countries studied indicates that such improvements did not result in enough gains in efficiency relative to economic productivity to bring about a significant decline in the cost of irrigation relative to gross value of output. Table 6.2 depicts an overview of situation with respect to results encountered with IMT, which indicates similar results.

In all countries, the cost of irrigation had increased for farmers and decreased for the government. This indicates that IMT reduced the financial pressure on the government with more responsibility being transferred to the farmers.

Water Fee Collection

Collection of water charges is an important issue of the reform. Across countries various methods are formed to initiate good collection. Efficiency of fee collection shows mixed impacts—it had increased in a majority of the countries, remained the same in few and decreased in three countries. The increased fee collection at reduced costs, as indicated in Table 6.3, depicts a positive trend in the responsiveness of farmers through cooperative management.

Water fee collection in Japan indicates that efficiency is of 98–100 per cent. Water charges are based on crop and area, but not on the volume of water actually used, even in the case of pumping.

Revising Water Rates

Over the last 15 years, the water fee has been revised twice in Bihar—once in 1995 and the second time in 1998. The revised water fees are Rs 88/acre for kharif crops and Rs 75/acre for rabi crops. However, the revised water fees are much lower than in many other states

Table 6.2 Cost of Irrigation

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Increased for farmers and decreased for government	*	*	*	*	*		*	*	*	*	*	*				
Unchanged for farmers and decreased for government											*					
Decreased for farmers and the government															*	*
Change unknown						*							*	*		

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

Table 6.3 Efficiency of Fee Collection

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Increased	*		*		*			*	*			*				
Decreased										*					*	*
Same				*		*	*				*			*		
Initially increased but currently is decreasing		*														
Change unknown													*			

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

Table 6.4 Water Fee Collection by WUAs in Bihar (as of December 2005)

WUA	Year	Paliganj	RPC 3	RPC 5	Manjauli	Adampur	GC 3	GC 6	Raghupur	Badhupar	Khajipur
Project Water fee, demand in Rs (kharif + rabi).[1]		Sone	Sone	Sone	Sone	Sone	Sone	Sone	Sone	Sone	Gandak
	1997–98	795,755									
	1998–99	861,649									
	1999–2000	673,078									
	2000–01	810,370									
	2001–02	818,766									
	2002–03	1,091,578	433,834	263,810	264,000	228,996	607,797	451,890	811,050	486,338	
	2003–04	1,095,507	389,834	254,531	281,600	220,200	588,495	452,298	763,756	476,588	604,656
	2004–05	1,041,274	296,384	214,923	299,200	220,200	574,349	293,478	621,826	249,832	496,593
Actual collection of water fee as percentage to the total demand.	1997–98	28.8									
	1998–99	34.6									
	1999–2000	46.0									
	2000–01	39.6									
	2001–02	37.6									
	2002–03	17.8					24.1	21.0	29.9	NA	
	2003–04	20.1	16.3	22.0	12.1	45.0	47.8	41.2	30.0	NA	NA
	2004–05	NA	20.2	32.4	50.7	18.9	67.8	NA	29.9	NA	2.4
Total water fee as per MOU as percentage to total water fee demand.[2]	1997–98	118.6									
	1998–99	118.3									
	1999–2000	120.7									
	2000–01	160.9									
	2001–02	176.9									
	2002–03	161.9	83.6	90.2	135.4	127.2	104.6	89.9	75.5	105.0	
	2003–04	161.3	112.1	121.7	204.7	183.0	113.2	89.9	80.2	107.1	100
	2004–05	157.3	110.0	89.3	129.6	144.4	116.0	138.5	98.5	204.4	100

Source: Field survey.

Notes: 1. Water fee in 1997–98 was Rs 70/acre for kharif crops and Rs 60/acre for rabi crops and in 2002–03 it increased to Rs 88/acre for kharif crops and Rs 75/acre for rabi crops.

2. Percentage indicated may vary from the WUA area. This is mainly because the area figures indicated in the MOU (between the WUA and the WRD) are quite different from the area figures reported by the revenue department. Indeed, actual figures on area irrigated are also different from the figures indicated in the MOU. The WUAs' demand to make an assessment of actual area irrigated has never materialized. This assessment should have been carried out through a joint survey by WUA members, WRD staff and revenue staff.

(see Table 6.5), which had revised water fees around the same time.

The Second Irrigation Commission of Bihar was asked to deal with the problem of low rates.

1. Prior to 1995, the irrigation rates were last revised in 1983. At that time, canal rates were set at Rs 89.45 per ha for the kharif season, Rs 51.15 per ha for rabi season and Rs 159.50 per ha for the hot weather season. Reductions were also identified for those who took only a single watering during the season and for those served by non-perennial canals. Rates for water from public tubewells and state lift systems were about 40 per cent higher. The Commission recommended raising the rates. But the state retained the kharif season rate and increased the rabi season rates to Rs 75 per ha (a 47 per cent increase) from 1 November 1995 as the first step toward increasing it to the point of covering costs.
2. The Commission recommended raising fees for non-irrigation use of water supplied through irrigation works.
3. The Commission noted that farmers who took irrigation water were not the only beneficiaries of irrigation development, particularly development of large-scale surface systems, which included road development and other infrastructure development. Therefore, it also suggested instituting an 'irrigation cess' on all land within the boundaries of an irrigation system.
4. The Commission made recommendations to improve the rate of irrigation fee collection. Over the 1987–92 period, the rate of fee collection varied from 5 per cent to a high of 17 per cent (Government of Bihar, 1994, Vol. IV: 11). The recommendations include reviving the *satta* system, having the WRD collect the fees or, where WUAs exist, entrusting fee collection to WUAs.
5. Most importantly, a Commission study entitled 'Introduction of System Management for Self-Financing of Projects' (Government of Bihar 1994, Vol. VI, Part V) has pointed out that making the irrigation schemes self-sufficient financially would require improving performance, reducing costs and involving farmers in the management of the system. In particular, this paper advocated creation of WUAs, giving them various sorts of agricultural and other assistance and turning over various aspects of management to them.

Table 6.5 Water Fee in Karnataka, Andhra Pradesh and Bihar (Rs/ha)

Crop	Karnataka (Effective from July 2001)	Andhra Pradesh (Effective from July 1997)	Bihar (Effective from 1998)
Paddy kharif	247.10	494	220 (for all kharif crops)
Paddy rabi	247.10	494	
Paddy summer	247.10	494	
Jowar kharif	86.50	247	
Jowar rabi	86.50	247	187.50 (for all rabi crops)
Jowar summer	86.50	247	
Maize	86.50	247	
Wheat	148.25	247	
Sugarcane	988.45	864.5	
Chillies	86.50	247	
Betelnut	86.50	247	
Groundnut	148.25	247	
Sunflower	148.25	247	
Soyabean	148.25	247	
Cotton	148.25	247	

Source: Field survey.

Irrigation management transfer thus was an integral part of the Second

Irrigation Commission's recommendations for resolving the financial problems of irrigation in Bihar.

Collection Based on Assumed Irrigation Area

After IMT, the responsibility of water fee collection rests with the concerned WUAs in Bihar. But the WUAs are yet to receive (even after three years of IMT) the area map of the distributary indicating plots. In the absence of the map, the WUAs work with assumed irrigated area and have attempted to collect water fees from farmers who are ready to pay. The WUAs are yet to realize their potential powers and penalty-imposing rights.

Lack of Training and Enforcement Mechanisms

Lack of training and enforcement mechanisms have resulted in lower levels of water fee collection across WUAs (see Table 6.4). It hovers in the range of 17–46 per cent in the case of the experienced Paliganj WUA to 24–67 per cent in the case of the GC-3 WUA. Active and aggressive office bearers in GC-3 and Manjauli have demonstrated that they can do it better.

Collection of Water Charges in Pakistan—Process and Constraints

In Pakistan, the revenue department collects water charges with the assistance of village heads, who receive a reward of 5 per cent of the total amount collected. After the reform, the government wants farmers' organizations to collect water charges. Farmers, however, will not comply with it if such money collection does not bring benefit to them. If farmers can control the money or can see the benefits from improved O&M, then they would collect the water charges. In case farmers' organizations do not collect water charges after the reform, the farmers want water charge assessors and collectors to be under the authority of farmers' organizations. The farmers' organizations may have a problem in collecting water charges from influential farmers, since ordinary farmers are in a disadvantaged position compared to influential farmers in a rural society. It would be necessary to figure out how to handle influential farmers who do not pay the water charges. A village head, who is nominated by the government based on the social structure of the village, would not have such a problem. There should be a mechanism to monitor and prevent defaulters. Social pressure alone will not be sufficient and other means will be necessary to implement the farmers' organizations' decisions regarding water management, including water charge collection.

There is generally an upstream and downstream conflict in any irrigation system. With the reform, the downstream farmers receiving no water will not pay the water charge, and then farmers' organizations and WUAs will suffer from shortage of income and funds for O&M or investment. If this is the case, upstream farmers will have to be more cooperative in distributing water to downstream farmers; thus, the upstream–downstream conflict will be mitigated to some extent. Farmers' organizations have to keep some portion of collected water charges for O&M of distributaries. The money collected should be shared by the farmers' and governments' organizations.

The Kissan Board of Pakistan proposed the shares of the collected money to be 60 per cent for the farmers' organization, 20 per cent for the technical agency (PIDA), 10 per cent for the agriculture department and 10 per cent for the other relevant departments. There has to be legal protection for such an arrangement. When most of the funds are controlled by farmers' organizations, farmers will be sure of the appropriate use of such funds, which will facilitate farmers' participation and water charge payment.

Revenue Sharing with the Government—Constraints

Poor Collection Capacities Overburden WUAs

In Bihar, the WUAs have to pay, as per the MOU, 30 per cent of their water fee collection to the government exchequer. In practice, the WUAs are finding this difficult. Many a time, the WUAs were unable to collect even that 30 per cent. In some cases, the WUAs are barely able to manage to collect the required amount and pay most of it to the government. For example, in the first year of operation, Paliganj ended up paying 68 per cent of its water fee collections to the government. But as its collections improved, its payment to the government came down to 30 per cent in 2003–04 (see Table 6.6). But in practice, Paliganj had to issue several show-cause notices to its members to expedite fee collection. Several new WUAs could not enforce similar mechanisms to enhance their fee collection. Poorer WUAs have ended up paying a sum much higher than their own collection. For example, the GC-6 WUA paid 140 per cent of its collection and the GC-3 WUA paid 124 per cent of its collection during its first year of operation (see Table 6.6). The office bearers have mobilized personal funds to adhere to the MOU conditions. Even the Khajipur WUA has paid 83 per cent of its collection to the government. All this also shows low levels of water fee collection, owing to poor enforcement mechanisms at the WUA level. The GC-3, RPC-3, RPC-5 and GC-6 WUAs have learnt their lesson and have taken stringent measures to enhance their water fee collection.

In Gujarat, a study by the DSC has brought out the extent of expenditure on administration covered by grants for administration and maintenance and repair. From the information available

Table 6.6 Amount Paid to the Government by the WUAs in Bihar as per the MOU (As a Percentage of the Total Water Fee Collection)

WUA	Year	Paliganj	RPC-3	RPC-5	Manjauli	Adampur	GC-3	GC-6	Raghupur	Badhupar	Khajipur
Project		Sone	Sone	Sone	Sone	Sone	Sone	Sone	Sone	Sone	Gandak
Percentage of actual water fee collection paid as part of the government share (30%)	1997–98	68									
	1998–99	28									
	1999–2000	56									
	2000–01	51									
	2001–02	62									
	2002–03	59					124	140	48	NA	
	2003–04	30	63	43		31	63	73	38	NA	NA
	2004–05		37	33	28	26	29	NA	46	NA	83

Source: Field survey.

for four irrigation cooperatives, it found that expenditure on maintenance and repairs is two to six times the grant received from the government.

1. All irrigation cooperatives, except Rangpur, spent two to six times more than the government grant they received for the purpose.
2. Higher expenditure was possible owing to the freedom of the WUAs to fix water fees at rates higher than the government rates.
3. The WUAs in Gujarat are empowered to fix water charges above the government rate and retain 100 per cent of the collection of additional charges. Gujarat was the first state in India to have introduced such an incentive to WUAs.
4. Water fees fixed by WUAs are 1.43 to 2.73 times higher than the government rates. These additional fees collected have enabled WUAs to meet their obligations of maintenance of canals as well as management of water distribution.
5. The WUAs cannot charge water fees less than the government rates. The higher than government rates was based on an apprehension that some irresponsible leaders of irrigation cooperatives may decide water rates below the government rates, but adequate enough to meet their obligation of paying government charges. This is possible because from the water charges collected, the irrigation cooperatives have to pass on 50 per cent of the charges levied to the government. Some irrigation cooperatives that are short of funds may indulge in populism and in the process may neglect the responsibilities for good management and particularly good maintenance.

Table 6.7 Amount to be Retained by Different Levels of WUAs in Andhra Pradesh

Organization Level	Major Irrigation System (Rs 200)	Medium Irrigation System (Rs 200)	Minor Irrigation System (Rs 100)
WUAs	50	60	90
Distributary committee	20	—	—
Project committee	20	30	—
Gram panchayat	10	10	10
Irrigation and CAD department	100	100	—

Reform Indicating Major Share to WUAs

In Andhra Pradesh, the APFMIS Act, 1997, had specified that the WUAs should get a major portion (though this is less than the portion of water fees that WUAs in Bihar retain) of water fee collection and this should be used for the repairs and maintenance of the distribution system and towards office expenses. Table 6.7 indicates the actual amount to be retained by the WUAs across the type of irrigation system in the state. However, owing to procedural delays, the government finally issued clear orders only in 2006 to plough-back these funds to WUAs.

Financial Viability of WUAs

Raising adequate resources for WUA administration and O&M alone is not sufficient. It is necessary to make sure that the WUA management is efficient and economical. Studies in Gujarat, Bihar and Andhra Pradesh indicate that the management of WUAs is generally not

efficient. The Chopadvav WUA in Gujarat had doubled the secretary's salary in 1998–99. But in the case of Rangpur, the secretary did not draw any salary during the drought years when there was no irrigation. The WUAs also tend to have less control on other administrative expenditure. For example, in the case of the Kakdiamba WUA in Gujarat, establishment costs are Rs 32,000/year (Rs 116 per ha) compared to Rs 13,500/year (Rs 36 per ha) in Chopadvav WUA. The WUAs in Kakdiamba and Chopadvav are incidentally in the tribal areas of south Gujarat.

According to the DSC study, the benefits (increased area by 17 per cent and productivity by 7 per cent), are estimated to be Rs 7,648/ha by the year 2008; thus, the entire command area would generate a net annual income of Rs 434.4 million against the investment of Rs 180.8 million. The total investment includes: (*a*) the government's investment of Rs 118.6 million (in rehabilitation, support to the WUA in annual O&M in the form of 50 per cent rebate on water charges and software support to DSC for organizing the community, (*b*) National Dairy Development Board's support of Rs 20.7 million for software support to the DSC, (*c*) farmers' contribution (towards rehabilitation and O&M) of Rs 37.2 million and (*d*) the DSC's contribution from its own resources of Rs 4.3 million in software. Owing to this demonstration effect, the DSC strongly justifies the financial viability of WUAs. What is required is a suitable environment for WUAs to function and perform. This would influence livelihood levels of landholders, which will also have a spread effect on the landless community outside the command area.

Financial Concerns

Fear of Financial Viability

Maintenance and operation of the system demands huge finances. Farmers are apprehensive that, in the absence of surety of guarantee finance, it would be difficult for them to fulfil the requirement of funds for O&M. Farmers are not yet confident of managing the system, as they are unsure of financial viability. Hence, they hesitate to take up the responsibility.

Unwillingness to Enforce and Collect Water Fees

The water resources departments generally complain that farmers are unable to pay water fees, though these are very low. In practice, the same farmers are paying six to eight times more for the same quantity of water when they buy groundwater or lift water from river or canals. In the SAS Project in Madhya Pradesh, the cost of pumping groundwater or lifting water from the river is Rs 150 per hour. At the rate of around five hours per watering per acre, pump water users spend around Rs 2,000 per acre per season. The cost is the same as that of pumping water from the canal to a distance of 1–2 km using diesel engines. At the same time, farmers are unable to pay even Rs 305 per acre per season to the government. It is rare to see, across the states, a special drive period in a year, or penalties for non-payment, or actions against poor collection of water fees. Whenever special initiatives were undertaken by a few individual officers, like in the Mahi-Kadana Project in Gujarat or subdivisions of the SAS Project in Madhya

Pradesh and divisions in the Godavari Project in Andhra Pradesh, the reaction has always been positive. But statewide initiatives are rare.

LESSONS/SUGGESTIONS

Some lessons that may be derived are:

1. Temporary financial support and incentives encourage user associations to assume their duties.
2. Some of the ways to raise funds for the O&M tasks to be performed by the association are: (*a*) member subscription according to holding size, (*b*) flat rates or metering as in China (more recently, many Chinese provinces have been experimenting with pre-paid electricity cards for agricultural electricity supply), (*c*) long-term loans, (*d*) fees for violations and environmental pollution, (*e*) full autonomy to raise funds and (*f*) government remaining as an observer to the process.
3. Clearly drawn financial agreements related to water transfers.
4. Development of financial resources and raise funds to carry out all water management activities.
5. Common platform to resolve payment issues and sorting ground-level problems (*dekhan* farms, Tajikistan).
6. Sharing costs and benefits with establishing systems (Japan's experience).
7. Focus of water bureaucracy should shift from water development to resource management (China's efforts).
8. Be proactive in establishing processes in financial management in spite of facing constraints as in Gujarat, Bihar and Pakistan.

Impacts

1. Regular meetings of the users group helped identify water shortages and distribution problems early on. These meetings also helped in the early detection of financial problems. Users' participation resulted in good cooperation among farmers and positive social impacts. However, most of these impacts could not be quantified.
2. In some countries like Egypt, irrigation improvement and user participation in the O&M of irrigation canals resulted in more agricultural production and more income to farmers (Abdel-Aziz, 2003). It also resulted in reduced costs of irrigation operation as well as reduced costs for the government for the maintenance of the shared private canals. In Tunisia, the fees paid by farmers were incomparable to the costs borne by the government.
3. Decentralization and transfer of water management to local agencies helped in adjusting the costs according to the irrigation network conditions (Al Atiri et al., 2003).
4. Water tariffs were established in Turkey according to the type of facility constructed and managed. For government-run facilities, farmers paid for the recovery of the O&M costs for water transmission from the source to the field. For facilities run by water users, water tariffs throughout the year were based on expected expenditures for the next year. There are also economic incentives for early payment and substantial penalties for late payment (Özlü et al., 2003).
5. In Yemen, farmers paid 30–50 per cent of the costs of the improved irrigation

systems. Farmers in user associations were allowed to accept the options of water management and agree on the percentage of their contribution to the irrigation improvement project (Abdul-Malek and Attas, 2003).

NOTES

1. Of the gross receipts of Rs 1.67 billion in 1986–87, direct and indirect irrigation charges constituted only Rs 0.98 billion (59 per cent). As against working expenses of Rs 4.93 billion, direct and indirect irrigation charges work out to only 20 per cent. See the *Report of the Committee on Pricing of Irrigation Water*, Planning Commission, Government of India, 1992.
2. The emergence of groundwater markets has, in the latter case, succeeded in efficient allocation of water resource between different users. However, in the case of groundwater, underpricing of electricity has led to over-drawal of groundwater causing rapid environmental degradation. In this case, the inequity between resource-poor farmers and large farmers (who have tubewells) as also inter-temporal inequity is of a grave nature (Rao et al., 1999).
3. In the case of sugarcane in Maharashtra, for example, irrigation cost per ha as a ratio of gross revenue from sugarcane crop declined from 11.2 per cent in 1968 to only 5.9 per cent in 1995. Its share in net revenue decreased from 19.3 per cent in 1968 to 9.7 per cent in 1995. In the case of paddy in Punjab as well, the ratio of irrigation cost to net revenue per ha has fallen from 38 per cent to 13–14 per cent.
4. This includes establishment costs of Rs 140 million and maintenance and repair costs of Rs 108 million.

The Role of Non-governmental Organizations in Promoting Participatory Irrigation Management

Chapter 7

Non-governmental organizations (NGOs) have been playing a pivotal role in shaping water users associations (WUAs) in several states. This chapter looks at the different NGOs engaged in this, their areas of operation and the approaches adopted by them to promote participatory irrigation management (PIM) in different states.

BACKGROUND

Non-governmental organizations are seen as one of the key agencies in creating an enabling environment for and creating links in setting up strong institutions for initiating PIM successfully. Funds and approaches are devolved through various funding agencies for NGOs to carry the work forward. In this context, the roles of NGOs have been different; while some have worked only at the grass roots, some have confined themselves only to Minor irrigation focusing on tanks while others have worked in Medium and Major irrigation projects. Several other NGOs have involved themselves in networking, research, documentation, etc. Each of these NGOs has played a significant role and has highlighted constraints and lessons learnt in the process. Simple but effective measures have been evolved where the actual benefits could be observed at the micro and macro levels.

LEADING NGOs

The work of some of the leading NGOs working on PIM in India are discussed next (see Table 7.1).

The Aga Khan Rural Support Programme (AKRSP) has been working on various aspects of water resource development in Gujarat including organizing farmers in several medium-scale tanks in Bharuch District, organizing lift and tubewell societies and working with water-harvesting groups. Apart from this, AKRSP has been offering advice to the Gujarat government on IMT.

The Development Support Centre (DSC) based in Ahmedabad has been playing an active role in demonstrating the benefits resulting from the role played by WUAs in the Dharoi Irrigation Project in north Gujarat. It has been taking a lead in several national-level workshops and commissioned studies related to PIM in Gujarat, Madhya Pradesh and Andhra Pradesh. The DSC's key initiatives have been: (*a*) finding gaps in networking of PIM in India, (*b*) supporting the National Support Group on PIM, which consists

Table 7.1 Summary of Pivotal NGOs

NGO	State it Works in	Year of Establishment	Focus
AKRSP	Gujarat	1986	• Organizing farmers in several medium-scale tanks in Bharuch District, organizing lift and tubewell societies and working with water-harvesting groups. • Managing canal systems particularly those systems that were not being utilized for various reasons. • Advising the Gujarat government on IMT.
Vivekanand Research and Training Institute (VRTI)	Gujarat		• Construction of lift irrigation structures. • Construction of water-harvesting structures.
Sadguru Water and Development Foundation (SWDF)	Gujarat	1975	• Lift irrigation systems to improve the lives of the Bhil tribals.
SRIJAN	Madhya Pradesh, Karnataka, Rajasthan	1997	• Increasing farmers' role in rehabilitation of canal infrastructure. • Management of canal water. • Helping department engineers adopt facilitation role towards WUAs.
Association for Social Action (ASA)	Madhya Pradesh	1995	• Building capacity of the farmers' organizations for smooth operation and maintenance. • Community mobilization for higher involvement in irrigation management. • Facilitating canal restoration works. • Providing agricultural support services to enhance water use efficiency. • Building capacity and resources within the WRD for implementation of PIM.
SOPPECOM	Maharashtra		• Advising the government in Maharashtra.
PRADAN	Tamil Nadu, Bihar (8 other states)	1983	• Organizing farmers to take over management in Tamil Nadu. • Developing lift irrigation societies and tank management associations.
Vaishali Area Small Farmers' Association (VASFA)	North Bihar	1971	• Establishing group-owned and managed tubewell associations. • Triggered similar efforts all over north Bihar.

mainly of NGOs and academics actively involved in the promotion of PIM, (*c*) identifying issues of critical significance for improving the performance of the irrigation sector, particularly the working of PIM, (*d*) organizing, through a collaborative effort with other research organizations, a study of the tail-enders in 19 canal irrigation projects in six states of India, (*e*) organizing a national workshop on the findings of these studies where recommendations were made, (*f*) organizing arrangements for feedback to policy-makers on how PIM works in the field, drawing attention to policy issues from Andhra Pradesh and Madhya Pradesh, (*g*) building farmers' organizations at village and project levels and enhancing their capacity through various means such as training and community organizing and helping to sensitize the staff of the irrigation department to participatory processes and (*h*) DSC is involved in direct implementation of the PIM programme in 56,800 ha of one Major and two Medium irrigation projects of north Gujarat. It is also in the process of implementing PIM in 5,000 ha of the Sardar Sarovar Project (Narmada

Project) to serve as a pilot project in implementing PIM in 1.8 mha. The DSC is probably the biggest NGO in India working in the irrigation sector. It is also active in providing training to farmers' representatives and irrigation officials. It has the complete infrastructure as required for such training. So far about 235 training programmes for farmers' representatives and 42 training programmes for irrigation officials and others have been offered by the organization.

The Centre for Applied Systems Analysis in Development (CASAD) worked with the cooperative society on the Right Bank Minor 7 in the Mula Project in Maharashtra. The Society for People's Participation in Ecosystem Management (SOPPECOM), an outgrowth of CASAD, continued this work and began working with a number of other WUAs in Maharashtra. SOPPECOM is also an advisor to the government of Maharashtra on IMT.

Professional Assistance for Development Action (PRADAN) has been working in water resources development in Tamil Nadu, Bihar and other states. Its role in organizing farmers in tank management has been rewarding.

Development of Humane Action (DHAN) has been playing a pivotal role in Tamil Nadu, Karnataka and Andhra Pradesh in designing and implementing tank-based WUAs. The DHAN Foundation has taken up three broad approaches depending on the local context and the amount of funds made available under different programmes of government funding—isolated tank development works, tank cascade development works and tank-based watershed works. The programme has a number of necessary components to ensure that the interventions are sustainable in the long run. The measures proposed in the rehabilitation of tanks comprise improvements not only to the physical works, but also institution building and software aspects like O&M of water resources.

The Institute for Youth Development, Karnataka, an NGO established in 1978, works on organizing and promoting youth participation in development and has worked on participatory tank rehabilitation. Its objective is to rehabilitate all natural resources and CPR with the evolution and re-establishment of traditional decision-making and management mechanisms at the village level and to create a regenerative, self-supporting agro-eco system.

The ASA based in Bhopal, Self-reliant Initiatives through Joint Action (SRIJAN) in Madhya Pradesh, Karnataka and Rajasthan, Bharatiya Agro Industries Foundation (BAIF) in Karnataka and Madhya Pradesh, and VIKALPA in Madhya Pradesh are some of the leading NGOs working on PIM in India.

The Institute of Resource Development and Social Management (IRDAS) based in Hyderabad was a pioneer in setting up WUAs in the SRSP project in Andhra Pradesh. Its committed retired officials from the government, with their rich experience, developed a model for users' involvement. They are now also working with the Command Area Development Authority (CADA) of Andhra Pradesh and a few other states, including Uttar Pradesh.

Jalaspandana, the south India farmers' organization for water management, was formed by farmers committed to development of the water sector and livelihoods of farmers in Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Pondicherry. It was established in 2003 with a focus on facilitating farmers' participation in the political process

of water policy formulation and implementation.

The International Network on Participatory Irrigation Management (INPIM) was established in 1998 under the patronage of the Ministry of Water Resources, Government of India, with support from the World Bank and through a grant made by the Ford Foundation. Its aim is to facilitate irrigation sector reforms in India through efforts outside of the government, but working closely with the government and influencing and supporting appropriate policy decisions. It follows the approach of promoting PIM in India by strengthening and promoting farmers' organizations for better management of irrigation systems and by helping to bring about appropriate policy changes. Its specific objectives include: (*a*) to facilitate and promote PIM in India, (*b*) network between various actors in the irrigation sector in India for better water management, (*c*) advocate and lobby for enabling policy reforms and initiatives for a sustainable pro-poor water policy and (*d*) policy advocacy, training, research, seminars and workshops, documentation and information dissemination.

APPROACHES FOLLOWED

Based on their experience and local needs, NGOs have adopted different approaches to promote PIM. Some of them are discussed here.

Gujarat: Dharoi Project by DSC

The collaborative effort between the Gujarat Water Resources Department (GWRD) and the DSC for promoting PIM in projects in north Gujarat started in 1995. In 10 years' time, that is, from 1995 to 2005, it was able to introduce full-fledged PIM including rehabilitation of canals in 18 villages covering 5,100 ha. Investments made during that period on rehabilitation of canals, organizing the community and operation and maintenance (O&M) by irrigation cooperatives amounted to Rs 22.4 million. The projected investment after National Dairy Development Board support for three years (2005–08) for the remaining area of 51,700 ha is Rs 158.4 million. Thus, the total investment for bringing all the command area of the three irrigation projects in north Gujarat (covering an area of 56,800 ha) under PIM would be Rs 180.8 million (Rs 112.7 million for rehabilitation, Rs 38.7 million for O&M and Rs 29.4 million for software support). The DSC has done a study on the economic impact of PIM in the Dharoi Project area where it has been introduced in the last 10 years.

The DSC had initiated measures to activate WUAs that it promoted in irrigation projects of north Gujarat to also work for productivity enhancement, along with better water management. The DSC is engaged in promoting and supporting local organizations of the stakeholders like irrigation cooperatives and therefore it is interested in examining their functioning and identifying issues that need to be attended to for their healthy functioning. It therefore undertook a study of seven irrigation cooperatives in Gujarat promoted by NGOs as well as the GWRD. The sample irrigation cooperatives selected were those that were functioning for five years and were located in different districts. The DSC has undertaken a study on the economic impact of PIM

Table 7.2 Expenditure Analysis

Name of the Irrigation Cooperative	Government Grant for Administration (Rs)	Expenditure on Administration (Rs)	Expenditure in Excess of Government Grant
Kakdiamba	7,507	42,000	6 times
Chopadvav	13,700	25,700	1.8 times
Rangpur	10,700	6,000	0.43 times
Thalota	5,900	11,500	1.95 times

Table 7.3 Income Analysis

Name of the Irrigation Cooperative	Average Total Government Assistance (Rs)	Average Income from Additional Water Charges (Rs)	Proportion by which Income from Additional Water Charges is in Excess of Government Grant
Kakdiamba	2,000	61,000	3.05 times
Chopadvav	34,400	70,000	2.03 times
Rangpur	35,700	23,000	0.86 times
Thalota	14,500	18,000	1.24 times

in the Dharoi Project area where it was introduced in 1995. The expenditure and the income of each society over the last five–seven years was studied. The main items of expenditure for irrigation cooperatives are administrative expenses—the secretary's salary and other administration costs. Summaries of expenditure and income are shown in Tables 7.2 and 7.3.

Madhya Pradesh: ICEF Project

Madhya Pradesh has a total irrigated area of 6.72 mha. So far the irrigation potential created in the state has been 2.2 mha, but actual utilization has been only 1.2 mha, that is, about half of the potential created. Because of poor financial status, the focus has been only on upgrading and rejuvenating existing projects. Activities in the irrigation sector have been mostly construction based, neglecting management aspects.

The India Canada Environment Facility (ICEF) has played a pivotal role in promoting NGO involvement in facilitating the formation and functioning of WUAs in various projects in the state. The ongoing ICEF Project (2002–07) titled 'Participatory Restoration and Management of Irrigation System by Water Users in Madhya Pradesh' is spread over seven projects (Birsagar, Gora, Koncha, Chhapi, Satak, Samrat Ashok Sagar and Segwal), incurring a total expenditure of Rs 153 million, with contributions from ICEF (Rs 114 million), WRD (Rs 19.6 million) and community contribution (Rs 19.6 million). The main activities in the ICEF Project include PIM awareness, training of WUA members, organizing exposure visits to WUAs, gender mainstreaming and *chak* development. A total of 24 WUAs have been organized under this project by four NGOs—SRIJAN (nine WUAs), ASA (10 WUAs), VIKALPA (two WUAs) and BAIF (three WUAs). Across the state, the ICEF project covers one Major, two Medium and four Minor (tank) projects. These 24 WUAs cover a total of 18,697 families.

The total designed area for all the seven projects is 49,258 ha, while the actual utilization is 32,895 ha or 67 per cent. All these NGOs together have to rejuvenate a canal length of 630 km, to reduce the gap area by 16,363 ha in the seven projects. The extent of gap area ranged from 49 per cent (in the Birsagar Project) to 83 per cent (in the Koncha Project). These projects are 25–40 years old.

Features of the ICEF–WRD Project

1. Participation of farmers in all aspects of project processes.
2. Upfront cash contribution to the tune of 10 per cent for the physical work

component of the project. Indeed, users' share was 30 per cent in the first year. Then, owing to complaints from the weaker sections, it was reduced to 20 per cent in the second year and then to 10 per cent in the third year. Till September 2006, users contributed a total of Rs 5.8 million. In some WUAs (for example, Sayar and Kamapur) farmers have pledged their jewellery and taken loans at 2 per cent/month interest to pay their share.

3. Capacity building of WUAs with issue-specific teaching modules prepared by NGOs and by WALMI.
4. Focus on water and agriculture productivity. Farmers are gradually shifting (though on a small scale) to cash crops and tree crops.
5. Project implementation and facilitation by WRD and NGOs.

SRIJAN AND ASA's EXPERIENCE IN MADHYA PRADESH

1. These projects have resulted in quantitative and qualitative changes in project planning, implementation, monitoring and fostering community participation in terms of cost and responsibility sharing at each level of the WUAs and the WRD (see Table 7.4 and Figures 7.1 and 7.2).
2. Developed a model case of PIM in the Satak Tank Project, which has been recognized by eminent PIM experts of India.
3. Participatory canal restoration work done directly by WUA and by deputing certified contractors.
4. Increase in actual command area by 30 per cent.
5. Proactive farmers' organizations, that is, the WUA and its sub-committees.
6. Small pilot experiment on water and agricultural productivity with successful communication of message of resourceful water use to fellow farmers.
7. Experiment on system of rice intensification in the kharif season and mango plantation in the Samrat Ashok Sagar Project.
8. The ASA has developed capacity modules (participatory canal restoration work manual, video CD on participatory walk-through) and resource materials, which have been successfully field tested during the course of project implementation.
9. The SRIJAN team organized street plays for generating awareness among water users about the ongoing PIM project in the district. The plays were staged in 10 WUA areas and portrayed the benefits that have accrued to water users who participated in the project. Bharat Gyan Vigyan Samiti, Bhopal, a national-level organization, staged the shows.

Figure 7.1 Framework Followed by ASA for Promoting PIM in Madhya Pradesh

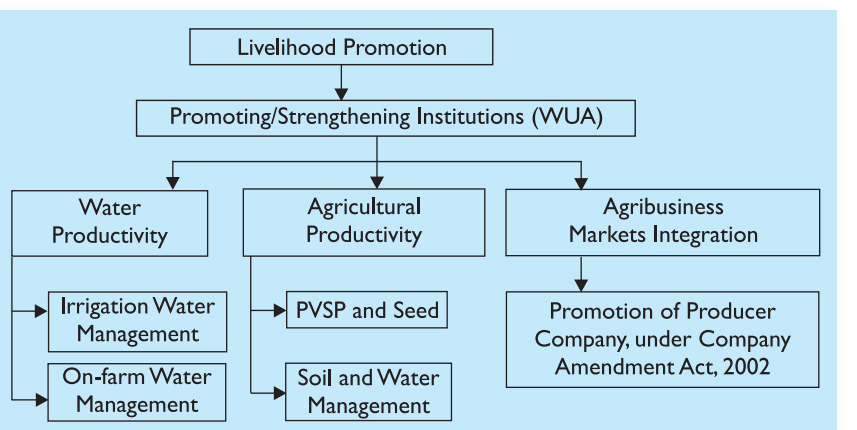
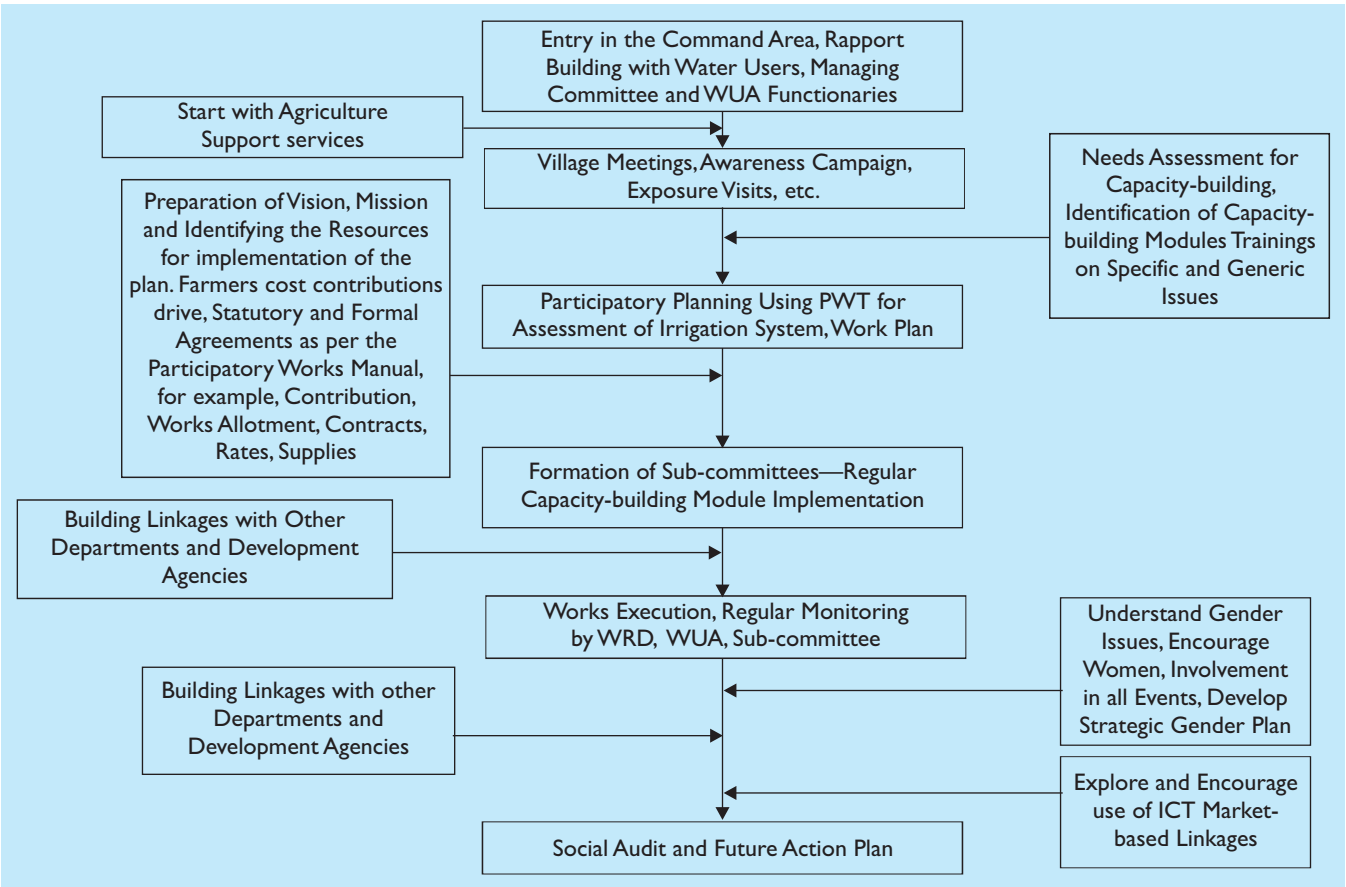


Figure 7.2 Schematic Presentation of the Institutional-building Process Followed by the ASA in Madhya Pradesh



10. The ASA has created policy-level impact on 'gender in PIM' based on the field experiences of the ASA.
11. Membership with full voting rights to the spouse of the male member of WUAs.
12. Formation of six sub-committees in each WUA and one of them will be a woman sub-committee.
13. Enhanced women's participation in WUA elections and in WUA managing committees.
14. SRIJAN has realized that WUAs need catalysts to influence local organizations to enable better water fee collection and to carry out allied activities.
15. Both SRIJAN and ASA feel that just 50 per cent of the total water fee retention is adequate for O&M. This would help the WRD reduce its expenditure on O&M. But, as a first step, the Act of 1999 needs to be amended to make a provision for 50 per cent retention of water fee collected by WUAs.

Maharashtra

In Maharashtra, 25 WUAs were established in Major and Medium projects by two leading NGOs working for IMT according to the Directorate of Irrigation Research and Development (DIRD),[1] Pune. Of the 25, 17 WUAs were established by the Pune-based NGO, SOPPECOM, and eight

Table 7.4 Field-level Challenges and Key Lessons Learnt—SRIJAN and ASA's Experiences

Challenges	Lessons
On-farm water management.	• Small and medium schemes are relatively quicker in their acceptance of PIM. • Policy and strategic intervention for large, medium and small schemes should be different.
Change in perception of water as a resource/ commodity.	• Need of perceptional change from water as a natural endowment to water as a commodity.
Creating awareness that PIM is a time-consuming process and is a sensitive issue as they feel it is the government's responsibility.	• Creating awareness requires great persistence, as it involves changing the mindset of various stakeholders. • Exposure visits had a great impact. Samaj Parivartana Kendra farmers, for example, were taken to see how an equitable system of water distribution could be put in place. They were also taken to Ozar where water users manage their irrigation system and get optimal productivity through a volumetric system of water distribution.
Pessimistic attitude of leaders and farmers.	• Needs perseverance. • The sociopolitical environment of the command area largely contributes to the success or failure of PIM.
Gap between the designated area for irrigation and actual water reaching the farmers was prominent. There is great disparity in the volume of water available to the head- and tail-end farmers of the command.	• But still the water tax collected was better in the tail-end villages, even up to 80 per cent. Tail-end farmers responded better. • Building stakes of the poor laid the foundation for taking up higher order issues like equitable water distribution. Equity is a daunting idea, especially, in a 20-year-old system where apathy and hopelessness were deeply rooted. • Assurance of receiving equitable water has curbed corrupt practices and increased the ownership of the canal among the water users.
Poor status of physical structures.	• Important to encourage the worst affected to initiate action.
Building institutions—lack of collective action.	• Collaboration between the government and NGOs is the core requirement for PIM. • NGOs for community mobilization is a must for PIM. • Twenty-four irrigation committees cover almost the entire command of Wagad Dam. • The irrigation societies meet monthly to deliberate over various issues and the managing committees take a final decision on these issues. • With water ensured, farmers need not spend sleepless nights to police the canals making sure that nobody obstructs the flow of water. • Policy back-up and integrated approach can increase the role of women in PIM. • The model can be replicated in small and medium schemes with similar socioeconomic and political structures.
Community contributions, financial sustainability of WUAs.	• Awareness creation, capacity building and participation in decision-making required.

WUAs by the Nasik-based Samaj Parivartana Kendra (SPK). Twenty-four of the WUAs are located in north Maharashtra and one in the Osmanabad District in the Marathawada region, which was established by SOPPECOM. Sixteen WUAs (out of the total 17) established by SOPPECOM were part of a scaling-up process. After the success of the Datta Irrigation Cooperative Society, formed in 1989 in the Mula command area, SOPPECOM tried to form a federation of Minor-level WUAs at the distributary level. They tried to make a federation of 14 WUAs, including the Datta Society.

While the WUAs set up by NGOs may be small (12 per cent of the total), NGOs themselves have made a great impact over the years. They have been one of the prime movers of the PIM movement in India over the last three decades. In Nasik District, all the WUAs established and working successfully were motivated by the Ozar-based WUAs and its creator Bapu Upadhyaya.

In Ahmednagar and Pune areas, the impact of the Datta Society and its promoters (CASAD/SOPPECOM) is clearly visible. The NGOs in Maharashtra have demonstrated the role that they can play and how they can have a positive impact on the performance of WUAs. The advantage of NGOs in Maharashtra is that they have long-standing and committed professionals who work with missionary zeal.

Samaj Parivartana Kendra

The Samaj Parivartana Kendra (SPK), a social organization founded and presided by Late Bapu Upadhyaya and Bharat Kawle, set up the Ozar Societies, which have performed very well by conventional norms and have helped many other societies on the Waghad System.

The SPK differs from other organizations in its approach:

1. Leadership and membership are all drawn from the same area.
2. The SPK was conscious in minimizing its role in the long run and hence responsibilities were devolved gradually.
3. High level of technical support requires a high degree of understanding and grasp of technical matters. They have put together a team of farmers that combines experience in farming, a high social standing, a grasp of the main issues, organizational ability and technical expertise. They have established procedures for monitoring and carrying out technical tasks, they keep meticulous and detailed records and find the right balance between purely technical solutions and the social requirements of the situation.
4. The organization comprises three societies that are separate legal and functional entities, but they function in a manner that gives them a larger collective identity and a number of benefits. A coordination committee of the three societies tackles common or inter-society matters.
5. There are 19 registered water user societies on the Waghad that cover almost all the command. The next logical step would be the formation of a federation of WUAs at the canal level, but the SPK prefers to take this step only after it becomes a felt need.
6. The WUA had a role to play in enforcing some degree of accountability through the MOUs between the WUAs and the irrigation department. This was highlighted in an incident where the irrigation officials claimed that the WUA was misusing the water and blamed it on negligent record keeping by the WUAs. The latter could ask for and obtain the necessary records, which exposed the discrepancy and led to the dismissal of the irrigation officials.
7. The WUAs maintained meticulous and detailed records.
8. Switching over to hourly basis resulted in increase in efficiency. The SPK employed an hourly basis for calculating the water charge for water use. In most water societies, the society pays the government on the basis of the metered quantity of water it receives, but the internal assessment of water charge for users remains based on area and crop. It increases state presence, facilitates recovery of water charges and links them to volumetric supply, but for the individual farmers in the command, nothing much changes and

his costs are still not linked to the volume of water he uses. In creating a push in the direction of water saving and increasing efficiency of water use, it goes only half the way. The need is to find a solution that is rapidly acceptable to farmers and easily implemented with little or no transaction cost. It has also led to an increase in discipline and efficiency. Better coordination between the farmers and canal operators allows the farmers to prepare their fields well in advance.

9. Crops in the rabi season were decided by the farmers as they knew about the availability of water.

PARTICIPATION OF WOMEN

Over the past decade, the need to involve women and men in PIM at all levels of governance has become prominent. Action plans and recommendations have called for efforts to strengthen women's capacity to implement and manage water projects as well as provide them with equal access to information and decision-making channels. Participatory irrigation management is viewed as an opportunity that creates a context for mainstreaming women's participation and gender equity in irrigation management thereby reducing the risks of gender biases. Women undertake more agricultural occupations than men in addition to other livelihood activities. Therefore it is emphasized that the involvement of women can make activities more effective, inclusive and equitable (Peter, 2004). A study conducted in Andhra Pradesh and Madhya Pradesh revealed some interesting findings:

1. The APFMIS Act, 1997, has provided that every WUA should consist of all water users who are landowners in a water user's area.
2. A very small percentage of women are landowners, thus denying them the opportunity to participate in WUAs. Madhya Pradesh amended its 1999 Act, to include the spouse of the land owner to be recognized as a full member of the WUA with voting rights. During the (second round) elections held in February 2006, 30 women were elected as presidents at the WUA level, and 300 women as territorial committee members.
3. In Madhya Pradesh, 98 women were elected as presidents and 830 women as members of WUAs through the normal electoral process in the study area; however, women occupied the present positions in WUAs at the behest of their male family members, who were motivated by their self-interest of acquiring de facto powers.
4. Women were not actively involved in playing their role as members.
5. Women were not directly involved in irrigation activities. They did not perceive any direct and immediate benefits to women agriculturists, although all of them agreed that benefits would accrue to the family in terms of more assured irrigation and increased production.

Self-help Groups Make a Difference in Canal Repairs in Madhya Pradesh

Two self-help groups (SHGs)—Asha Ki Kiran and Durga in Kamapar Village

Box 7.1 Gender Mainstreaming in PIM—ASA's Initiative in Madhya Pradesh

A systematic gender-oriented strategy has been developed as part of PIM in order to promote active involvement of women in community affairs related to canal restoration and maintenance. The objectives of this strategy are (*a*) to create an environment more responsive and gender sensitive to women's needs, (*b*) ensuring an equal access to participation and decision-making for women and (*c*) equal access for women to their fundamental legal and social rights.

To mainstream gender into PIM, a two-pronged intervention strategy is required—capacity building of women and gender sensitization of men. The ASA had advocated a number of policy level changes in PIM: (*a*) providing voting rights to the spouse of WUA members, (*b*) mandatory inclusion of one woman member in the management committee and (*c*) formation of women's sub-committees.

The next steps are: (*a*) reservation of 33 per cent of the seats in management committees, (*b*) trainings on managing financial and technical aspects and (*c*) managing records of the WUA's day-to-day activities.

In the project area, 74 per cent women voters exercised their votes during the WUA elections.

in the Samrat Ashok Sagar Project showed interest in canal restoration to cover 5 acres of unirrigated land and 26 acres of waterlogged land within their command area. These SHGs were ready to give 20 per cent of the total cost as cash contribution as per PIM project norms. The SHGs actively participated in the walk-through survey along with the sub-engineer and WUA members. The 20 per cent share amounted to Rs 6,000. This amount had to be paid by eight beneficiaries, of whom six were poor and members of the SHG.

Punjabai was the first woman to contribute her share of Rs 390. Patel (a rich man in the village) whose land was under the command, but located inside the middle, refused to pay in the hope of getting water once the canal was repaired. Several other plot owners also wanted to be free riders. But, one of the SHG members, Mathurabai, and her husband, Gajraj Patel, intervened in favour of the work since they suffered because this canal was in a state of disrepair. Santabai and Mathurabai borrowed money (Rs 500 and Rs 800) at 2 per cent/month interest from their SHG savings to contribute. In the next few days, in spite of the rains, women took interest and stood in the field to complete the task. Finally, all the funds were collected and the canal was completely rejuvenated (SRIJAN, 2006).

Positive Participation in Gujarat

In Gujarat, the implementation of the National Water Policy guidelines was initiated on an experimental basis in the district of Bharuch. The results proved so encouraging that in 1995, the state government declared a policy on PIM, along the lines of the national policy, emphasizing farmer participation in planning, implementation and management of direct and indirect irrigation projects and seeking the cooperation of voluntary organizations.

Participatory irrigation management has been initiated with support from the AKRSP (India), a non-communal, non-profit rural development organization with focus on natural resource management. The core concern of AKRSP(I) is organizing communities and building their capacity to manage their resources. The organization encourages the participation of women in its programmes.

When AKRSP(I) first undertook the PIM projects on a pilot basis, not much attention was paid to the involvement of women in managing irrigation systems. This was chiefly because the role played by women in irrigation and productive use of water was virtually invisible. However, growing awareness within the organization led to conscious efforts to involve women in the canal irrigation management societies and to change the perception that women could not

handle matters of irrigation or were not concerned with it.

Women were involved as nominal members only; only landowners were made regular members and, being nominal members, women had no say in decision-making. Slowly, however, following the organization's proactive efforts at involving women in the management committees, people began to be convinced that involving women would bring about overall development within the village community. In fact, their involvement is now visible in every aspect of PIM, whether it is motivating farmers' groups, overseeing canal construction, repair and maintenance, committee decision-making, framing the rules for water distribution, setting the terms for irrigation, water distribution and administration, liaising with government agencies and the like. With rampant alcoholism in this region, monitoring water distribution at night is the only problem the women face, as perceived by them.

As a result of involvement in PIM, the lives of the women have undergone a complete transformation. They are much more confident and have taken control of their lives, of their families and also that of the community. Other notable changes are an increase in their knowledge base and increased mobility. Where earlier they did not venture outside the village, they now walk into any government office and interact with government officials. Their tolerance of injustice has been considerably lowered, as is evident in their personal lives. However, women's involvement has not been accepted without protest. Many women faced, and continue to face, social disapproval and familial opposition.

Apart from their personal struggles, women face opposition from farmers and the community. Construction work being supervised by women is often stalled or destroyed. Still, the women carry on. (Info Change News and Features, July 2003).

Gender Issues Find a Voice in WUA Trainings

Throughout Central Asia, women play a critical yet often 'invisible' role in agricultural production. The USAID-funded Water Users Associations Support Programme (WUASP) encourages women to actively participate in trainings and meetings where appropriate. Owing to local traditions and customs, addressing gender issues can be a challenge. For instance, women do not typically enter mosques in Tajikistan. However, after WUASP mobilizers explained to the community of Rohati Jamoat, Rudaki District, the objectives of the WUASP, the mullahs from the local mosque helped to disseminate information on upcoming meetings and trainings. As a result, two women—out of 22 WUA 'Ohchakman' members—actively took part in a WUASP training on 'WUA Organizational and Leadership Development' on 13–14 August 2005, which was held in the local mosque. One woman related how in the 34 years that she had lived in the community, this training session was the first time she had ever set foot in the mosque. Through participating in WUASP trainings, men and women in the community developed knowledge and skills to increase agricultural productivity and improve their own economic livelihoods. The Rohati community also came to realize that men,

as well as women, can make important contributions to agriculture-related issues. Ms Lutfia Kholova said: 'Now I try to participate in all training programmes conducted by WUASP in order to improve my knowledge and increase my self-esteem. Moreover, our people started to realize that the programme helps to solve long-term problems with irrigation systems and promote the agricultural development in our area.'

Summary

1. There is need to explore various opportunities for involving women in WUAs in the context of existing legal and social constraints.
2. Agriculture is a joint farming activity involving the entire household and the women's role in decision-making at the family level cannot be ignored. Developing their skills and knowledge to participate better in performing various irrigated agriculture operations and also in effective decision-making obviously enhances the effective functioning of WUAs and the realization of the objectives.
3. Social norms and values mainly discourage women to participate actively. Since, a majority of them belong to an economically-active age group, intensive training for changing their traditional inhibitions and attitudes and building their capacity/ability to act independently will give high dividend (Rao and Shyamala 2002).
4. In Madhya Pradesh, motivation and opportunities would help women to take decisions for betterment of irrigation management.
5. Policy change in tune with the national water policy brought about a significant change in Gujarat.
6. The role of NGOs in promoting women is significant.
7. In Gujarat and Madhya Pradesh, women have resisted opposition and have proceeded further in spite of facing challenges.
8. Voting rights within the WUA's structure has empowered more women to become committee members in Madhya Pradesh.

Across the states, the status of women in irrigation management varies. The situation calls for further clarity in rights with effective policy changes to empower them at various levels.

TANK-BASED NGOs

DHAN Foundation in Tamil Nadu

The tank programme of DHAN Foundation has been in operation for more than a decade. In consonance with the organizational mission of building institutions of marginal communities, teams are engaged in forming tank farmers' associations and other nested institutions to restore the tanks from decay and facilitate their sustainable performance. The DHAN Foundation's experiences of working has been through farmers' organizations formed at the habitation level, cascade level and district level for conserving tank and pond systems mostly in drought-prone areas. Over the years, the programme has gained national and international attention for its sustained and innovative efforts towards poverty alleviation through community organizations in natural resources development.

Since 1992, DHAN Foundation has been active in tank conservation projects.

A hundred-member dedicated professional team located in drought-prone areas of Tamil Nadu, Andhra Pradesh and Karnataka in south India works with great zeal towards making the tanks more useful to the rural communities. The programme, named Vayalagam, combines development activism with field implementation. The programme has the following major components:

1. Institution building for tanks forms the core of the programme wherein communities are mobilized to conserve the tank system in its entirety.
2. Integrated tank development component ensures that the conservation works are planned and implemented meticulously with people's involvement and on a tank cascade basis for ensuring highest possible returns along with sustainability.
3. Tank-fed agriculture development provides appropriate methods and techniques for using water and land efficiently.
4. Tank endowment is provided to village tank institutions on a matching basis to sustain conserved tanks.

The Vayalagam Tank-fed Agriculture Development Programme

1. Poverty reduction of small and marginal farming communities, the landless and women through conservation and development of small-scale water resources.
2. Sustaining livelihoods by stabilizing tank-fed agriculture.
3. Building nested institutions and its sustenance to ensure local management.

The DHAN Foundation through its tank conservation programme has promoted 1,041 *vayalagam*s (tank associations) covering nearly 100,000 farmers for rehabilitating tanks and promoted 1,542 micro-finance groups (MFGs) by covering 22,000 members among tank farmers to cater to their financial and agricultural needs. Six hundred and eighty MFGs have been linked with banks and the Kalanjian Development Financial Services (KDFS) for agriculture development and water conservation. Conservation works worth Rs 103.147 million were carried out.

Approaches Adopted for Tank Rehabilitation

Tank-based Watershed Approach

The major thrust of the watershed development programme funded by the District Water Management Agency (DWMA) is as follows:

1. Rehabilitation of existing small-scale water bodies like ponds and tanks and construction of new water-harvesting structures are carried out through tank-based watershed development in the project area.
2. Taking up in situ soil and moisture conservation measures to prevent soil erosion and to induce moisture conservation in the soil.
3. Horticulture development and afforestation works in order to improve vegetative cover, thereby addressing the ecological balance.

Rehabilitation in a Cascade Approach (Chain of Tanks)

Tanks act as flood moderators and drought mitigators. An isolated tank

rehabilitation approach will not yield fruitful results in watershed treatment. To make tank rehabilitation effective, the DHAN Foundation covers the tanks in a chain to have complete treatment which leads to the conservation of all the rain water and ensures the filling of all the tanks in the chain. This will also save crop loss during floods.

People's Organizations in a Nested Institution Model

To create an effective demand system across all levels, DHAN promotes institutions at different levels through which it addresses their demands and issues effectively.

1. Tank association or user group: This is a primary farmers' association formed at the habitation or village level by including all members in the village, both direct and indirect beneficiaries. All activities related to the tank will be channelized through this association. The prime focus of the *vayalagam* (village-level association) is to involve all the people for planning, implementation and future maintenance of the developmental works.
2. Cascade association or watershed association: This is at the cascade or micro-watershed level. This association comprises representatives from all village-level associations. It will take up development issues at the cascade level.
3. Federation: By including all village-level institutions at the *mandal*/block level, a farmers' federation will be organized by registering it under the Trust Act. This federation would promote and nurture all other people's institutions for self-management. The main objectives of this federation are: (*a*) promoting and nurturing people institutions, (*b*) resource mobilization, (*c*) need-based development activities in member institutions, (*d*) policy advocacy at the *mandal* and/or district level.

People's Contribution

Without people's participation and contribution, the future maintenance of any development work will be questionable. In order to enlist the active participation of the people, the DHAN Foundation mobilizes 25 per cent of the estimated cost of development as people's contribution through cash, kind or labour. Out of this, 15 per cent will be kept with the user group (tank association) and 10 per cent will be placed in the watershed development fund. This has led to greater sustainability and ownership of people. The people are enjoying the benefits of the developmental works long after the completion of the project. In the initial stages there was great resistance to this concept, but thanks to continuous efforts and proper concept seeding, the DHAN Foundation was able to achieve this and the associations have around Rs 2.5 million as people's contribution (excluding the Watershed Development Fund).

Creation of Endowment for Tank Maintenance

To rebuild the tradition of endowment, the DHAN Foundation mobilizes people's contribution and provides a matching grant. This amount is deposited within the village-level association and that will be kept in a fixed deposit to get

maximum benefit out of it. The amount deposited will not be utilized till the end of the project. This matching grant of the endowment is mobilized from different philanthropic institutions to facilitate maintenance of the structures. So far DHAN Foundation has mobilized Rs 600,000 from the Sir Ratan Tata Trust as against the people's contribution of Rs 835,000 through 46 associations. The fund would become a rallying point for the villagers and the interest derived from it would be made available for small repairs and development works of common interest. This will keep the association alive and active.

Social Security for Tank Farmers

To address the issue of vulnerability and risk, the DHAN Foundation mobilizes farmers towards micro-insurance for human, livestocks and crops in collaboration with mainstream insurance firms like Life Insurance Corporation (LIC), Birla, MetLife, ICICI and the like.

Cost Coverage

This is one of the most prominent activities that the DHAN Foundation is creating among the tank associations for sustainable institutions. People are sharing a part or complete management service cost for the services provided by the institutions. The services include micro-finance, agriculture-related services including input supply and produce marketing, social security and the like. This is expected to help the institutions to function on their own in a sustainable manner without depending on external support.

Vayalagam Movement

The DHAN Foundation has initiated the *vayalagam* movement (people's movement to stress tank conservation) in order to spread the message about the importance of tank system rehabilitation and water conservation and development by people themselves in a way to 'build people to build people'. The movement also includes financial support from benefited families to initiate tank development programmes in other areas where they are desperately needed. As a part of the movement, DHAN conducts *padayatras*, seminars and workshops at different levels. The following are the features of the *vayalagam* movement:

1. Charging well owners for automatic recharge that takes place and the benefits accrued. They succeeded in convincing the farmers and also devised a charge.
2. Building checkdams to check losses in drains as a substantial portion of the canal seepage and system losses appear in wells or in downstream flows and the water detained helps to recharge wells in the command area.
3. It evolved several other practices that were location suitable and the SPK cautions that the model needs to be flexible as co-management would take different forms in different situations.

NOTE

1. The DIRD is a multidisciplinary and multifunctional organization of the Irrigation Department of the Government of Maharashtra situated in Pune, Maharashtra, India.

Capacity Building and Monitoring

Chapter 8

This chapter focuses on efforts taken towards capacity building and the role of the Water and Land Management Institute (WALMI) in a few states. Efforts taken towards developing database on water users' associations (WUAs) are also discussed.

CAPACITY BUILDING IN PIM

Dramatic changes have taken place in the irrigation sector during the past two decades. Farmers organized into WUAs have replaced government agencies in managing the lower sections of large irrigation networks and, in many cases, are managing entire systems. This transformation of management from government to users has brought many benefits including improved management, lower overall management costs and empowerment of local people that has multiplier effects in community building and quality of life. Yet, these new potentials and responsibilities also need to be supported through training and capacity building not only at the level of policy-makers and irrigation staff, but also at the level of WUA managers.

Capacity building for participatory irrigation management (PIM) plays a significant role. It identifies various actors in the irrigation sector whose capacity and performance determines the outcome of PIM policies and programme. The requirement of capacity building of the principal actors varies with their level. Responsibilities at the policy-making level require that they should have the capacity to create a conducive environment and arrange for administrative, financial and software support to facilitate change in the departments' working mainly as a construction agency to its new role as facilitator for promotion and strengthening of farmers' organization (Shah, 2000).

INTERNATIONAL EXPERIENCES

Improving Local Participation: Experiences from Sri Lanka, Thailand, Indonesia and the Philippines

Community Organizer

Sri Lanka provides the clearest case of explicitly choosing to rely on recent graduates despite very high rates of staff turnover (Uphoff, 1991). The Indonesian experience shows that retraining existing agency staff is feasible. Using farmers as organizers seems to have considerable potential though it may depend on local social conditions. An outside organizer may be less necessary if farmers are already able to assert their interests while dealing with the agency officials. Another approach would be for experienced organizers to move into the role of trainers and supervisors.

However, even in the Philippines, a country with a long history of using the participatory approach, it has proved difficult to create many permanent positions for organizers. Most continue to be contractual employees.

Participatory Siting

Innovation in the design of structures and canals for farmer management has had less progress and deserves further support. Agencies build many projects at locations where farmers have long experience building and managing irrigation systems. The Philippines pioneered the use of sociotechnical profiles to gather background information about existing irrigation systems and other local conditions involving community organizers and farmers. Walking through proposed sites together enabled farmers and engineers to discuss design decisions in the field, which helped in the flow of information and established a joint decision-making process for planning. Participation in siting draws on local knowledge of property rights, water flows and soil conditions and it is relatively easy for the agency to recognize that farmers possess valuable information, which they can contribute. It also helps to accommodate farmers' requests.

Pakistan: Strengthening Training Programmes

By strengthening training programmes, the newly established institutions in the irrigation sector, farmers' organizations, can play their role as major stakeholders in the operation and maintenance (O&M) of the irrigation and drainage system. Thus, the target of the Farmer Managed Irrigated Agriculture (FMIA) project was the establishment of the institutions and provision of external support for strengthening the newborn institutions. The capacity-building programme was initiated after the formation of farmers' organizations on distributaries/Minors. Owing to lack of involvement in management, the farmers in Pakistan are not well informed about water resources and their management. The governmental management pattern and the societal structure also kept farmers away from water resources management. In this socioeconomic environment, the task envisaged for farmers' organizations could not be accomplished until an intensive capacity-building programme was organized. The International Water Management Institute (IWMI) under the FMIA project assessed the training needs of the farmers. The training programme organized included social organizer volunteers workshops, awareness on institutional reforms, discharge measurement and walk-through surveys, organizational and financial management, farmers' organization rules, regulations, byelaws, action plans and transfer agreements, crop assessment and *abiyana* collection and workshops on agricultural production practices. In all 2,206 members of watercourse associations, farmers' organizations and agency officials were given training in different fields.

It is a widely recognized fact that without some form of long-term and consistent support mechanism, the rural groups cannot be easily maintained because the change process in rural societies is very slow. Some kind of external support is needed to nurture these newly born organizations and this is likely to be true for farmers' organizations. There is a need to familiarize farmers

with all the skills they would require after the transfer of responsibilities of irrigation and drainage management. The following training needs were suggested: (*a*) effective communication strategy and conflict resolution, (*b*) equitable water distribution after IDMT, (*c*) optimum use of water, (*d*) business plan and (*e*) financial management.

Tajikistan: WUA Members Act to Control their Own Future

Many villages in Tajikistan use water from canals for domestic and irrigation purposes. Despite the importance of this resource, villagers often throw garbage in the canals without realizing the harmful affects their actions have on the health of the community. Through the local WUA—Samarkandi—established under the Water Users' Association Support Programme (WUASP), villagers and officials raised awareness within the community of the consequences of water pollution and what prevention measures needed to be taken. At a WUA general assembly meeting, members approved the Samarkandi WUA and the local community's proposal to host an environmental awareness event on 'How to Avoid Pollution in Canals' at a school. This school serves several villages, including the Mehtari, Samarkandi and Ohchakman WUAs. At the event, members of the WUA discussed the importance of preventing water pollution. Children also read poems, presented a short 'skit' and performed a dance, all related to the importance of clean water and how children can make a difference. In addition, the school organized a Committee for Ecology and Environment Protection, establishing 'patrols' of children to ensure that the water in the channels around the school and nearby areas is clean. More than 200 children participated, along with more than 30 community members (including women) and members of the WUAs. The state-run Tajik television Russian language news programme featured the event, as did local television and radio programmes.

This initiative highlights that with public awareness people can gradually change their perception of the value of water and the need to make it their responsibility to ensure that water best suits their needs. Given that international organizations have limited funding and face time constraints, communities understand that it is critically important to teach children how to prevent and resolve environmental problems. This event was a major step in institutionalizing such environmental programmes in schools.

Tajikistan: WUA Invests in Human Resources Development

Members of the Habib Fozilov WUA in Kabodiyon District, Tajikistan, supported by USAID's WUASP, have realized the importance of actively investing in the professional development of its employees, including women. Developing the skills, knowledge, and capacity of staff can provide high payoffs in increased productivity, expertise and economic success for any organization. The Habib Fozilov WUA selected Ms Anisa Ismoilova as a promising young candidate with high potential to participate in English and computer training organized by the NGO Chashma in Shaartuz. The WUA used its own resources to pay for Ismoilova's training courses. Upon successfully completing the training courses, the WUA board of directors appointed her to

the position of assistant accountant. She now works alongside the WUA manager, Sudur Bigidjanov, assisting with WUA activities, including developing activity and financial reports on a computer in the WUA office. Meanwhile, she continues to diligently study to improve her English to be able to better communicate with experts from international organizations. In the future, the Habib Fozilov WUA plans to invest in improving the capacity of its other members as needed. The WUA understands the value of a greater gender-balanced organization and encourages women to participate in irrigation management to ensure that they have equal rights and benefits.

Experience with Capacity Building in Irrigation System Modernization in South-east Asia

The experience of the Food and Agriculture Organization (FAO) in capacity building and evaluation of large-scale irrigation systems in South-east Asia has indicated the need to consider both hardware and software in the modernization process. The FAO's learning is that management is about much more than farmer participation. In water management circles, there is a new interest in 'professionalization' of management, which is a blind area of PIM in the region. It is often mentioned that the management capacity building of farmers and staff of WUAs is only one side of the picture. The other side is the staff in the government agencies controlling the upper end of irrigation systems, and controlling the policies that determine how water is managed. This level of capacity building is a 'blind spot' of the government agencies and institutes concerned with irrigation management. Capacity building in people-management is seen as a way of improving overall irrigation management.

It was considered important to formulate management capacity-building programmes for government irrigation managers. Capacity building is needed to enable irrigation managers (as well as high-level policy decision-makers) to manage irrigation systems—and the whole irrigation sector—with a true awareness of long-term efficiency and sustainability.

Investment Area

The solution involves providing the right know-how to the stakeholders and improving institutions (IPTRID, 2003). It requires capacity building at every level—from farmers to the government. An integrated approach is needed that goes beyond training and brings wider issues into the picture: applied research and demonstration, technology transfer, community participation, effective governance, technical assistance and institutional development. Capacity-building programmes to assist developing countries in formulating sustainable agricultural water management strategies are a most important strategic investment need for international funding agencies because they act as seed funding for stable and sustainable economic growth.

Current thinking in most international financing agencies is that investment in a programmatic approach will lead to strong domestic drivers for investment. Capacity building should be part of an overall reform programme with full policy

support. Only a strong commitment by policy-makers can create the conditions for trainees to use their new knowledge once they return to work.

TRAINING PROGRAMMES

Training programmes have been held in different countries with a focus on building capacities at various levels. A few prominent ones are described next.

Bari Training Course, Italy

Faced with a clear need for training related to PIM, particularly in the Mediterranean region, CIHEAM/IAMB has worked together with the World Bank and the International Fund for Agriculture Development (IFAD) to develop a capacity-building programme aimed at training in key countries embarking on PIM. Since 1997, the Mediterranean Agronomic Institute, Agronomique Méditerranéen de Bari (IAMB) and Centre International de Hautes Etudes Agronomiques Méditerranéennes (CIHEAM) have been running its course on PIM at Bari, Italy. Experts from several countries in the region attend the course and this is an important sign that both donors and official government authorities are now better recognizing its importance in the development of water resources and are envisaging the required measures. The Bari training course on capacity building for PIM is aimed at helping these countries devise new training programmes and revise existing training programmes as part of the process of implementing PIM reforms. Training of trainees was also another programme that was run jointly with the World Bank and IFAD at Bari. The programme included several brainstorming workshops to discuss plans, policies and strategies for enhancing the PIM concept.

Training Programme in Turkey

The International Network on Participatory Irrigation Management (INPIM) and the State Hydraulic Works, Turkey (DSI) conducts a 10–12-day programme on 'International Capacity Building on Participatory Irrigation Management'. The course is aimed at the faculty of training institutes or consultants who are involved in WUA capacity building, WUA managers, policy-makers and NGOs or government/irrigation agency staff who work with WUAs. The purpose of the course is to improve the effectiveness and sustainability of WUAs and at the policy level to support and strengthen the implementation of national PIM programmes. The course attempts to address the issue of capacity building at two levels by providing inputs in key areas and by facilitating the exchange of experiences among participants to widen the scope and vision of the different actors in the reform process.

The capacity-building programme on PIM seeks to improve the capacity of those working in the field of irrigation management to use participatory management methods as a part of irrigation reform. The programme aims to train up to 45 participants from among irrigation managers, practitioners, policy-makers and trainers involved in national programmes, through a 12-day intensive course that includes lectures, group exercises, discussions and field visits.

Madhya Pradesh's PIM Act and Training Initiatives—A Positive Start

To provide complete know-how regarding the aims and objectives of the Madhya Pradesh PIM Act and its provisions, the first-phase training of trainers was conducted by WALMI for 120 selected and competent assistant engineers (AEs) of the WRD in March 2000. In the first phase, a capacity-building programme for presidents/members of WUAs and lower-level field functionaries was offered in May 2000. In the second phase of training, special attention was paid to the implementation part of PIM.

Master trainers were trained at WALMI in October 2000 and WUAs/field functionaries were trained at district headquarters during January–February 2001 by master trainer resource persons from WALMI and senior officers of the WRD. Apart from this, regular workshops are organized at district headquarters. Problems arising during the implementation of the PIM programme are discussed and every effort is made to solve them.

In addition to this, a regional conference of presidents, TC members and competent authorities was convened at Balaghat in November 2000, which was chaired by the chief minister of Madhya Pradesh and attended by ministers, members of Parliament, members of the Legislative Assembly, district/*janpad* panchayat presidents, etc. Another state conference of presidents and competent authorities of WUAs was convened in Bhopal in December 2001, which was again chaired by the chief minister of Madhya Pradesh. District-wise training of the presidents and competent authorities took place at the Madhya Pradesh Administrative Academy in 2003. A quarterly magazine *Madhya Pradesh Sinchai Sandesh* is published for projecting the PIM activities in the state.

A panel of experts was invited in 2001 to assess the progress of implementation of PIM in Madhya Pradesh and make suggestions.

Refinements Required

Several experienced trainers of the state feel that the following aspects should be the future focus of PIM training:

1. Attitudinal changes for WRD officials at various levels and user organizations.
2. Skills to enhance efficiency levels of water use and land management at the field level.
3. Participatory irrigation management related procedural, administrative, organizational and financial issues.
4. Building and using case studies—both successes and failures.
5. Orientation to NGOs on their role to promote PIM and active involvement of media agencies.

WALMIs/IMTIs

The Water and Land Management Institutes (WALMIs) are institutions with a mandate for training in PIM-related issues. There are 13 WALMIs in different states in India. These have been set-up to help irrigation departments to grow out of the 'construction mode' and make a transition to 'management mode' though high quality, broad-based training of irrigation department staff and farmers in the command area. All the Water and Land Management

Training Institutes or (in some states) Irrigation Management and Training Institutes (IMTIs), established with USAID support during late 1980s, have good and vast infrastructure for training activities. The Command Area Development and Water Management (CADWM) wing of the Ministry of Water Resources supports national-level training courses as part of the capacity-building process for promoting PIM. Over the years, the institutions have been neglected (in several states). Some of them (for example, those in Maharashtra, Madhya Pradesh and Andhra Pradesh) have been given a key role in providing training to both officials and farmers on various components of PIM. Several of these institutes are in need of proper attention from the WRD and good leadership on a continuous basis. Unfortunately, in most states, chief engineers close to retirement or officers without much experience or interest in training are posted as directors of these institutes. This has been a reason for the decline in the activities of these institutes. They need to be re-engineered and converted into more autonomous organizations to cater to the emerging needs of the respective states. They require more professional staff to be more competitive and take up allied activities. This would help them become self-sustainable in the long run.

In recent years, several WALMIs have attempted to craft themselves within the given constraints. Andhra Pradesh has hired professionals from the open market; Madhya Pradesh has converted its WALMI into a hub of training activities for rural development, agriculture, drinking water and sanitation besides water resources. The Madhya Pradesh WALMI is tied up with a series of training programmes and earns enough funds for its maintenance. It has also brought in an Indian administrative service officer to head the institution and streamline its operations. The Madhya Pradesh WALMI, which was earlier under the control of the WRD, is today under the control of the rural development department. In the case of Gujarat, though attempts were made to re-engineer WALMI, they could not fructify in practice.

Bihar

The Bihar WALMI, based in Patna, was started in 1987 with support from USAID, under the Indo-US Water Resources, Management and Training Project. As part of this project, WALMI took the lead in initiating the action research project in the Paliganj area of the Sone command area. In Bihar, this was the first step towards PIM in major canal irrigation systems.[1] This action research was started in 1988 and the Paliganj distributary was one among the four irrigation systems. The committed team of engineers and sociologists, hired by WALMI, and organizational behaviour specialists from the A.N. Sinha Institute of Social Sciences, Patna, collaborated in this activity for nearly four years. Even after the closure of the USAID-funded project, WALMI continued (though on a lower scale) to strengthen the Paliganj WUA.

Based on Paliganj and other (including Gara Chaube and the Jamunia branch canal) experiences, WALMI continuously worked to promote WUAs in Bihar. Over the years, WALMI organized several training programmes for senior, middle and junior officials and organized a large number of capacity-building activities for farmers and WUA office bearers.

The efforts made by WALMI were focused mostly on enabling better performance[2] of the WUAs in terms of (*a*) increase in irrigated area, (*b*) increase in conveyance capacity of the canals, (*c*) more confidence in farmers on timely availability of water, (*d*) significant decrease in number of breaches during irrigation and obstruction to water flows and (*e*) increase in crop productivity by 1.5–2 times. All this was possible with active support from the Sone Command Area Development Authority (CADA), which enabled it to construct field channels in 17 villages. In another 35 villages, work is under progress. The state is also encouraging WALMI to undertake experiments in irrigation management transfer (IMT).

To cover 50 per cent of the total culturable command area (CCA) of the created Major and Medium irrigation potential of the state under PIM during the Tenth Five-Year Plan, farmers are being motivated and trained to take up this programme and field officers of the WRD are being trained to promote this programme amongst farmers. A separate wing is functioning in WALMI, which organizes training programmes in Patna as well as in fields for officers and farmers. Handbills and related information, booklets, etc., are distributed during these training programmes. The help of the media is being taken for wide publicity of the programme and to create awareness amongst the farmers.

Madhya Pradesh

The Madhya Pradesh WALMI is based in Bhopal and it provides year-round training programmes.

1. In the first phase, orientation was provided to select 120 AEs of the WRD during March 2000. In May 2000, training was provided for WUA presidents and executive members along with lower-level field functionaries of the WRD.
2. In the second phase, stress was on the implementation of PIM. To begin with, training of trainers was organized at WALMI for a month in October 2000. District-level training programmes were organized for WUA functionaries in early 2001 with support from WALMI.
3. Several workshops were organized at the district level to exchange views across WUAs and WRD functionaries of both district and lower levels.
4. Regional workshops for WUA presidents, TC members and competent authorities were organized during November 2000. The chief minister, other ministers, local MLAs, MPs and others chaired some of these regional workshops.
5. In October 2001, an expert committee on PIM visited Madhya Pradesh to observe the progress made in implementing PIM.
6. In December 2001, a state-level one-day conference was organized in Bhopal for WUA presidents and competent authorities. The chief minister, deputy chief minister and the chief secretary of Madhya Pradesh chaired it.
7. Till 2003, WUA presidents and competent authorities, in batches of 30 each (15 WUA presidents and 15 competent authorities) were trained by the Madhya Pradesh Administrative Academy.

8. A quarterly magazine—the *Madhya Pradesh Sinchai Sandesh*—is published for presenting PIM activities in the state.

WALMI's Role in Promoting PIM

Several steps taken by WALMI, Madhya Pradesh, have led it to be a good facilitator for promoting PIM in the state. These include: (*a*) action research programme in the Samrat Ashok Sagar Project, (*b*) establishing a community sprinkler irrigation system in the Barna Project, (*c*) pilot project on the development of FMIS in the Barna and Samrat Ashok Sagar projects, (*d*) farmer's training programme on PIM, (*e*) organizing visits of Madhya Pradesh farmers to other states, (*f*) providing assistance in the formulation of the PIM Act, 1999 (*g*) organizing several state and regional-level training programmes for WRD officials of various levels and for farmers, WUA presidents and office bearers, including the training of trainers, (*h*) developing modules in association with the WRD for training programmes, (*i*) follow-up strategy for PIM—six years follow-up programme for each WUA, follow-up training for DCs and PCs and training programmes on PIM for senior-level officers of the WRD.

MAHARASHTRA: EFFECTIVE AND POSITIVE INITIATIVES IN THE KATEPURNA PROJECT

Formation of WUAs and the need for the efficient utilization of water was propagated through newspapers, radio, exhibitions, pamphlets and posters to encourage farmers to participate in irrigation management. Slogans on PIM and efficient use of water were written on compound walls, canal structures, offices and public places to promote collective action.

Katepurna Silver Jubilee Function

The beneficiaries felicitated the project-affected people for their sacrifice, the engineers and the government in the silver jubilee function. It was a unique gathering of society, government and media. The chief minister of Maharashtra called for such programmes to be organized at other project sites to honour the contribution of such projects towards national development.

Establishment of the NGO Sinchan Sahyog to Promote the Efficient Use of Water

Sinchan Sahyog is an NGO established at Akola to promote the efficient use of water. It was established with inspiration and guidance from Dr Madhavrao Chitale, former secretary-general, ICID. The working committee comprises irrigation engineers, agricultural industrialists, seeds experts, economists, MLAs, media personnel and farmers. The broad objectives of the organization are to promote strategies for the efficient and effective use of available water resources, to undertake training programmes and to encourage people's participation in irrigation management. The Akola centre has contributed in educating, training and providing solutions to farmers. Sinchan

Sahyog has taken an active part in promoting farmers to form WUAs and to adopt improved irrigation practices. It has also undertaken a drive in water literacy by organizing small workshops for farmers by demonstrating to them the methods of water measurement and water accounting. The organization's website is www.sinchansahyog.org.

Maharashtra Irrigation Conference 2001

A two-day state-level conference on 'Irrigation in 2000' was organized at Akola on 20–21 January 2001. The conference was devoted to irrigation management, development in farming systems, water literacy and women's participation. The attendance at the conference was overwhelming with around 500 participants, including political big-wigs and senior officials of the state and scientists. The message of water conservation was spread wide in the region after the conclusion of the conference. It was for the first time that such a large gathering was organized in the region on the issue of water conservation.

Computerization and Website

Computer laboratories were established in the divisional as well as sub-divisional offices with five computers. In the first stage, computerization of basic records, water account settlement invoicing, etc., was undertaken to enable better system management. A software—Irrigation Management and Information System—has been developed by the Akola irrigation division for complete processing of data from water demand, application to billing of water charges for efficient and timely irrigation management. To provide timely information on irrigation management and to create general awareness, a website—www.irrigationaid.org—was launched.

GUJARAT

The following estimate for training has been worked out on the recommendations made by the training group on PIM in Gujarat.

1. Training for farmers: Gujarat has 18 Major (having a command area of more than 10,000 ha), 165 Medium (having a command area of 2,000–10,000 ha) and 5,000 Minor irrigation projects. Some 1.8 mha of land is under the command area of these irrigation projects. The PIM law will be applied in about 1.5 mha of the command area, since the task force has recommended the exclusion of Minor irrigation projects having an area of up to 500 ha now managed by the panchayats. The Sardar Sarovar Narmada Project which has the potential of a command area of another 1.8 mha is not included in these estimates, as the Sardar Sarovar Narmada Nigam Limited (SSNNL) has been pursuing its own independent PIM model. The task force is of the view that the strategy and plan of action may also be considered for adoption by SSNNL authorities to the extent they are compatible with the Narmada PIM model.

   It is envisaged that: (*a*) there would be 5,000 WUAs formed in a command area of 1.5 mha at the primary level, by assuming that an

area of 300 ha will be covered by each WUA, (*b*) there would be 500 distributary committees (DC) formed in a command area of 1.5 mha at the secondary level by assuming that a command area of 3,000 ha will be covered by each DC, (*c*) there would be 100 projects committees (PC) formed in a command area of 1.5 mha of 10 Major and 90 Medium irrigation projects at the project level, (*d*) in the case of Minor irrigation projects having a command area between 500–2,000 ha, there will be a one/two-tier system as proposed by the task force with WUAs at the grass root and PCs at the upper level, or only one PC covering the entire command area.

The task force further suggests that an intensive training programme needs to be prepared. The existing farmers and farm women training centres (under the agricultural department) and other infrastructure available should be utilized for conducting such capacity-building programmes so that a large number of farmers can benefit. Training organizations identified by the Training Group on PIM offer these programmes in their operational areas.

2. Training for government staff: At present, there are about 3,000 section officers and 500 deputy engineers and executive engineers working in the irrigation department. They are involved in the design construction and management sector of the department. As their job is transferable, all would need to be trained on PIM. On the assumption that there may be a turnover of staff at a rate of 20 per cent, it is estimated that nearly 3,000 section officers and 500 deputy engineers will need to be trained about PIM. The task force is of the opinion that a wide range of resource persons would be required for the training programme. Outstanding religious leaders who can effectively motivate people, and academics from IIM, IRMA, AMA, and outside the state may be approached for conducting training programmes.
3. Training of NGOs: Development workers of NGOs would be included in the training programmes of the section officers/farmer leaders by the respective training organizations. As recommended by the Training Group on PIM, WALMI, AKRSP, DSC and Sadguru would be part of this training.
4. Strengthening WALMI: WALMI, has tremendous potential to play a leading role in capacity building once PIM is enacted by law. WALMI has excellent infrastructure and other facilities, which are essential for the smooth functioning of any training institute. To convert WALMI into an institute of excellence, the government constituted an expert group to study the functioning of WALMI. After studying the working of 32 high-performing institutes of the country, the group drew lessons that can be applied for setting up a new institute or transforming an existing mediocre institution into an institute of excellence. The expert group has suggested three alternatives for transforming WALMI into a high-performing knowledge institute. It would be proper to have the report processed early. It has also been suggested that there is a need to improve the working of other water-related

institutes in the state to institutes of excellence. The estimated cost is Rs 87.5 million.

5. Participatory Irrigation Management Facilitating Team (PIMFT): For implementation of PIM by department officers, the PIMFT would be constituted at the circle level to support WUAs and distributary committees in attending to their various functions. The team will consist of professionals and work exclusively for promoting PIM that requires motivating and organizing farmers to take up new responsibilities, capacity building, continuous monitoring and providing guidance including hand-holding operations. The PIMFT will be constituted throughout the state, serving all Major and Medium irrigation projects.

The PIMFT will function under the respective superintending engineer according to the guidelines. The superintending engineer, supported by a competent selection committee, will nominate them based on their suitability, taking particular care that they are not substandard 'spareables'. The duration of the implementation of the PIMFT would be five years. If sufficient regular staff is not available, graduates of rural institutions such as Gram Vidyapeeth Sanosara, Saraswati Vidyapeeth of Samoda (Mehasana District) and NGO workers with the requisite qualifications may be appointed on the PIMFT on appropriate remuneration. For the discipline not available with the department, officials could be taken from other departments on deputation or from the open market on a contractual basis.

It is envisaged that 30 PIMFTs for a command area of 50,000 ha will be required to facilitate the implementation of PIM in the state. Approximately Rs 150 million would be required for community organizations, salaries and travelling expenses of 30 PIMFTs over a five-year period. As per government policy, the participation of NGOs in the implementation of PIM should be welcome. Non-governmental organizations may also constitute such PIMFTs at the circle level, if it is mutually convenient. They would be assisted financially on the same norms as mentioned earlier. The policy followed by SSNNL in its command area for community organization and facilitating work for PIM may be considered while finalizing the details of the PIMFT.

6. Independent division for PIM: An independent division for PIM needs to be established consisting of professionals from the fields of engineering, agriculture, economics, social sciences management, planning, statistics and gender equity.

7. Role of NGOs (see Chapter 11 for more details): Once PIM is established by law in the state, the NGOs which are involved in PIM implementation will focus more on the software area to make PIM a real success. Some recognized NGOs like DSC, AKRSP and Sadguru and relevant experts would also contribute their services to provide regular feedback on the programme to the commissionerate of PIM. Also, these experienced NGOs will be entrusted the work of helping the government on software aspects like communication, research, policy and the like. These NGOs may be compensated for their support.

MONITORING AND DATABASE

Gujarat

The PIM directorate has been set up at the state level as part of the WRD.

1. At the chief engineer level, one SE has been nominated as SE for PIM to monitor PIM implementation.
2. At SE level, one of the EE has been nominated as AE for PIM implementation.
3. The district collector makes a monthly review of PIM and works undertaken. One EE has been made a nodal officer for the district to assist the collector for review meetings.
4. The EE for PIM holds monthly meetings with WUA presidents to review PIM and provides feedback to the state PIM directorate.

Maharashtra

In Maharashtra, the monitoring task has been entrusted to the Directorate of Irrigation Research and Development (DIRD), Pune. The DIRD officials collect information regarding PIM activities from the irrigation officials on a continuous basis. The DIRD presents a bi-monthly status report. Project-level monitoring is supposed to be done by field officers for which guidelines have been laid in the document related to WUAs. But in practice, the DIRD has inadequate staff. The existing staff have to do all this work in addition to their regular work. The DIRD can only suggest the measures, but has no authority to implement them.

Developing Database on WUAs—Maharashtra and Andhra Pradesh

Maharashtra and Andhra Pradesh are working on developing a database and updating it on a regular basis. The database would help in grading WUAs based on their performance and would help understand key elements like (*a*) crop patterns, (*b*) collection of water charges, (*c*) water discharged, (*d*) water use efficiency, (*e*) season-wise area irrigated and (*f*) organizational details, including number of meetings held, conflicts, if any, and other details. In Maharashtra, the DIRD, Pune, has collected data for 414 WUAs out of a total of 1,127 WUAs. Tabulation is yet to take place.

In Andhra Pradesh, a rapid survey was carried out during early 2006 to understand the performance of tank-based WUAs.[3] The state has 11,277 Minor irrigation sources, which are under the control of the Minor irrigation department. For the first time in the country, the state did a survey to understand the performance of its tanks and tank-based WUAs. The rapid assessment survey covered each Minor irrigation source—tanks, *anicuts*, overhead channels, lift irrigation schemes and the like. The engineering staff of the Minor irrigation department and local NGOs participated in the collection of data. The information collected relates to the type of source, capacity, tank bed area, borewells and other wells in the command area, designed command and actual area irrigated in the last five years, water levels during the last five years, reasons for gap, the present status of structures like bunds, surplus weir, siltation, growth of weeds, encroachment, expected cost of restoration, expenditure on operation and maintenance and other maintenance during the last five years. In addition to this information, the status of functioning of each WUA like number of farmers, female farmers, Scheduled Caste and Scheduled Tribe farmers, involvement of farmers in the maintenance of structures, tax collection, regulation of water, SRI paddy cultivation, productivity levels,

information on social capital like *rythu mithra* groups (farmers' groups) and self-help groups in the villages was also collected.

The key findings of the Andhra Pradesh survey are as follows:

1. More than half of the tanks (56 per cent) have a command area of less than 200 acres. Tanks having a command area of up to 500 acres constitute 81 per cent of the total. One per cent of the tanks have a command area greater than 2,000 acres, while 12 per cent of tanks have a command area greater than 500 acres and less than 2,000 acres.
2. Information on the status of structures like tank bunds, surplus weirs, sluices, shutters, Minor channels and feeder channels were collected. The responses have been registered as good, satisfactory or unsatisfactory. Sixty–Seventy per cent of the Medium irrigation tanks have structures that are in good physical condition, while roughly 30 per cent of tanks have structures that are in a satisfactory state and the remaining are in an unsatisfactory state. Minor channels are in good condition in up to 70 per cent of the tanks followed by shutters in about 68 per cent of tanks. The status of surplus weirs is unsatisfactory in up to 12 per cent of tanks.
3. The distribution of Minor irrigation tanks based on water levels for the past five years is as follows. In 2000–01, about 32 per cent of Minor irrigation tanks were full, while in 2002–03, only 15 per cent of tanks were full and more than half (55 per cent) of the tanks received only 25 per cent of water inflows. Over the period of five years, about 15 per cent of tanks have been filling up to half their capacity.
4. About 36 per cent of tank farmers are aware of *warabandi* and are implementing it. In 23 per cent of the cases, *warabandi* has been successfully implemented. However, in 64 per cent of the tanks, *warabandi* is not being implemented. Of this 64 per cent, 33 per cent are aware of *warabandi* and are not implementing it, while 31 per cent are not aware of it.
5. The survey has captured the distribution of tanks based on the awareness levels of tank users. It is found that in about half (47 per cent) of tanks users are not aware of SRI (system of rice intensification). In 53 per cent of tanks, farmers are aware of SRI. In 14 per cent of tanks, farmers have agreed to take up SRI. In 17 per cent of tanks, farmers need technical know-how to adopt SRI.
6. Distribution of tanks based on the demand and collection of taxes has been arrived at as one critical finding of the assessment. In 20 per cent of tanks, the tank users are not aware of tax collection. In 44 per cent of tanks, the tank users are aware, but have not taken any steps to take up tax collection. In 36 per cent of tanks, users are aware and have taken up tax collection. In 14 per cent of tanks, the collection is up to 50 per cent of the total stipulated amount, while 10 per cent of tanks have collected between 51–75 per cent of the stipulated amount and in 12 per cent of tanks, collection is above 75 per cent of the stipulated amount.

POTENTIAL BENEFITS

The benefits of capacity-building programmes have been as follows:

1. Higher irrigation efficiency and productivity for irrigated agricultural production ('more crop per drop').
2. Enhanced sustainable livelihoods for people involved in irrigated agriculture.
3. Protection for soils and reduction of waterlogging and salinization.
4. Protection for people and land against water damage through flood mitigation.
5. Collection of run-off through water harvesting.
6. Better water resources management to conserve water supplies and quality.
7. Enhancement of water management capacities at the farmer's level.
8. Reduced financial expenditure to the government.
9. Building capacity with the right approach by identifying needs and gaps in current capacity to get best responses for specific needs is beneficial. The strategy will be most effective if it combines the right mix of interventions at different levels, according to the identified needs.
10. Field research and sorting problems help in tying up the fragile linkages. Process documentation research emphasized monthly reports and quick reporting while there is time to respond constructively to the problems. Much conventional research emphasizes questionnaire surveys and other quantitative methods, which are often not relevant to issues that affect implementation (Korten, 1980). Process documentation stresses qualitative research focused on problems. Researchers are able to be flexible about gathering information from many sources and following up new developments. The principal elements thus, are a problem-oriented approach, quick reporting of information and responses from senior officials.

NOTES

1. In minor irrigation systems and for tubewell-based irrigation, NGOs took the lead in the early 1980s to set up user organizations. These have been very successful in different parts of the state, for example, Vaishali Area Small Farmer's Association (VASFA) and Gangoi Area Small Farmer's Association (GASFA) in north Bihar. The VASFA model was one of the successful models of group wells promoted and functional in Vaishali and Muzaffarpur districts of Bihar. This was supported by CAPART, Government of India, during the early 1980s. This model has demonstrated that small and marginal farmers can form small groups to jointly invest in wells to extract groundwater at reduced per person costs and also enhance tubewell pump run hours per year. The VASFA also provided both backward and forward linkages to enable member-farmers to gain maximum benefits under this model. For more details, see Brewer et al. (1999).
2. See Chapter 5 for a discussion on the Paliganj WUA.
3. The Irrigation and Command Area Development department of the Andhra Pradesh government has carried out during 2005 a rapid survey of all Major, Medium and Minor irrigation projects based WUAs to understand their performance and status. The key findings presented here are based on that rapid survey and based on the *Jalayagnam*, a report released by the government of Andhra Pradesh in 2005.

Institutional Reforms

Chapter 9

This chapter provides an overview of institutional bodies set up for participatory irrigation management (PIM) and related issues. Efforts in Pakistan, Tajikistan and Karnataka towards irrigation financing and in Bihar and Madhya Pradesh towards PIM provide insights into their experiences. Other institutions like the Water and Land Management Institutes (WALMIs) are also discussed.

The limited success of the previous wave of PIM reforms in Asia has led some analysts to the conclusion that these reforms had been incomplete and that it was necessary to deepen the institutional reforms to ensure that they were successful. It has also led to an interest in importing to Asia reform models from other regions, particularly Latin America, which are expected to be more successful. The level of chaos (difference between stated policies and actual policies) and of anarchy (subversion of policies) in the formal irrigation systems of the region, which comprise the great majority of irrigated areas with the exception of certain countries (Afghanistan, Nepal, Laos PDR), is often rather high. While lack of discipline and institutional issues contribute greatly to this situation, many of the problems can be traced to: problems in initial design; export of design concepts outside of their area of validity; difficulty in controlling and operating the systems; layouts with confused hierarchies; serious flaws in operation strategies; inconsistencies between operating rules at various levels and between operating rules and farmers' requirements; changes in farmers' requirements not reflected by changes in system policies; poor quality of the water delivery service to farms; and lack of flexibility at all levels. However, efforts in reforms at the institutional levels have led to significant impacts.

INTERNATIONAL EXPERIENCES

Farmers Police Irrigation Systems: Pakistan's Experience

By managing their own irrigation systems, farmers are helping to stop water theft, a chronic problem in Pakistan. Farmers empowered with rules to run their own irrigation systems have found ways to deal with problems that successive governments failed to resolve in decades. The newly set up area water boards (AWB) and farmers' organizations have effectively prevented illegal use of the community resource and have helped generate revenue for the central coffers. Pakistan began forming farmer groups and regulatory bodies to promote ownership of irrigation systems. The early results of the policy shift are already evident. An evaluation of the performance of 85 farmer groups of the Lower Chenab Canal (East) Circle, shows that many farmer groups have attained 100 per cent reduction in water theft.

The average recovery of water tariffs has also grown to about 75 per cent compared to 52 per cent when the government operated the system. The public system was corrupt and large farmers could use more water than what they paid for while the poor did not get adequate water as a result of which they refused to pay.

The problem had become acute and sometimes farmers would even pull down canal banks to let water flow into their fields or siphon it using pipes in collusion with officials of the irrigation department. Even though theft is punishable under the law, flouting the rules had almost become cultural and people had begun to take pride in stealing water and cheating on tariffs. The Provincial Irrigation and Drainage Authority (PIDA) was formed in 1997 to promote PIM in the Punjab Province. It then transferred irrigation management responsibility to autonomous bodies at three tiers—the PIDA, AWBs and the farmers' organizations. Management transfer is funded under the Rs (Pakistani) 27 billion (about US$ 450 million) National Drainage Programme (NDP). The irrigation management programme is funded entirely by the provincial government. The new institutions are the government's response to the deterioration in irrigation management, including poor maintenance, says Sajjad Siddiqui. According to him, 'Practically no one owned the systems, but everyone was using them.' Under the PIDA Act, farmers' organizations are put in charge of policing field-level distribution, controlling theft, resolving disputes and collecting water tariffs. In return, they get to use 40 per cent of water tariffs to meet operation and maintenance (O&M) costs. Each farmer group has nine members elected by water users and must include three members from the most disadvantaged sections of the community.

This arrangement has led to some panic among the staff at the irrigation department who now fear that they could lose their jobs. The farmer groups also have authority to hire and fire employees—so they are in full control. Today many government employees have begun to seek jobs at the newly created institutions, including the farmer groups. Every farmers' organization is given water strictly in accordance with the collective requirement of areas under its jurisdiction. If any one steals water, he deprives another farmer of his rights and no one is ready now to let go of a single drop of water from his share. People who take more than their share or steal are first issued warnings and those that continue to do so after being warned are charged fines as high as 20 times the price of the stolen water. When everyone uses a fair share, even those at the tail-end of the canal get water. Officials at PIDA said that putting the system in place was not easy especially because of the opposition by farmer groups that had found ways to beat the system. Social mobilizers were recruited to visit rural areas and explain the idea to the local people; the system was introduced only after people were convinced of the benefits of participatory management. The system has been so successful that other provinces have begun following the path shown by Punjab.

Non-functional WUAs in Beni Amir, Morocco

During the field research period it was observed that there is no communication between the members of the WUAs and

their leaders, which led to a situation in which either farmers did not recognize their WUA board, or were simply not aware about the existence of WUAs. Furthermore, no difference in irrigation management was noticed between sectors organized in WUAs and sectors which were not: it was found that water management, allocation, distribution, control, invoicing and maintenance was the same, with and without WUAs. The objective of ORMVAT[1] is the implementation of a privileged dialogue and effective participation of farmers in the orientation of the mode of management that has to be adopted by ORMVAT. However, no difference in communication between ORMVAT representatives and farmers could be traced in the locations with and without WUAs (individual farmer contacts are directly with the *aiguadier* or with distribution staff). Also, WUAs do not have much responsibility in irrigation management.

The following constraints were detected in PIM implementation:

1. A strong paternalistic feeling—the 'weight of history': The government, first by the intermediary of the French colonist and later on by the intermediary of the Moroccan state through the ORMVAT, always had and still has a strong role in the functioning of the (state initiated, planned, designed, constructed) irrigation system. Indeed, ORMVAT is till now responsible for the distribution and allocation of water, from the principal canal of the irrigation system to the individual farms. It executes and controls maintenance and is responsible for the rehabilitation of the system, from the largest to the smallest canals. It is ORMVAT that collects water fees paid by farmers, controls the volume of water that should be given to each of them, at the moment of its choice. It also has a considerable role in spreading information about agriculture in order to plan the crop cycles and to provide adequate agronomic advice to farmers.
2. Though ORMVAT progressively disengaged itself from some activities (supply of seeds, fertilizers, control of agricultural transformation activities such as sugar refineries, milk cooperatives, etc.) it still maintains close relations with these activities, by means of some subsidies and by being member of the board of directors of these organizations.
3. Strong state intervention has slowed down the process of PIM implementation because it has led to a situation in which (*a*) the farmers do not want to take over the responsibility of irrigation system management and (*b*) the ORMVAT staff do not want to lose their responsibilities and tasks (and their jobs). Irrigation management has always been the job of the government and nobody sees the necessity to change it.
4. There is a lack of real motivation for the central government to give up its role of irrigation manager and therefore there are no real incentives for improving the PIM process.
5. The lack of a precise framework along with some institutional barriers is even a disincentive for the functioning of WUAs. Furthermore, because of the high rate of illiteracy of farmers (more than 70 per cent are illiterate), the democratic process of elections is affected (the election of WUA leaders is done by a show of hand) and there is room for manipulation. Farmers

are afraid that the WUA leaders will use their power to serve their personal interests instead of serving the interests of the community as a whole, which is also a factor that slows down the PIM process.

6. Even though local conditions in Beni Amir somehow fit with some points of the theory related to irrigation management transfer (IMT) (water scarcity should simulate irrigation reform, the relatively good performance of the infrastructure should permit that the IMT programme take-off relatively 'quickly', availability of cash money for farmers to pay water fees), real IMT programmes did not come off the ground in Beni Amir. Indeed, the actors' expectations and local specificities have to be taken into account: (*a*) the irrigated perimeter of Beni Amir, as it is managed nowadays by the ORMVAT, functions relatively well, (*b*) the government has some priorities that it does not want to change, (*c*) the staff at the ORMVAT does not want to lose its position as irrigation manager and (*d*) farmers do not want, and do not have the capacity, to take over irrigation management.

However, in the context of worldwide liberalization that also affects Morocco, the strong bureaucracy of ORMVAT is likely to face a restructuring and redefinition of its tasks and administrative organization in the coming years. Indeed, pushed by development banks and international trade negotiations, the Moroccan government is likely to restrict budget expenditures, which could imply the necessity of reforming the partly subsidized ORMVAT. Furthermore, in the context of liberalization, the government will be obliged to change its interventionist role, which will also lead to the reorganization of the irrigation agencies in Morocco.

Irrigation reforms in Morocco imply a lot for the country:

1. A drastic change in its agricultural policy, a complete redefinition of the actors' roles and a strong disengagement of the state from irrigation management.
2. The switch from the actual situation to a more liberalized one cannot be done overnight. Socially, politically and technically it implies modifications that will certainly not be achieved without conflicts.

Many elements have to be taken into account concerning the implementation and formulation of irrigation reforms. Studies concerning existing irrigation reforms are helpful in drawing lessons that may be adapted to local conditions rather than having to find a standardized solution. Indeed, many studies reveal the danger of implementing 'standard models' as blueprints. Processes are complex and context specific and this has to be taken into account in irrigation reforms. This study confirms that sociopolitical analysis is necessary because it informs on whether irrigation reform is a process that comes from a need to reform or whether it is the result of external pressure by development funding agencies. It can make more grounded choices for courses of action and approaches. It is an essential element in a reform process that also wants to learn from experience and develop and improve itself on the basis of that experience.

This analysis shows that the existence of a strong central government can be, at the same time, a catalyser and a restraint for the PIM/IMT process: a catalyst because real motivation of the central government can speed up the process, but a restraint because of the difficulty to change strong bureaucracies.

Reform of Governance of the Office du Niger in Mali

Contracting irrigation management, in conjunction with upgrading of fields, canals, rice varieties and cultivation practices, can multiply paddy yields per hectare by a factor of three and per cubic metre of water by six and result in good farm incomes as well as improve the government's finances. This is demonstrated by the reform of the Office du Niger in Mali, an agency that manages the head works and distribution network of a 60,000 ha irrigation scheme in the interior delta of the Niger River in West Africa. During the 1970s and much of the 1980s, the Office du Niger suffered from yields around 2 T/ha and a cropping intensity that dropped to 60 per cent. Farmers were forced to sell their paddy to the Office du Niger that enjoyed a monopoly on marketing and milling. Sale of paddy to merchants resulted in the farmer's eviction from the scheme and from the area, since farmers were only tenants of their fields and the entire delta was administered by the Office du Niger. Farm prices were low and the ability and willingness of farmers to pay the water fee limited, if not lacking. Fee income was largely insufficient to maintain and operate the canals.

The agency's 4,000 staff ran not only the irrigation network, but also supplied seeds, fertilizer and insecticides, provided extension, stored the paddy, worked the rice milling factories, ran a seed farm, produced farm equipment, managed guest houses and restaurants, staffed health clinics and ran literacy courses. Because of this nearly complete vertical integration, the agency was all-powerful and in the absence of transparency and accountability mechanisms, numerous, but not all, staff engaged in rent seeking. This vertical integration was useful when the scheme was under construction, for then the interior delta of the Niger was almost uninhabited. However, after construction and the development of roads and towns, vertical integration gradually lost its meaning and instead became a source of inefficiency and lack of accountability. The scheme survived through major annual infusions of funding by the Government of Mali that turned to donor governments for financial and technical support.

Reforms and Further Changes

In 1979, a round table of representatives of the government, the Office du Niger and the donor governments reached consensus on the need for reforms and initiated a reform process that in 1995 reached temporary closure. At that stage, farmers had become free to de-hull paddy and sell rice to whom and when they wanted and to buy inputs where and when they chose. All non-irrigation activities had been privatized, a first three-year performance contract had been signed between the minister of finance of the Government of Mali, the chairperson of the board of the Office du Niger and two elected representatives of the farmers. The Office du Niger was established as a public enterprise with full financial and administrative

autonomy and two co-decision making mechanisms involving staff and farmers became formal components of the management structure.

The first co-decision making procedure concerns O&M. Between 50 and 60 per cent of all income from water fees must be spent on the maintenance of the scheme's distribution network, depending on its technical quality. This network is split into five units, called zones that receive their share of the annual O&M budget based on their share in collection. Priorities are set in co-management committees at the tertiary, secondary and primary levels, composed of representatives of farmers and O&M staff. Once preliminary priorities are set, O&M staff costs them and a final decision is reached. All maintenance is contracted out to private agents. Farmers on the committees received training in bid handling and inspection of work is no longer done by O&M staff, but by independent commercial verification agencies.

The Office du Niger collects fees. Enforcing fee payment is a two-stage process. During the first phase, the committees prepare proposals to the management for the eviction of farmers with arrears. During the second phase, the director of the zone approves the list and forwards it to the managing director for implementation. Sanction for non-payment of the fee is severe. Since the farmers are tenants, they may be evicted from their land. Eviction occurs every year and is therefore a credible threat. The process has two advantages in that it links maintenance to fee payment and allows for the temporary consideration of local attenuating circumstances.

The other co-decision making procedure focuses on the three-yearly performance contract between the Ministry of Finance, the Office du Niger and two representatives of the farmers. The latter are elected by the inhabitants of the villages in the area through a two-tiered process just before the start of the negotiation of the new contract. Since the government owns both infrastructure and land, the Office du Niger and the farmers are formally engaged only in managing these assets. The contract sets the water fees, details the part that must be spent on maintenance in each zone and sets goals for increases in cultivation intensity, new construction and rehabilitation. It also defines how funds will be managed, how the contract will be monitored and what rights and obligations farmers have.

Farmer rights increase slowly. During the negotiation of the current contract, farmers obtained the right that the monitoring of outsourced maintenance be transferred from O&M staff to independent commercial verification firms. The contract defines the services that the government purchases from the Office du Niger and sets the price. In the current contract, the government buys such services as the design and supervision of rehabilitation and construction projects, the O&M of the head works, the maintenance of a register of land tenancy titles and the provision of extension and functional literacy training to the farmers.

Some Major Outcomes

1. In many zones, paddy yields climbed from 2 T/ha to 6.5 T/ha; water use dropped from 1,500 m^3/T to 250 m^3/T, an increase in the crop for drop ratio of 600 per cent.

   Cultivation intensity in the majority of the zones rose from 60 to 115 per cent. Income from one

season of paddy, on an average-sized farm of 3 ha in these zones equals 877,500 FCFA (that is equivalent to US$ 1,350 at Euro 0.88 to US$ 1). Other sources of farm income are vegetables, which at the level of the scheme yield an income equal to 30 per cent of the income from paddy and livestock. The number of hectare per staff increased from 13 to 170. Collection rates in the well-rehabilitated zones are practically 100 per cent. Water fees in those zones equal 8.5 per cent of gross value of output (calculated at FCFA 110/kg).

2. Sustainability of the network is now assured to the point that private companies are investing in the provision of small farm equipment and the construction of a 1,000 ha scheme to run a seed farm, and donor governments are now funding extensions. After nearly 40 years of stagnation, the command area is expanding again.

Four Defining Features

1. One defining feature is the absence of WUAs. The absence of WUAs may historically be linked to the efforts in the 1980s by the Government of Mali to make the multipurpose villages associations also responsible for irrigation matters. At the same, the co-decision and co-management procedures emerged from a donor-funded project and these were embraced by parts of the Office du Niger staff in the face of the relative ineffectiveness of the village associations. Literacy on the scheme appears to be 35 per cent and it may be argued that these procedures well match an environment where administrative and accounting skills are scarce. The co-decision and co-management procedures find their legal basis in a presidential decree that defines the new mode of operation of the Office du Niger.
2. Another feature is the fact that fees are collected by the Office du Niger, which also implements the sanction of evictions and handles court litigations.
3. The third main feature is the degree of transparency. The farmers on the canal committees know the fee income that the headquarters collect in their zone and the percentage that the headquarter must return. They also know the composition of the zone's budget and are in a position to track expenses and staff use of resources (vehicles and telephones). Farmers in the villages are involved in the negotiation of the performance contract and the final version is translated into the local language and communicated in village meetings.
4. Co-decision, co-management and transparency of budgetary arrangements together create accountabilities between the Office du Niger staff and farmers. It provides farmers with an ability to pay, through improved incomes, as well as a willingness to pay. In combination with the staff's technical skills, they assure the sustained existence of the distribution infrastructure. The core of the institutional changes can be summarized as corporatization of the agency and contractualization of its links with the government and farmers. The technical staff is now accountable to both hierarchical superiors as well as to representatives of farmers.

EFFORTS IN INDIA

A number of expert committees have expressed the desirability of improving the management of irrigation systems so as to make them more responsive to the needs of user cultivators. However, experience shows that this will not succeed unless these systems are distanced from political interference and debureaucratized. The recent debate on these issues among the experts all over the world has resulted in a remarkable consensus on the need to (*a*) make the project authorities financially accountable by according them operation autonomy; (*b*) associate the user farmers with decision making process in the projects at various levels; (*c*) entrust the Water Users Associations with the tasks of managing the systems in their area of operation as well as collecting the water charges on the basis of some workable formula linking the rates with the quantity of water consumed and (*d*) allow the private sector to take up renovation and modernization of parts of whole of the projects where feasible and to manage the systems by charging the commercial rates' (Rao and Gulati, 1994).

The Vaidyanathan Committee recommended that, on the institutional front, user groups be involved in management of irrigation systems and that their role should be gradually increased from management of Minors to distributaries and then to main canal systems. The preconditions of carrying out this recommendation are that there exist WUAs, which can take delivery of water from irrigation authorities at wholesale level and that there are measurement devices installed to measure the volume of water at the distributary level. At present, both these preconditions are not satisfied in most of the irrigation projects. As a result, the recommendations of the Vaidyanathan Committee can only be implemented in the long run.

The government has been slow in moving in that direction. Nevertheless, a beginning was made in the Ninth Five-Year Plan to set up a working group on PIM, which recommended that farmers' involvement in the management of canal irrigation works should be taken up on high priority. To start with, 2,000 pilot projects were planned to cover atleast 2–3 per cent of canal-irrigated area in the country in the Ninth Plan itself. Gradually, this was supposed to be increased to bring 50 per cent of irrigated area under PIM. Although, it requires quite a bit of spadework in terms of defining water rights, the role of jurisdiction of WUAs vis-à-vis that of the state irrigation departments, how the disputes would be settled and so on, yet a beginning has been made in some states. The announcement of a one-time management subsidy to states in the central government budget of 1999–2000 for forming WUAs was another positive step in inducing institutional reform. Later, even the Working Group on PIM for the Eleventh Five-Year Plan spoke strongly in favour of the need to strengthen and scale up PIM in India.

The focus of these associations was management of irrigation systems through involvement of farmers. Cost recovery and other financial aspects were not the motivating factors for such organizations. It has been pointed out (Gulati et al., 1999) that this aspect may be of much greater importance to the future of irrigation systems since state funds are shrinking and central government support is limited. This is true especially because only a few of these WUAs have really emerged as robust institutions and most die out once external support is withdrawn. It is noteworthy that, so far,

the impetus for IMT in different states in India has come from external agencies, the Indian government's policies and donor pressures (Brewer and Raju, 1996). This may influence the type of WUA and the legal framework within which these institutions operate.

Irrigation Sector Reforms in Gujarat

During 1985–87, Gujarat faced one of the worst droughts of the century. The drought left an indelible impression in the minds of the farmers regarding the importance of irrigation and the need for new irrigation schemes throughout the state. However, the status of the irrigation sector was highly unsatisfactory. Most of the Minor irrigation schemes with a command area of less than 1,000 ha were not functional. At most places, tail-enders did not have access to irrigation water. Many senior officers of the irrigation department were not satisfied with the state of affairs and several attempts were made to change the scenario. The externally-aided projects had tried to push through farmers' participation through the formation of WUAs, etc., but since these were formed merely to satisfy the conditionalities of the external agency and without any internal conviction, there was little real participation of farmers. Farmers who were in the command area of irrigation schemes found their complaints unheeded. The problem was increasing year by year because there were insufficient funds for O&M.

Reform Process

The Aga Khan Rural Support Programme (India) (AKRSP[I]) had helped, in 1987, to establish lift irrigation cooperative societies in a tribal district of Bharuch, which had only 6 per cent of its cultivated area under irrigation despite having an average rainfall of 1,100 mm. The co-operative societies were functioning well, setting their own water rates (three to four times the government rates) with high recovery. During a discussion on the relative success of such schemes vis-à-vis the government schemes, the secretary (irrigation) (the highest ranking government official in the irrigation department) pointed out that while these small schemes of 50–100 ha were noteworthy, a large number of canal irrigation projects of the government were underutilized. In fact, there was one very near the AKRSP(I)'s area of operation. By revitalizing such a project, more than 500 ha could be irrigated and 500 tribal farmers could have access to irrigation facilities. Nervous about taking on such a large project, AKRSP(I) had a series of meetings with the farmers of the Pingot Irrigation System which, on the right bank of Mich, was irrigating 10 ha of land against the planned 500 ha. The tribal farmers in the command area were cynical and indifferent because they had been complaining since 1982 when the dam was established and had gotten nowhere. To focus on this, AKRSP(I) appointed a community organizer in 1989 specifically to motivate and organize these farmers. This process took three years (the society was registered in 1991). Senior officers looking after the project were asked to test the canal, identify the lacunae and rehabilitate the system along with the farmers.

Realizing that in canal irrigation the government would always be a major actor and unless the government's attitude was changed there was no hope,

the Ford Foundation was requested to sponsor an exposure visit to the Philippines for the staff of the irrigation department and the AKRSP(I). The Gujarat government sponsored the visit of the founding father of PIM in the Philippines, Benjamin Bagadion, who went around Gujarat and addressed the irrigation department staff in a major workshop. While, on one hand, AKRSP(I) was asked to take up more pilot projects in Bharuch, on the other hand, it was asked to work on changing procedures to make farmers participate in the review system rehabilitation. Because of these outdoor meetings (usually held in farmers' fields), villagers and NGO field staff acquired confidence in dealing with government engineers. Working groups involving the secretary and even the chief secretary (the highest ranking bureaucrat in the state) were established and all these fora had farmer leaders from the initial pilot projects of Pingot and Baladeva.

A second exposure visit to the Philippines in 1993 led by the secretary (irrigation) ended with a workshop in which PIM was explained to over 100 senior staff from the state. Because of this, there was awareness in the entire state about what was happening in Bharuch District and the need for a change in approach by the irrigation department. The AKRSP(I) found that though the irrigation staff at the highest level were very clear about the need for PIM, at the operational level, they resented the involvement of farmers. Field staff did not understand and approve of the new role vis-à-vis farmers and there was resentment towards NGOs for introducing these changes. Hence, the AKRSP(I) staff, along with some interested staff from WALMI, undertook a large amount of training to change the attitude and behaviour of the staff as well as clarify why PIM was being introduced. Over time, many staff from the irrigation department emerged as trainers and it has become easier to convince newer staff.

In 1994, the secretary (irrigation) was transferred and the new secretary fortunately ensured his commitment to the reform process as he was exposed to the concept. In 1995, these efforts resulted in the Government Resolution of 1 June 1995, clearly establishing PIM as a state policy. Collaboration with the AKRSP(I) continued, both in terms of exposing procedural bottlenecks and training of irrigation staff through field exposure visits and workshops.

Over the last two years, targets have been set for irrigation department staff to involve farmers. There is continuous emphasis by NGOs that farmers' societies cannot be measured only by targets, but by farmers taking up more responsibilities. The condition of getting farmer contribution (5 per cent for new projects and 10 per cent for old projects) for rehabilitation, which is a part of the PIM resolution, ensures that farmers are involved intensively before rehabilitation (it takes a lot of dialogue and interaction to get farmers to contribute). Though the government depends on NGOs for organizing the community, community organizers (COs) trained by NGOs and deputed to the irrigation department may help in scaling up the process. Increasingly, at the project level, coordination between farmers and irrigation staff does not require NGO involvement.

The Outcome

There is a Gujarat government resolution that actively invites farmers to participate

in the management of irrigation systems. To prevent this resolution from being mere rhetoric, a memorandum of understanding (MOU), through which farmers take over the irrigation systems, has also been established:

1. A large number of procedures have been created and changed to ensure that farmers can effectively participate in the management of their own irrigation systems.
2. Within the irrigation department staff, there is an acceptance that the way ahead is through involving farmers. There is also an acceptance that NGOs are equal partners in the reform process and community organization being an essential component, there is justification for any government subsidy for the cost of the community organizing process by NGOs.
3. This reform process has survived three governments (that is, three different political parties) and political leaders of all these parties have agreed that farmers' participation and handing over responsibility by the government is the way ahead.
4. It has also survived changes in key personnel over time, that is, the secretary (irrigation) has changed and so have most of the chief engineers. This has affected the pace of the reforms in some places, but has not led to any reversal of policy.
5. In terms of impact, 25,000 ha of land has been handed over to farmers. Now the government has started taking up PIM on its own, where NGOs are not present. The major impact is in the mindset of the departmental staff.
6. At almost all levels it is accepted that there is a need to change. Participatory irrigation management is now a part of the criteria on which irrigation staff are assessed, which ensures that the reward system within the department also recognizes PIM.
7. Increasingly in training programmes, the irrigation staff is asking for input on how to do PIM. The stage of convincing them as to why PIM is needed is over.

Setting up Financially-autonomous Bodies for Irrigation Financing

Canal irrigation financing in India suffers from two distinctive problems: (*a*) funding for construction of ongoing or new canal networks has been shrinking, leading to undue delay in completion of projects, which in turn raises costs and reduces benefits and (*b*) the resources for normal O&M are under severe pressure as the cost recovery from canal irrigation is extremely low and state budgets are not able to allocate more funds because of the fiscal crunch. Such resource constraints are not unique to Indian irrigation. Both irrigation and domestic water supply projects worldwide face situations of serious underfunding, particularly from conventional development assistance and government expenditures. The World Water Commission (2000) made a strong plea for establishing public–private partnerships and tapping international capital markets for financing water sector development as well as creating more efficient management. Yet, much of the emphasis in these discussions has been on international financial markets and particularly the role of multinational corporations in financing water-related infrastructure.

Much less attention has been given to the potential of domestic financial markets to provide such funding. Since the 1980s, the Indian capital markets have emerged as an important source of funds for corporate units in private and public sectors. Primary capital mobilization by private sector companies in the form of equity and debt rose from less than Rs 2 billion in 1980 to over Rs 43 billion in 1990–91 and then recorded a quantum jump to over Rs 260 billion by the end of 1994–95 (GOI, 1996: 81). During this period, several state governments had also begun to tap into this domestic financial market to finance irrigation development.

This is not the first time that such institutional reform is being proposed. Indeed, the working group on Major and Medium irrigation projects for the Eighth Plan considered the issue of inadequate funding for projects in the Seventh Plan. Against the spillover liability of Rs 260 billion for Major and Medium projects that remained incomplete from previous plans, the outlay was only Rs 115 billion. To enable the central government to assume a more positive role, in 1988, the Ministry of Water Resources formulated a proposal for the establishment of the Irrigation Finance Corporation to provide financial assistance to projects of national importance in the irrigation sector (GOI, 1995). Though this proposal was supported by a large number of states, the Planning Commission did not approve it. Over the years, the states that had important ongoing projects established autonomous irrigation finance corporations. Karnataka's Krishna Bhagya Jal Nigam Limited[2] (KBJNL) is one of them (Hooja et al., 2002). Is KBJNL pointing towards the type of institutional reforms that may be in the offing to solve the problems of canal irrigation financing? Can the structure and functioning of KBJNL be a model for ensuring efficiency, equity and sustainability of canal irrigation? These are difficult questions, which require an in depth evaluation of KBJNL against the yardstick of an irrigation institution (agency) that can achieve these basic objectives of canal irrigation.

Financially-autonomous Irrigation Agency (FAIA)

The creation of Financially-autonomous Irrigation Agency (FAIA) can be an effective means for: (*a*) introducing administrative and financial autonomy, (*b*) increasing accountability, (*c*) facilitating contacts with, and contracting out to farmers, NGOs and private firms, (*d*) introducing less politicized procedures to set and collect water charges and (*e*) mobilizing private sector funds. The key concept is self-financing. After a pre-defined nascent period, such corporations must provide for O&M and recurrent expenditure out of their own revenues (capital expenditures may still continue to be 'largely' funded by the state). They must have both the mandate and the authority to set water charges at a level adequate to cover their expenses and service their debts. Once such self-financing has been established and recourse to treasury funding for recurrent and O&M expenditure cut off, they can also sell debt in the bond market (World Bank, 1997).

A review of irrigation financing in several countries (Small et al., 1989) has identified FAIAs as one potentially powerful reform. Small and Carruthers (1991) argue that this approach is desirable from the efficiency perspective because a policy of user fees implemented by a FAIA creates the potential for improvements, both in the O&M of existing irrigation

facilities and in the process by which investments decisions are made. The potential for improvements in O&M stems in part from the greater control that an FAIA can have over its budget. But the key to attaining higher efficiency under FAIA lies in linking incentives of the agency staff with their performance in satisfying the demands of end users. If the income of these FAIAs is dependent on the revenue they themselves collect for irrigation service, this will provide incentive for more regular and stricter collection of revenues from user groups. Because users withholding payment in response to poor service will then have a direct impact on agency budgets (including salaries), it also creates incentives for better irrigation service to facilitate fee payment. Financial autonomy thus provides a functional link between collection of revenue from users of irrigation water and more effective irrigation performance by suppliers of water (Svendsen, 1991). Further, with financial autonomy, incentives are created to increase agency income and to reduce costs.

Taken together, these factors should help establish a relationship of mutual dependence between the supply agency (that is, the irrigation department) and the farmer user group. The irrigation agency provides an essential service to farmers, that is, irrigation water in the quantity and quality desired by the user, while users, in turn, provide the agency with the financial resources necessary for its existence and operation. This mutual dependence can result in greatly expanded potential for efficient irrigation management (Gulati et al., 1994: A-78). It is the possibility of creating this critical link that distinguishes the FAIA from the typical irrigation department approach. To be an effective FAIA, it is necessary to establish the link between incentives and performance, irrespective of the kind of financial autonomy it has.

Structurally, the FAIA can be an agency of user groups or a private company or an autonomous corporation created by the government under the Company Act or a combination of any two or more of these. So long as it can introduce commercial principles, link incentives with performance, meet the O&M costs (and a part of capital cost) and promote efficiency, equity and sustainability in the use of canal irrigation waters, it serves the purpose.

However, this is not the first attempt in India. The Andhra Pradesh State Irrigation Development Corporation was registered in 1974 to function on corporate lines and access private and institutional finance. But cost recovery never even approached actual expenses; the corporation accumulated heavy losses and could not service its bank loans. It no longer attracts bank finance owing to its arrears. The Gujarat Water Resources Development Corporation, wholly owned by the government of Gujarat and registered under the Companies Act, is engaged in groundwater exploration, construction and management of public tubewells, but faced worsening financial and operational conditions ever since its inception in 1975.[3] The 1994 finance committee suggested that the corporation be wound up (Kolavalli and Raju, 1995; Shah et al., 1995).

Four Indian states (Gujarat, Maharashtra, Karnataka and Andhra Pradesh) have now set up corporations, or *nigams*, that focus on mobilizing funds for surface irrigation. All four states started their corporations mainly to overcome reduced budgetary allocations for the

irrigation sector. These corporations were broadly established on the lines of public sector companies to mobilize funds. The emphasis was on mobilizing funds from institutions, particularly those which are directly or indirectly regulated and/or are linked to government rather than individuals.

The capital and debt markets have proved to be an important alternative source of funding. The debt markets trade bonds of public sector undertakings and corporate debentures. Major investors in these bonds are institutions because of the investment pattern specified by the Indian government. There are prospects for such financing to become a major source of funding in the near future.

The states of Maharashtra, Andhra Pradesh and Karnataka have established independent corporate bodies to develop and utilize water from the River Krishna. The utilization levels and dates were forced by the Krishna Waters Dispute Tribunal (Bachawat Award) in 1973. The Maharashtra Corporation and KBJNL are the only ones which have placed bond issues. Both have been successful. Maharashtra's first two issues were substantially oversubscribed, allowing it to place a third issue privately for close to Rs 10 billion. An innovative sort of government guarantee in both Maharashtra and Karnataka has satisfied investors that the bonds will get serviced. Thus, as the states have been forced to generate funds from outside sources, the capital market and debt market have become major avenues for irrigation financing.

The big question, however, remains: do these corporations usher in reforms in canal irrigation that can lead to higher efficiency, better equity and sustainability in the use of canal waters? The answer lies in evaluating whether corporations like KBJNL have evolved mechanisms linking incentives for the agency staff linked with their performance; whether they have been able to distance pricing of water from political interference; and finally, whether they have been able to raise resources by revising water rates and collecting revenue, and/or directly from the market as market loans and developed capacity to pay back later. It has not ushered in major performance improvements, mainly because the agency has some in-built lacunae:

1. The environs demanded raising money fast and it accomplished that. However, it did not pay any attention to the long-term sustainability of the system, either in terms of financial sustainability or managerial and infrastructure sustainability.
2. Improvement in performance of the system was neither part of its objective nor do its current functions stress performance. This is in spite of most of the irrigation project review studies emphasizing the crucial need for performance improvement. Here, the stress is more on rapid construction.
3. In its present form, KBJNL is not sufficiently equipped to address the larger issues of reforms in the irrigation sector: increasing efficiency in project performance; increasing agricultural productivity; enhancing revenue generation; providing users more productive roles to play in the project; reducing operational costs over time; or sustainable management of the project.
4. To fulfil the credit rating agency requirements, KBJNL had made some promises like raising water prices, formation of WUAs and collection of revenue through WUAs. After four

years of functioning, these promises were not kept by KBJNL nor was there any serious attempt to move towards that direction.

As far as the question of mobilizing more capital resources is concerned, KBJNL seems to have done a successful job.[4] The additions in structures over the last five years will keep raising the book value of assets. On the other hand, payment of interest that is due would have to be settled by the budgetary resources of the state government as KBJNL has failed to generate internal resources to pay back even the interest on these loans, not to mention the principal amount. So far KBJNL has failed to revise the water rates to any reasonable level that can ensure the payment of debt. This is despite the fact that, in theory at least, it has the power to fix and collect water rates. It did try to raise water rates, but the proposed water rates were not approved by the government and therefore they could not be implemented. Because of the continued dependence on the state budget to pay for expenses, the 'financial autonomy' of KBJNL is really a myth.

On the other hand, the proposed water rates were never discussed with farmers. The new fee recovery strategy focuses on volumetric sales and on organizing users to become involved in system management and fee collection. But the failure to consult with users about basic issues in canal development, fees or contracts, has created resistance. The approach remained typically 'top-down'. When farmers came to know of the hefty increases in the proposed water rates, they started agitations, mobilized political support and thwarted any increase in water rates. As a result, the same old water fees are levied and only a part of that is collected. This is nowhere near the actual expenses on O&M of the project, not to talk of any interest or part of the loans raised.[5] Thus, the potential of FAIAs seems to have remained unachieved even after four years of existence.

But did the corporation link incentives with performance to do a better and quicker job? When the National Irrigation Administration of the Philippines became financially autonomous, it introduced incentives to increase agency income and reduce its costs at the project level, and included these incentives in the performance appraisals of the employees. Clearly there is a lack of vision among the management staff about what an FAIA can do. It also indicates inadequate conceptualization of KBJNL as an autonomous body. Both agency staff and farmers interviewed believe that the state will repay all debts and they continue to act based on that premise of 'business as usual'. Furthermore, many of the staff have no long-term identification with KBJNL nor an incentive to see it succeed because they are there only on deputation from the Karnataka government (especially the regular irrigation department).

Direction of Change: Requisites for User Involvement

Overall, it appears that PIM is moving in the right direction. But the speed of change is slow and one will have to wait and examine the exact nature and design of this experiment. The degree of success will depend upon how far the user groups get interested in managing canal networks, how much autonomy is granted to project authorities and how much transparency is introduced in the management of funds. Learning

from the experiments tried out so far, conditions for the success of WUAs can be outlined (Kolavalli, 1997). The result of a number of studies of Indian WUAs suggests that major factors influencing the viability of WUAs are wide-ranging and comprehensive changes in the legal framework and policies, autonomy of WUAs, a new accountability of the irrigation department to WUAs and attitudinal changes in the bureaucracy (GOI, 1997; Navalawala, 1994). With the Seventy-Third Constitutional Amendment Act, strengthening grassroot institutions like the panchayati raj, it is possible to think of transferring management to local-level institutions. The case of West Bengal points to the efficacy of decentralized management of infrastructure like irrigation (Sen, 1999). The overall performance of WUAs in canal, lift and tank irrigation in the states of Gujarat, Maharashtra and Tamil Nadu has also been studied. The major pointers obtained from the IWMI-IIMA study (1996) and other studies are given next:

1. When faced with a legal fiat that water shall only be sold to groups of users, farmers are quick to come together.
2. The existence of some flexibility in determining water charges helps allocation rules. Successful WUAs often differ from region to region and depend on crops grown and corresponding irrigation schedules.
3. External support for WUAs may be necessary to create capability. An NGO or the irrigation department may play the role for a limited period of time.
4. The creation of WUAs changes the strategic position that the irrigation department and its line agencies have held for a long period of time. Likely reactions of this set of vested interests must be taken into account. Additionally, their experience needs to be tapped within the new institutional framework.

Although, certain factors have been identified as crucial to the success of WUAs, ultimately the key factor is designing institutions that are appropriate for a given socioeconomic, legal and political context. It is useful to note that there exists a wide range of options in irrigation management systems ranging from total farmer management to complete agency control (Subramaniam et al., 1995).

Full agency control is often reported as a form of management although in practice it does usually involve some user representation, informal though it may be. Similarly full WUA control is also rare in practice. 'Agency O&M, user input' is the more common form of irrigation management. Under shared management, agencies are responsible for O&M, but not completely. The WUAs share some O&M responsibilities while chiefly representing users. Many irrigation management transfers today are characterized by WUAs subsuming the responsibilities of O&M while the state agencies continue to own and regulate the system. Another interaction system is where the WUA not only manages the system (that is, it has O&M responsibilities), but also owns the system. The state agencies have only a regulatory function here. What model is followed depends largely on the system level. At the river basin level, for instance, the state usually plays a dominant role and the users very little. For the main system level, again the state retains ownership and O&M responsibilities, although user representation may enable them to participate in decision-making. Shared management and WUA O&M are usually

found at the system or distributary level. Ownership by WUAs and agency regulation are often seen as the culmination of management transfer programmes at the distributary level. Even here there are exceptions. In Bali (Indonesia), for instance, even the river basin level has little role for the state with temple priests allocating and distributing water in a traditional management framework. Similarly, in the Philippines and Nepal, there is WUA ownership of some main systems as well (Subramaniam et al., 1995). Thus, rather than an indiscriminate application of a successful model, there must be an effort to design and modify one that is most appropriate to the given context.

In addition to the formation of WUAs, ownership of canal networks starting from the distributaries through the issue of water bonds must be given priority. Another policy is the establishment of tradable water rights (Bruns and Meinzen-Dick, 2000; Rosegrant and Binswanger, 1994). This would require investment in irrigation technology—for conveyance, metering, diversion and institutional improvement and would result in more efficient water use.

Financial Autonomy

Individual irrigation systems should also be made financially autonomous, like corporations so that its income depends chiefly on the revenues that it collects for the irrigation service. This would provide incentive for stricter collection of revenue from users; apart from superior service that would facilitate better recovery. Although in terms of efficiency these corporations would be better performers than government departments, they are likely to be natural monopolies. It would therefore be essential to ensure transparency in the transactions and capital expenditures of these agencies. The need to keep their expenses transparent and under control is even more if private sector participation were introduced. In this context, each state should have an independent regulatory commission for canal irrigation—along the lines of those for electricity supply—with decentralized agencies at the user group level. These organizations should have a fair representation of farmers, state government including irrigation bureaucracy and independent well known citizens of the state such as retired judges of high courts or other such organizations. This would bring the operations of this department somewhat closer to the people. The commission can streamline the process of awarding contracts to private parties for building structures, can inform the public on various issues and ensure transparency in matters related to expenditure and revenue. As stated earlier, there are reports of rampant corruption in irrigation departments and unless means are devised to plug these leaks any new policy drive will have only partial success. This type of regulatory commission can also act as a dispute settlement body in case differences arise between farmers and project authorities, or even within the farmers' groups. In short, its functions would be:

1. To delink pricing of canal waters from short-sighted political considerations.
2. To ensure transparency in contracts and check leakages.
3. To involve user groups in awarding contracts relating to usual repairs and maintenance.

4. To involve user groups in collection of water charges on an attractive commission basis, to act as an arbiter or dispute settlement body between users and the irrigation agency to ensure that levy of water charges is conditional upon actual delivery of water.

To conclude, institutional reforms must necessarily accompany price reforms and must focus on input supplying agencies, the modes of their operation and formation of new institutional mechanisms where considered necessary (Rao and Gulati, 1994). Institutional reforms would provide the right environment for undertaking price reforms by depoliticizing or disengaging the state from the management of irrigation systems. It would make individual irrigation systems financially autonomous in a way that their incomes are dependent on the revenue they collect from users of the service that they provide. Additionally, it would enable linking of the payments for irrigation service with the quality of service offered by the agency in charge of the irrigation system, which has largely been absent so far. Unless this functional link between revenue, service and performance (Gulati et al., 1995) is accomplished, the chances of successful reforms in this critical sector would remain very low.

Reforms at the State Level: The Case of Karnataka

Over the last three decades, Karnataka has focused more on creating irrigation potential. Financially it has resulted in spending more on creating capacities without a proportionate increase in revenue generation and this has led to significant cost and time overruns. This is in spite of squeezing budgetary allocations to irrigation, from 41 per cent in the First Plan to 16 per cent in the Eighth Plan. Unfortunately, increased expenditure (in nominal terms) in the irrigation sector has not resulted in improvement of services, owing to considerable increase in non-plan expenditure under capital and revenue heads. A recent study (Raju and Amarnath, 2002) has estimated budgetary support at the macro level and recovery levels of water charges by reviewing the unrecovered costs and growing liabilities of the irrigation sector. It has looked at implications and possible options for bailing out. The estimated unrecovered cost in Karnataka was Rs 23,350.18 million in 1998–99. If the interest on capital (Rs 4160.67 million) under the revenue expenditure of Major and Medium irrigation is netted out as it is included in computation of the annualized capital cost, the unrecovered cost will be Rs 19,180.51 million.

Water rates are quite low for all crops (except sugarcane) compared to water rates prevailing in Andhra Pradesh introduced in 1997; it is 50 per cent less (compared to Andhra Pradesh) for an irrigated crop like paddy. The difference is more for other crops. The average water rate is around Rs 242/ha in Karnataka and Rs 367/ha in Andhra Pradesh. The estimated revenue based on revised water rates (area irrigated in 2000) will be Rs 557 million in Karnataka and Rs 846 million in Andhra Pradesh. Even if Karnataka revises its water rates to be on par with Andhra Pradesh, the additional revenue accrual will be around Rs 300 million based on the latest estimates of gross irrigated area (excluding groundwater-irrigated area) of 2.3 million ha (as of March 2000).

Of the total revenue expenditure, after netting out interest on capital, around

51 per cent is spent on establishment and 49 per cent is spent on maintenance. The immediate concern of the government should be to recover this current expenditure through user charges. At present, the average current cost (that is, excluding interest on capital) is around Rs 734/ha while the average revenue is around Rs 242/ha; this is based on the revised water rates (July 2001) with a revenue yield of Rs 550.78 million and a gross irrigated area of 2.3 mha.

Two sets of reform scenarios are proposed to reduce the government's recurrent costs and to increase revenue levels and the user's role. The proposals are in tune with the current trends at the global level and in some progressive states in India like Andhra Pradesh, Madhya Pradesh and Rajasthan. Also, plenty of spadework has been carried out in Karnataka over the last few years in the following areas:

1. Appointing a high power committee on PIM.
2. State water resources policy (draft) and also national water policy.
3. Recent amendments to the Irrigation Act.
4. Community-based rehabilitation of Minor irrigation tanks.
5. Empirical evidence of WUAs on a pilot basis.
6. CADA's programme.

The proposed reform agenda supports: (*a*) the creation of WUAs, (*b*) transfer of system maintenance and repairs to WUAs, (*c*) reduction of the government's costs on maintenance, repairs and establishment, (*d*) improvement in water use efficiency and better system performance, (*e*) higher revenue generation and (*f*) bigger role for users' organizations and smaller role for the government.

Reform Scenario I

The reform scenario should aim at the following:

1. Increase the water rates by 20 per cent every year for the next five years and then review the status. This should be done with prior consultation on a wider scale with WUAs.
2. Share 50 per cent of the revenue with WUAs in the first year 2000–01.
3. Of the remaining 50 per cent, increase the share of WUAs by 10 per cent from the second year, 20 per cent in the third year, 40 per cent in the fourth year and so on up to 2010–11.
4. After adjusting for average inflation (assumed at 10 per cent), reduce the maintenance cost by 20 per cent every year.
5. After adjusting for average inflation (assumed at 10 per cent), reduce the staff cost by 20 per cent every year.
6. The gap between the revenue and current expenditure (net of interest on capital) would fall from Rs 910 million in 2000–01 to zero in 2009–10. Besides, it would generate a surplus of Rs 130 million in 2010–11.
7. Water charges per ha will increase from Rs 348 in 2000–01 to Rs 1,796 in 2009–10.

Reform Scenario II

1. Water charges will be revised to be on par with Andhra Pradesh at the earliest.
2. Average tariff will be around Rs 528/ha in 2000–01.
3. Rest of the agenda will be as in Reform Scenario I.

4. The gap between the revenue and current expenditure (net of interest on capital) would fall from Rs 700 million in 2000–01 to a surplus of Rs 60.5 million in 2005–06.
5. Water charges per ha will increase from Rs 528 in 2000–01 to Rs 2,725 in 2009–10.

The irrigation sector will be generating a surplus from 2010–11 if Reform Scenario I is followed (see Table 9.1). This would enable it to meet investment costs for the future. In case, Reform Scenario II is implemented from 2005–06, there would be surplus which can be utilized to meet future investments and costs. By facilitating better water users' role through WUAs, the government can generate additional revenue and reduce its maintenance costs as well.

The situation offers an opportunity for reform and this is surely a win-win situation for the farmers as well as policy-makers. This can be achieved by ensuring that the quality of irrigation service is linked to the price being charged and that the costing of this service is transparent and there is an effort to keep these costs down through innovative methods. Canal irrigation subsidy can be reduced/rationalized without adversely affecting agricultural output. The farmers have the capacity to pay for higher irrigation charges and many are also willing to pay, but they need to be assured of better irrigation service and the plugging of leakages in irrigation funds. For this one has to grant greater autonomy to the irrigation authority, involve farmers in management and decision-making, establish an independent regulatory commission and make the system more transparent than what it is today by allowing the 'right to information', especially those related to contracts to private parties. With these institutional reforms, one hopes that canal irrigation in India will be able to overcome not only the issue of subsidy, recovering O&M expenses and 1 per cent of cumulative capital expenditures at historical prices, but also be on a sustainable path of higher efficiency—both physical and financial.

Efforts in Bihar

Bihar has taken the following steps over the last 10 years to promote PIM (see Table 9.2).

Participatory Irrigation Management Cell in Bihar

The state has set up a PIM cell attached to the secretary, WRD, to coordinate PIM activities in the state. The cell is headed by a superintending engineer (presently with additional charge). The cell is expected to facilitate activities related to formation, registration and management transfer at the state level and to coordinate with WALMI. The PIM cell with active cooperation from WALMI is currently carrying out activities related to: (*a*) transfer of all distribution systems to WUAs, (*b*) monitoring the performance of WUAs, (*c*) acting as a mediator to solve problems of WUAs and conflicts arising between WUAs and the state government, (*d*) facilitating WUAs with all the facilities as per direction of the central government, (*e*) training WUAs with the support of WALMI and (*f*) acting as the secretariat of the PIM programme in the state.

Table 9.1 Proposed Financial Reforms in the Irrigation Sector in Karnataka

	1998–99	1999–2000	2000–2001	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Revenue expenditure net of interest (10 per cent annual increase)	169	186	205	225	248	273	300	330	363	399	439	483	532
Estimated revenue (based on July 2001 water rates of the Karnataka government)	56												
Estimated revenue based on Andhra Pradesh's water rates	85												
Establishment cost (60 per cent of the revenue expenditure)	102												
Maintenance cost (40 per cent of the revenue expenditure)	68												
Reduce the maintenance cost by 20 per cent*		60	52	46	41	36	31	28	24	21	19	17	15
Reduce staff cost by 20 per cent*	102	89	79	69	61	54	47	42	37	32	28	25	22
Total revenue expenditure	169	149	131	115	102	89	79	69	61	54	47	42	37
Increase water rates by 20 per cent	56	67	80	96	116	139	167	200	240	288	345	414	497
Share of WUAs*			40	53	69	90	117	150	192	245	311	373	448
Revenue to be accrued by the government*			40	43	46	49	50	50	48	43	35	41	50
Gap			91	72	55	41	29	19	13	10	13	0	–13
If we follow Andhra Pradesh's water rates													
Increase water rates by 20 per cent	85	102	122	146	175	211	253	303	364	437	524	629	755
Share of WUAs*			61	80	105	137	177	227	291	371	472	566	679
Revenue to be accrued to the government*			61	66	70	74	76	76	73	65	52	63	75
Gap			70	50	31	16	3	–7	–12	–12	–5	–21	–39
Total irrigated area (mha)	2.307												
Average tariff (Karnataka's water rates) (Rs/ha)			348	418	501	602	722	866	1,040	1,248	1,497	1,796	2,156
Average tariff (Andhra Pradesh's water rates) (Rs/ha)			528	634	761	913	1,095	1,314	1,577	1,893	2,271	2,725	3,270

Note: * 50 per cent of revenue accrual to be devolved to WUAs in the first year (2000–2001) and reduction in the government's share by 10 per cent/year.

Table 9.2 Steps Followed to Form WUAs in Bihar

Sequence of Steps Followed	Responsibility	Duration	Remarks
Orientation (training for both officials and farmers)	WALMI	Once in a year for each zone	Bihar has 10 zones
Follow up with ad-hoc WUA members	WALMI	Two months	
Selection of irrigation system	Executive engineer and chief engineer	One year	
WUA formation	Farmers	Two months	
Registration of WUA	Inspector general of registrations	6–12 months	
Capacity building	WALMI	One year	
MOU and system transfer	WRD	Two years	(Paliganj WUA took four years)

Note: Time taken—two to five years.

MEASURING THE PERFORMANCE OF WUAs

The criterion for WUA performance assessment has remained unclear across the states in India. The WRDs in states like Gujarat, Andhra Pradesh, Maharashtra, Karnataka and Bihar largely assess the performance by (*a*) the number of WUAs and (*b*) area irrigated by WUAs. This is very much in tune with standard practice of WRD in measuring the irrigation systems performance by area irrigated in kharif and rabi seasons and on the other side by discharge levels. Rarely is there a scope to indicate the extent of tail-end area irrigated and reduction in conflicts owing to better functioning of WUAs. But there is wide variation across the agencies and WUAs on assessment criteria itself. The perception of success and its measurement varies across these agencies, as summarized next. As part of indicators to measure successful WUAs, the WRD should consider: getting water to the entire area, tail-end irrigation, economic levels of improvement in terms of better production levels, water fee assessment collection, maintenance and repairs of the canal system, water efficiency use and marketing of agricultural produce. Performance measurement criteria (see Table 9.3) should include: (*a*) functions of WUAs, (*b*) support provided by the WRD staff and (*c*) outcomes on crop season-wise and on an annual basis.

Table 9.3 Measuring the Performance of WUAs

WUA Preference	WALMI Preference	Bihar PIM Model Guidelines by the WRD
• Reduction of water conflicts. • Extent of tail-area irrigated. • Water availability on time and quantity available.	• Acres/cusec. • Area irrigated. • Production (T/acres). • Conflict management.	• Minimum 60% farmers as members. • Two meetings/month with 80% attendance. • Achieving 80% of the designed irrigation intensity. • Diversification around core activity. • Democratic functioning.

Field Staff Constraints

The field staff of the WRD face several constraints in working on PIM. Some of the key points, which several junior engineers (JE) across the state stressed, are: (*a*) all decisions/letters should directly go to WUAs rather than via the chief engineer (CE)/executive engineer (EE), (*b*) the JEs cannot focus adequately owing to other engagements and workload, (*c*) they need a separate person on a full time basis at the JE level at the subdivisional officer's (SDO) office, (*d*) the SDO office has 22,000 ha (in the case of the GC branch canal in the Sone command). One JE for PIM and one SDO for PIM is required to supervise and assist WUAs and they should be provided with associated expenses because the JE and SDO need to (*a*) attend and set up VLCs, (*b*) attend WUA meetings, (*c*) help in assessing irrigated area and (*d*) help in collecting revenue by imposing rules.

Savings to the Government

At the JE level, saving to the JE's office is around Rs 250,000/year by withdrawing local field staff (such as the *sutkar*, *meti* and *amin*—all three are related to water distribution and maintenance and repair works) and their travel costs. Earlier the JE's office use to spend Rs 100,000 and collect only Rs 50,000. Now the SDOs do not spend and yet collect Rs 40,000

through WUAs. That is a big gain for the field offices.

1. At the EE level, water demand is Rs 20 million/year from the current area (kharif—60,000 ha and rabi—35,000 ha). But the actual water fee collection is around 20 per cent. Encouraged by existing WUAs, the EE's office has submitted a proposal to initiate another 30 WUAs (at the rate of 2,000 ha/WUA). If all these WUAs are transferred to the system, the EE's office will make savings of Rs 3.5 million/year on O&M, Rs 5 million/year on establishment and Rs 1 million/year on other expenditure. Thus there is a total savings of Rs 9.5 million/year to the government. If the government clears the local EE's proposal, the entire divisional area of 60,000 ha can be transferred to WUAs in the next six months. But, there are procedural delays at the headquarters to process the request and facilitate smooth transfer.
2. At the CE level, in the Sone command area, area coverage is 450,000 ha in the kharif season and 250,000 ha in the rabi season. In his jurisdiction, out of 150 sanctioned JE positions, 45 are vacant. The JE-level staff is a crucial link with the WUAs. After system modernization, the CE feels that he could provide designed discharge of 1,400 cusecs. At his level, total water fee demand is Rs 150 million (Rs 99 million in kharif and Rs 50 million in rabi). Actual collection is 60 per cent of the demand. However, from the year 2006, the situation may change, since irrigation revenue collection has been transferred to the WRD.
3. Water fee demand at the CE level of the Eastern Main Canal of the Gandak command area is Rs 1,260 million; it includes arrears of Rs 1,170 million and current demand of Rs 9.2 million. But actual collection is only Rs 827,000. The CE has a command area of 246,000 ha (CCA) and his season-wise target is (*a*) kharif—201,000 ha and (*b*) rabi—66,000 ha. During the last year, the achievement was 143,000 ha in kharif (71 per cent of the target) and 159,000 ha in rabi. Part of the problem is lower discharge levels in the main system; the designed discharge is 8,560 cusecs and in practice it rarely exceeds 6,000 cusecs mainly owing to poor system capacity and not because of lack of water availability. Another related problem is shortage of staff; against the sanctioned positions of 350, only 157 are in place. The CE feels that the system has the potential to develop 40,000 ha with the available water, with a duty of 30 acre/cusec because sandy soil needs canal expansion and the waterlogged area is 51,950 ha. Waterlogging is a major constraint in the Gandak command area. From October to December, a major part of the command is waterlogged, but some of it gets cleaned during the rabi season.
4. Owing to severe shortage of staff at the field level, the existing staff feel that they are better placed after the formation of WUAs and the transfer of responsibilities of irrigation management to the WUAs. In spite of the savings in staff time and size, the government is able to earn better revenue compared to earlier years. Field staff also underlined that after the WUAs took over the management,

there have been fewer complaints and conflicts for water. Hence, they strongly urge for the formation of more WUAs in all command areas.

Recently Formed WUAs

Recently, the WRD has transferred 20 irrigation systems (distributary or sub-distributary) to 20 WUAs in the Sone and Gandak command areas. On 17 December 2005, these 20 WUAs along with senior WUA members (of the Sone command) were invited for a day-long orientation programme on bookkeeping and WUA functions at WALMI, Patna. Fifty-two farmers (representing 25 WUAs) participated. At the end of the day-long deliberations, a discussion session was coordinated to understand the participants' views on the seven points covering their initiation to a long-term vision. Their responses are summarized in Table 9.4.

Table 9.4 Responses from 25 WUAs

Focus	Summary of Farmers' Responses
Who influenced the formation of the WUA?	WALMI (specifically I.C. Thakur, earlier L.P. Srivastava), Paliganj WUA.
Expected benefits from WUAs.	Less control from department officials; use rights and control of all resources—canal lands, bunds, trees, water allocation and distribution.
Help required from the WRD.	System restoration before transfer; good communication with more frequency between the WRD and the WUA; ensuring adequate and timely supplies in the transferred systems; ensuring right to information.
Criteria to assess WUA performance.	Monthly meetings and attendance; conflict resolution; water fee collection; area irrigated across crop seasons; extent of tail-end area irrigated; good understanding between village-level committee and distributary-level committee.
Capacity-building requirements.	Capacity building is very important. It helps in creating awareness about water use and suitable cropping pattern and cultivation methods (for example, SRI paddy); it creates awareness on system maintenance and repairs; it is important for maintaining and updating all relevant records; it helps to facilitate provision of agricultural inputs and forward linkages; it helps in the formation of subject committees and in their monitoring; it facilitates visits to good WUAs (both within and outside the state) to learn lessons.
Changes expected from, before and after WUA formation.	Timeliness and adequacy of water supplies; canal system maintenance; better control on resources; better powers and responsibilities to control WUA affairs and system operation.
Long-term vision (for 10 years).	WUAs will have full control of canal system; farmers get all benefits of irrigated agriculture; the WUAs would like to formulate a three-tier project-level federation to control water allocation, distribution and provide forward and backward linkages to all farmers; improve water quality levels in some places; would like ensure the repayment of World Bank loan, if any, disbursed for PIM in Bihar; utilize all CADA funds and staff for implementing on-farm development works in all command areas of the state; ensure WALMI conducts year-round training programmes on PIM; over a period of time, ensure all members of the executive committee of WUAs are trained at WALMI.

MINIMUM CONDITIONS REQUIRED

Office bearers of WUAs and officials underlined minimum conditions required to promote PIM in the command areas. They can be summarized as given next. Indeed, several of these conditions are rarely considered either during WUA formation or at the system transfer stage. Hence, these conditions have become more crucial for the proper functioning of WUAs.

1. Minimum physical rehabilitation

   (*a*) To enable the water distribution system to perform as per the designed pattern.
   (*b*) Installation (or renovation) of gauge records and shutters wherever required to regulate water.
   (*c*) Work allotment by the WRD may be in proportion to water fee collection level by the WUA.

2. Drawings, maps and records of distribution system transferred, landowners' details, canal alignment and

discharge levels as per design, and suggested cropping pattern.

3. After transfer, the sub-divisional and divisional-level office should be made accountable for the next five years in delivering mutually agreed discharges both on time and in the required quantity. This should be reflected in the MOU.
4. The WUA should be formed much before system rehabilitation is planned. In planning (minimum) rehabilitation of the system, the WUA should be involved from the beginning, both in the walk-through survey and in prioritizing the works. All these meetings should be held in the concerned village for transparency and clarity.
5. The PIM cell (of WALMI) or the identified wing of the WRD needs to do the following:

   (*a*) Form a spearhead team of three persons (irrigation engineer, social scientist and agronomist) to initiate dialogue with users and to provide orientation to users. This team should maintain a record of progress made for each WUA, indicating the kind of support provided to the WUA and outcomes on a regular basis.

   (*b*) The PIM cell needs to develop an effective database and monitoring and learning system for the WUA.

   (*c*) The PIM cell needs to be authorized to give allotment for repairs based on a joint survey of the proposed system for transfer.

   (*d*) Modern technology and management of the canal system: Both the field staff and active members of leading WUAs stress the need to bring in modern technology and high quality in all civil works related to the command areas. If decisions are taken on lining of main and distributary canals, the work should be assigned to major companies to provide high quality work with prefabricated concrete slabs. That would enhance the life span and make the lining less prone to damages. These contractors/companies can also be made responsible for long-term (20–30 years) maintenance work at no cost. They can also explore, repair (in a few cases, build) operate and transfer the canal system. The field staff and active WUA members also discussed the quality of the national highways as an example of the benefits of modernization.

DEMARCATION OF ADMINISTRATIVE AREA

A WUA is constituted based on a hydraulic unit. Therefore, WUA area will generally be spread over more than one village. Further, farmers in a single village will have membership in more than one WUA depending on the location of their field. It is possible that a single farmer may own land in more than one WUA area. However, s/he is eligible to vote only for one WUA. Discussions with farmers suggest that they have encountered practical difficulties in dealing with such issues in the absence of guidance from officials.

In 2003, the area for WUAs was demarcated again in Andhra Pradesh. As a result, the number of WUAs in the Telangana region come down marginally compared with the number of WUAs 1997. On the other hand, the number of WUAs in coastal Andhra increased. In the words of officials, the area for WUAs

has reduced to less than 5,000 acres in 2001 from 8,000–10,000 acres in 1997. Similarly, the area for DCs has reduced to 20,000 acres from 90,000 acres. In the words of a WUA president in coastal Andhra, the reorganization of WUA area was aimed at reducing the influence and control of WUA presidents over large financial resources.

Several concerns emerge from this process:

1. There seems to be delay in ploughing the water fee back to WUAs.
2. There was no preparation of revenue officials on the measures required from the revenue department in the reorganization of WUA area.
3. In coastal Andhra Pradesh, reorganization resulted in two WUAs, one for the head-reach and the other for the tail-end. As a result there is conflict between the two.
4. While size is important for operational reasons, collective actions and other sociopolitical dimensions also need to be taken into consideration. Officials need to sensitize farmers and minimize conflicts.

Reorganization

Along with reorganization of WUA area in Andhra Pradesh, some changes were made in the institutional structure of WUAs. Some of the important changes are as follows:

1. The number of territorial committee members has been increased to 12 for WUAs in Major and Medium irrigation projects and to six for those in Minor irrigation projects.
2. The position of vice-president was introduced in 2003; either the president or the vice-president should be elected from the tail-end TC and they will jointly manage the accounts.
3. Indirect election of WUA president instead of direct elections.
4. One-third of TC members will retire once in two years, which is aimed at providing continuity to the WUA. This also means that elections for president and vice-president will be held once in two years.

According to some WUA presidents, two years is too short a period for achieving anything meaningful. It is their experience that during their first year in office they could not do much because of water shortage and other reasons. The next one year will also pass just like that. Another point made by some of the WUA presidents is that indirect elections would help political lobbying. Though there is an understanding among people that either the president or the vice-president must be elected from the tail-end, in reality local choices or power equations have led to this rule being ignored in a few cases.

Irrigation Department

The department officials, being competent authority, have been providing support for WUAs in the implementation of the project activities. They continue to manage the project activities, while WUAs provide them support in implementing works. The officials continue to play a regulatory role and they need skills of facilitation. Across the WUAs, it was felt that people have improved relations with the irrigation department after the formation of WUAs. On the whole, people's ability to demand services from the department has considerably improved.

Agriculture Department

The support of the agriculture department in providing knowledge, technology and extension is critical in the context of efficient use of water. Farmers have felt that the agriculture department generally provides inputs like seeds and subsidized inputs; but does not provide strategic interventions for the overall improvement of the agricultural system in the irrigated area. Farmers would like the agricultural officials to participate in different meetings of WUAs and also in project-level meetings to help farmers in crop planning. Farmers have felt the lack of a relationship between the irrigation and agricultural departments. They suggested that the agricultural department should participate in the important meetings of the WUAs and provide support in crop planning and other agricultural investments.

Gram Panchayat

The *gram sarpanch* is involved whenever there is a conflict. There is lack of trust between this functionary and WUA members. The involvement of the *gram* panchayat (GP) is seen as interference rather than collaboration. A few experiences in the state suggest that the role of the GP can maximize the resource base of the WUA. In this context different perceptions are presented:

1. The *sarpanch* should be given an advisory role in the WUA in view of his position (he has authority on resources in the village). This will help information flow from one to the other.
2. People see a role for the GP in providing linkages with different government programmes. Since plough-back of tax takes time, the *sarpanch* can mediate with the revenue officer/MRO. He/she can also play a role in the case of disputes between two villages, or decisions related to water allocation.
3. At present there is no role for the GP. People suggested that co-opted members should also be drawn from among farmers. On other users, they have felt that command farmers should be major stakeholders.
4. The GP continues to control grass and trees, though the WUA is entitled to raise revenue by selling grass and trees. The GP has the right and continues to auction trees and grass in its jurisdiction. There is no response from GPs to a resolution of the WUAs asking the GPs to handover these rights. The GPs have also not responded to the notice issued by the irrigation department to give it its share from the auction of trees (the rule as it existed before WUA formation). Only a few GPs have responded to this notice.
5. The GPs also auction fish from drinking water tanks, but WUAs have no rights on this.
6. There has been improvement in tanks owing to works undertaken in recent years. Earlier, a big farmer of the GP used to take care of water regulation. At present, there is a specific institution to look into water management. Relations with officers have also improved. The GP invites the WUA for review and other meetings. There is a need for the GP to play a role in the WUA. Co-opted members of the GP should not interfere in the decision-making process.
7. The role of the *sarpanch* is important in conflict resolution. Though the village secretary[6] takes part in tax

collection, there is no link between the PRI and the WUA. The WUAs need a separate identity to perform their functions. In fact, after WUAs were formed there is now someone to take interest and concentrate on various aspects of water management.

8. The GP has a role in tanks with less than 100 acres command area. However, given the responsibilities the GP is entrusted with, they may not be able to give much time to these tanks. There was no awareness regarding sub-committees and the panchayat's role in water management.
9. There is also relation with the GP as they are involved in water fee collection through the village assistant.
10. The role of MLAs and other political leaders is also important as they can provide additional resources from the MLA/MP funds. They are also important in the context of conflict resolution, negotiating with officials and setting priorities in the area.
11. If a tank is drying up, the WUA has supported the release of water. Women are not allowed to wash clothes in periods of water scarcity. The GP, though it does not play any role in the WUA, will need to take the initiative to save water by reducing water wastage.
12. Water for other uses: The Major and Medium projects are meeting other needs besides that of irrigation. The role of WUAs in this is very important. In the absence of a project-level committee, decisions on other uses are always interpreted as political. The intensity of the need and prioritization is not at all understood.

In a majority of WUAs, there is suspicion regarding the role of GPs in WUAs. There is a need for building trust between the two institutions; besides there should be focus on taking up certain pilot projects to demonstrate how the two institutions can improve the effectiveness of PIM. There are several examples wherein the GP and the WUA have worked together on issues such as seeking resources from the food-for-work scheme, resolving conflicts, etc. They need to understand their respective roles and forge relationships for the larger benefit of the community with respect to water management.

INSTITUTIONAL ISSUES

There is, in some cases, resistance by the irrigation agency since it perceives IMT as a threat to its power and personnel. Elite dominance with user participation in important matters is decreasing leaving decision-making in the hands of a small self-perpetuating group. At the WUA level, some legal and financial constraints do not allow the WUA to provide specific services. Frequent turnover of qualified staff makes the sustainability of WUAs difficult. Irrigation canals in most cases are damaged and non-functional so forming WUAs is difficult and non-sustainable. Access of farmers under the command area to the market is limited. The WUA activities are routine and new services are rarely developed for water users. Lack of trained personnel with expertise in technical and environmental issues, who are able to maintain quality control is another area that needs to be addressed.

Collective Action and PIM

Conditions for collective action covers physical, socioeconomic and policy

environment that determines the likelihood and success of local collective action for irrigation management. Similarly, water scarcity plays an important role in organizing farmers. Many authors have suggested the existence of an inverted U relationship between water scarcity and returns to an organization. The size of the WUA has been a matter of debate wherein it is opined that it is difficult to manage large WUAs compared to smaller ones, apart from which there are intricate issues between states. Similarly, the social background of farmers plays an important role in organizing WUAs. Market linkages also have an influence on collective action and, hence, they need to have sufficient incentives. Irrigated production should be profitable. Legal recognition of WUAs is important as farmers' organizations in irrigation systems can take a variety of organizational forms. The cooperative structure is generally the most complex to set up. If government recognition is needed for certain tasks in irrigation management, it is essential that the requirements for such recognition are not too difficult for average farmers to understand. Simple procedures and maximum flexibility in organizational form and procedures are desirable to reduce the transaction costs of WUAs.

It is important to draw examples of viable farmers' organizations, emphasize the need for community property creation based on farmers' investment and a collaborative approach with WUAs and government agencies. An approach that seeks to encourage the emergence of capable, independent and viable WUAs is one that critically examines the hidden assumptions buried in the language often used to describe WUAs. Furthermore, support services for WUAs must promote the functioning, not just the form, of WUAs. Finally, such an approach must seek to negotiate an acceptable balance between the rights and responsibilities of all parties. This sets a challenging agenda for action—one that ultimately can be pursued only if effective incentives are put in place for irrigation agencies to change themselves, while at the same time making resources available at the field level for iterative and meaningful action research on new forms of agency–farmer collaboration and cooperation.

Collective Action in Canal Irrigation

With specific reference to collective action in canal irrigation, it has been stated that although lessons from the experiences in other countries are valuable, it is not possible to recreate the experience of other countries in India. Building on existing patterns of cooperation in Indian canal systems is more likely to lead to success. But for this we need a better understanding of the factors that facilitate and constrain farmer participation. The findings based on an empirical study in Rajasthan and Karnataka indicate that PIM programmes are most likely to succeed in establishing organizations if they begin with somewhat larger command areas and are relatively closer to a market centre, as these are the factors that are significantly related. Organizers are likely to find more fertile ground where there is established social capital or patterns of cooperation in other spheres. The study suggests that temples or religious institutions provide better indicators of this social capital than formal economic

cooperatives. Finally, leadership potential is crucial. Both traditional leadership, represented by influential persons from the local area, and modern leadership, represented by college graduates, can play an important role. Taking advantage of the local social capital and leadership potential is likely to lead to more active organizations, but this may also require flexibility in approaches to allow local people to tailor the organizations to their own needs and capacities. Organizations should not be treated as an end in themselves. For farmers to play a significant role in all the critical functions of irrigation management including allocation, distribution, operation and maintenance and conflict resolution, there is also need for local institutions to allocate and distribute water, institutions to manage conflicts and collective action for operation and maintenance. Hence, PIM programmes and their staff that implement them need to keep these larger objectives in mind.

Issues of Governance

The intention in transferring canal management to WUAs is that their empowerment would lead to improvement in the performance of the irrigation sector in terms of efficiency, equity and sustainability—institutional, financial and ecological. Though some studies have indicated early gains when WUAs managed local distribution of water, several simultaneous measures should be undertaken. It is now widely understood that an irrigation system will not be able to perform as needed without basic institutional reforms, and this generally means devolution of some or all its responsibility—and authority—for irrigation management to WUAs. But it is also increasingly recognized that devolution must be accompanied by a more comprehensive and responsible support system for WUAs that includes both the public and private sectors in a new partnership.

Not Half-hearted Decentralization, but Genuine Empowerment

Vermillion reinforces what is learnt from inspiring examples of WUAs mostly promoted by NGOs. Whether in bottom–up or top-down approach through the legislative route, what is required is that WUAs should feel a real sense of ownership and responsibility. Only then they would be in a position to assure the member farmers that they would deliver the agreed number of waterings with predetermined frequency that would suit the raising of the principal crops of the area. This will earn for the WUAs the allegiance of the members essential for raising resources to meet their obligations of maintenance of the system and its proper management. This would mean empowering WUAs to decide and collect water rates (their own and on behalf of the government) sufficient not only for present requirements, but also for building up reserves to meet future exigencies.

WUAs versus Panchayats

In many of the areas where WUAs have been formed, there is a clash of interests among panchayats and WUAs on who is to own the system, particularly when watershed schemes are being handed over to the panchayats. Such situations

would add on to the already existing vagueness and differences. An alternate institutional set-up at the local level has created a different set of conflicts.

Constrained by Procedures and not Investments

The wave of PIM is catching up across the states and many of them are eager to produce fast results. Issues that were not realized initially, but are now posing as road blocks are the following:

1. The formation of WUAs feels automatic once the policy and act are proclaimed and rules are framed. What is not realized is the fact that these formations remain on paper unless the government finds ways of handholding WUAs in the initial stages.
2. Capacity building, largely interpreted as organizing a few trainings and exposure visits, is felt to be adequate for enabling the WUA executive members to function. These half-hearted training programmes involved imparting some uninterestingly delivered lectures to the elected members of the WUAs. There was no system of monitoring—analysis-learning—passing on the learning. The regional or state-level review meetings rarely (almost none) have any indicators to understand the impact of training.

Reluctance to Learn and Scale Up

Over the last three decades, a good number of irrigation projects (Major, Medium and Minor projects) in various parts of India have successfully demonstrated the process of WUA formation, methods to be adopted for their capacity building and skill upgradation, indicators to be measured in crop-season review meetings and critical areas where the help of the WRD and agricultural and allied departments is required. These pilots and small-scale replications have been demonstrated by local cooperative societies (in Maharashtra and Gujarat) and NGOs (DHAN in Tamil Nadu, SOPPECOM in Maharashtra, AKRSP and DSC in Gujarat, SRIJAN and ASA in Madhya Pradesh, BAIF and Oxfam-India in Karnataka and IRDAS in Andhra Pradesh). Wherever a few interested officials of the WRD either in CADAs or in WALMIs, have taken interest, it has paid rich dividends to the community. Yet, in recent years, evidence of lessons having been learnt is not seen in practice on a large scale. What has resulted is a two-track approach: one, on a large scale by the WRD or CADA with stress on the Act and policy, leaving the water users to pick up threads on their own every five years, in view of elections and new leaders getting elected. So the water users end up starting from scratch again. Several elected leaders of WUAs across the country said: 'we don't know what our jurisdiction is, nobody has given us details. We are yet to get a copy of the Act and policy and whatever was given to the earlier leaders is not with us. Even after two or three years (after the second elections) we have not got any funds for civil works, nor are we allowed to collect water fees and retain it.' There are some exceptions to this. Some WUAs in Bihar are collecting water fees and retaining them. Recent amendments to rules in Andhra Pradesh have initiated steps to plough back the water fee collected to WUAs, but WUAs are yet to get the power and right to collect water fees as provided for in the APFMIS Act, 1997. Even WUAs in Madhya Pradesh are yet

to get any right to collect (the percentage to be retained is not mentioned in the Act) water fees as provided for in the MP PIM Act, 1999.

Legal Issues

Although countries across the globe are passing legislative acts, which have largely brought in lot of positive impacts, further refinement is required. One of the most commonly mentioned one is the need for comprehensive laws and regulation. The level of farmers' participation in WUAs is not defined. It is not clear whether WUAs are really democratic institutions as required by the law, or whether they are turning into special interest associations without the full involvement of farmers. A major legal issue affecting the transfer is the ownership of the infrastructure and assets already constructed and in operation. These continue to belong to the state; only their administration is transferred to users. The absence of a national water code results in confused and sometimes conflicting legal interpretations.

In countries that have largely stabilized PIM, second-generation problems persist. For instance, there is lack of definition about what rights to water WUAs should have. Volumetric right of water was not given in the concession title given to the modules. Priority for use of water for human consumption has not been defined as there was confusion about what domestic, human and urban uses are and how the priority rights for these uses should be established over the agricultural use of water, mainly at the time of shortage of water. Plans did not include amounts of water for ecological purposes in the irrigation plans of districts and modules so that the pollution problems of surface water flows could be reduced.

LESSONS LEARNT

Niger, Mali

The model evolved in Mali appears replicable elsewhere in Africa because it matches the literacy levels and financial management capacity of users, requires only limited training inputs, provides the government with some negotiated steering capacity through the performance contract and insures financial sustainability highlighting the reform initiatives' suitability to the local context.

Gujarat Study

Initiatives taken in the Gujarat Project highlight ways of improving institutional reforms.

1. Within every bureaucracy there are key individuals who can become change agents if they are motivated and transformed.
2. Exposure visits to successful areas and preferably to areas where similar types of individuals have transformed themselves can be invaluable for this transformation.
3. If one desires to reform the existing public system, it is essential to demonstrate that this can be done. Because the AKRSP(I) could demonstrate successful PIM projects in a backward tribal area, the irrigation department had to acknowledge that farmers could manage their own irrigation projects and farmers' participation was not merely rhetoric but a reality.

4. The state-level working groups were official bodies and therefore survived the changes. The government staff are subject to transfer all the time and political systems often change in a country like India. Hence, it is essential to create systems and procedures that will survive these changes. The working groups which were formed at the district and state level wherein the highest officers could interact directly with farmers, ensured that this forum was available to farmers and NGOs to interact regularly with the government staff, regardless of which government was in power.
5. Most farmers, if organized and committed, can manage their own irrigation systems. Groups of farmers will agree to pay water rates higher than the government rates if they find this necessary for the viability of their society.
6. Non-governmental organizations can bring about macro-policy changes successfully provided there is a positive political acceptance of the role of NGOs in civil society.
7. Reforms that have started from within (the state of Gujarat in this case) are more likely to be sustainable than those imposed by external agencies as conditionalities. However, it is essential that the regional bureaucracy receives support at the national level. In this case, there has been a conducive environment supporting PIM at the national level, with two national PIM workshops being held recently.
8. Since a large number of decisions on procedures and policies were discussed at the grassroot level meetings with farmers, NGO staff and government field staff, the policy and procedural changes are realistic and address the need of all three parties involved in the reform process.
9. A large number of exposure visits, training sessions and workshops involving farmers and irrigation department staff, with NGOs playing a facilitating role, are required in the initial phase to internalize changes within a bureaucracy.
10. The reform process in the government sector, because of its strong, rigid hierarchical structure, is top-down. Hence, the key change agents have to be officials with powers to change the existing way of working.

Setting up Financially Autonomous Bodies for Irrigation Financing

Four Indian states (Gujarat, Maharashtra, Karnataka and Andhra Pradesh) have set up corporations, or *nigams*, that focus on mobilizing funds for surface irrigation. These were set up to overcome reduced budgetary allocations for the irrigation sector. They were established on the lines of public sector companies. The emphasis was on mobilizing funds from institutions, particularly those that are directly or indirectly regulated and/or are linked to the government rather than to individuals.

The capital and debt markets have provided an important alternative source of funding. The debt markets trade bonds of public sector undertakings and corporate debentures. The major investors in these bonds are institutions because of the investment pattern specified by the Indian government. There are prospects for such financing to become a major source of funding in the near future. The Maharashtra Corporation and the

KBJNL in Karnataka are the only ones that have placed bond issues successfully. Maharashtra's first two issues were substantially oversubscribed, allowing it to place a third issue privately for close to Rs 10 billion. An innovative sort of government guarantee in both Maharashtra and Karnataka issues has satisfied investors that the bonds will get serviced. Thus, as the states have been forced to generate funds from outside sources—the capital market and debt market have become major avenues for irrigation financing.

NOTES

1. In the context of disengagement of the Moroccan state, objectives of the regional government agency responsible for irrigation management in the area, Office Regional de Mise en Valeur Agricole du Tadla (ORMVAT), are to evolve from complete state management up to the farm level to a more participatory management.
2. At the root of the KBJNL formation lies the sharing of the waters of the River Krishna. The river flows through Maharashtra, Karnataka and Andhra Pradesh states. In 1971, the Krishna Waters Dispute Tribunal (KWDT) was set up to allocate utilization levels of Krishna's waters. The KWDT reported its findings by 1973, and the states provided the answers for the queries raised by the KWDT. In 1976, the KWDT said that the award (popularly known as the Bachawat Award) may come under review by May 2000. (However, because of lack of initiative from these states, the award has not been reviewed and the old status continued into 2002.) Thus a deadline was set to utilize the given water allocations by the three states. Under this award, Karnataka is to utilize 734 TMC (20.7 million ha m) of water from the River Krishna.

   The Upper Krishna Project (UKP) was developed to take advantage of the award. The state government sought the World Bank's assistance during 1980. The World Bank gave two credits: one expired by 1986 and another in June 1997, for a total loan of Rs 5.48 billion. Meanwhile, in 1988, the state felt the need for an authority to look into required land acquisition, which was posing a major problem in project implementation.
3. The corporation has accumulated a loss of over Rs 700 million and depends on the government for large subsidies to continue its operations. It faces constraints on what it can charge for its services and cost escalation add to the deficit every year. Nearly 20 per cent of the deep tubewells that were not being adequately utilized have been closed down; the corporation began leasing out the tubewells to users in 1987 to reduce costs. It had a staggering wage bill of Rs 220 million for a staff of 6,400, while its annual gross income was only Rs 60 million.
4. Fund raising has become easy for KBJNL because: (*a*) Karnataka is not a heavily indebted state, (*b*) Rs 50 billion is not a high enough amount to shake up the government's financial health in crucial conditions, (*c*) the highest payment will be only in one year, that is Rs 17 billion in 2004. According to the management of KBJNL, this is manageable. Its borrowing is only for a fixed period. Investors know the purpose of borrowing. Further what boosts up their confidence is the fact that the project completion is on schedule. Other reasons include the lack of political interference and the fact that the company also places its funds temporarily in other banks to earn interest (at 9–10 per cent).
5. The actual O&M cost in UKP has turned out to be Rs 912/ha, which is almost 200 per cent higher than the amount projected by KBJNL (Rs 300/ha) in its prospectus. The current water fee levels, according to the senior official of KBJNL, are very low and collection of this even lower. Even the revised rates, which would be about 20 times the current rates, may not be able to recover the high O&M costs of KBJNL.
6. The state government appoints the village secretary for monitoring and evaluating the revenue details of the villages he is in-charge of; he works under the *mandal* revenue officer. Generally, a village secretary looks after a cluster of villages in a *mandal*/*taluk*.

Enabling Environment

Chapter 10

Farmers can develop rules and sanctions and the benefits of WUAs would be greater than costs where WUA distributes benefits and costs fairly. If this is the expected result, it is important to understand what makes PIM work.

In creating an enabling environment for participatory management to work, the stakeholders must be interested and willing. The government, the incumbent power broker and major 'stakeholder' in most national irrigation sectors, must be willing and interested. At least three sections of the government must support PIM: political leadership, administrative leadership and irrigation agency leadership. A high level of political commitment for PIM is most important. This has been highlighted in Mexico, Indonesia and Montenegro where WUAs have a well defined and strong legal basis.

Some would argue that the more powerful stakeholder must also be brought into any discussion of PIM policies at the earliest stage. Here farmers themselves are referred to. They have the most to lose and also to gain from changes in the way their irrigation systems are managed. The membership of farmer stakeholders overlaps with governmental stakeholders in the form of political leaders who represent farming constituencies. These political forces that can speak on behalf of both the government and the farmers can be particularly important in both designing and promoting PIM reforms. The transfer of full management authority to WUAs (with legislation, regulations and transfer agreements) is another important criterion.

The types of restructuring could be: (*a*) down-size or 'right size' agency, (*b*) retrain and redeploy agency staff, (*c*) transfer agency staff to the WUA (as done in USBR, Mexico), (*d*) change from centrally-financed line agency to service-financed utility and (*e*) adoption of new roles. The new roles for the agency could be: (*a*) managing river basins and aquifers, (*b*) protecting watersheds, (*c*) regulating the sector, (*d*) monitoring water quality, (*e*) building capacity of WUAs, (*f*) providing support services to WUAs, (*g*) monitoring and auditing the performance of WUAs and (*h*) providing new incentives and accountability mechanisms for WUA, agency and private sector.

Interest and commitment through expressions of interest in PIM are strengthened by facilitating participation in workshops where international experiences are shared (for example, the WBI seminars in Mexico, 1994; Turkey, 1996; Tokyo, 1997; IIMI/FAO seminars in China, 1994; Thailand, 1996). Specific study tours to 'model' countries and schemes are arranged. The World Bank had arranged such study tours to Spain, Mexico, Argentina and Chile. Teams of political and administrative leaders have participated in these visits. The first such visit to Mexico by senior Turkish policy-makers was followed by study tours of several contingents of government officials from the public works

department. These visits and the shared experiences clearly contributed to the speedy implementation of PIM in Turkey. In Egypt, a tour of the USAID-assisted Irrigation Improvement Project was organized for legislators by the Ministry of Water Resources. The tour contributed to a much better understanding of, and subsequent policy support for, shared financing and management of the irrigation system by the government and water users.

The role of a PIM 'promoter' is very significant. One clear lesson from participatory experience is the importance of a PIM promoter or 'champion' who is effective in mobilizing support within the government/irrigation agency. Typically this role is played by a key official within the agency. In the Philippines, for example, the assistant administrator of the NIA is rightfully considered the father of PIM in that country's irrigation sector. In Mexico, there were well-placed champions within the national water agency (CNA). Perhaps it is possible to rely on a senior consultant (who has the ear of top officials) to mobilize support within the agency. This is the approach being tried in Orissa, India, where a consultant on 'farmer organization and turnover' will serve as a guide, but not a direct supervisor, to the irrigation department field staff re-trained as organizers. A cadre of specialized social organizers will also be involved as assistants to these engineers.

Building consensus about the need for change by stimulating a policy dialogue about the need for change and options to be considered can be based both on experiences within the country and by examples from outside the country. Within the country, public discussion of problems faced by farmers whose water services are unreliable or inequitable could be complemented by highlighting other cases where management reforms have resulted in improvements. Universities and centres of higher learning can help organize public discussion events. The media can help in reporting the outcome of these events and highlighting key issues in the debate. Non-governmental organizations can assist in seminars with water users. In Egypt, a professionally-made video film was made available to television stations that attracted large rural audiences in a pilot project area.

Bringing policy-makers into contact with PIM cases in other countries is a high-priced activity, but it can be a powerful ingredient in swaying long-held opinions. Study tours, if carefully arranged and if the right people are involved, can make dramatic differences in the outlooks of individual officials.

A danger in designing and implementing PIM programmes (and a cause for their failure) is the lack of attention to farmers' interests and support. Since the impetus for PIM often originates in the perilous state of irrigation agency budgets, the focus for PIM from the agency's perspective could be quite limited, for example, targeting financial contributions from farmers. The question, of course, is: why should farmers be interested in organizing themselves, if it results in higher fees? Improvement in services and potential for income enhancement are better motivators for user organizations. Farmers' incentives cannot be assumed, but rather must be assessed through field interviews and discussions with a representative sample. Farmers' involvement in designing a management model for PIM that builds in strong incentives is critical and often a neglected step in PIM implementation.

Participatory irrigation management has to be seen as one part of a broader package. Farmers are interested in much more than just the irrigation system; they want to improve agricultural production and, more broadly, to improve their livelihoods. Strong programmes to modernize agriculture, agri-business and marketing could be looked into. In Mexico, when the National Water Commission first met with farmers to discuss their interests and what their priorities would be for irrigation improvements, it expected that farmers would ask for more lining of their canals. This is an expensive, but important improvement to canal networks in many areas. The Commission was surprised to hear from the farmers that what they were most interested in was full management autonomy. Instead of a physical improvement, they were looking for institutional improvement. Both types of improvements were within the authority of the government to arrange, but through different means; one required a simple financial outlay, the other required legal changes.

The essential capacities needed by WUAs are: (*a*) the capacity to govern the irrigation system, (*b*) the capacity to commission management services and (*c*) the capacity to invest adequately in irrigation system to ensure productivity and sustainability of irrigated agriculture (see Table 10.1).

Capacity to govern irrigation systems include (*a*) defining service area and objectives, (*b*) setting and enforcing rules, (*c*) selecting and removing leaders, (*d*) settling disputes and (*e*) negotiating at the basin/aquifer level. The types of governance in practice include (*a*) direct governance (Mexico, Indonesia, Kyrgyz Republic), (*b*) joint governance (the Philippines, China, India, Ferghana Valley in Central Asia) and (*c*) representative governance (Turkey).

The policy-working group should assess: (*a*) is the basic reform really needed? (*b*) what elements of the reform are needed? (*c*) how sensitive are the reforms? (*d*) what kind of reform process is needed? (*e*) how should changes be designed and adopted? and (*f*) what incremental improvements are needed? The policy working group should facilitate: (*a*) negotiations between officials and stakeholders and (*b*) promote incremental improvement.

TRIGGERS FOR IMT

1. In Mexico, political will at the highest level of the government was the main component in the IMT programme. In 1989, with a new administration in office, comprehensive water management was recognized as a top priority issue. The CNA was created and a national policy on privatization took off.
2. In Colombia, it was the National Planning Department that submitted the Land Reclamation Programme in 1991–2000.
3. In Turkey, budgetary crisis led to a squeeze on financial allocations to the state water resources agency (DSI). This provided the initial impetus.
4. In Argentina, a programme to modernize the entire economy, which began in 1990 with the privatization of large electricity utilities, led to the turnover of water management to the provinces.
5. In the Philippines, the NIA embarked on an ambitious programme in 1974 to increase rice production. One provision of this policy was

Table 10.1 Support to Enable WUAs to Govern Irrigation Systems

Governance	Management	Support to Commission Management Services	WUA Capacities	Making Adequate Investments	Basic Reforms/ Incremental Improvments
Legal empowerment of WUA.	Choose service providers (for example, Andhra Pradesh, China).	Train the WUA about how to make and enforce agreements (contracts) for O&M services and reorient agency.	Make budgets and set service fees.	Train the WUA to make budgets, set and use fees, make asset management plans, conduct financial audits.	Basic reform for fundamental, sensitive change may need 'big bang', but not to forget incremental improvement.
Granting a water use right to the WUA.	Make service agreements.	Provide technical and financial services.	Mobilize sufficient resources from and for water users.	Government shifts from financing O&M to assisting with capital investment and regulation.	Incremental improvement for adoption of new management methods, information systems, etc., but not to forget reforms.
Do participatory appraisals (irrigation, agriculture).	Monitor and regulate service provision and behaviour of farmers.	Build capacity of WUA.	Manage bank accounts, obtain credit.	Government or private sector provides demand-driven assistance (for example, rehabilitation in Guangzhou, China)	Underlying incentives and accountability mechanisms.
Facilitate democratic formation of WUA and selection of leaders (for example, Andhra Pradesh and Indonesia).	Enforce service agreements and rules.	Help settle disputes fairly and rapidly.	Make and implement asset management plan (for capital investments).	The government designs smart subsidies that encourage local investment (for example, KIIF, Indonesia).	Promoting basic reform.
Facilitate preparation of WUA constitution, rules and service plans.	Participate in management audits (as done in Andhra Pradesh and Indonesia).	Regulate the sector and manage basins.	Develop a capital reserve fund.		
Facilitate irrigation governance audits.		'Unbundle service provision' and diversify service providers.			
		Capacity to invest adequately in irrigation.			

for subsidies for O&M of systems to be gradually phased out over a five-year period at which time the NIA would be directly dependent on collections from farmers. The hydraulic infrastructure should be in fair condition and an affordable and reliable water supply should be available most of the time. Being in fair conditions means the hydraulic infrastructure is in operating conditions capable of delivering water to farms in sufficient amount to satisfy crop needs and in a timely manner. Surface

drainage of surplus water and salinity should not be limiting factors. If these basic conditions are not satisfied, then a rehabilitation plan should be considered.

Political and Social Factors

1. In Mexico, although the irrigation districts had suffered considerable deferred maintenance, the IMT programme took off quickly because all of the systems were performing satisfactorily at the outset, with water conveyance efficiencies at main and secondary canal levels of the order of 60 per cent. The readiness of users to assume management responsibilities has to do with political and social factors.
2. It seems clear that water users from Saldana and Coello in Colombia were 'ready' in 1976 when they asked their government to turnover the administration of their districts to them.
3. Because of its political background and social context it is apparent that Argentinean farmers were also ready for the change.
4. In Turkey, farmers were used to a tradition of strong central government and many, especially the early adopters, were market-oriented producers. This made them somewhat receptive to the government's declarations about the necessity to transfer managerial and financial responsibility. In most districts of Mexico, however, this was not the case. In the first place there was the land tenure issue. After the 1910 Revolution, land was divided between two types of small farmers—*ejidatarios*, who worked small plots of land held communally and small landowners, some of whom belonged to the *hacendados* or landlords' elite. Second, there were numerous voracious, government-controlled *ejido* leaders who, when consulted about the coming change, voted against it suspecting that the change would mean a reduction of their status. Promotional aspects of IMT in Mexico were vital to overcome these difficulties.

Various other reasons have triggered the initiatives taken in adopting PIM. Most possible reasons quoted across countries are listed in Table 10.2, which presents an interesting picture of the key motivating factors, levels of progress, initiatives undertaken and other aspects related to PIM.

Irrespective of the countries, the factors that have motivated IMT have been O&M problems, farmers' request to take over management, shortage of funds and poor collection of water fees by the government and as part of the general liberalization policies of the government. Similar factors were prevalent in other countries where the traditional institutional set-up was falling apart and IMT was seen as a solution to set the system right (see Box 10.1).

Participatory irrigation management was adopted across countries and approaches were varied. The following sections give an overview of the commonalities across countries in adopting the policy and legal framework and the implementation process.

Policy and Legal Framework

All the countries have felt the need for bringing in a policy and legal framework to take care of specific aspects (see Table 10.3). Most of them have regularized the rights issue in maintaining

Table 10.2 Factors Motivating IMT

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Poor maintenance of irrigation systems	*	*			*	*		*		*	*	*	*	*	*	*
Poor operation of irrigation systems	*	*	*		*	*		*	*	*	*	*		*	*	*
Farmers requested to take over management	*	*	*	*					*			*		*	*	*
Shortage of government funds to allocate to O&M		*	*	*	*	*		*		*	*	*	*	*	*	*
Government could not collect enough fees from water users		*	*		*	*		*		*	*		*	*	*	
Pressure from central department		*	*		*							*		*	*	
Part of general liberalization policies of government		*		*	*			*		*	*	*		*	*	*
Insufficient collection of government fees												*				
Perception by farmers of rising costs with no local control over O&M of irrigation and drainage schemes										*						
Poor irrigation service													*			
Pressure from donors							*						*			
Inequity and unreliability of water													*			
Recommendations from donors for irrigation rehabilitation														*	*	

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

Box 10.1 The Mexican Experience

The Mexican IMT programme concluded at the end of the year 2000, or almost 11 years after it was initiated. It transferred 95 per cent of its 3.2 million hectare to 427 WUAs serving 474000 water users; 72 of its 82 districts have undergone total transfer, 7 partial transfers, and 3 are to be transferred. It has generated a wealth of experiences not only for the country but also for the international community. Some of the most important lessons are listed here.

Strong political support: IMT received a political commitment not only at the highest level of government but also from large groups of economically powerful farmers. A strong message went to all parties involved that the programme would be enforced and no reprieve was possible.

Institutional rights and powers: The programme was supported with a new water law that defined property rights over water and provided the new service arrangements with clear rights, roles, functions and responsibilities. In addition, it was developed on already existing strong institutional and ideological basis for user representation in the new organizations. IMT "model" appeared to be just one but in reality it was many models that catered to local needs and concerns.

Adequacy of incentives for farmers: A strong and wide-reaching promotion and training campaign had been designed as an integral component of the process. This became a mechanism by which farmers got to know of better potential outcomes and impacts of taking over.

Overcoming resistance by irrigation agency: During the initial stages of IMT, the Irrigation Agency resisted the programme. It perceived IMT as a threat to its power and personnel. However, the programme was flexible enough that allowed for staff to be either relocated to other areas or to be hired by the newly created organizations, if desired.

Support systems: With IMT implementation and the new institutional arrangements derived from it, many support services that were previously provided by government agencies also became part of WUA responsibilities—agricultural extension services, technical assistance, legal matters, and training programmes.

Source: Enrique Palacios V., Country Cases, INPIM.

irrigation and enforced sanctions, obtained credit and made contracts. Technical support is another important factor. However, implementation is weak with respect to training of WUA staff, monitoring and evaluation and policies to reorient the mandate of the irrigation agency.

National policies for IMT implementation vary on objectives and scope.

1. Under the Philippines Water Code of 1976, the appropriation of water by an irrigator association has priority over requests of individuals. The government then helped farmers organize themselves into irrigator associations which entered into various types of contracts with the NIA to handle O&M of the system.
2. In Turkey, the General Directorate of State Hydraulics (DSI) is the main executive agency for water resource planning, execution and operation. It was established in 1954 and is part of the Ministry of Energy and Natural

Table 10.3 Policy and Legal Framework

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Water right for users	*		*		*		*	*	*			*	*			*
Water rights for WUAs												*				*
WUA's right to use and maintain irrigation infrastructure	*	*			*		*	*		*		*	*	*	*	*
WUA's legal right to enforce sanctions, obtain credit and make contracts	*	*			*			*		*		*	*	*	*	*
Dispute settlement and appeal process	*	*							*			*	*			*
Policy to redeploy agency staff displaced by IMT	*	*										*				
Technical support service for WUAs	*			*				*	*	*		*		*		*
WUAs linked to river basin management	*															
No specific legislation adopted for IMT				*		*					*					
WUAs have the right to develop businesses and make profits							*		*	*		*	*			*
Policy to reorient the mandate of the irrigation agency							*						*			
WUA linked to river basin management								*								*

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

Resources. Since the early 1960s, DSI has had a programme to transfer O&M responsibility for secondary and tertiary distribution networks to the irrigation agencies. Under the programme, irrigation agencies entered into contracts with the DSI to take administrative responsibility for tasks such as collecting and submitting farmers' water demand application forms to the DSI, managing water distribution below the secondary canal and cleaning and minor repair of canals and other small hydraulic structures. Although the existing municipality law appears to be providing a workable initial basis for the formation of irrigation agencies, further development and evolution may require a law specifically for them.

3. Argentina is a federal entity divided into 23 provinces, which are autonomous in all aspects related to water (rights, granting, duration, taxation, etc.). The IMT programme began in 1990 as a response to pressure from the national government to reduce bureaucracy and render public administration more efficient.
4. In Mexico, the 1989 presidential decree that created the CNA also granted the agency the responsibility to (*a*) define the country's water policies and (*b*) allocate water to users through licences and permits. The new policy: (*a*) created autonomous and self-financing and water utilities to provide water services in cities and in irrigation districts, (*b*) encouraged water re-use and water quality conservation and (*c*) promoted a new water culture based on efficient use of the resource.
5. In Colombia, the policy of IMT is part of a larger shift in agricultural policy towards minimizing state subsidies and regulation. However, the state continues to play a major role in land

reclamation and rehabilitation and expansion of irrigation areas.

Irrigation Management Transfer Implementation Process

Formation of WUAs, selection of leaders in a democratic set-up and training thereafter has been adopted in most of the countries, indicating the success of the initiation process (see Table 10.4). Farmers have also participated and contributed for repairs and maintenance. There is less focus on strengthening the process and sustainability of management. In countries like Mexico and Colombia, where PIM has been successful in the initial stages, second-generation problems are cropping up, which need to be addressed for long-term sustainability. Except for Colombia, Peru and Senegal, other countries have incorporated most of the required steps during the implementation of IMT.

Outcomes of IMT

Many governments assume that transfer of management responsibility to farmers' organizations will improve the accountability of irrigation services to the farmers, make the service more cost efficient, motivate the farmers to invest more in maintaining irrigation systems and, ultimately, make irrigation systems and irrigated agriculture more sustainable (Vermillion, 2004) (see Box 10.2).

Based on a study conducted by the International Water Management Institute (IWMI) in 1992 in four countries (Sri Lanka, Colombia, Indonesia and India) in two phases in attempting to answer some important questions like the main strategies adopted, impact

Table 10.4 Irrigation Management Transfer Implementation Process

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IMT steering committee	*				*				*			*	*	*		
Farmers' participation in planning/review	*			*	*			*	*	*	*	*		*		*
Formation of WUAs	*	*		*	*	*	*	*	*	*		*	*	*		*
Democratic selection of WUA leaders	*	*	*	*	*				*		*	*		*	*	*
Training of WUA staff in finance and administration	*		*	*	*			*	*	*	*	*	*	*	*	
Training of WUA staff in O&M, repair/improvement of infrastructure	*	*	*	*			*	*		*	*	*	*	*	*	
Farmers' participation in repairs/improvements	*			*	*	*	*	*	*	*	*	*	*	*	*	*
Farmers paid part of the cost of repairs/improvements	*		*	*		*		*	*	*	*	*	*	*		*
Training for irrigation agency staff	*		*		*			*	*	*	*	*		*	*	*
Limited redeployment of agency staff to units transferred to WUAs		*			*											
Redeployment of agency staff		*	*	*	*					*		*	*		*	
Monitoring and evaluation programme				*	*		*	*	*	*		*		*	*	

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

of IMT and ways that IMT could be organized and implemented to produce successful results, it was found that:

1. Irrigation management transfer had reduced government expenditure.
2. There was no significant change in irrigation intensity or in adequacy or equity of water distribution, but improvements in communications and responsiveness to farmers' needs by management staff was reported.
3. No significant change was reflected in increased productivity.
4. With respect to maintenance of irrigation infrastructure, results were mixed.
5. Regarding agricultural productivity, the results were mixed; however, it depended on many factors.
6. Increased economic productivity also indicated mixed results and the impact of IMT could be seen in the long run in terms of cost savings and new technologies influencing positive effects.

Initially, payment by farmers increased, but the cost of irrigation to farmers relative to the gross value of the output of irrigated agriculture declined over time after IMT. This was due to more cost-efficient management techniques and an overall increase in economic productivity. Research in some places in the four countries within a five-year post-IMT time frame indicates that such improvements did not result in enough gains in efficiency relative to economic productivity to bring about a significant decline in the cost of irrigation relative to the gross value of output.

An overview of results from IMT is presented in Table 10.4. In all countries the cost of irrigation increased for farmers and decreased for the government. This shows a positive sign with reduced financial burden on the state and more responsibility for the farmers. Efficiency of fee collection shows mixed impact where it increased in the majority of the countries, remained the same in a few countries and decreased in three. As water fee collection levels increased, added with reduced costs (see Table 10.4), a positive trend has resulted, depicting the responsiveness of farmers in cooperative management. The quality of maintenance has also improved in the majority of the countries. In the majority of the countries (see Table 10.4) timeliness and equitable distribution of water had improved which could be attributed to IMT; the WUAs had been able to organize themselves. Equity in water delivery was

Box 10.2 Tajikistan Passes Its First Water User Association Law—A Success Story

In November 2006, the Parliament and President of the Republic of Tajikistan signed the Water User Association Law, the first of its kind, into law. Previously, water user associations (WUAs) registered under the Law on Public Associations lacked the legal rights needed to effectively operate and maintain their irrigation and drainage systems. The USAID-funded Water User Association Support Programme provided critical assistance, including providing expert legal advice and bringing key stakeholders together to provide comments and recommendations on the draft law. In particular, the WUASP's legal specialist collaborated with other major donors to draft a WUA law for the Ministry of Land Reclamation and Water Resources (MLRWR) of Tajikistan to consider. When the draft WUA law was made open for public comment, the WUASP also provided copies to partner WUAs for their feedback and co-sponsored, with the NGO 'Nature Protection Team,' an open parliamentary hearing. WUA members provided oral and written feedback to the draft WUA law for the ministerial-level WUA Law committee to consider at this hearing. A number of the WUASP's partner WUA members assisted in drafting the WUA Law, fostering a sense of ownership for the law itself among local farmers.

In general, the farmers feel that the law will be of great benefit to them. According to Rahmatulloev Ubodullo from the WUA 'Ohchakman', 'The WUA law provides us the opportunity to protect our rights as an independent organization and the ability to solve our problems through interaction with government officials. Now as an organization, we cooperate with the MLRWR, Water Department and other organizations.' The new Water User Association Law represents a significant step forward in enhancing and strengthening water user associations, as well as providing a climate that will promote investments in the agricultural and water sector in Tajikistan.

also more in most countries (there were three exceptions), which again indicates a positive trend.

In the majority of the countries, area irrigated increased or remained the same (see Table 10.5). However, in three countries there was a decline in area irrigated, which could be attributed to many local factors. With respect to crop yields, there were mixed results: change in yield patterns and positive effects of IMT would take a long time to become visible. Similarly, farm income in the majority of the countries remained the same as before, except in three countries, indicating increased income. Environment-related aspects had not been adequately addressed as indicated in Table 10.5. The problems of salinity and waterlogging have remained indicating that IMT needs to work towards incorporating the management of environmental concerns.

EFFORTS IN INDIA

Policy Framework

Policies for Government Irrigation Schemes

Based on the experience so far in promoting PIM in India, the following appear as essential elements for creating an enabling environment for making a success of PIM through clear, high-level support:

1. Identify and document successful WUAs promoted by NGOs or by enlightened efforts and use the information for disseminating best practices.
2. Clear and strong legal status of WUAs, reaching up to project and later to basin level for PIM.
3. Water rights for WUAs and individual farmers for entitlement of agreed quantity of water depending on landholding in proportion to the total command area and also availability of water from season to season.
4. Statewide basic common principles of decentralization and devolution, adequate funding with flexibility for farmers' organizations to develop systems and practices to suit local requirements.
5. Institutional reform should accompany rehabilitation.
6. Integration of 'PIM Plus' to develop agriculture, agri-business and marketing.
7. Forums providing interactions between irrigation agencies and interested NGOs and academics to identify issues and possibilities for taking forward the objectives of PIM.
8. Water should be allocated first to the 'assured irrigable command area' for each season. The district collector or responsible WRD official should declare this area. The amount of water allocated should be 'sufficient for the maturity of the crops' in the area during that season.
9. All landholders within the 'assured irrigable command area' must pay irrigation fees for the season whether or not they take water for irrigation.
10. If extra water is available during a season, the government officer responsible for the area may then allocate water sufficient for the crops to the 'probable irrigable command area'. Landholders in the area allocated water must pay irrigation fees for the season subject to actually receiving sufficient water.
11. The state government may decide not to declare an 'assured irrigable area' within a scheme. Instead, the

Table 10.5 Results of Irrigation Management Transfer

Specifics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Cost of Irrigation																
Increased for farmers and decreased for government	*	*	*	*	*		*	*	*	*	*	*				
Decreased for farmers and government															*	*
Change unknown						*							*	*		
Water fee Collection																
Increased	*		*		*			*	*			*				
Decreased										*					*	*
Same				*		*	*				*			*		
Canal Maintenance																
Improved	*	*	*		*	*			*		*	*			*	*
Declined				*			*	*								
Same										*				*		
Change unknown													*			
Timeliness and Equity of Water Delivery																
Timeliness																
Improved	*		*			*		*			*	*	*	*	*	*
Not improved							*									
Same				*	*											
Change unknown		*														
Equity of water delivery																
Improved			*							*	*	*	*	*	*	*
Declined	*					*		*								
Same		*		*			*		*							
Crop area, yields, environmental																
Area irrigated																
Increased		*	*						*	*	*	*			*	
Decreased				*				*								*
Same	*				*	*	*							*		
Change unknown													*			
Crop yields	*															
Increased			*			*				*					*	*
Decreased																
Same		*			*		*	*	*			*		*		
Change unknown											*		*			
Farm income																
Increased										*					*	*
Same	*	*	*			*		*				*				
Change unknown							*				*		*			
Salinity														*		
Increased			*													
Decreased																
Same	*	*		*			*		*	*						*
Waterlogging																
Increased							*									
Decreased																
Same	*	*	*	*						*						

Source: Compiled from country profiles, INPIM.

Note: Countries indicated: 1—Argentina, 2—Colombia, 3—Dominican Republic, 4—Ecuador, 5—Mexico, 6—Peru, 7—Senegal, 8—Zimbabwe, 9—Australia, 10—Armenia, 11—Bangladesh, 12—Nepal, 13—Pakistan, 14—Sri Lanka, 15—Albania, 16—Bulgaria.

government may require that every farmer desiring water for a particular season must submit an application to the responsible WRD official who then must grant the water in writing on the applications. If the WRD official receives applications from 75 per cent of the farmers in a given area, he may order delivery of water to all fields in the area and require all farmers to pay irrigation fees. Applications are currently required in the Sone system and under all state tubewells and river lift schemes.

12. The government sets irrigation fees on a per hectare basis. Different fees are set for different seasons. Also, a distinction may be made between a single irrigation and more than one irrigation during the season. The law says that fees may differ from scheme to scheme. However, there are currently two sets of rates only; one for all state surface schemes and another for all state lift schemes.
13. Till 2005, irrigation fees were assessed by the revenue wing of the WRD and collected by the revenue department. It was proposed that from 2006 the revenue wing should be merged with the irrigation wing and the local executive engineer should have the responsibility of both providing irrigation and collecting revenue.
14. Resolution of disputes among users on the same village channel is left to the village or channel owners to resolve unless any appeal is made to WRD officials. Resolution of other irrigation disputes is the responsibility of WRD officials.

National Water Policy

The National Water Policy (1987 and 2005) seems to have had an effect on the interest and form of proposals for IMT in most of the states. First, the earliest experiments with organizing farmers for transfer took place in the Command Area Development Programme. This was and is a national programme. Several states have not been able to make use of central funding for some of the activities such as the support of WUAs mainly because funds are given on a matching basis.

The National Water Policy advocates gradual involvement of farmers in various aspects of irrigation management. The policy states: 'Efforts should be made to involve farmers progressively in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates. Assistance of voluntary agencies should be enlisted in educating the farmers in efficient water use and water management' (MOWR, 1987: paragraph 12). This policy is, of course, not binding on the state governments since water is constitutionally a state subject. However, the Second Irrigation Commission Report frequently quotes, paraphrases, or simply copies the wording of the National Water Policy's rather vague statement on farmers' involvement.

Finally, the recent effort of the central government to promote PIM has had some effect. This is currently being pushed by the central Command Area Development agency within the Ministry of Water Resources. Statements in interviews and in papers in workshops imply that the primary importance of the national effort to promote PIM is to give greater legitimacy to the theory that transfer is

a way to help solve the state's financial problems.

Legal Framework

Irrigation management transfer is granted with a policy issuance in the sense that specific guidelines are drawn on a legal basis indicating the extent of transfer—complete/partial. This may include provisions for water rights; status, powers and responsibilities of WUAs; dispute resolution arrangements and new roles of the government. Clarity in sharing responsibilities between the government, WUAs, contractors, NGOs or other private sector entities is necessary. Apart from this, the extent of responsibilities of managing sub-levels, tertiary or secondary canals, watercourses or minor canals has been defined. Legislation is enacted as part of IMT to provide the legal basis for reform. Water use rights, rights to improve and extend infrastructure across private and public land, right to require water users to become members and pay for the water service, right to make rules and enforce them with strong sanctions and the like would require legislation.

Box 10.3 Focus on PIM in the State Water Policy of Rajasthan

- 'Promoting beneficiary participation in all aspects of water planning and management, with particular emphasis on WUA intended to manage and maintain irrigation and drinking water systems, both physically and financially.
- Farmers to be involved in various aspects of management of irrigation systems—water distribution and collection of water charges.
    - Evaluating results of ongoing pilot projects.
    - Introducing changes in legislation for fostering user participation in irrigation.
    - Prioritizing of funds for rehabilitation and modernization of irrigation projects where farmers are willing to form WUAs.
    - Assistance of civil society organizations/NGOs to educate farmers on water management and efficient water use to prepare ground for public acceptance of reforms, regulations in water sector and demand management.
- Involve local bodies, NGOs and voluntary agencies at all stages and eventually transfer the management to them with due involvement of women.
- Organizations at the intermediary level between the State Government, and WUAs with representation of PRIs, water user groups and public representatives should be planned to bridge the gap between policy, planners and water users.
- Financial incentives should be given to panchayats, local bodies, WUAs to encourage water conservation and water management.
- Formation of user organizations and associations at various levels to evolve strategy for judicious and equitable use of water to propagate usufruct rights to communities.'

Source: Water Resources Department, Jaipur, 2006.

Water Laws in the Philippines, Mexico and Colombia

1. National water laws that clearly specify the rights of irrigation associations and individual users appear to be an important factor in successful management transfer. Without such rights, irrigation associations are extremely vulnerable to increased demands from other more powerful users, such as industries and municipalities.
2. Beginning in 1976, the Philippines attempted to develop a water rights register of all water rights in the country, including specifying in volumetric form the water rights of the national and communal irrigation systems. All irrigation associations must register their water rights. Once legally registered, water rights cannot be withdrawn except for failure to use them as stipulated in the law.
3. This system can be contrasted to that of Mexico where the irrigation associations are given a limited concession to use the irrigation infrastructure and associated water supply, but do not have a clearly specified legal right to a volumetric supply. With domestic supply having priority, irrigation associations are not ensured a constant water supply over time. The concessions are also for a fixed time frame (20–30 years) after which they can theoretically

Box 10.4 Main Objectives of PIM in Bihar

1. 'To initiate participation of farmers in water management, irrigation scheduling, distribution and maintenance of system at the micro-level so as to:
   (*a*) to improve irrigation as well as water use efficiency or optimal production per unit volume of water; and
   (*b*) to make the best use of natural precipitation and groundwater in conjunction with the canal water for increasing irrigation and cropping intensity in the command.
2. To develop a sense of economy in water use amongst the users.
3. To facilitate the users to have a choice in selecting crops, cropping sequence, timing of water supply and period as well as frequency depending upon the soils and availability of water, climate and other infrastructure facilities available in the commands such as roads, markets, cold storages etc., so as to maximize the incomes and profits.
4. To delineate responsibility of water distribution and maintenance of system between the users and the department for attaining high serviceable standards of the system.
5. To promote equity amongst the users both relating to allocation and actual supply of water.
6. To facilitate resolution of conflicts among farmers.
7. To entrust collective and community responsibility on the farmers to collect water charges and payment to government.
8. To improve and sophisticate deliveries precisely as per crop needs by the department at the supply points of the minors and thus reduce operation losses.
9. To create a healthy atmosphere between the managers and users in the entire operation.'

Source: Water Resource Department, Patna, 2005.

be reassigned to another user. Since none of the concessions has expired to date, it is unclear exactly what process will be used to determine granting of a second concession.

4. The country where irrigation associations appear to be most vulnerable to changing water demands is Turkey, where water is controlled by the DSI and the associations have no water rights. This system works in areas where there is little competition for water, but leaves the associations extremely vulnerable in areas where municipal and industrial use is expanding rapidly. Colombia is somewhere in between these two situations, but is still highly dependent upon the national irrigation agency, as the country has yet to establish a legal water rights system.

Experiments in IMT in India often had no legal support. In many cases, no laws exist that permitted organized farmers to take on irrigation management functions while there are laws that actually seem to prohibit aspects of the changes. To avoid conflicts with existing laws and to ensure that the changes are not undone through legal challenges, there is a need to ensure that laws support transfer.

Irrigation management transfer requires four types of legal support (Brewer et al., 1999):

1. Legal recognition for WUAs at different levels of the project.
2. Legal authorization for WUAs to (*a*) acquire and distribute water, (*b*) repair and maintain the irrigation system, (*c*) collect water fees, (*d*) punish defaulters within their area and (*e*) resolve disputes among water users within their area.
3. Appropriate legal definition of water allocation and resource mobilization procedures.
4. Legal definition of means for dispute settlement among WUAs and between WUAs and state agencies.

Presently, none of the states in India has made legal provisions that are complete. The following section specifies the details of provisions of PIM acts in India (INPIM, 2001).

1. *Provisions in PIM Acts*: Recognizing the need for sound legal framework for PIM in the country, the Ministry of Water Resources has brought out a model act to be adopted by the states for facilitating PIM. The legal framework provides for the creation of farmers' organizations at different levels of the irrigation system as discussed next:

(*a*) Water users' association will have a delineated command area on a hydraulic basis, which shall be administratively viable. Generally, a WUA would cover a group of outlets or a minor.
(*b*) Distributary committee will comprise five or more WUAs. All the presidents of WUAs will comprise the general body of the distributary committee.
(*c*) Project committee will be an apex committee of an irrigation system and presidents of the distributary committees in the project area shall constitute the general body of this committee.

The associations at different levels are expected to be actively involved in (*a*) maintenance of the irrigation system in their area of operation, (*b*) the distribution of irrigation water to the beneficiary farmers as per the *warabandi* schedule, (*c*) assisting the irrigation department in the preparation of water demand and collection of water charges, (*d*) resolving disputes among the members and the WUA and (*e*) monitoring flow of water in the irrigation system.

2. *Enactment of Legislation for PIM*: As a result of various conferences/seminars, there has been an increased consciousness in the states about the need for actively involving farmers in the management of irrigation systems. Some states have already taken steps for providing legal backup for the implementation of PIM. Details are given in Table 10.6.

Legislative changes in implementing PIM were made in different stages. Special committees have been formed to promote PIM and address specific issues in some states. In states that are already successful like Andhra Pradesh, the focus is more on transparency and accountability at the WUA level. In Gujarat and Maharashtra, draft bills have been circulated[1] and are yet to be finalized. In Assam, the Irrigation Water Users Act is being finalized and stress has been given to the formation of committees. In Tripura, guidelines for handing over irrigation schemes to panchayats for collection of water charges have been drawn up for O&M and a notification has been issued. In short, PIM is at various stages of refinement.

The need for legal recognition of WUAs is largely satisfied by registering WUAs under the Central Societies Registration Act of 1860, various state Societies Registration Acts, or Co-operative Societies Registration Acts.

Table 10.6 Status of PIM-related Acts

Name of State	Position of Issue/Amendment of Irrigation Act
Andhra Pradesh	Enacted the Andhra Pradesh Farmers' Management of Irrigation Systems Act, March 1997.
Goa	Enacted the Goa Command Area Development Act, 1997 (Goa Act 27 of 1997).
Karnataka	Promulgated an Ordinance on 7 June 2000 for amendment of the existing Karnataka Irrigation Act, 1957.
Madhya Pradesh	Enacted the Madhya Pradesh Sinchai Prabandham Me Krishkon Ki Sahabhagita Adhiniyam, 2000.
Orissa	Enacted the Orissa Pani Panchayat Act, 2002.
Rajasthan	Passed the Rajasthan Sinchai Pranali Ke Prabandh Me Krishkon Ki Sahabhagita Adhiniyam, 2000.
Tamil Nadu	Enacted the Tamil Nadu Farmers' Management of Irrigation Systems Act, 2000.
Kerala	Enacted the Kerala Irrigation and Water Conservation Act, 2003.
Bihar	Enacted the Bihar Irrigation, Flood Management and Drainage Rules, 2003 under the Bihar Irrigation Act, 1997.
Maharashtra	Enacted the Maharashtra Management of Irrigation Systems by Farmers Act, 2005.
Assam	Draft Irrigation Water Users Act was prepared with a thrust on the formation of committees at various levels.
Tripura	Guidelines for handling over irrigation schemes to panchayats for operation, maintenance and collection of water charges for irrigation schemes. Notification was issued.

Source: Review.

Box 10.5 Refinements Suggested by NGOs in the Policy and Legal Framework of Madhya Pradesh

1. Role for Women
   - In the Act, 1999, only landholders had rights to vote. Very few women headed households had lands on their name, thereby, depriving women representation at the WUA level.
   - Amendments were suggested to have voting rights to both husband and wife to recognize all voters as members. Thereby, during the second elections held in February 2006, the state had 30 women elected as presidents at the WUA level, and 300 women as territorial committee members.
2. Farmers' role from planning stage.
   - Beneficiary farmers have been accorded a role for their involvement from the planning stage of a new or to be renovated irrigation project. This was implemented in MPWRSP.
   - Necessary amendments to the Act is being worked out.
3. Representation in PRIs
   - WUAs will be provided representation in all panchayat raj bodies and other concerned local bodies (for example, district planning committees, mandi committee).
4. Demands from the WUAs.
   - The WUAs should be allowed to withhold fees in case of poor service delivery—both in terms of quantity and timelines at various levels. Though the Act lets WUAs collect water fees and retain a share of it, it does not mention the specific percentage to be retained. Over the last six years, no effort has been made to enable the WUAs to retain their water fee collection.
   - More freedom for the selection of crop pattern at the WUA level.
   - Water trading rights for each individual needs a clear mention in the Act.
   - Many WUA presidents (elected in February 2006) were unaware of the Act (even in November 2006). They wanted the *amin* (field functionary of the revenue department) to explain it to them or provide basic details about it.

Source: Based on interactions with NGOs and WUA presidents, November 2006.

However, Maloney and Raju (1994) have suggested that registration should be provided through new legal enactments by including such recognition in revised state irrigation acts which was provided in Gujarat's 1996 draft irrigation act. Joint management committees may not require formal registration, but their functions need legal recognition. There is concern about the structure of WUAs to be specified in law.

No state has yet provided full legal support for transfer policies. This is appropriate in those states where the policy has not yet been fully defined and where experiments are still going on. Tamil Nadu has issued a government order defining its policy, but it is clear that time is still needed to ensure that the policy will work as expected. Maharashtra and Kerala have fully defined their policies. Kerala has the most comprehensive law, but it fails to allow for farmers' initiative, provide means for WUAs and joint management committees to enforce their decisions and is applicable to only some irrigation schemes. The Maharashtra Irrigation Act, by comparison, provides better legal support for the state transfer policy, but does not recognize WUAs. Gujarat's draft law provides sufficient powers to WUAs to make transfer work as expected. It blends needed changes in water allocation and resource mobilization procedures together with the powers needed by WUAs. No state law provides adequate means for rapid and fair resolution of disputes among WUAs and the irrigation agency.

KEY LESSONS

1. Enabling environment plus support is equal to a capable WUA (Mexico, Indonesia and Paliganj, Bihar).
2. Water users' association without empowerment is common, but not productive or sustainable.
3. Water users' association with empowerment is rare, but productive and sustainable (Mexico, in some places in Andhra Pradesh and Indonesia). Rehabilitation/construction provides the incentive to form WUA, but is risky (many Asian cases, however, the reverse is true in Madagascar and USA, etc.).
4. Participatory irrigation management should be integrated with reforms in the irrigation, agriculture and environmental policies (Mexico).

NOTE

1. The status in 2007.

The Way Forward

Chapter 11

Water management is a serious problem and has invoked efforts towards water management partnership. This has resulted in different experiences at both the national and the international level. Various issues have evolved differently across countries; some are general, while others are site specific. Understanding the issues, the similarities and drawing lessons across these experiences would help in creating pathways to move forward.

POLICY TRENDS

Policies to support farmers' participation in irrigation include institutional organizers, decentralization and pricing policies along with elements of a legal framework that promotes constructive interaction between farmers and government agencies. The process of developing effective partnerships between farmers and government agencies is neither automatic nor easy. There would be resistance from both sides unless the benefits to both are clear. But, increasing organized participation is critical for the sustainability of irrigation systems. In this context, the need is for a strong commitment from the government and effective policies to work with farmers to improve water resource management.

Participatory irrigation management (PIM) is receiving a great deal of attention in India. Both at the centre and in the states, this is seen in the number of expert working groups making recommendations, in legislations being amended and in programmes being put in place. All this can lead to dramatic transformation of the Major and Medium irrigation sector or it can be another trend that comes and goes with little impact. There is potential for PIM to contribute to more efficient irrigation system management and marginally reduce the fiscal deficits of irrigation. However, for this to take place it requires moving from recommendations and plans to action on the ground. Unless farmers themselves respond, nothing will be achieved. Even registering water users' associations (WUAs) throughout the irrigated commands will not accomplish anything lasting unless the organizations become active in irrigation management. The success of PIM policies must be measured not in the number of recommendations or programmes, or even in registered associations, but in the level of constructive involvement of farmers in improving the performance of irrigation systems. This raises the critical question whether and how farmers will respond to government overtures to increase their participation. Pilot projects show that much can be achieved, but whether these pilot activities can be scaled up to cover large areas remains a question (Raju et al., 2000).

POSITIVE BENEFITS

Research on WUAs has recorded significant positive benefits to local farmers and the system as a whole. These include:

1. Improvements in the equity of distribution of irrigation water.
2. Greater participation of farmers in management decisions.
3. Greater water use efficiency because of cropping and management decisions.
4. Greater participation of farmers in the operation and maintenance (O&M) of the irrigation system.
5. Better productivity per water unit.
6. Development of networks of communication that often draw on traditional management systems. By allowing devolution of decision-making with regard to irrigation management to the local level, farmers can mitigate disputes and design management solutions to water variation over time.

While the benefits of irrigation management transfer (IMT) are well documented, devolution of irrigation management authority has negative components as well. Researchers and citizen advocates have documented several levels of problems. Some centralized irrigation systems have functioned well, and WUAs may not have the economies of scale to match the services provided through these systems. Scaling-up IMT may mean imposing WUA management on irrigation communities—thus undermining the benefits of WUAs from user system ownership of the process. The establishment of WUAs in place of a government irrigation management agency could leave the farming community in an unequal bargaining position with upstream users, such as hydroelectric companies or companies using hydropower for industry. The WUAs do not necessarily benefit from the commercialization of irrigated agriculture or market access. The reality is that WUAs are seen as a strategy for irrigation management, but are not a panacea.

Some centrally-managed irrigation systems have actually performed well and have been able to keep costs low for small farmers compared to locally-managed systems. Farmers have opposed IMT for several reasons: the costs of maintaining the systems locally were likely to exceed the cost of government service provision, even if those were doubled; the WUAs were likely to have trouble obtaining services on their own in remote areas with irrigation agency support; there were concerns about the capacity of WUAs to carry out many of the management functions and to deal with conflicts on their own.

Critics have noted that policy statements about the benefits of IMT have often ignored the potential for local-level corruption, inefficiency and inequity of distribution, and the positive mitigating role that a central government agency could play in this regard. Sri Lanka, Indonesia, Pakistan, Ethiopia and Kenya have engaged in water delivery reforms that led to the establishment of WUAs and transfer of irrigation rights and responsibilities to those associations. Rather than empowering the local communities and NGOs, the result of the legislation has in many cases been lack of local organizations and the deterioration of management systems for the delivery

of water services. Farmers complain in all five cases of being asked to pay ever-higher prices for irrigation delivery, without the promised improvements in efficiency and service delivery. While in theory WUAs will be better able to manage irrigation systems because they are locally based, if IMT involves eliminating or downsizing the government agency that is designed to protect irrigation interests, WUAs are likely not to have power in negotiating with upstream users. Examples of this can be found along the Mekong River, where ADB-funded hydroelectric dams have severely limited irrigation options for downstream users. The locally-organized, village-level irrigation associations have lacked the power to oppose these projects or to force the private corporations that manage the dam, reservoir and hydro-electric plants to distribute water equitably to downstream users for irrigation and other purposes.

COMMERCIALIZATION, MARKET ACCESS AND WUAs

Water users' associations are often considered as an important step in moving developing country farmers from production of subsistence crops to production of commercially viable crops such as fruits and vegetables for export. The theory is that through market availability, small-scale farmers will be able to raise sufficient capital to pay fees to WUAs for O&M and improvements of irrigation systems. Thus the government can eliminate subsidies and expenditure on small-scale irrigation. However, a World Bank technical report notes that commercialization of agriculture tends to break down collective action and cooperation that are thought to be critical to the success of WUAs.

Experts on IMT and WUAs argue that transfer of irrigation management must not be taken as a given good. They propose several performance indicators that may be typically used—technical impact (water availability, equitable distribution, expansion of irrigated area, efficient delivery of water and improved upkeep of systems), productivity impact (tangible benefits of increased yields, intensified cropping patterns and improved farm incomes), financial impact (reduced irrigation costs and increased cost recovery), environmental and other non-tangible impacts (changes in water quality, waterlogging and salinity).

THE WAY FORWARD

Irrigation management transfer will not happen only by making/adopting appropriate rules. Used for decades to receiving, however unsatisfactorily, water on payment of paltry charges, farmers would be reluctant to pay an economic rate that will have to be almost five times the rate that prevails in most of the states. Planned efforts will have to be made to create awareness and understanding of what cost they were already incurring in terms of production loss when served by indifferent bureaucratic management. By appropriate motivational methods, most important being exposure visits to WUAs working satisfactorily, farmers will have to be assisted to appreciate that paying higher water charges and strengthening their own WUA would obtain for them far more benefits, particularly more productive and profitable crop-husbandry, than the cost of higher water charges and sharing responsibilities

for management. For better coordination and responsiveness to the requirement of the farmers organized at the ground level, WUAs should be organized and federated up to the entire irrigation scheme.

To acquire the strength of robust people's organizations, WUAs cannot be only creatures of the law. They should be indeed self-governing, but with access to and linkages with external resources. The state irrigation departments will have to design various measures of support keeping in view the need for increasing self-reliance on the part of the WUAs.

Second-generation problems are emerging as discussed earlier. These include conflicts over water, often with municipalities, owing to poorly specified rights; insufficient revenue to support proper O&M; poor accounting and bookkeeping practices; widespread firing and hiring of staff when directors change; nepotism in staff appointments; and the use of the director's position as a political springboard. Other problems stem from the poor condition of irrigation infrastructure and the failure of the government to fulfil rehabilitation commitments and duplication of effort and poor coordination between the associations and the irrigation department.

Refine Performance Measurement Criteria and Monitoring Mechanisms

The performance of WUAs/DCs/PCs should be measured in a transparent and simple manner. Across the states, WALMIs, groups of WUA presidents and individual farmers have suggested the following to be measured:

1. Extent of gap between design and actual command area reduced, crop season-wise.
2. Quantity of water supplied at the WUA and DC level on a weekly basis and daily gauge records to be maintained by the WUAs. The extent of the difference between the design and actual amount. Water use efficiency at the WUA and DC level, in ha/Mcum (hectare per million cubic meter) or acres/Mcft (acres per million cubic feet).
3. Number of irrigations received by tail-enders at the WUA level, crop season-wise.
4. Water charges collected by the WUA against the government rates and percentage retained or received back.
5. Amount spent on maintenance and repairs and establishment per year (preferably in Rs/acre).
6. Additional resources (financial, physical and others) generated by the WUA or DC (in Rs/acre).
7. Amount saved by the WRD at the JE/AE/EE/SE level for maintenance and repairs, including work-charge staff and other expenses (in Rs/acre in their jurisdiction).

Monitoring should be on a crop season-wise and annual basis. This should be done at the WUA, DC and PC level and again at the state level. The formats currently being used by Maharashtra and Andhra Pradesh may be refined and scaled up. Also, the entire database should be computerized.

Streamline Capacity Building and Involve NGOs

Skills Upgradation Inadequate

Capacity building has taken a backseat in several states. As the WRD develops, its personnel require skill upgradation in areas like canal operation, system

maintenance, dispute resolution and handling joint survey (joint *ajmoish*) and for dealing with the revenue department. In several states (Madhya Pradesh, Andhra Pradesh, Rajasthan and Bihar), since the election of new office bearers in recent years, there has hardly been any interaction between the territorial committee members of the WUA and the WRD staff. Nor was there any orientation programme conducted for the territorial committee members. Indeed, in most of the places we found that there is a dire need for understanding the roles and responsibilities of WUAs and of the WRD. Some territorial committee members were unhappy regarding the extent of their involvement in canal maintenance and control over unauthorized lifting of water from canals, owing to their lack of understanding about their powers. For example, when some 1,080 pumps (each with 3–5 hp electric pumpsets) were installed on the main canal (below 234 km) in the Sri Ram Sagar Project in Andhra Pradesh, to irrigate the unauthorized command area, the WUAs remained mute observers.

Capacity Building

There seems to be reasonable effort to build the capacities of WUAs through training and exposure visits. The WUAs formed in the recent elections (January 2004) are yet to receive input to deliver their responsibilities. Around 20–25 per cent functionaries have been re-elected and the rest are new. The capacities built in the previous periods should not be lost and there is potential to use them as change agents (including trainers). The content should include issues like revenue generation, collaboration with other institutions like the panchayati raj institutions (PRIs) and water scheduling, in addition to institutional development and management. The role of other allied departments in enhancing productivity and thereby water use efficiency is observed to be at a sub-optimal level. The need is widely perceived by all actors, but systems/mechanisms to arrive at pragmatic solutions seem to be absent. The capacities of farmers and WUAs to assess, analyse, plan, implement and monitor are inadequate. Skills are to be developed for long-term planning and sustainable utilization.

Officials are happy that a system for local participation is coming up. They seem to have limited capacity to facilitate the roles of different people. They continue to play a regulatory role and cannot facilitate PIM. They need to be equipped with skills to facilitate PIM.

Transitional Issues

Water users' associations have played a good role in minimum rehabilitation activities. Resources were plenty, but now much of the work is dependent on plough-back money. After rehabilitation, WUAs have to concentrate on O&M, water management and production. There is a need for reorienting the WUAs on their changing roles and priorities. Otherwise WUAs will continue in a mindset created during the minimum rehabilitation phase. The future training strategy must include the following:

1. Farmers must be trained in villages. One possible way is grouping farmers in WUAs into smaller groups and training them using local resource persons. A number of WUA members have already been trained. They may be appropriately used in the future to transfer skills and knowledge of WUA operations to others.

Box 11.1 Rehabilitation of the Irrigation System through Farmers' Participation

- 'Maintenance provides for effective delivery and distribution of irrigation water. Maintenance works can be classified into three categories.
  - Normal maintenance is activities, which are required to be done each year or season like desilting, weed removal, repairs to revetment, etc.
  - Deferred maintenance are those which have got accumulated over the years, which are postponed due to several reasons like reconstruction of sluices, strengthening of embankments.
  - Original maintenance is done to rehabilitate and improve the system like lining, modifying the outlets, constructing additional hydraulic structures.
- Repair refers to immediate restoration of irrigation system or structures to its functional condition and can be divided into two types, in-season repair and off-season repair. In-season maintains the ability of irrigation facilities and structures to convey and control the flow of irrigation water during the season as planned or designed while off-season repairs ensures the upkeep of irrigation facilities.
- Rehabilitation refers to the broad repair of numerous facilities and structures in regular intervals like restore the capability of the irrigation system and structures to convey and control the flow of irrigation water, improve the efficiency and effectiveness in the conveyance and control of flow of water, etc.
- Diagnostic Analysis refers to the actual problems and its constraints have to be identified by the WUAs through walk through survey of the system and based on which resolving them should be planned and solved through farmers involvement, prioritization of works, assessment of resources and allocation, work out estimates, execution followed by monitoring and maintenance.'

Source: Irrigation Management and Training Institute, Kota, 2005/147.

2. The irrigation department should play an important role in facilitating local capacity building. They need to identify and involve trained people in local capacity building.
3. It is not enough to train farmers. There is a need to involve *gram* panchayat (GP) members, secretary and revenue members. Cooperation between them is needed as there is no proper collection system.
4. The capacities built should also be correlated to the impact, developing appropriate indicators.

Refining Training Programmes

Capacity building must not be merely viewed as a training programme aimed at bridging gaps in knowledge and skills among farmers and agencies, but also as facilitating the change process. A blend of skills and attitudes needs to be imparted at all levels, which also includes policy-makers (Peter, 2003). Operating a WUA requires a lot of new skills to innovate the technical, administrative and financial management of the WUA. Irrigation agencies also require new skills to tackle WUAs and farmer leaders. Collective action depends on a wide variety of internal and external factors as already mentioned. Some of the common skills that would be required are: technical, O&M, inventory and asset management, preparation of estimates, procurement, quality control, water management, crop–water requirement, water scheduling and budgeting. There should be training programmes for O&M staff aimed at solving specific problems in each district. The programmes should be based on individual diagnoses of district needs. A transfer programme should be accompanied by training for both WUA directors and their operating staff. The system of training should be ongoing.

Strengthening Institutions

There is a need to promote farmer networks and federations**.** Farmer networks and federations could provide a platform for debate on the water sector and irrigation reform issues. Very rarely are farmers provided with an opportunity to take part in policy formulation. Farmer networks could offer opportunities for intense consultation, feedback and policy formulation as they relate directly to the users and hence they have stronger incentives to cooperate. In large irrigation systems INPIM is currently promoting farmer networks in three south Indian

states on a pilot basis. There is a need to carry out institutional reform in the sector through improved role definition and management of WUAs. Developing a comprehensive programme by defining the concepts of WUA property infrastructure and assets must be top priority. Simple well-defined procedures for obtaining water concessions are needed and arrangements should be made for the autonomous regional corporations overseeing water resources to establish equitable fees for water use, control and surveillance. Full support of all staff members by making them familiar with the transfer process and communicating a clear commitment to the process from the top management are vital.

Research and Development

There is a need to (*a*) conduct research programmes on irrigation management and on the transfer and validation of technology, (*b*) conduct research and educational programmes on environmental problems to promote awareness and (*c*) ensure correct use of agrochemicals and pesticides and preservation of water quality.

Leadership and Sociopolitical Problems

The election of WUA directive boards generated conflicts in the beginning when the associations were formed. Since that time, however, water users are participating more actively in the election of their executives and conflicts have declined. These processes will improve as experience is gained, particularly if additional training is made available. The problem of changing the WUAs' qualified staff without a justification following the selection of new directors can be solved if the new regulations for the modules define the guidelines to be followed in order to lay off qualified personnel. Such provisions are currently being considered in the preparation of draft regulations. Also, regulations may help control the politicization of the directive posts and misuse of the O&M funds for political purposes. The problem experienced in some modules of the use of a director's seat as a springboard to political office and the neglect of association duties should thus be limited. Legal instruments are a good basis for conducting and maintaining a transfer programme, but enormous efforts will be required to ensure the effectiveness and sustainability of WUAs if they are to administer LDDs and participate, along with the government, in the management of Colombia's water resources (Subramanian, 1996).

Build and Strengthen Partnerships with NGOs and Cooperatives

Over the last three decades (1975–2005), across the states, farmers' cooperatives and NGOs have demonstrated that they can play a crucial role in promoting users' participation in water management, whether in Major, Medium or Minor irrigation projects. Undoubtedly, some of these agencies have comparative advantage in bringing in suitable professionals, flexibility in methods to be adopted according to local conditions, willingness to modify the procedures to meet local needs, continuously design better methods and high energy levels to work. The committed professionals surely add to their credit both at the junior and the senior level with

long-term commitment to the cause and given assignment. These components have clearly marked the difference that assessment studies have found on PIM across several states (Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu).

A proper blending of both government agencies and NGOs/cooperatives can truly bring in improved changes in implementing PIM and move towards IMT at the project level. Even the multilateral agencies and donors need to adopt this partnership to achieve better results in PIM, for example, the ICEF Project in Madhya Pradesh, AKRSP(I) and DSC's efforts in Gujarat, DHAN's continued work on tanks in Tamil Nadu, IRDAS and Jalaspandana in Andhra Pradesh have shown positive impact of such partnerships. Still lot of potential exists in these partnerships to refine the approaches adopted, interventions designed, monitoring mechanisms adopted and on-course corrections to be incorporated. Interestingly, the experience has made the Command Area Division (CAD) of Andhra Pradesh directly hire training coordinators and place them at the command area level. This has started yielding improved dividends in establishing rapport with users, translating the CAD's initiatives at the field level and to bridge the gap between users and the department. This happened because of the absence of suitable NGOs in many places. Since, the WRD finds it difficult to place suitable field staff (at the middle and lower level) for a long time in a single place, it is essential to have partnering organizations which can have professionals in place for a continued duration. The WRD can play an effective regulatory and guiding role.

Restructure Financial Management

Financial Strategies

1. New strategies in financing have grown out of the realization that large investments create incentives and constraints that fail to promote local resource mobilization for O&M and improvement of the irrigation systems. A central challenge for irrigation reform is to escape from being trapped in a cycle of deferred maintenance, poor performance and wasteful premature rehabilitation. One of the new strategies is to link water charges to O&M.
2. New strategies in financing include smart subsidies, sinking funds/reserve funds, an incremental approach to rehabilitation, building creditworthy WUAs and improved service delivery.
3. It is important to raise irrigation tariffs to the level of financial self-sufficiency before the transfer so that WUAs can support adequate O&M programmes.
4. In order to finance programmes of support, the government should provide subsidies. It should also foster the participation of users in support programmes and, if possible, the participation of state or county governments. Users' participation will guarantee not only better management of funds, but also a major interest in the programmes on the part of the users.
5. Right to manage and operate the irrigation system has to be accompanied by some involvement of the farmers in the investment and total

cost coverage for O&M activities. Sustainability and ownership issues are satisfactorily answered through real empowerment, investment and responsibility to maintain efficient operation of the systems.

Financial Requirements

1. At present, it is difficult for many WUAs to generate sufficient income to achieve financial self-sufficiency. Several solutions have been proposed. One calls for indexing irrigation tariffs to the prices of agricultural products. Another proposes a tariff structure having a fixed component estimated in terms of water rights and a variable component based on water delivered. These proposals are included in the regulations currently being negotiated with users in pilot districts. Acceptance of a component in the irrigation tariff earmarked for a contingency fund will depend on successful government efforts to control inflation, or else on the creation of a national contingency fund.
2. A set of standard bookkeeping practices is needed for WUAs nationwide. It is also necessary to mandate both technical and accounting audits on an annual basis in all WUAs.

Re-engineer Main System Management and Linkages

Water Allocation

Water allocation has to be at the project, distributary and WUA level. Project-level allocation is normally made and the stakes are well defined as it involves either inter-state, inter-regional or even inter-district issues. Allocation could be of three types: hydraulic unit wise, that is, distributary, Minor, Sub-minor, etc., or irrigation department administrative unit-wise, that is, circle, division, sub division, section, etc., or PIM institution-wise, that is, distributary committee, or WUA. Allocation could be based on the project design or available water at a particular point of time. As per the provisions in the APFMIS Act and the observations made during the field visits, the demarcation of WUAs is based on the command area and not always in line with hydraulic units such as distributaries, Minors, etc. Measurement of allocated water against available water, which is very important in PIM, hence seems to be enveloped in ambiguity. Measurements of discharge are normally possible at the inlets of the hydraulic units or any other suitable place, which is not practised or even appreciated to the required level. At the project-level the allocation and its measurement are relatively easy owing to the fact they are monitored by technocrats on a well-designed system. Water allocation could be influenced politically also.

Efforts aimed at building the capacities of WUA functionaries and water distribution staff and provisions for measuring allocated water therefore need to be made. Proportionate allocated water should be based on storage capacity. Proportional volume should be shared with DCs and measures should be taken to avoid overlapping. Allocation of water should be clear among irrigation systems, administrative units and institutions. Both institutions and farmers should know what volume of water is available to them. Measurements should be made possible at the DC, PC and WUA level.

Like in other countries, system deficiency has acted as a major hurdle in India as well. In older projects, there

are many problems like deterioration of old control and measuring structures, leakages and seepage at various places, erosion of banks and beds, siltation and weed infestation. These are serious problems, hindering farmers to take over system management on technical and financial considerations. Unless these structures are put back into shape, it would be difficult for any WUA to organize and manage them.

Water Management, Maintenance and Repairs

1. Lack of water measurement and flat rate charging systems for irrigation water have fostered waste of water, lack of equity in distribution, low crop yields, increased salinization and waterlogging of soils and aquifer mining.
2. Training of directors and operating technicians hired by WUAs is essential to improving the management of water.
3. Poor condition of infrastructure makes water delivery more difficult, diminishes the flexibility of the network, delays delivery of water and delivers too much or too little water.

Environmental Effects

1. Irrigated agriculture plays a prominent role in environmental deterioration, though, when contrasted with the damage caused by urban and industrial sectors, the damage is relatively modest. Some of the legal and managerial solutions suggested earlier will help ameliorate these impacts. Moreover, new regulations tighten control of the dumping of agrochemical wastes. Nevertheless, the need to make users aware of the importance of preserving the environment should be emphasized.
2. At the same time, it is of utmost importance to propose practical actions to prevent the dumping of sewage water from towns and industries and to reduce the pollution of rivers and aquifers, since irrigation users are the ones directly affected. Not only are they forced to use polluted water, but water quality constrains their crop choices, particularly the more profitable cultivation of fresh fruits and vegetables.

Provide Enabling Environment

Package of Incentives for Farmers

A package of incentives would enable the farmers, particularly when they have the support of NGOs that work as facilitating agencies, to demonstrate their capacity for taking care of the canal system transferred to them with efficiency, equity and sustainability (for example, in Gujarat). Some of the important government orders that had an enabling impact on farmers are listed next. In the absence of enabling provisions, states like Andhra Pradesh and Madhya Pradesh, which have covered far larger areas under PIM, appreciate the significance of these orders even for their own PIM programmes.

1. Canals to be rehabilitated prior to transfer with irrigation cooperatives contributing 10 per cent of the costs.
2. General order for such construction to be first offered for execution to farmers' organization, then to NGOs and then, if both decline, to the irrigation department.

3. When entrusted to an irrigation co-operative, one-third of the estimated cost of work to be undertaken to be given as advance.
4. Issue instructions simplifying the procedure for purchase of material and quality control when works are entrusted to irrigation cooperatives.
5. Farmers are far happier with efficiency when canals are rehabilitated by them.
6. Water charges are decided by the government, but collected by WUAs. They retain 50 per cent of collection for maintenance and management of canals and deposit 50 per cent with the government.
7. The WUAs are moving towards financial viability.

Incentives for NGOs to Work as Facilitating Agencies

In Gujarat, the WRD reimburses 90 per cent of the cost incurred by recognized NGOs for engaging special staff for promoting PIM. However, only AKRSP(I) and DSC has availed this incentive as government assistance does not cover full cost; there are also procedural problems in availing such assistance.

Task Force on PIM

The Gujarat government had appointed a task force on PIM not only for preparing the bill for transferring government canals to farmers' organizations, but also to give recommendations on the supportive measures essential for the success of participatory management such as capacity building of farmers and irrigation staff as well as indicating a package of incentives required for farmers and staff. The task force comprised senior officials, NGOs and academics.

Promote Model WUAs

Through a collaborative effort of the WRD and the DSC, supported by the National Dairy Development Board (NDDB), irrigation projects covering 56,700 ha (Dharoi—45,000 ha, Guhai—7,200 ha and Mazam—4,500 ha) are being developed as models of PIM. Appreciating the significance of such model projects for more efficient utilization of water and serving as inspiration for other projects to take to the participatory approach, the NDDB has gone out of its way to sanction Rs 20.7 billion for the DSC as 80 per cent of the cost of providing software support for making PIM a success in these three projects. The WRD has agreed to provide Rs 82. 7 million over the same three-year period to meet 80 per cent of the cost of rehabilitation of canal systems to be transferred to farmers.

Legal Refinements

1. Water rights: To be successful, WUAs need to be vested with a clear water right to give the right incentives for improvement of the irrigation system. Secure water rights also protect WUAs from infringement of their allocation and share of water by other powerful interest groups such as industries and municipalities.
2. Legal: Awareness of legal provisions and procedures, dispute resolution.
3. Successful transfer requires an appropriate legal framework. This framework must define clearly the right to water, forms of organization, responsibilities of each party and the

manner in which activities should be regulated. Fiscal benefits must also be considered for companies that manage the irrigation and drainage infrastructure.

For WUAs to assume this type of responsibility, the World Bank suggests a new legislation to be put into place that ensures the following elements: (*a*) water use rights, (*b*) rights to use, improve and extend infrastructure across private and public land, (*c*) right to require water users to become members and pay for the water service, (*d*) right to make rules and enforce them with strong sanctions, (*e*) right to choose service providers and release or hire O&M staff, (*f*) right to make and implement an O&M plan, (*g*) right to set, collect and use a service fee, (*h*) right to make legal contracts and own property and (*i*) right to determine cropping pattern (normally by consensus among water users).

The World Bank technical papers break down irrigation rights into three categories: (*a*) management control, (*b*) physical facilities and (*c*) water. Management control involves not only O&M of canals and pumps, but also skills of planning, design and construction of new or rehabilitated facilities, as well as project evaluation. Rights to physical facilities would include physical works such as dams, diversion structures, pumps, network of canals of pipes for distributing water, mechanical equipment for cleaning and repairing these facilities, as well as land resources, such as canal right of ways, vacant land and amenities on the land such as trees. Water rights involve considerations of geographic location (whether a user is upstream or downstream on a canal), timing of water claim relative to other users and the proportion of flow in the canal or aquifer that can be diverted for the irrigation purposes of a given user. Water rights may also be measured through volume.

The solution to second-generation legal problems involves developing acceptable implementing regulations of the law at the level of the basin or aquifer. As for environmental improvement, it is still hard to convince water users to use 'ecological' amounts of water whose run-off is necessary to guarantee the survival of aquatic plants and animals. In order to achieve this objective, it will be necessary to carry out a promotional campaign directed at water users from agricultural, urban-domestic and agro-industrial sectors. It is necessary to regulate overexploitation of aquifers.

In many states, there is no or very little legal backup and lack of policy decision at the government level to take up PIM, which is a big impediment in the implementation of PIM. The most important obstacles in the progress of PIM in India are lack of adequate, explicit and enabling provisions in the state acts governing the development and management of the irrigation sector. Legal provisions visualize only a very marginal role for WUAs and are restricted for all practical purposes to the distribution of irrigation water within the outlet command. Involvement of WUAs should prove beneficial in the following cases:

1. Investigation and planning of new schemes.
2. Involvement of WUAs in the construction of irrigation projects.
3. Operation and maintenance of irrigation projects where WUAs have been given legal authority to fix and collect water rates, punish defaulters and pay a part of water charges to the government.
4. Explicit provisions relating to compensation to WUAs in the case of failure on the part of the government to deliver the predetermined share

of water to the associations as per agreement.
5. Provision of specified legal mechanism for resolving conflicts.
6. Registration of WUAs should be under specific provision for registration of WUAs with the concerned department of the state governments itself.
7. Emergency provisions considering the possibility of failure of WUAs. The acts should have a regulatory standby provision by which the individual water user or the irrigation scheme is not allowed to suffer on account of such failures.

In the Uttar Pradesh hills, water rights have played a crucial role in the development of irrigation in the past much as they continue to condition farmers' irrigation behaviour even when these rights have been legally withdrawn. Given the limited water and land resources in the hills, any substantial increase in irrigated area can come only at high cost per unit area. Productivity from land can, however, be improved by efficient management of the existing systems, both government and farmer managed (for example, the Ladyura farmer-managed irrigation system).

WHAT CAN DONORS DO?

Funding agencies (including grant and loan-making bodies) may focus on making permanent interventions and supporting sustainable organizational structures at the user and government agencies level. Adequate emphasis should be given to continuous capacity building and skill upgradation in all agencies (user organizations, government and NGOs). More specifically, the following aspects may be facilitated through a long-term approach:

1. Support network and supportive group at an all-India level.
2. Facilitate evolving policy and legal framework at the state and central level and, if necessary, at the local government level (*zilla* panchayat, *taluk* panchayat and *gram* panchayat).
3. Promote studies on successful and unsuccessful WUAs and lessons learnt from them.
4. Help design and implement people-based plans for the rejuvenation of village-level water bodies on a basin or sub-basin level approach basis.
5. Provide adequate space for NGOs to play a key role in the formulation of basin and sub-basin level plans and implementation, and policy and legal framework formulation.
6. Promote model project committees on a pilot basis in each state to learn and scale up at the state level.
7. Promote participatory monitoring and learning system for ongoing and future tank projects.
8. Support establishment and functional database and resource centre on tanks and other water bodies. This will include the use of GIS and satellite-based imageries and regular update of the database.
9. Promote a centre of excellence on village-level water bodies and their management on a long-term basis. This centre should be equipped with professionals and provide on a regular basis (if necessary online) backward and forward support to user organizations, NGOs, government agencies and researchers. The centre can also be equipped with database services. The centre can establish links

with concerned agencies for frequent updates and cover progress made on the field.

Despite a variety of institutional arrangements on PIM, each model has its advantages and is specific to the context of the country. With the emergence of the private sector and the changing role of irrigation itself, new public–private partnerships are likely to emerge. The scope and character of WUAs will have to enlarge to focus on issues relating to improved service delivery, integrated water resource management and basin and catchment management. Sustainability of WUAs is a key to success. Participatory irrigation management affords opportunities for reforms in the irrigation sector. As farmers' organizations take progressive roles and responsibilities, the role of the government and irrigation agencies needs to change to that of a facilitator and regulator. The likely roles are detailed elsewhere. For PIM to be successful, governments need clarity of objectives, create an enabling environment, provide an appropriate framework, clearly identify champions of reforms and regularly monitor and evaluate WUAs (Peter, 1997).

Sustainability of WUAs is dependent on a host of internal and external factors. Some of the key elements for promoting PIM are: realigning incentives for participation and redefining the roles of the government. In the past, governments have been solely responsible for development. The general trend towards decentralization and fiscal crises in governments have led governments to divest most of the roles to the private sector and user organizations. Development is transitioning from top-driven approaches, which failed to deliver, to community-based and community-driven approaches. Participatory irrigation management offers a way out in bringing users into focus. It reflects a win-win situation for the government and users.

There is a gradual effort to transition irrigation management companies to form cooperatives and WUAs. Cambodia is planning to set up a PIM directorate to promote PIM. Indonesia enacted a new water law in 2001 that transfers management of all public irrigation systems to WUAs. The government will facilitate IMT, focus on capacity building and rehabilitation linked to WUA initiatives and contributions. Several decrees have been issued focusing on different aspects of the transfer as part of the overall decentralization policy of the government (Vermillion, 2002). Svendsen et al. (1997) suggest possible new roles for irrigation agencies: (*a*) river basin planning, (*b*) water resources allocation and monitoring, (*c*) development of new policies and regulations, (*d*) environmental monitoring and enforcement, (*e*) groundwater monitoring and control, (*f*) project planning, design and construction, (*g*) technology transfer to irrigation agencies, (*h*) advisory services to associations, (*i*) monitoring of association performance and (*j*) arbitrating disputes.

Research on WUAs has shown significant positive benefits to local farmers and the irrigation system as a whole. These include equity in distribution of water, increased collection of water charges, greater water use efficiency because of increased participation of users, and cropping and management decisions. Participatory irrigation management has provided opportunities for wider networking among farmers at the system and national level, successful examples include ANUR in Mexico, the

Federregios of Colombia, the national union of WUAs in Albania and the farmers' networks in south India and Nepal. Sheer communication has been able to mitigate a variety of conflicts.

Water users' associations are not perfect; there is growing realization of the capture of WUAs by the elites, non-inclusion of all water users, corruption and inefficiency. Like any other organization, WUAs are bound to have weaknesses. The role of the government would be to constantly regulate and remedy any deviations through appropriate measures. Government oversight on PIM is critical to the success of the WUAs. To conclude, PIM is not a panacea, but a strategy for irrigation management.

FUTURE INVESTMENT OPTIONS

Promote Project-level Pilots

Based on the consolidation of all the learning, a few pilot schemes should be initiated at the project level for full-scale management transfer. These pilots, at the rate of one or two per state, could be undertaken in selected states (Orissa, Chhattisgarh, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka and Maharashtra). However, a series of public consultations need to be organized to streamline stakeholder involvement and their roles and responsibilities. Support organizations, with good field experience (that have already soiled their hands in this field) have to be involved from the designing stage. A clear monitoring process and periodical evaluation and learning process should be in place from the beginning. Some of the measurable indicators (at the WUA, DC and PC level) are: additional area irrigated, water use efficiency, amount spent on operation, maintenance, repairs and establishment by the WUA and the irrigation department, water deliveries at regulation points and resource mobilization by the WUA/DC/PC. This would help people to be convinced about the possibilities and potential benefits of IMT. The whole exercise at each project level can move in phases on a hydraulic boundary basis. Good documentation should be an essential part of this scheme. Season-wise and annual performance measurement would indicate the benefits of IMT.

PIM Directorate

Within the WRD, a dedicated PIM directorate headed by a mid-career administrator is essential to take care of all aspects of PIM. This has been amply demonstrated in Madhya Pradesh and Bihar. In view of the growing interest and workload related to PIM, such a directorate is essential. The directorate can maintain liaison between WUAs, DCs, PCs and all related departments, including the WRD. The directorate needs to establish and facilitate linkages with other departments to enhance livelihoods of water users. Some of its functions could include: providing information and guidance in setting-up WUAs/DCs/PCs, organizing periodical elections and meetings including annual general meetings, facilitating the flow of funds from various sources (water fee collection, plough-back and other resources) and facilitating capacity building of all levels of functionaries of user organizations and of department personnel through WALMIs/IMTIs or NGOs. To begin with, the same six

states (listed earlier) may be selected as focus states. This would help develop an integrated approach for IMT.

Help Setting Up and Strengthening Water Regulatory Authorities

Currently, Maharashtra and Uttar Pradesh have water regulatory authorities (these have been proposed in Andhra Pradesh). The lessons from these authorities need to be learnt and replicated in other states, including successful experiments of the water auditing system in Maharashtra. These authorities need to be oriented to focus on IMT and this should be institutionalized in their processes and performance measurement, for example, consultation with user organizations on fixing and revising water tariff, water allocation to WUAs on volumetric basis and at sub-basin levels for all competitive sectors (domestic, industries, agriculture and for the environment).

Enable Robust WUAs/DCs/PCs

There is need to create an environment to strengthen and activate WUAs/DCs/PCs to function in a more dynamic manner. There is need to re-engineer their performance levels and set clear goals and action plans in the selected pilot projects. There should be capacity and leadership skills. The WUAs need to be supported to take care of second-generation issues and enable them to handle both forward and backward linkages required at their level. This may vary across the locations. In a few locations, based on local conditions, WUAs need to be supported to take care of conjunctive water management, waterlogging and salinity problems. In all these steps, the active role of support organizations (for example, NGOs) would be helpful. One of the initial steps is to carry out a joint walk-through survey to reassess the current status of landholdings, area irrigated season-wise with number of irrigations and crops grown.

Try Alternate Models

Irrigation management transfer need not be only through user organizations. However, they are the first priority. Alternative models seem to be equally attractive. Initial discussions indicate that private channels play an important role.

1. A financial company is planning to take over an irrigation project in western India on an as-is-where-is basis and then rejuvenating and operating it for the next 20 years with massive investment. The initial exercise indicates that the payback period is around eight years and in the process landholders would be major beneficiaries owing to crop diversification and high returns. An added advantage is enhancement in water use efficiency and assured supplies on time.
2. A few open house discussions with leading WUA presidents across Andhra Pradesh indicated their willingness to take over the entire irrigation project. The bidding level went up from Rs 50 billion (for a partially complete project) to Rs 400 billion (for a million acre plus project, which has been completed). These biddings were made by a group of engineers who had worked for several years on those projects and

by leading WUA presidents. They are willing to take over the project on an as-is-where-is basis, with a guarantee of supplies to all existing landholdings. The future operating companies would like to have full control on any additional savings in supplies, tourism and other related activities.

3. A few years ago, the federation of the Lower Bhavani Project in Tamil Nadu was willing to take over the entire project and agreed to pay Rs 25 million per year to the government, when the government was finding it difficult to collect even Rs 2.5 million as water fees.

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