GUIDELINES FOR ESTABLISHING FARM FORESTRY ACCOUNTANCY NETWORKS

MOSEFA

(Monitoring the Socio-Economic Situation of European Farm Forestry)

European Commission Concerted Action

FAIR CT96 1414

European Forest Institute Research Report 12

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Preface

A significant proportion of privately owned forested land in Europe is owned by small-scale family enterprises where farming and forestry activities are combined. According to the 1990 Forest Resources Assessment 1990 (UN-ECE/FAO, 1992), the number of farm forestry enterprises in European Union member countries was around 10 million, covering 31 million hectares of land, which is approximately 32% of the total forest land area.

The owners of the small-scale family forestry enterprises are key actors in various policy processes, such as sustainable development, forest certification, criteria and indicators for sustainable forestry, forestry strategy in the European Union, as well as in various rural development schemes. This implies rising demand for information on the socio-economic situation and economic performance of small-scale family enterprises in different parts of Europe. Despite the relevancy of the socio-economic information at the farm level across the Europe, harmonised methods to measure, monitor and compare the economic sustainability of forestry, have been missing.

The sustainability of forestry is often directly linked with the efficient management and profitability of forestry. Several countries such as Austria, Germany and Switzerland can rely on statistically sound sampling data, at least for some categories of forest enterprises. Other countries such as Finland, United Kingdom and Portugal are preparing to set up this kind of economical monitoring in one way or another. However, there are only comparatively few studies dealing with the methodological aspects of forest accountancy data networks and those that exist often emphasise the specific problem of accounting and sampling for the specific purposes in question.

Realising the common need, the methodological challenges and the practical obstacles related to the design and support of economical monitoring systems in forestry, a European Commission Concerted Action funded project MOSEFA – Monitoring the socio-economic situation of European farm forestry (FAIR CT96 1414), was launched in 1997. This book is one of the main outputs of the project and is aimed at providing assistance for developing a generally

applicable monitoring system for the assessment of the socio-economic performance of farm forestry enterprises in Europe.

We wish to thank all participants of the Concerted Action and other colleagues involved in the implementation of the project. Our special thanks are due to the contributors to these guidelines, Dr Walter Sekot, Mr Juha Hakkarainen, Mr Terry Thomas, Mr Raymond Schrijver and Mr Timo Kallio. Also, we would like to thank the associate coordinator, Mrs Johanna Väyrynen of the European Forest Institute for her valuable contribution to the project and these guidelines especially.

Pentti Hyttinen
Coordinator 1.3.1997–30.8.1998
Anssi Niskanen
Coordinator 1.9.1998–30.8.1999

Executive summary

The guidelines for establishing farm forestry accountancy networks (referred to as the guidelines) have been prepared under European Commission Concerted Action FAIR CT96 1414 – MOSEFA (Monitoring the socio-economic situation of European farm forestry). The main aim of the guidelines is to provide assistance for developing a generally applicable monitoring system for the assessment of the socio-economic performance of farm forestry enterprises. Because the adoption and use of monitoring systems and accounting networks are at different phases in different countries at the moment, the guidelines do not aim to provide a fully standardised monitoring system at the European level. Instead, the guidelines were prepared to help to improve the baseline of harmonisation for national and international development of farm forestry accounting.

The expected users of the guidelines include professionals working with the issues of socio-economics of farm forestry, as well as policy makers and forest economic researchers. Also teachers and lecturers of forestry accounting in universities and other schools with forestry economic education may find the guidelines useful for their course programmes.

The guidelines are designed to help particularly the planning and development of accounting networks under various conditions. Chapter 1 briefly introduces the importance of farm forestry enterprises and the problems of monitoring their economic performance. Chapter 2 discusses the definitions for farm forestry and prospects for extending EU Farm Accountancy Data Network (EU-FADN) to forestry. Chapters 3 and 4 demonstrate the problems of sampling, and establishing the necessary organisational arrangements for creating a farm forestry accounting network, respectively. Chapters 5, 6 and 7 form the core of the guidelines, including the accounting of monetary and non-monetary information, outline of a database system, as well as examples of the outputs that can be derived from the accounting system. In Chapter 8, the prospects for international comparability and harmonisation are discussed. The book final chapter summarises the major elements of the guidelines and demonstrates the practical implementation of the guidelines.

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Abstract

The principal objective of these guidelines is to provide assistance for developing a generic monitoring system for the assessment of the socio-economic performance of farm forestry enterprises. The guidelines are designed to assist the economic monitoring for farm forestry enterprises through the compilation and development of monitoring methodology.

The guidelines have approached the objective of monitoring the economics of farm forestry enterprises from the perspective of forestry accounting. In these guidelines, some recommendations are made as to how to overcome the difficulties of accounting in forestry and how to help to improve the harmonisation of the protocols used for farm forestry accounting in Europe.

To be able to establish a representative sample of farm forestry enterprises, comprehensive and up to date information on the total population of the enterprises in question is necessary. As the information on the total population is seldom complete, information deficits need to be considered together with the costs of improving the sample representativeness. In many cases the optimal approach is not to strive for a total representation of the underlying population, but to reshape the population under investigation by defining respective cut-offs.

Once the sample is established, data are collected from the sample enterprises either by special enumerators or the data is reported by a farm forest owner. Once collected, accountancy data can be stored into a database system and processed according to the principles of: *financial accounting* for determining the financial profitability and asset value of an enterprise; *cost accounting* for providing information on costs; and *management accounting* for providing information to assist the management of a farm forest enterprise.

Often the monetary information collected at the farm level has to be combined with non-monetary information such as physical quantities of input and output (cubic metres, hectares, etc.), measures describing forest resources (age class, etc.) as well as purely qualitative information (skill, education, etc.). In addition, as forest services are often of high value to forest owners and other stakeholders, they should be explicitly considered in accounting as far as possible. Such items as hunting, recreation, amenity values and nature protection may sometimes have

considerably high economic importance for forest owners, compared, for example, with timber production.

For international comparisons of the economic performance of farm forestry enterprises, it has to be accepted that at the moment the data are not produced in a consistent way among many European countries. Because different countries are at different phases as regards to the adoption and use of the monitoring systems and accounting networks, it was not seen realistic at the stage of these guidelines to aim for a fully standardised monitoring system at the European level. Therefore, the guidelines support the development and application of monitoring systems that would lead towards international harmonisation – keeping in mind consistency and comparability – but not restricting the flexibility of national applications.

1 Introduction

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Key points:

- Various policy issues, such as sustainable development, forest certification and rural development imply a rising demand for information on the socio-economic situation and performance of farm forestry in different parts of Europe.
- The MOSEFA Concerted Action was established to assist in harmonising the heterogeneous national approaches of monitoring systems and to produce generally applicable guidelines to build up forestry accountancy networks.
- The objective of these guidelines is to support the development and application of such monitoring systems that would help to provide more consistent and comparable information on European farm forestry, and more specifically, on the socio-economic variables of interest.

1.1 Farm Forestry as Socio-Economic and Political Issue

Privately owned forests account for 65% of the total forest land area in the European Union (Commission of the European Communities, 1998). There are approximately 12 million private individuals that can be classified as forest owners. Their economic importance is underlined by the fact that in most countries privately owned forests play a major role in timber supply for forest industries.

A large part of private forest holdings are owned by small-scale family enterprises, which combine farming and forestry activities. According to the Eurostat statistics (Eurostat, 1998), the number of *'agricultural holdings with wooded area'* in the EU countries is almost two million, covering 23.5 million hectares out of the 132.7 million hectares

of total wooded area in the EU. This indicates that farm forests tend to be highly fragmented into small plots.

Various policy issues, such as sustainable development, forest certification and rural development, imply a rising demand for information on the socio-economic situation of farm forestry in different parts of Europe. Socio-economic aspects of sustainable development have been previously recognised in the UNCED in Rio 1992, as well as in the resolutions of the Helsinki Ministerial Conference for the Protection of European Forests in 1993. During their follow-up processes, socio-economic issues have gained increasing attention, and most recently, in the resolutions of the Lisbon Ministerial Conference in 1998, socio-economic sustainability was given the main emphasis. An essential conclusion here is that the sustainability of forestry is directly linked with the efficient management and profitability of forestry.

In the recent years, the active discussion on forest certification has led to numerous proposals for forest certification systems. At the European Union level, there is a proposal for a Pan-European Forest Certification Standard (PEFC). In this system, as well as in most of the other systems, socio-economic aspects have been included in the criteria of sustainability. However, proper tools to measure and monitor the socio-economic situation are still missing. Similarly, forest owners often lack the necessary information on the financial consequences of forestry activities to make rational management decisions.

Forest related policies aimed at promoting rural development have recently been highly recognised in the European Union. The recently elaborated EU Forestry Strategy (Commission of the European Communities, 1998) and the Agenda 2000 proposal state that income from forests can play an important role in maintaining a good social structure, and forestry can contribute to the overall economy of rural areas. Farm forests are concentrated in rural and mountainous areas where depopulation is substantial, and which are at a disadvantage compared with industrialised areas. Farm forestry enterprises play a key role in the implementation of various regional, national and international level policies.

The above mentioned EU documents pay attention not only to the traditional questions such as the continuing viability of individual farms, to which the production of timber and other products can

contribute, but also to more recent questions such as the contribution that the landscape value of attractive woodlands can make to the rural economy through tourism. The contribution that forests can make in such diverse areas as watershed protection, habitat creation and conservation, and recreation is now widely recognised. Increasingly, forest owners are either required by statute or influenced by financial incentives to alter their management practices with the objective of increasing these environmental benefits, and in some cases decreasing environmental disbenefits. Here, while profitability in the usual sense may be of less importance than the concept of non-market benefits to society in general, the financial implications for owners cannot be ignored.

Regarding the reform of the EU's Common Agricultural Policy, one of the major concerns has been the extent to which agricultural land can and should be converted to forestry or woodland, and the policy measures that would achieve this. In almost all European countries there are policies to support farmers who convert their agricultural land to forestry. As a result, large-scale afforestation of agricultural lands is expected. However, in most cases profitability information to determine the relevant level of public support is insufficient. Again, profitability – particularly the *relative* profitability of different land uses – is central in making the land use decisions at the farm level.

In addition to the above mentioned EU's Forestry Strategy, Pan-European Forest Certification Standard and Agenda 2000 Proposal, the following activities have already been initiated related to this topic area in the EU-countries:

- Discussions on expanding the EU-FADN (Farm Accountancy Data Network)/RICA to forestry and other non-agricultural income return on a voluntary basis (RI/CC 1157, 1157/1 and 1157/2, Abitabile et al., 1999; Brookes, 1998a);
- PACIOLI "Panel in accounting for innovation, offering a lead-up to the use of information modelling" (Contract no. AIR 3 CT 94 2450);
- EC funded pilot study on "Analysing costs and revenues of private forestry in the European Community as a precursor to the systematic modelling of the same on a regular basis";
- European Forest Information and Communication System (EFICS); and

- the studies by ECE/FAO Timber Committee on productivity and profitability in European forestry (ECE/FAO, 1993: TIM/EFC/WP.2/R.135).

The recent economic and political developments suggest a more comprehensive analysis on the socio-economic situation of farm forestry. The economic performance of farm forests and other small-scale forests is of importance for each of the various areas described, but the availability and comparability of the information required to assess the economic performance is often insufficient and varies widely from country to country within Europe.

1.2 Farm Forestry Accounting Networks

1.2.1 Farm forestry enterprises

The concept of *farm forestry* causes some complications (Lin, 1998). In many contexts, strictly taken, farm forestry includes only forests owned by farmers, excluding remotely owned forests and forest areas owned by people who have their main occupation outside traditional agriculture.

In some contexts, a broader definition is used including all the *non-industrial private forestry* under the term of farm forestry. Sometimes a size limit is applied identifying farm forestry with the notion of *small-scale forestry*. In addition, especially in the Scandinavian countries, the term *family forestry* has a meaning very close to farm forestry. The concept of farm forestry is further elaborated in Chapter 2.

As with all businesses, economic conditions greatly impact on farm forestry enterprises. However, the possibilities for monitoring the economic conditions and profitability in farm forestry enterprises are often lacking, especially as far as the forestry is concerned.

1.2.2 Accounting networks

Several European countries, e.g. Austria, Germany, Norway and the Netherlands, have established economic monitoring systems for farm forestry enterprises (see e.g. Hyttinen and Kallio, 1998a). What is common between these monitoring systems is the idea of systematically collecting data on the socio-economic situation and using the information in some manner, e.g. to evaluate the effects of proposed and prevailing policies on farm forestry enterprises.

In general, long-term monitoring of the economic performance of farm forestry enterprises is most practical to implement through *accountancy networks*. In these networks, a sample of farm forestry enterprises is selected using various sampling techniques. The sample farms can be monitored for several accounting periods, or continuously. The typology of the sample can be based on the type of farm, the size of a farm in terms of area or net return, production region, or on various site characteristics such as quality, difficulty or location. The data and results from similar farms in the sample can then be combined and generalised for the rest of the similar farms in the population.

In order to minimise the costs, the data collected through accountancy networks can be supplemented with the data from existing statistics, markets and from farm forest enterprises engaged in various networks. In practise, the combination of data from different sources can present problems for validity and reliability of the composite data set.

1.2.3 Issues to be addressed

Monitoring the socio-economic situation of farm forestry comprises several types of problem areas as presented in Figure 1. The chapters of this report are structured according to these problem areas. In establishing an accounting network, all these issues have to be considered and solved as far as possible.

First of all, it is important to clarify the purpose of the whole exercise. As far as the information to be produced is concerned, an essential observation is that different people and stakeholders need different types of information (Hyttinen et al., 1997; Brookes, 1998b). For example, an individual forest owner, faced with a decision on whether or not to sell a parcel of timber, will be interested in the likely prices in his or her particular region over a relatively restricted time period. A national government, on the other hand, may be interested in average prices across the country over an extended period.

Before any decisions are made on the parameters to be monitored, the stratification of type of holding (by ownership type, size, region and so on), or the way in which information is to be collected, it is necessary to identify the different potential users of the information, the type and quality of information that they will require, and the potential sources of information. This question is addressed in Chapter 2.

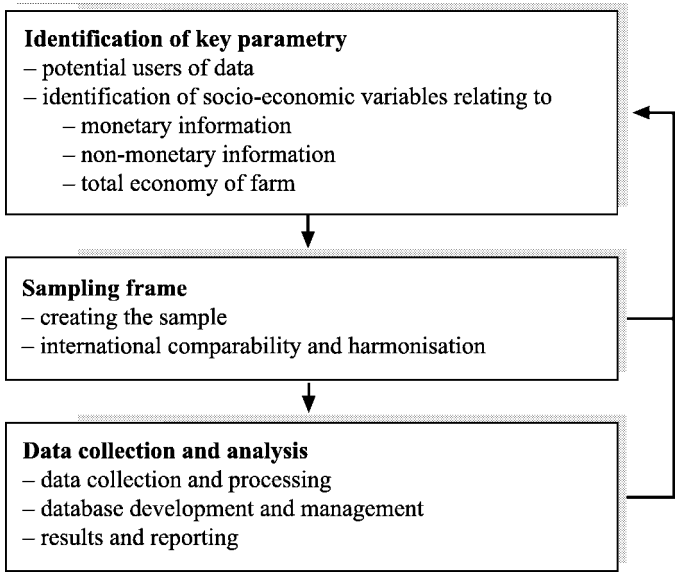

Figure 1. Issues to be addressed in establishing a system for monitoring the socio-economic situation in farm forestry.

After defining the purpose of the monitoring and the information needs of the interest groups involved, some statistical questions need to be addressed. In practice, it is not possible to collect comprehensive information on all the farm forest owners because of the huge number of individual farm forest owners and farm forest enterprises. Therefore, the parameter values for the whole population must be defined by creating a sample, i.e. collecting a limited amount of empirical data that can be then analysed and generalised to the whole population. The basic question includes the choice of the sampling method, sampling size and grounds for stratification (e.g. size of the woodlot, type of farm forest owner, location, etc.). The theory of sampling will be utilised to find answers to these questions. The questions related to sampling are discussed in more detail in Chapter 3.

Although networks of bookkeeping woodlot owners have already been established in some countries, the profitability information produced so far has been mainly based on a subjectively selected sample, not using orthodox statistical sampling (Hyttinen and Kallio, 1998b). Where more orthodox sampling techniques have been used,

sample sizes have been small thus making it difficult to make valid statistical inferences.

The main problems in establishing a bookkeeping network of farm forest owners for producing statistically valid information include the following factors, which may affect each other:

- the difficulties in obtaining both a current and a comprehensive list of farm forest owners to design the sample;
- the high probability of having a poor initial and continuing participation in bookkeeping by forest owners;
- the validity of the data, i.e. whether the farm forest owners are willing to give correct information; and
- response rate bias, i.e. the selectiveness of the respondents, as the most active farm forest owners have the highest motivation to continue bookkeeping from year to year.

After minimising the effects of the theoretical problems related to the sample, the practical implementation requires attention to be paid to various organisational arrangements, which are discussed in Chapter 4.

The core of the subject matter is accounting, which falls in the field of business economics. On the farms belonging to the sample, receipts and expenditures may be recorded in a number of ways. Research questions could be, for example: what are the required data that a forest owner should enter in bookkeeping records and what are the calculation procedures that lead to the desired indicators describing profitability and other socio-economic information?

The accounting questions can be addressed by applying the methods of cost accountancy and ratio analyses in the theory of firm to farm forestry enterprises (Hyttinen et al., 1997). From this viewpoint, harmonising the calculation procedures for the costs and revenues is one of the most challenging problems in order to make the results from different countries comparable. For example, there are large differences between regions and countries in the procedures applied in timber trade, in the productive capacity of woodlands and in the structure of forest ownership. Taking the different taxation and subsidy policies into account makes the interpretation of the calculations even more complicated. Moreover, currency rates complicate comparisons further. The accountancy issues are discussed in Chapter 5.

1.3 MOSEFA Concerted Action

The Concerted Action project – MOSEFA, Monitoring the Socio-economic Situation of European Farm Forestry – was launched at EFI in March 1997 under the European Union FAIR3 Programme (Hyttinen and Kallio, 1998a). Seventeen research institutes from fourteen European countries participated in the project. During the project, the group was enlarged by inviting three external participants from countries with interests in farm forestry accountancy (Figure 2).

The Concerted Action was established to harmonise the heterogeneous approaches of monitoring systems at country-level and to produce generally applicable guidelines to build up forestry accountancy networks. The detailed objectives were to:

- make the existing experiences and expertise on farm forestry accountancy data networks generally available;
- outline approaches for an international socio-economic scheme of statistics on farm forestry;
- develop common guidelines for collecting socio-economic data of farm forestry enterprises adaptable to different purposes and various conditions; and
- identify the most essential research needs and prepare further research activities at the European level.

The publication of the Guidelines for Establishing Accountancy Networks was set as the main outcome of the MOSEFA project. Four workshops were arranged during 1997–1999 focusing on: (1) the methodological issues of cost accountancy; (2) the sampling schemes for socio-economic studies in farm forestry; (3) the prospects for international statistics on farm forestry; and (4) collating and reporting the project outcome. These guidelines were prepared step by step by bringing in the various elements of the workshops.

1.4 The Purpose of the Guidelines

The ultimate long-term goal of these guidelines is to facilitate the provision of consistent and comparable information on European farm forestry, and more specifically, on the socio-economic variables of interest. The objective of these guidelines is to support the development and application of such monitoring systems that would lead towards

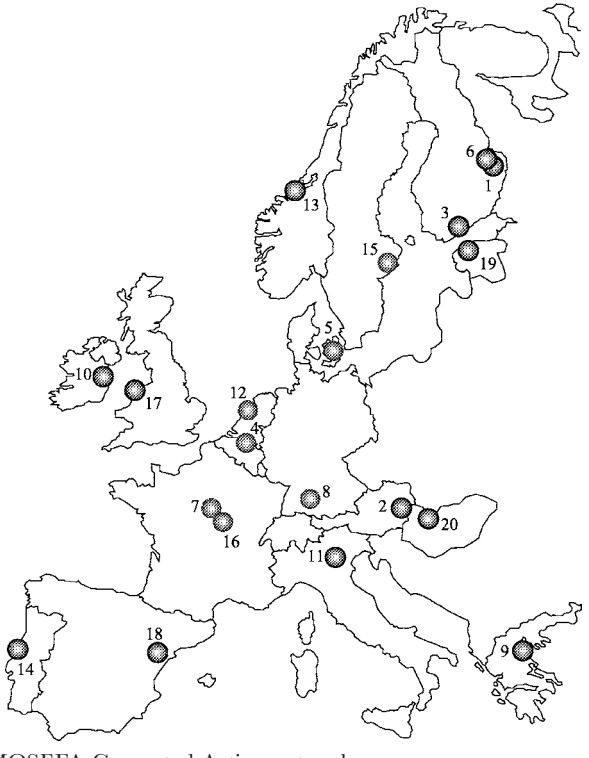

Figure 2. MOSEFA Concerted Action network.

Participants:

1. European Forest Institute
2. Universität für Bodenkultur, Austria
3. Finnish Forest Research Institute, Finland
4. University of Ghent, Belgium
5. Royal Veterinary and Agricultural University, Denmark
6. University of Joensuu, Finland
7. Association Forest-Cellulose, AFOCEL, France
8. Forstliche Versuchs- und Forschungsanstalt, FVA Baden-Württemberg, Germany
9. Aristotle University of Thessaloniki, Greece
10. Irish Forestry Board, Coillte Teoranta, Ireland
11. Istituto Nazionale di Economia Agraria, INEA, Italy
12. Agricultural Economics Research Institute, LEI-DLO, The Netherlands
13. Norwegian Agricultural Economic Research Institute, NILF, Norway
14. Escola Superior Agraria de Coimbra, ESAC, Portugal
15. Skogsägarnas Riksförbund, Sweden
16. Institut pour le Développement Forestier, IDF, France
17. University of Wales, United Kingdom

External participants:

18. Consorci Forestal de Catalunya, Spain
19. Estonian Forestry Development Programme, EFDP, Estonia
20. University of Sopron, Hungary

international harmonisation of farm forestry accounting methods – keeping in mind consistency and comparability – but not restricting the flexibility of national applications.

At this stage, because different countries are at different phases as regards the adoption and use of the monitoring systems and accounting networks, it was not seen as being realistic to aim at a fully standardised monitoring system at the European level. Therefore, it is to be noted that the purpose is not to aim at standardisation, but rather harmonisation. By adopting the principles and procedures of these guidelines, the body in charge of a new or an existing accounting network can produce information that can be better compared with the information produced by other accounting networks, especially when the other network is also using these guidelines as a basis for their system.

The main users of the guidelines will be policy makers, extension services, researchers and instructors dealing with socio-economic issues of farm forestry. As far as the information produced by the monitoring system is concerned, naturally, an essential group of users will be the farm managers who run their enterprises aiming at higher profitability and other benefits from their business.

As the users of the guidelines represent a diversity of interests, especially when considering the international approach applied in MOSEFA, the guidelines will include a general outline for the overall development and application of economic monitoring and farm forestry accounting, and a more detailed outline for practical accounting applications.

The guidelines will help to develop economic monitoring for farm forestry enterprises and their accounting systems in a methodical way. These guidelines cannot be taken as the final solution, but rather as a part of the evolution of better guidelines. More detailed studies are needed to develop the approaches and principles further, and to learn from the application of them.

2 Objectives and Framework of Accountancy Data Networks

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Key points:

- As yet there is no commonly agreed definition of farm forestry in the EU.
- The advantages in adopting a broad conceptual definition of farm forestry include the possibility to comprise a highly diverse set of forestry activities under an accounting network.
- The group of farms under investigation needs to be clearly defined at the implementation phase of the network.
- A widely applicable monitoring system needs to fulfil as far as possible the requirements of various actors and stakeholders, including forest owners, forest owners' associations, forest advisory and extension organisations, policy makers, as well as representatives from financing, research and education.
- The development of accounting networks is an appropriate method for estimating the economic performance of farm forestry enterprises particularly under temporal changes.
- For the time being, it would appear difficult to achieve a comprehensive farm forestry accounting system by extending the Farm Accountancy Data Network (FADN) to farm forestry without special sampling designs.
- The two major problems to overcome are the absence of relevant activities from the current FADN system and the lack of coordinated activities directed at extending monitoring into farm forestry in a systematic way.
- Two practical problems limiting the better inclusion of forestry accounting in the FADN are: (i) the nature of the activities involved in the growth and management of trees that differ fundamentally from that of agriculture; and (ii) the determination of the financial and economic values and quantities of various inputs and outputs, in addition to the assets in forestry, which are not possible to do with the same accuracy as in agriculture.

2.1 The Concept of Farm Forestry

The concept of farm forestry has two important components. Firstly, what is conceived as a farm forest from the socio-economic perspective of the land holders, and secondly, the activities in terms of characteristic forest technologies, which combine with socio-economic features to make it 'different' from industrial and conservation forestry occurring elsewhere and outside the agricultural sector.

As yet there is no commonly agreed definition of farm forestry in the EU. Indeed even at a national level, definitions of farm forestry either do not exist or differ widely between member countries. In a current and future land use policy environment that favours an expansion of forestry activities within the agricultural sector, refining and defining the concept of 'farm forestry' is important if consistency is to be attained between the member countries when examining both the holdings and the forestry activities taking place within them.

In circumstances with no commonly agreed definition*, it is helpful firstly to consider the meaning and function of a definition itself. This can be considered as *'A description of an entity by properties'*. A descriptor is a distinguishing property and typology is the study of the distinguishing features (descriptors) of a group. The facility to compare information concerning a particular type of activity, distinguished by a set of property descriptors that are assumed to underpin some previously defined concept, is therefore a useful one.

In practise, definitions can be very tightly or very loosely defined by property descriptors. Taking Norway as an example, in order to qualify as a forest farm the holding must conform to the following descriptors:

a) Forestry and agriculture must be owned and run by a private person who lives on the farm. The enterprise must have at least 5 hectares of agricultural land and it must have at least 50 m^3 of sustainable yield annually. Net farm income from on farm activities must be at least 50% of total net income (including wages).

* An alternative for deriving an operational definition of farm forestry would be to simply apply the definition that has been adopted by the regulations of the FADN, and record all forestry costs and revenues as a part of the hitherto disregarded non-agricultural income. Chapter 8 reports on discussions to allow this on a voluntary basis. In the absence of specialised sample designs, such a procedure will in most cases end up with the bulk of farm forests which are monitored being very small and economically minor entities.

Ownership, size, output and contribution to net farm income from farm forestry activities clearly function to distinguish these holdings from others within the agricultural sector. This contrasts sharply with two alternative definitions in use at the present time. In Italy for example, the accepted definition of 'farm forestry' currently includes:
b) All forestry activities integrated with agricultural land in a private (or, in some cases, public) farm.

Similarly according to UN-ECE/FAO forest resource assessment (FAO, 1990), a 'farm forest' is defined as:
c) Forest and other wooded land that is owned by individuals, families or corporations engaged in agriculture as well as forestry.

As far as the holding is considered, neither definition mentions any distinguishing factors other than ownership and presence of some form of forestry activity. Moreover, all types of forestry activity can potentially be included in definitions given in (b) and (c).

In the context of accountancy networks this poses a question. Should definitions be broadly or narrowly defined? There are advantages in adopting a broad conceptual definition of farm forestry especially since it can comprise a highly diverse set of forestry activities. Thus, at least at the outset, the definition places a boundary around what may appear to be qualifying, yet highly diverse ranges of holdings and activities. In an operational context, however, and in order to determine the eligibility for inclusion for a forest farm in the monitoring process, additional property descriptors may need to be introduced. For example, considering the definition in a broad sense, modern farm forestry might be perceived as:

The purposive integration of forest trees including shrubs and agricultural activities within the farm holding in order to contribute to satisfying one or more of the following management objectives of the farm business: environmental enhancement, economic viability and amenity improvement.

This is a definition deliberately designed to encompass not only several types of increasingly relevant forest farms but also contrasting types of farm forestry activity within their boundaries. Depending on the focus of inquiry, qualifying farms, for example, might be distinguished on the basis of property descriptors such as:

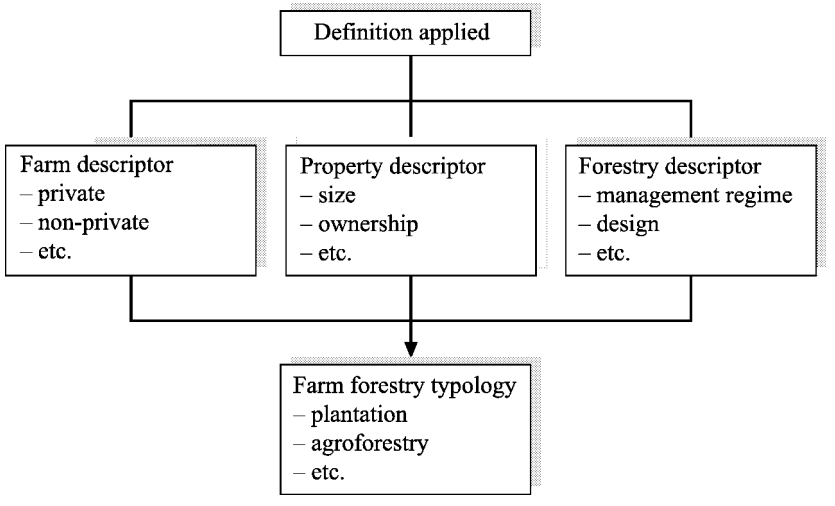

Figure 3. The logic of defining a 'farm forestry enterprise'.

- size;
- ownership;
- economic output;
- type of crop planted area; and
- management objective.

Similarly within this definition, types of farm forestry could also be differentiated, based on descriptors relating to plantation design and management practice. Figure 3 describes the logic of this process of defining a farm forest enterprise.

To conclude, the guidelines can be applied under a narrow or broad definition of farm forestry, depending on (i) what purpose the information is used for, and (ii) the requirements for the accounting information. The group of farms under investigation, however, need to be clearly defined at the implementation phase of the network according to the specific requirements of the implementors.

Table 1 suggests an indicative list of the kinds of property descriptors, which might be appropriate to farm forests and the forest activities within them. Describing the characteristics of farm forestry using these criteria allows the opportunity to create a typology based on common features. The resultant types of farm forestry can then be used for the comparison of social and economic trends within and between countries. Individual countries may define their own

Table 1. Indicative property descriptors for forest farms and farm forestry activities.

Category	Descriptor	Examples
1. Physical	Size of forestry	area, width
	Type	broadleaf/coniferous/mixed (certain percentage or more of the species)
	Tree height	height at maturity
	Stand density	tree crown cover
	Output	timber: volume, use
		non timber forest products: type, quantity
2. Economic	Income	net income
		proportion of total farm income
3. Social/Legal	Ownership	private
		jointly owned
4. Environmental/ Amenity	Conservation/ habitat creation or protection	wood production
		conservation
		wildlife
	Soil/water conservation or climate control	watershed protection
	Accessibility	public
		restricted

types of farm forestry using the parameters most appropriate to them. As long as these parameters are clearly expressed in the typology, the interpretation of data will be clear. This also allows less obvious forms of farm forestry – such as planting for conservation, production hedgerows, types of agroforestry and amenity forestry – to be identified and included in the analysis.

Taking amenity forestry as an example, assume the focus of interest is a comparison of the costs of managing game cover on leisure orientated forest farms where this type of woodland represents between 25% and 50% of woodland on the farm. Figure 4 illustrates how these farms and activities might be identified from others whose key management objectives are conservation and timber production. This is done on the basis of two property descriptors: (i) key management objective; and (ii) proportion of woodland cover

Chapter 6 discusses in greater detail the practical aspects of formulating a database capable of holding socio-economic information on farm forest holdings combined with technical and financial data concerning the farm forestry activities practised there. The database

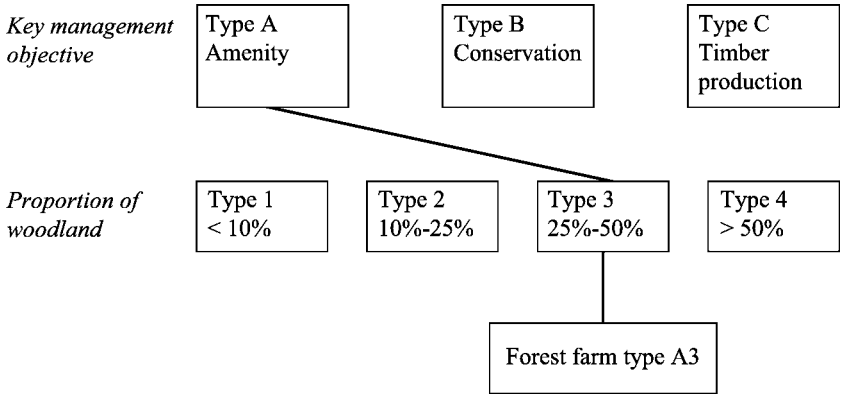

Figure 4. An example of deriving a typology of Forest Farms based on management objectives and woodland cover.

provides an important link in converting what are essentially static definitions of farm forestry into flexible working definitions. Modern database technology enables qualifying boundaries for holdings and activities to be continually revised depending on the focus of interest. The choice of property descriptors and limits placed on them to describe farm forest typologies could be based on prescriptive criteria agreed by member countries, some of which could be unique to a particular country or region. Alternatively, they may be selected to describe what is most typical or of greatest strategic interest to the various actors in the country concerned. In this context, the next section provides an overview of information needs.

2.2 Overview of Information Needs

Monitoring of the economics of farm forestry is needed primarily to assess the profitability of forestry as well as the farm level impacts of the changes in economic and political environments. "In principle, information on the socio-economic situation of farm forestry is likely to be needed in farms, forest owners' associations, forest advisory and extension organisations, policy making, financing institutions, as well as in research and education. An accountancy network may help in overcoming respective information deficits by continuously providing representative data covering various aspects of the socio-economic performance of farm forestry enterprises on different levels

of aggregation. Among the important preconditions for a widely applicable monitoring system is the requirement to fulfil the specific needs of various actors" (Hyttinen et al., 1997, pp. 9–10). The current section discusses the information needs of the key actors.

Forest owners participating in the monitoring system need to receive detailed information on the transactions of their own woodlots. Other forest owners should receive comparable information on woodlots similar to their own to support their management decisions. Information on the results achieved by others helps in defining a realistic picture of the potential of their own property, i.e. it allows benchmarking.

Forest owners' associations need to receive information that is valuable in promoting the common benefits of their members. The forest owners' associations may utilise the data in three ways: (i) they can provide hard data on economic conditions when negotiating collective agreements, tax breaks or subsidies; (ii) they can provide their members with comparative information; and (iii) they can use the information to compare the main economic trends at an international level.

Forest advisory and extension organisations need the data when they assist forest owners in making decisions on forestry practises. Cost–benefit calculations based on real life examples can be expected to be more reliable than those based on hypothetical cases.

Policy makers and governments need data that they can utilise in planning forest policy instruments directed at non-industrial private forest owners. For example, indicative information on the expected long-term costs and revenues helps greatly in determining the regional levels of support for field afforestation or other subsidies for forestry measures. The economic relevance of farm forestry has also been recognised by agricultural policy makers.

Banks and other financing institutions need data that they can use in determining clients' credit worthiness and the schedule for the repayments. For example, the value of forest area as security of pledge for a loan can be estimated based on the results achieved in corresponding circumstances on surveyed woodlots. The data can also be utilised in the sale and purchase of forest woodlots: for example, the buyer can calculate an estimate of the return on his investment.

Research into forestry business economics and education of forestry workers in general can be improved by having up-to-date empirical data on costs and revenues. Such information describes the forest

enterprises in economic terms, provides the basis for statistical analyses and modelling, and may eventually contribute to the creation of decision support systems for training purposes or practical forest management.

Once the major users of monitoring information are identified, it is then necessary to address the issue of what information is required to satisfy the information needs of these groups. For a functioning monitoring system, as discussed in Chapter 5, individual components such as the quantity and price of labour, machinery and other units of production are needed to derive the overall profitability of a farm forestry enterprise. In principle, the information of the quantity and value of individual components such as timber sales (m^3), labour and machine inputs (hours), materials (kg, litres, other units), etc. form the basis for any monitoring system of the socio-economic situation of farm forestry enterprises.

The untransformed data concerning the individual technical and financial parameters in the business is usually aggregated to provide information about aspects of farm forestry enterprises. The aggregation of data can be done with respect to costs and benefits, time or spatial dimensions and with various levels of aggregation. The aggregated information may well be of high importance for national and international analysis on farm forestry, whereas at a farm level the aggregated information may have considerably less use.

It is important to note, however, that while aggregated data can be compiled from more detailed information, the reverse is not true. Original, non-aggregated data in terms of type, coverage and quality cannot be derived from the aggregated data. This emphasises the importance of the development of a general database as presented in Chapter 6 from where information presented at various levels of aggregation can be extracted.

2.3 Prospects for Extending EU-FADN to Forestry

The Farm Accountancy Data Network (FADN) is a harmonised information system, which provides accounting data on the physical, structural and economic characteristics of farms in the European Union. The FADN is formed on the basis of EC regulations effective since 1965 and the respective national legislation that has developed since then. According to the regulations of the FADN, forestry is

regarded as a non-agricultural activity and is therefore not recognised by the respective reporting systems.

The FADN is based on annual systematic sample surveys covering a sample of approximately 58,000 agricultural holdings in the EU member countries. Based on data coming from the farm accounts of the sample, the FADN system provides information on the income and economic situation of agricultural holdings in the EU.

The FADN was originally developed to provide monitoring information for the Common Agricultural Policy (CAP) implementation. Therefore, the ability of the FADN to provide information on non-agricultural incomes, such as those from forestry, is limited. Often farms with forestry activities are excluded from the FADN farm samples, or revenues and inputs of forestry activity are excluded in the accounts. Furthermore, the information on farm returns based on existing FADN survey forms, often does not permit the separation of non-agricultural inputs (Brookes, 1998). At present, several EU countries (Denmark, Germany, Spain, France, Netherlands, Austria, Finland and Sweden) have forestry data of some kind already available along with the FADN, and eleven countries consider gathering respective forestry data as feasible (Abitabile et al., 1999, p. 39).

In countries such as Austria and Finland, where forestry is economically significant, some forestry data have been collected under the FADN system since 1995. The collection of forestry information is, however, limited on farms that practise agriculture (Hyttinen and Kallio, 1998b). In countries such as Belgium, Denmark, France, Greece, the Netherlands (except temporary woodlands and Christmas tree plantations) and Portugal, where forestry is relatively less economically significant, the collection of practically any forestry data in the FADN system is omitted (Hyttinen and Kallio, 1998b).

Nevertheless, one of the main strengths of the FADN system is the systematic and high coverage of farms in the sample. If farm forestry accounting was included in the FADN system, one major benefit would be to avoid sampling problems common for many applied farm forestry monitoring systems. The inclusion of farm forestry accounting in the FADN system would require that special forestry units or mixed forestry and agriculture units are generally accepted to FADN. If one is willing to permit a complete separation of forestry from agriculture on surveyed farms, a commonly agreed methodology for variable, fixed and investment inputs in forestry, and for the valuation of forest assets

would have to be adopted (Brookes, 1998a). Even in this case, one remaining problem would be that those holdings having only forestry activities would be automatically left out from the sample.

In practise, a complete farm forestry accounting system under the FADN system is difficult to establish. This is not least for the following two reasons: (i) the nature of the activities involved in the growth and management of trees differs fundamentally to that of agriculture; and (ii) it is not possible to determine with the same accuracy in forestry as it is in agriculture, the financial and economic values and quantities of various inputs and outputs, in addition to the assets. Nevertheless, the FADN provides the only existing cross-national network for monitoring the socio-economic situation of farms in the European Union. Therefore, it also provides a logical basis for developing the farm forestry accounting systems in the member countries in a harmonised manner. This conclusion is not new and has been discussed elsewhere (Abitabile et al., 1999; Brookes, 1998b).

Since the establishment of the FADN system, non-agricultural activities have become more important in farm enterprises. As the whole-farm approach is in principle dominating the FADN system, this has increased pressure to record separately, the returns and inputs of non-agricultural activities on the farm. It is possible that trees will be considered as another crop and forestry incorporated into the classification of farms. This is not yet ruled out, however, and it may be that the first steps must be taken in surveying the population before any representative accounts can be collected on a comparative basis (Brookes, 1998b).

One possibility to improve the sampling of the FADN and to avoid the inconsistency of farm and farm forestry accounting would be to build up a sub-sample for farm forestry accounting on the basis of the FADN system. This sub-sampling, which has been practised for example in Austria, is not sufficient to completely satisfy the purposes of economic evaluation of farm forestry (Sekot, 1998b), but may provide a realistic contextual basis for farm forestry accounting especially in countries where forestry has little importance for farm forestry in general. Sampling issues are discussed more closely in Chapter 3.

2.4 Alternative Methodologies

The selection of an appropriate method for estimating the economic performance of farm forestry enterprises depends on the purpose for which data are collected and the type of subsequent analyses. A number of options present themselves. If the aim is to improve the quality or increase the amount of long-term monitoring information, it may be appropriate to establish a new system to collect the data, or to renovate an existing system to fill the gaps. If the objective is to get information relatively quickly to answer some acute question, existing systems or surveys need to be utilised. The frame for the collection of supplementing data is made easier if the existing monitoring systems can be tailored to the new requirements.

Among the alternative methodologies for long-term monitoring of the economic performance of farm forestry enterprises is the creation of *accountancy networks*. In these networks, a sample of farm forestry enterprises is selected. The sample farms can be monitored for several accounting periods, or continuously. The typology of the sample can be based on the type of farm; the size of a farm in terms of area or net return; production region; or on various site characteristics such as quality, difficulty or location. The data and results from similar farms in the sample are combined and generalised for the rest of the similar farms in the population.

Another possibility for estimating the economic performance of farm forestry enterprises is to establish specific surveys for data collection. This approach can be useful where there is a shortage of knowledge on some important economic characteristic. To fulfil the gaps in information, a sample of enterprises can be selected, studied and the respective results reported. Delphi-type sessions can also be used in this way. These typically involve bringing together experts in the field to provide information based on first hand knowledge of a particular facet of an activity or problem, or often to comment on the reliability of 'best estimates' of parameters obtained in some other way. The importance of this methodology is in modifying and complementing the existing information from the long-term monitoring system.

Leaving aside, for the moment, considerations of how and what data is collected, the ultimate objective of a monitoring system is to provide a basis for estimating the economic performance of farm forestry enterprises to develop *models* that can be used for the assessment of

the likely economic performance of real farm forestry enterprises, or to simulate the outcomes of the hypothetical situations that farm forestry enterprises may face. Modern spreadsheet technology has transformed this area in recent years making rapid appraisals and re-appraisals of performance possible based on 'what if?' type questions with respect to technical and financial parameters. Such models can often clarify through sensitivity analysis those parameters for which accuracy is essential in the short term. Alternative approaches to data collection of the type described above can then be employed. There is, however, little substitute for collecting representative data through well developed accountancy networks once the integrity of the model is established and protocols agreed. Although a number of modelling systems exist for this purpose, agreements on protocols are absent, and therefore, the existing data in any European country cannot be considered satisfactory for this approach at the moment.

Sector calculation models are models where forestry and economic information is used as an input for calculating the economic result for private forest holdings. The economic results of the model may include, specifically, the net income for the year and the return on forest capital. In Sweden, where the sector calculation model has been applied by the Swedish Federation of Forest Owners, the forestry information is taken from the national forest inventory data. Information for actual forest management patterns is derived from local forestry authorities, information on the costs of various forestry operations is derived from forest owners' associations and local contractors, and information on wood and timber prices is derived from forest owners' associations. This information is combined in a calculation model applying simple spread-sheet techniques to estimate the economic results in terms of annual net income per 100 hectares and return on capital before and after taxes.

The selection of the appropriate methodological approach depends principally on the requirement of data and the needed accuracy of the results. For various purposes, the development of accounting networks is important. The use of surveys, for example, can at best complement the information collected through long-term monitoring systems. Also the model building is greatly enhanced by using accounting information gathered through a network system. In these guidelines, the emphasis is on describing the establishment of a long-

term monitoring system for farm forestry, similar to the EU-FADN system established in agriculture.

2.5 Summary

This chapter began by considering the conceptual definitions of farm forestry on agricultural land and the ways of distinguishing it from industrial and conservation forestry. It distinguished between broad and narrow definitions of forestry and emphasised the role of modern database technology in providing flexible working definitions for typologies of farm forest holdings and activities. These in turn can be used to provide comparisons of economic performance between countries based on commonly agreed property descriptors and protocols with respect to data. In providing an overview of information needs, differences were identified as between the various actors involved; however, the importance of disaggregated data collected to commonly agreed protocols was emphasised. Difficulties associated with extending the existing FADN system to include farm forestry activities were outlined before considering other mechanisms for collecting information. Finally, consideration was given to methodological aspects of data analysis and the use of models. Although spreadsheet modelling in particular is a useful vehicle for the purposes of data analysis, and in the short term, can determine those parameters of greatest significance to profitability based on 'best estimates', once the integrity of the models has been established, there is little substitute for supplying the models with information based on accounting and technical information derived from well organised and long-term monitoring systems.

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3 Creating the Sample

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Key points:

- Information on the population of farm forests to be investigated is a prerequisite for sampling purposes as well as for statistical inference of the results.
- Overcoming respective information deficits may necessitate trade-offs between the quality of information and statistical sophistication on the one hand and costs of information on the other.
- The sampling frame serving as an intermediate between the population and the sample has to define the unit of investigation as well as any cut-offs that are not to be covered by the sample.
- Various sampling techniques can be considered along with accountancy networks, the alternative concepts differing in terms of statistical quality, efficiency, methodological sophistication as well as data requirements.
- Accuracy, validity, reliability and representation are the key features describing the quality of the results and should therefore be considered already in the planning stage.
- The statistical quality of an accountancy network is likely to be affected by self selection bias on the one hand, and panel effect on the other hand: incentives for participation and the rotation of the panel should be considered as possible remedies to these problems.

3.1 Information on the Population of Farm Forests

In order to establish a sample, it is a prerequisite to have information on the population that is to be represented by the sample. In general, different types and uses of respective information might be considered. For example, the characteristics of the population of farm forests may be required for the delimitation of the population under investigation, that is, the population has to be described by features that clearly allow the researcher to distinguish the members of the

population from the non-members. Similarly, the basic concept of farm forestry underlying the respective investigation has to be specified in an operational way. This could be achieved, for example, by referring to a certain kind of ownership along with a minimum as well as a maximum area of forest land (for details and examples see Chapter 2). A further potential use of features describing the population of farm forests refers to the identification of relevant sub-populations. Characteristics of the population may serve as grouping variables for deriving additional categories of interest, for example, additional size classes or geographical units such as production regions or administrative units (NUTS levels I to III).

In addition to the sample design, statistical inference has to rely on data, which are available with respect to both the sample as well as to the whole population. The relevant information inferred will depend on the quality of the representation to be achieved within the network. If no statistical inference is sought, little information on the population is required. Simple inferences may refer just to very basic data such as the number of units (e.g. enterprises), area of forest land or the annual cut. In Austria for instance, there is a monitoring system providing data on the annual record of cuts referring just to two size classes of private forestry. In such a case it is advantageous to apply identical borderlines. More sophisticated inference may refer to items such as size class, in terms of standard net return or category of holding as expressed by the structure of the total standard net return.

Further data describing the population may serve as background information to be related to the economic information out of the network. In this context one may consider, for example, agricultural features of the farms and especially various socio-economic data such as agricultural income (out of the FADN) or available farm labour.

It is important to realise that different sources of information on the population of farm forests are likely to vary with the underlying concept of farm forestry, and therefore may not be compatible with one another. Some sources may refer to the enterprise as a business unit, others to the forest as a management unit where multiple properties might be concerned, and still others may refer to the forest owner as an individual, to the household as a unit of ownership and management, or to farm forestry as a category, e.g. along with a national forest inventory. Due to such conceptual differences, the data available may be inconsistent, describing in fact not all the same population, but

different ones. Nevertheless, data referring to slightly different entities may still be of indicative significance for the purpose of networking.

In the early stages of establishing an accounting network one should look for all possible sources of information relevant to the population under investigation (see Bürg and Sekot, 1997). For obvious reasons it is not possible to provide a comprehensive list of such sources here, but one should at least consider the following categories:

- agricultural census, especially in so far as the forestry part of the farms is reflected there;
- national or regional farm register;
- Farm Accountancy Data Networks;
- cadastral register documenting the ownership of each individual parcel of land;
- lists of members, especially when land owners are obliged to be a member e.g. of a chamber of agriculture and forestry;
- lists of persons recognised by the social security insurance as farmers;
- statistics of persons or entities, who or which have previously applied for a forestry grant;
- tax registers (e.g. ground tax);
- National Forest Inventory; and
- investigations and scientific studies of different kinds at the sub-national, national or supra-national level.

Some of those sources may exist, but nevertheless prove to be inaccessible, e.g. for reasons of tax confidentiality. On the other hand, accessibility might be achievable with access to the relevant political agency.

Sources of information should be screened, not only in terms of content and accessibility, but also in regard to qualitative aspects of the information. The data should be comprehensive, reliable, valid as well as reasonably accurate (see Hyttinen, 1995). For judging these categories one has to address, among other things, the means of data collection: was it a reporting system? a survey? what kinds of biases were likely? and how have the biases been dealt with?. A key issue of data quality, however, is timeliness. Outdated information may not only be useless, but even misleading. Taking into consideration the dynamics of the respective features, one needs to strive for data that

are as timely as possible. The crucial question of compatibility between data sets has already been addressed.

When establishing an accountancy network one is likely to face various information deficits, which have to be overcome. Usually a trade-off has to be achieved between the scientific sophistication of the networking activity on the one hand, and the costs of providing the relevant information on the population on the other. Consequently, the methodological concept may have to be adapted according to the information available, so that the balance of available database and statistical approach is secured. As an alternative to costly investigations,

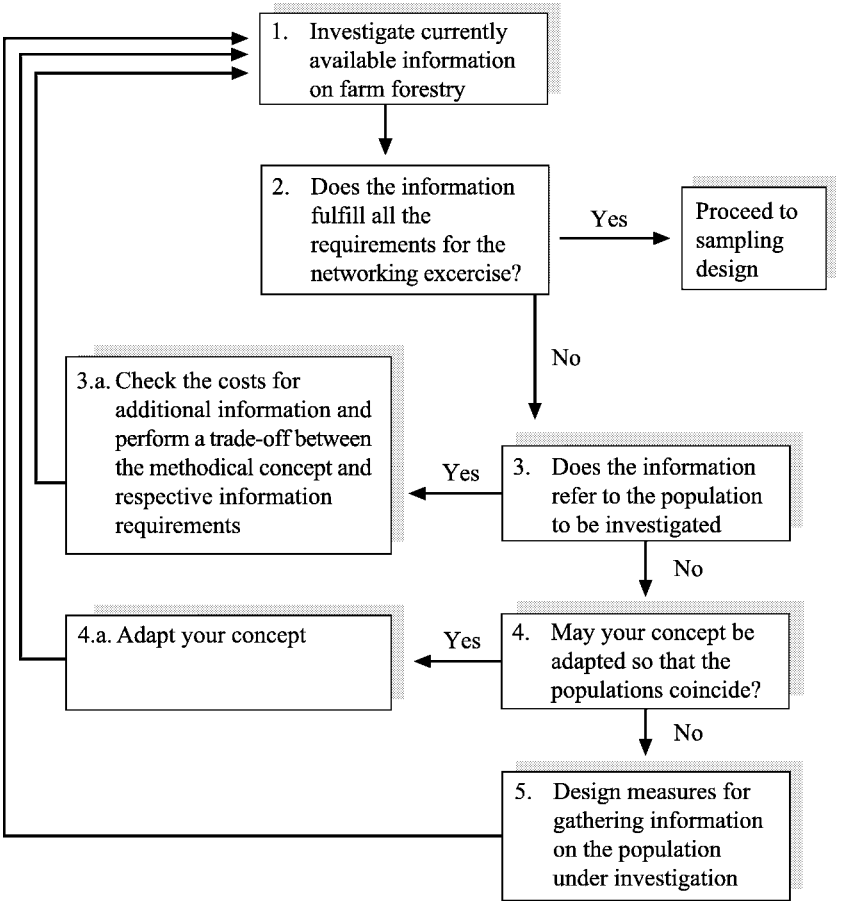

Figure 5. Process for overcoming information deficits.

surrogates originating from, for example, agriculture, may be utilised. Under certain conditions, a precursory study may be justified, such as a survey or even a monitoring system covering the main characteristics of the population. The general scheme for dealing with such information deficits is depicted in Figure 5.

3.2 Developing a Sampling Frame

When developing a sampling scheme, the respective frame conditions have to be clarified first. The following short checklist highlights some of the relevant features:

- what are the target variables?
- what level of accuracy is required for the individual target variable?
- what are the most relevant categories of farm forests to be described?
- what budget is available?
- what is the organisational setting like (see Chapter 4)? and
- what information is available on the population (e.g. see the Swiss study on structural features of public forest enterprises by Speich and Brassel, 1980)?

In many cases, the optimal approach is not to strive for a total representation of the underlying population, but to reshape the population under investigation by defining respective cut-offs. Therefore, it is important to identify those parts of the population that are of minor interest or the representation of which would be especially costly or difficult. Alternatively, the important segments of the population could be identified and sampling restricted to them. Many of these are categories for which information is likely to be of interest. Those could be the numerous but very small entities, the x% largest enterprises, or special types of enterprises in terms of ownership such as jointly owned forests, management goals, structural characteristics, significance of forestry for the farm in terms of income. The type of information on the population, too, may suggest respective cut-offs along with the network. Information on those parts of the original population that are treated as cut-offs is of special interest along with the interpretation of the results. At the very least, the size and significance of the respective cut-offs should be indicated.

For the selection of the segments of the population for sampling, an operational definition of the multi-dimensional concept of farm forestry is necessary (see Chapter 2) providing a comprehensive typology of the kind of farm forests to be investigated. For any kind of statistical imputation it is a prerequisite to be able to clearly identify an object as part of the population under investigation. Furthermore, it has to be defined for which sub-populations statistical inferences will be of interest. Respective categories have to be elaborated by means of grouping variables.

For methodological reasons, the original population itself and those means of representation (e.g. a register) that serve as basis for selecting the units to be sampled have to be distinguished. It has to be recognised that there might be an incomplete coverage of the population and that, consequently, the results refer to the represented part of the population only.

Especially along with farm forestry, the panel of the FADN could serve as sampling basis as is the case in Austria. A necessary prerequisite is, however, that the national FADN framework recognises not only the agricultural part of the farms, but also the forestry characteristics like area and standard net return. This implies an extension of the general scheme of farm typology underlying the FADN activities. Once the national FADN recognises forestry, the network of farm forests can be established as a sub-sample of the FADN panel. Consequently, the selection of the members can be viewed as a two-stage process, where the first stage of establishing the FADN is already complete and thus cannot be solely adjusted to the goals of the forestry investigation. In the second stage, the forestry sample may concentrate on those farms within the FADN, where forestry is of special significance and the forestry share of the total standard net return exceeds a certain threshold value (e.g. 25% or 50%).

Usually, the unit of investigation will be the individual farm. Alternatively, it could also be the management unit. To apply an operational definition of farm forestry, it has to be clarified how special kinds of forest ownership and management, such as jointly owned forests, cutting rights (which may be interpreted as establishing an ideal property), consortia or common property are to be dealt with. Another element of the sampling framework refers to the question of whom to address. The financial and administrative entity serving as the unit of investigation, be it a management unit, a unit of ownership

or a household, may be represented by one or more respondents. With farm forestry, this respondent is likely to be the farmer. In most cases, the farmer will be the one who has the main responsibility for all the forestry management measures and who is also the owner of the forest. There may be situations, however, where conditions of ownership and responsibility may be different, involving for example the farmer's wife or a second or even a third generation of the family living on the farm. It cannot be taken for granted, therefore, that the respondent approached as the 'farmer' is a generally valid representation of both ownership and management alike. Alternative respondents could be other members of the household or even the staff of the forestry extension service.

3.3 Sampling Techniques

Usually, an accountancy network is meant to be representative of a larger population. However, this is not necessarily the case. The suitability of a certain methodology cannot be assessed in general terms, as it is always dependent on the respective goals and frame conditions. Therefore, the process of determining the appropriate approach has to concentrate on the clarification of those key elements first. The broader the scope of the investigation and the more general the information needs, the simpler the sampling technique applied should be. Only for optimising the efficiency of a system devoted to a very specific information need, will a more sophisticated methodology be useful.

Efficient sampling techniques like 3-P sampling (probability proportional to prediction), the Nayman allocation or otherwise pre-stratified samples imply a multiple-stage procedure and regularly require specific information in advance. Such a stratification could be based on, for example, the significance of forestry for the total economy of the farm. In that case, the sampling ratio, and thus also the probability of a farm being selected as a test farm, would be related to the proportion of returns from forestry, and the investigation would be focused on those farms dominated by forestry (e.g. share of forestry >25%), whereas the other farm types would be represented at a lower level of accuracy.

Generally, stratification means the definition of typological sub-units. In terms of statistics, stratification is useful for enhancing the efficiency of a sample when the variance of the target variable is

significantly higher between the categories than within them. However, stratification is only justified when there is a significant relationship between the characteristics used for stratification on the one hand and the target variable of the investigation on the other. The more target variables that are sought, the poorer the prospects for rationalisation by means of stratification will be.

The more target variables included, the poorer the prospects for rationalisation by means of stratification will be. As is the case with the FADN, which clearly focuses on income, the sampling design can be based on a scheme of stratification derived by combining several major typological characteristics. With regard to economic information on forestry, Kroth and Bartelheimer (1981) discuss the following criteria for stratification:

- administrative unit (province);
- type of ownership;
- category of holding (in terms of composition of the standard net return);
- size class as derived from the forest area; and
- level of profitability as described by the standard income per hectare.

Statistical correlation is also indispensable when aggregated values are to be calculated by means of weighting procedures (see Chapter 7). Aggregated values other than the target variable may show no such correlation and therefore are prone to biases when the same weighting procedure is applied. For example, harvesting costs may differ significantly between geographical units due to the respective landscape. However, there is no reason to assume that overhead costs or wood revenues are related to this feature in the same way.

What follows are some standard sampling approaches discussed in terms of their respective advantages or disadvantages in the context of their usefulness when selecting test farms for an accountancy network.

Statistical (random) sampling. Random sampling means that in the selection phase there is an equal probability for all elements of the population for being selected as a sampling unit. Practically, this can be achieved by associating a random number to each element of the population as represented in a register. Given a sufficient size of the sample, statistical sampling guarantees for an unbiased selection of the units to be sampled. Only in the case of random sampling

can the sample size necessary for complying with the accuracy of the target variable be calculated directly. However, for such a calculation it is necessary to have at least a rough estimation of the variability of the target variable within the population. Depending on the size of the population, a high level of accuracy may require a huge number of entities to be sampled. The statistical quality of the data is likely to be low, if there is a limited budget, a large population and a heterogeneous target variable. The sampling scheme proposed for the Forestry Information System in Switzerland, for instance, corresponded to the concept of random sampling (see Seiler et al., 1992).

Quota sampling. This is a two-stage procedure requiring pre-information. In the first step, typological entities are defined. Those categories are either sub-populations to be described by aggregated target variables or alternatively represent entities where the target variables are supposed to behave more homogeneously than in the overall population. For each of these groups, the number of units to be sampled is defined, usually without specifying the method of selection. Consequently, the selection itself may follow the concept of purposive sampling; however, random sampling could be applied as well. Given the significance of the grouping, this approach may enhance the efficiency of sampling. Usually, the FADN activities are based on such a concept. The respective sample size is defined for all of the categories defined according to size and category of holding. In Austria, the individual farm is thereafter approached in terms of purposive sampling.

Purposive sampling. In this case, the units to be sampled are selected on purpose, resulting in sample of the respondents displaying a particular set of useful characteristics. It is especially appropriate when the population is rather small. In such cases where the theoretical advantages of random sampling are no longer valid, purposive sampling may still enhance the efficiency of the study, concentrating on the most significant elements. However, it is statistically invalid to calculate the variance of a target variable if the sample is selected purposively.

Systematic sampling. Depending on the documentation available on the population, systematic sampling may be an approach that can be used to select the elements to be investigated. For instance, every n^{th} item listed in a record of farms may be chosen for investigation. Where

the population is rather small, a stratification of the general list may be introduced, so that all relevant categories are covered equally. In this case, systematic sampling is just one special type of quota sampling. Such a technique has been applied with the network of jointly owned forests within the province of Tyrol (Austria) (see Enk, 1988; Sekot, 1998d).

Cluster sampling. This is a two-stage technique for efficiently sampling small entities scattered over a large area. Such approaches are common, for example, with some National Forest Inventories. The enhancement of efficiency is directly linked to the reduction of travelling costs. Cluster sampling is a special kind of stratified sampling, where the probability to become part of the sample of those elements being located outside the regions selected in the first phase is zero. Along with forest accountancy networks, one could in a first stage sample geographical units (be it communities, regions or NUTS-levels) at random. Within this sub-population a full survey or quota sampling could then be applied.

Combined techniques. If the population to be described is known to encompass significantly different types of enterprises, a stratification of the population, as well as of the sample might improve the statistical quality of the results. For instance, the forestry information system for Switzerland was initially designed to differentiate the sampling approach according to the size-classes of the enterprises in terms of allowable cut (see Seiler et al., 1992, p. 5). It was proposed that the few largest entities exceeding an allowable cut of 5000 m^3 per year should be covered by a full survey, whereas quota sampling should be applied to the other size classes. In fact, all of the multi-stage sampling procedures like quota-sampling or cluster sampling may be subsumed under the category of combined techniques.

3.4 Questions of Accuracy, Validity, Reliability and Representation

The significance of the results to be obtained by means of an accountancy network depends on the quality of the measurement. In general, there are four criteria (accuracy, validity, reliability and representation) which characterise the quality of any information

derived from sampling. Consequently, those measures have not only to be borne in mind, but should also be checked explicitly.

Accuracy. Where statistical inference is valid, the accuracy of the results can be described in terms of standard error or coefficient of variation (e.g. standard error of the average profit per cubic metre). These measures can be calculated for each target variable. However, there is no overall measure of accuracy for multiple-purpose investigations (as is the case with accountancy networks), which usually are to provide a considerable number of different items simultaneously. In practice, measures of accuracy will be of interest for key variables only. It has to be kept in mind, however, that the measures of accuracy are defined only when the population is large enough and the sampling units are selected at random. In all other cases, accuracy cannot be determined properly. It is, nevertheless, still advisable to indicate the range of respective confidence intervals thereby making explicit the fact that any results are subject to errors, and therefore, are not necessarily significant up to the very last digit. For instance, in the Dutch reports the respective confidence intervals are indicated graphically (see Berger et al., 1997). Ultimately, the significance of any differences in financial ratios, be it between successive years or different groupings (e.g. size classes or regions), can be assessed only when taking into consideration the respective standard errors associated with their estimates (see Sekot, 1994, p. 155).

Validity. The different aspects of validity all refer to the question of whether the indicators and techniques applied are suited for deriving the information of interest. An operational definition of all variables to be measured is a prerequisite of indicator validity. This applies to monetary as well as to non-monetary characteristics. Consequently, documentation covering all the definitions of variables is indispensable in terms of validity. Where the data collected stem from cost accounting, no valid financial ratios (e.g. turnover ratio) can be obtained. Conversely, measures of efficiency can only be derived from cost accounting. At best, some surrogates can be defined, meeting respective information needs at a lower level of significance and validity. Data collection methodology, be it field work manned with specialised staff or a reporting system, has to be also considered in terms of validity. In addition, average results where weighting

procedures applied for calculating average results may introduce an additional bias.

Reliability. Operational definitions as well as unambiguous protocols for deriving the information of interest are necessary for securing a high level of reliability. The measurements must not be affected by the individual characteristics of the people involved in data collection and data processing, or by features of the sampling unit. For example, it has to be generally agreed as to whether subsidies are to de deducted from the respective costs or recorded separately as a type of income. The same applies to value-added tax as well as many other items.

Representation. The quality of the representation is mainly affected by the number of sampling units and their distribution within the population. Ideally, the distribution of all features significantly related to the target variables should be the same in the sample as is found in the population. This can be checked to some extent by comparing respective sampling ratios referring to different items such as the number of enterprises, allowable cut, area, etc. The more homogeneous these sampling ratios are, the better the representation of the population by the sample will be. In practice, the ultimate distribution will depend on the mode of selecting the sampling units, the sampling scheme and other influences like non-response. Theoretically, the size of the sample is directly related to the variability of the items to be sampled and to the required degree of accuracy of the results. If the main target variable can be identified, the necessary size of the sample can be calculated in a straightforward manner. When the population is rather small, a finite population correction should be taken into consideration. As there is a multiplicity of target variables, a range of sample sizes can be estimated (e.g. the Swiss study by Seiler et al., 1992). Finally, the decision on the sample size has to be derived from a trade-off between costs and accuracy.

For reasons of efficiency, the *size of the sample* should be determined to just comply with the required level of statistical quality. As a general rule of thumb, each stratum for which aggregate data is to be calculated should be represented by at least 20 to 50 entities. Kroth and Bartelheimer (1981, p. 29) propose a minimum number of 40 units for each stratum, assuming a coefficient of variation of 100% (taking net profit as the target variable) and referring to a probability of error of 20% (which means that the true mean lies within a range of 20%

of the estimated value). In the case of a random selection out of a normally distributed population, the minimum number of elements to be sampled can be calculated according to the formula:

$$n = \left(\frac{z_\alpha}{d}\right)^2 \cdot \sigma^2$$

where n = number of elements
z_α = limit of the normal distribution for the double-sided test according to the respective probability error (e.g. when $\alpha = 5\%$ then $z = 1.96$)
d = allowable standard error of the mean
σ^2 = variance of the target variable

For practical application one can as well use instead of d and σ^2 the respective values given in percent of the average, which means the standard error percent ($d_{\%}$) on the one hand and the coefficient of variation ($cv_{\%}$) on the other. Although the statistical preconditions for an exact calculation may not be fulfilled in all cases, Table 2 provides a guide to the relationship between the size of the sample and respective statistical properties. Whereas the measures of accuracy may be selected purposively, the variance of the target variable must be calculated separately.

Because accountancy networks are more or less stable monitoring instruments, the statistical quality of the results is potentially affected by a number of peculiarities associated with this approach. The networking exercise may suffer from *self selection* bias in the same way as surveys do. Participation in an accountancy network is voluntary in most cases. If there is a significant relationship between the factors influencing the decision to join and the variables to be monitored, the results may be biased to some extent. Along with other accountancy

Table 2. Minimum size of a sample as determined by statistical properties (adapted from Kroth and Bartelheimer, 1981, p. 30).

$cv_{\%}$	25			50			75			100		
$\alpha(\%)$	20	10	5	20	10	5	20	10	5	20	10	5
$d_{\%} = 20$	3	4	6	10	17	24	23	38	54	41	68	96
$d_{\%} = 15$	5	8	11	18	30	43	41	58	96	73	120	171
$d_{\%} = 10$	10	17	24	41	68	96	92	152	216	164	271	384
$d_{\%} = 5$	41	68	96	164	271	384	370	609	864	657	1083	1537

networks it has been assumed repeatedly that those respondents who are more interested in the performance of their business are more likely to agree to participation. Consequently, the sample would be biased towards better results in economic terms, because the economically less interested elements of the population would be more likely to refuse to participate, and would therefore be under-represented. Incentives for participation may well reduce the overall level of non-response, but self selection bias may still occur. There is little evidence of the practical significance of such effects because this problem has not been addressed either frequently or thoroughly.

Representation may also suffer from self selection bias if sub-populations such as size classes show different rates of non-response and the sampling scheme does not take care of this aspect. In this context, a scheme of quota sampling may prove to be more advantageous than a random sample. In principle, this problem may be overcome by following the rule to replace any non-responding unit with a similar one. In practice, however, the typology of farm forests may well miss some relevant features and thus the replacement with similar elements will always necessitate some subjective judgement.

The purpose of monitoring implies that an accountancy network is being operated at least for a series of years. Especially when dealing with accountancy data, the investigation usually requires an adjustment and extension of the enterprise's system of accounting and documentation. Furthermore, an atmosphere of trust and understanding is a prerequisite for voluntary participation. For these reasons, the individual farm forest should participate in the network for at least three years. A panel made up by a fixed set of units that are screened every year is an ideal basis for detecting year-to-year changes and trends of the target variables. However, even if the sample has originally been selected at random, the panel formed by the sampling units may develop in a different way than the whole of the population, thereby suffering from a decrease in the quality of representation. Such a *panel effect* may occur in any kind of unchanged sample used for temporal monitoring purposes. Along with accountancy networks, this effect could even be reinforced by the fact that the participants are exclusively provided and confronted with specific economic data and maybe even advice. Consequently, they may be expected to improve their economic performance in comparison to non-network members.

The *rotation of participants* within a *rotating panel* is a potential remedy for the panel effect. Rotation means the purposive replacement of some or all of the sampling units within a monitoring system. In the case of one major target variable, the optimal progress of rotation depends on the auto-correlation of the target variable. As a compromise between the aspects of the panel effect on the one hand, and fluctuations of the sample on the other. For organisational reasons, it will also be advisable in most cases not to exchange the whole sample every n (e.g. 5) years, but to replace $1/n$-th of the sample each year. A period of participation of e.g. 5 years would thus imply a yearly replacement of 20% of the sample. In the Dutch network, for example, the rate of replacement is about 15% per year, the individual farm staying in the sample for about six years (see Luijt and Schrijver, 1998, p. 67). In addition, it has to be kept in mind that a full replacement of the sample at regular intervals would impair the statistical quality of the resulting time series. In that case, year to year changes of the target variables would be affected by the sampling error only when the panel is exchanged, whereas in the period between such changes the sampling error does not influence the significance of any differences, the sample itself being a stable population. Thus, only a partial rotation (i.e. replacing not the whole sample, but only a certain proportion of the sample every year) is recommended.

In practice, several networks are operated without any rotation of the panel, thereby taking the advantage of monitoring a real panel. As far as the composition of a sample in terms of participants remains constant over a certain period of time, the analysis of trends and time series may bring about significant results even for small (sub-)samples. In that case, year-to-year changes of the results are not affected by any sampling error as they are derived from identical units of investigation. However, the composition of any such sample is likely to change within a few years or even from year to year, be it along with the purposive replacement according to a planned rotation of the panel, or be it by chance (e.g. individual units quitting participation for some reason). If the sample is rather small, the quality of time series may be especially affected negatively by such *fluctuations of the sample* (see Sekot, 1990, p. 81). As far as the data of previous years are all available in a database system, the effects of any fluctuations can be checked by comparing the time series of the constant part of the sample with those describing the full sample of the respective periods. Ultimately, the respective

advantages and disadvantages of stable panels and rotated panels have to be assessed for each case. From a statistical point of view, it would be best to implement a rotating panel of such a size, that year-to-year changes in the target variables can be detected at the level of accuracy requested. Where the main emphasis is the year-to-year change and the sample size is limited by budget constraints, a fixed panel may be preferable.

4 Organisational Arrangements

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Key points:

- To encourage voluntary participation in an accountancy network on a broad basis, a mix of persuasion and incentives is to be applied, the feedback of economic data being the key element for personal concern on the side of the farmer.
- Various institutions may be considered for taking responsibility for the task of running the network, the integration of the organisation in charge of the FADN as well as of a forest owners representation being advisable.
- Data may either be collected in the field or reported by the farmer. These alternatives differ in terms of costs and also in terms of qualitative aspects.
- Accountancy data are a delicate matter in terms of taxation and the farmers' privacy has to be guaranteed when they provide the data.

4.1 Policy Tools for Encouraging Participation

The task of developing accounting network involves the collection of data stemming from accountancy and describing the economic situation of the farm forest enterprises. Usually, farmers cannot be obliged to provide any such data. Moreover, any formal obligation would be likely to be counter-productive resulting in the farmer having no interest either in cooperating or in the provision of accurate data. The same would apply to measures where provision of some service (including subsidies) was linked to the 'voluntary' participation in an accountancy network. Consequently, one can state that good results out of the network are incompatible with imposing pressure on anyone to participate.

To reduce the rate of non-response it is important to persuade farm forest owners to participate voluntarily. When approaching farmers

with a view to securing their participation, it may prove of little effect simply to appeal to their individual feelings of self worth – "the warm glow effect". It may be more effective to convince them that they are part of a much larger group all of whom are helping each other. The main arguments may therefore refer to items such as the following:

- the results are valuable for the lobbying on behalf of farmers;
- the results help in justifying subsidies for farmers;
- the results are of importance for a sound forest policy;
- the network activity provides a valuable data base for forestry extension; and
- the network increases the potential for further cooperation, e.g. in terms of marketing.

In the above cases the prospective participant may benefit from the activity only indirectly, and as such the prospects of these as means of persuasion for motivating participation are often rather poor. The rational respondent also recognises the option to benefit from free riding without personal involvement in the process of establishing the respective database.

Incentives of various kinds can be expected to encourage voluntary participation. The role of any such incentives is to provide the farmer with arguments so that a rational respondent will value the benefits associated with participation higher than the costs: the main cost item being the entrusting of his accountancy data to the organisation running the network and the people involved in data collection and data processing. The following main categories of incentives may be considered.

Feedback of information. Unless the farmer has a personal interest in the outcome of the investigation, they will hardly be motivated to provide comprehensive data of the utmost quality. Consequently, one form of incentive is data feedback to the farmer by providing information compiled from the network activities. The basic element of the individual feedback will usually be a standardised output on the farm level, encompassing the summarised and tabulated data input as well as various ratios derived thereof (see Chapter 7). This data may serve as a basis for the economic analysis of the period under investigation. Furthermore, such documentation is a valuable, and very often the only, basis for establishing and analysing time series data. In addition, aggregated values may also be provided enabling

the farmer to perform some kind of inter-firm comparison. In order to function as an incentive, however, all of the individual feedback has to be presented in a way the farmer can understand and act on. This applies to the terminology as well as to the computations and their interpretation. Therefore, the provision of graphs as well as of comments in simple wording in addition to the original tables is highly recommended. However, the feedback of information is only likely to motivate the interested farmers, thereby promoting self selection bias. The more significant and useful the information provided, the more serious the panel effect may become. By using the information for the rationalisation of their forestry activities the participants may improve the profitability of the forestry activities, when compared to the average farmer, so that their results are no longer representative of the whole population.

Provision of a forest management plan. At least in some countries, forest management plans are the exception rather than the rule in farm forestry. Nevertheless, farmers also tend to appreciate a forest map as well as information on their growing stock and cutting potential. Consequently, the provision of a forest management plan as a reward for participation is a costly, but powerful means of motivation. As an additional benefit, the application of this incentive may contribute to the promotion of forest management planning at the farm level, which might be an interesting issue for forestry extension. On the other hand, a standardised and actual forest management plan may by itself be a source of data to be sampled along with the network. This applies to the measures of area (e.g. total forest land, commercial forest) as well as to the allowable cut. Furthermore, characteristics of the forest use, along with the typology of farm forests (see Chapter 2) such as tree species composition, productivity in terms of mean annual increment, average volume of growing stock per hectare or age class structure can be provided by the forest management plan. The provision of a management plan, however, may serve as an incentive only for those farmers who are interested in such information, and who have not got an actual plan from some other sources already (positive and negative self selection effect). Furthermore, a management plan serving its original purposes should help to improve the performance of forestry thereby contributing to some kind of panel effect. Irrespective of whether a forest research institute, a forest extension service, a civil engineer or another institution is to elaborate the forest management

plans, the contents as well as the procedures of those parts of the plans that are used for accounting have to be clearly specified and standardised so that comparability of the results is guaranteed.

Integrating the network activity into measures of forestry extension. Data collection as well as the elaboration of the individual feedback could be offered to farmers as part of a regular consulting package, either free of charge or even for a fee. In that case the advice rendered to the farmer would be the key issue of the activity, the generalised results delivered to other addressees being just a side effect (at least from the point of view of the farmer concerned). For practical reasons, such agreements should cover more than just one year. Each year or every n (e.g. five) years, a limited number of such contracts could be offered so that the organisation in charge may control the costs along with the size of the sample and even care for a rotation of the sample. Any such offer would, however, imply the issue of sampling to be reduced to a special kind of self selection process. In addition to self selection bias, panel bias is also likely to be significant.

Monetary contribution. In most cases, being paid is a strong argument for people to change their attitude. However, providing financial data involves non-monetary aspects, such as trustworthiness and faith by the respondent, so that any monetary contribution is not to be seen as a payment for the (market) value of the data, but as a reflection of gratitude on part of the collector and reward for conveying an additional secondary benefit to other farm foresters. In any case, the question of participation in the network should not be reduced to the farmer's consideration of their willingness to accept. The willingness to accept is an individual feature of the single farmer and an approach of iterative bidding to determine the individual price for participation could hardly be afforded. By relating the amount of the monetary contribution to the completeness and the quality of the data provided and/or to the time of delivery one may use this approach as an incentive for improving the performance of the participants. (It is a minor but nonetheless a systematic question in accounting, whether such contributions are to be recorded as forestry income.)

As previously indicated, each type of incentive gives rise to side effects so that not only the respective costs and the effectiveness as means for motivation, but also the statistical quality of the sample should be considered when deciding on the mix of incentives to be

Table 3. An overview of policy tools for motivating participation.

Policy tool	Likely effect(s)
Legal obligation for participation	± Counter-productive in terms of motivation and quality of data
Linking participation to a separate service or subsidy	± Counter-productive in terms of motivation and quality of data
Persuasion by appealing to 'warm glow'	Limited effectiveness
Persuasion by appealing to the common interest of farmers	Limited effectiveness due to 'free-rider' option
Feedback of specific information	High motivation for the interested ones (self selection bias?); panel effect?
Provision of a forest management plan	High motivation; panel effect?
Integrating the network activity into measures of forestry extension	High motivation for the open-minded ones (self selection bias!)
Monetary contribution	Motivation based on financial benefits

applied. Besides the aspects of financing and putting the respective tools into practice, the main challenge of applying incentives for participation is also to motivate people to join the network. Usually some combination of persuasion and incentives will provide a practical solution. Apart from the formal aspects of tools, the personal way of approaching the farmers is a key element in successfully recruiting participants. Therefore, it is essential to chose the right staff for this kind of field work, where social skills are far more relevant than technical know-how.

The policy tools generally available for motivating farmers to participate in an accountancy network as well as their likely usefulness are summarised in Table 3.

4.2 Data Collection and Data Processing

There are a number of options as to the organisation of the networking activities. The institution(s) financing the network have to decide which organisation(s) should be charged with the field work and data processing. Usually, the following institutions are likely to have an interest:

- public research institutes such as a national or provincial forest research institute;
- university institutes, especially those dealing with forest economics;

- municipal, district or regional chambers of agriculture and forestry;
- forestry extension services;
- forest authorities;
- forest owners' associations;
- private research institutes; and
- private companies rendering services in bookkeeping.

In addition to the technical and organisational capability of a potential institution and the price to be paid for the service or the costs incurred by using it, there are some further aspects to be considered when deciding on the institutional structure of the network. Firstly, it is advisable to involve, or at least secure the backing of, a forest owners' association or another representation of farmers' interests such as a chamber of forestry. Such an approval or their involvement is valuable for the promotion of the networking activities since it proves to the farmers that the goal of the network is in line with their common interests. Furthermore, the local representatives of such an organisation may be especially successful in recruiting participants, knowing the farmers personally or at least being used to address them in the correct manner. However, not all farmers may feel adequately represented by such an organisation and as a result may refuse to participate in the network. The status of member or non-member of the respective organisation may also influence the farmers in their decision when the membership is voluntary. Being addressed as a prospective participant, they may also feel pressure to become members of the organisation.

Another option to be evaluated is to make the organisation(s) running the FADN (whether they are public or private organisations) responsible for operating the forestry network. There would be several potential advantages from such a solution. Firstly, experienced staff for all respective activities as well as special devices for sampling, data processing and the computation of aggregated results would be available. Secondly, such an arrangement could facilitate the integration of the forestry network into the activities associated with the FADN. Only by means of such an organisational integration may the forestry network be practically established as an extension or a sub-sample of the FADN, which would in turn, facilitate the assessment of the total economy of farm. The optimal practical solution may involve some kind of cooperation. For instance, recruiting participants, field

work for data collection and data processing may be performed by different organisations.

Once the sample is established, there remain two main activities that have to be performed every year. These comprise the collection of the data and data processing. In principle, there are two alternative ways of organising data collection: (i) data collection in the field by specialised staff; and (ii) reporting of data by the farmer.

Data collection in the field by specialised staff. In this scheme, each farm is typically visited by a researcher (or any other personnel doing the field work) every year. The data are collected on the farm, the researcher filling in forms or recording the data on a notebook computer. The farmer has to provide respective records (e.g. on purchases, sales and working hours), which have to be kept up-to-date throughout the year. Obviously, this alternative is a costly one, involving considerable personnel and travel costs. These costs are more or less independent from the size of the farm, the comprehensiveness and quality of the data to be recorded by the farmer throughout the year being the key factor for the time to be spent on the farm. On the other hand, the person collecting the data is experienced in the system of data recording and may check and correct any questionable entries. By discussing the general situation as well as specific details with the farmer, additional information becomes available, allowing for the correct interpretation and consequently also for the correct recording of the data. Data of poor quality or missing items may thus be detected and corrected. Furthermore, the personal contact may motivate the farmer as the data are collected by a person and do not 'vanish into a black box'. The utility of the whole activity as well as specific items of the output can be explained repeatedly and specifically, thereby furthering the acceptance and the understanding on behalf of the farmer. Depending on the organisational context, the visit may also be used for other purposes such as advising or consulting.

Reporting of data by the farmer. The alternative and less costly way to obtain the data is to have the farmer report data to the organisation in charge of the networking activity. This means, that the farmer has to keep records throughout the year and deliver the completed forms for each accounting period. The major drawback of this approach is that the data can be checked only in regard to formal mistakes as there is no combined effort to transfer the data into the respective forms. A modern variant of this reporting concept is to provide the farmer

with special software for bookkeeping so that the data to be delivered to the network are just a by-product of the farmer's own accounting. However, such a concept is likely to work only for bigger farms, and with farmers who are familiar with electronic bookkeeping methods. Consequently, it will not be generally applicable in all cases.

Depending on the mode of data collection, the subsequent steps of data checking and data processing may be organised in different ways. Data checking will usually encompass two stages. A formal check – Are all codes defined properly? Is the data set complete? Does any value exceed a plausible limit? – is performed as soon as the data are recorded by means of electronic devices. This can be made on the farm when the data are recorded using a notebook computer or by the farmers themselves feeding the data into some appropriate bookkeeping software. Alternatively, this formal check can be performed at the central location of data processing. A second type of check is performed by an expert looking for weak signals indicating a mistake. This expert can be the person recording the data on the farm or someone checking the incoming data delivered by the farmer. Usually, a further inquiry addressed to the farmer will be necessary to identify and correct any such mistakes. In this context, the system of data-recording by research personnel on the farm is clearly advantageous.

Until recently, data processing was a job to be undertaken centrally involving mainframe computers or at least PC technology. Now it is possible to provide personalised feedback immediately after data collection is completed on the farm. The data enumerator is typically equipped with a notebook computer, or sometimes the farmer may have a PC and bookkeeping software from which the reports can be generated.

4.3 Questions of Tax Secrecy and Data Protection

Accountancy data are a delicate matter since they both describe the financial situation of an enterprise and are of utmost relevance for taxation purposes. The concept of an accountancy network implies, however, that such data are collected, stored and centrally processed. Consequently, particular care is necessary to ensure that farmers have faith in the system when providing data. One major abuse of data becoming known to participants may be sufficient to make the whole network collapse.

The prospective participants must be fully informed of the nature of data collected and how it is to be stored, the organisation(s) involved in data processing and the intended use of the data. This information should be provided in written form and the farmer should be asked to sign a statement of approval, thereby granting the organisation in charge the right to use and store the individual data as specified. On the other hand, the organisation running the network has to guarantee that no individual data will be either published, given to a third party or used for other purposes than those agreed upon without explicit permission of the farmer. In this context it might be advantageous to state 'scientific analysis' as a general way of using the data so that the agreement does not only apply to the computation of some standardised output.

In so far as the network is to provide only a clearly defined set of standardised output such as average figures and imputations, the safest precautionary measure is not to store any individual data any longer than is necessary for the completion and checking of computations. Consequently, individual data would normally not be stored for a span of time exceeding one year, thus limiting the risk of abuse. This implies, however, that these data are not available for any further analysis and information once lost is lost for all time, a fact that might not be appreciated from the scientific point of view.

Further measures refer to general means of data protection, including the limitation of access to the database (e.g. by defining authorised users and by introducing additional passwords), the encryption of data, file protection, the destruction of documentation and output that is no longer required and so forth. It is advisable to establish a respective code of practice so that the data are safeguarded as well as is possible. This code should cover the whole lifetime of the individual data and respective documentation, encompassing the stage of data collection as well as the different steps of data processing, data storage and handling of the output.

Given all those precautionary measures, there may still be a certain risk of tax offices asking the organisation operating the network for individual data concerning a certain farm. Depending on the national situation one should investigate such a worst case scenario and elaborate respective contingency plans. The best safeguard against such a predicament would be a legal regulation of the kind requested by regulation no. 79/65 of the Council of the European Community

from June 15th 1965 as concerns the FADN. This regulation states that national measures have to guarantee that accountancy data collected within the framework of the FADN must not be used for taxation purposes. When negotiating the establishment of a forestry network it might be worthwhile to suggest similar regulations or to strive for an agreement of the kind that the regulations pertaining to the FADN should also be valid for the forestry investigations. Since FADN has recently suggested the voluntary extension of the agricultural framework to forestry and other non-agricultural income, strong arguments for such an agreement are already at hand. In practice, it should be sufficient to have all individual data anonymised so that an immediate identification of the individual data is not possible.

The risk of intentional abuse of the data should also be kept in mind. For instance, in case the work of someone involved in the networking exercise is not satisfactory, that person should be given notice of employment and access rights for that person should be cancelled in advance. The same applies to someone envious of the person(s) in charge of the network. By adopting a system where nobody has access to the data unless positively identified, the risk of intentional abuse may be reduced further as no anonymous action is possible.

Depending on national legislation concerning data protection, it might be necessary to have the kind of electronic processing of personal data registered by a public office. In Austria for instance, such a registration is indispensable and the respective code number (DVR-Nr) has to be printed on all related output. Everybody concerned, is free to inquire what kind of data are processed by whom and for what purposes.

5 Accounting of Socio-Economic Variables

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Key points:

- Financial accounting gives a picture on the overall profitability, the financial situation as well as the assets value of an enterprise, recording all business transactions of an enterprise.
- Balance sheet shows the financial status of the business at the end of an accounting period, including the change in the value of the growing stock.
- Cost accounting provides information about costs, which the management accountant uses to plan, control and make decisions.
- Management accounting provides information to assist management in its function to optimise economic efficiency and achieve the set goals.
- The system to be recommended for data collection and analysis for total economy of farm forestry should separate and distinguish the forest entities from the owner's other entities.
- Three main categories of non-monetary information – quantities of inputs and outputs, quantitative measures describing the forest resources, and qualitative information – supplement the data and analyses of monetary information.
- Accounting for forest services in environmental and social accounts encompass relevant ecological and social aspects associated with farm forestry.

5.1 Monetary Information

5.1.1 Financial accounting

For farm forestry entrepreneurs, timber production can be seen as a segment of the overall business activities, where the financial results and other economic characteristics play an important role in decision making. The profitability of forestry is also essential for securing

the sustainable management of private forests. In financial decision making, the forest owner will consider ways to increase revenues, cut costs and sometimes consider options whether to invest or not invest in his/her property.

The economic performance of a farm forestry enterprise can be monitored by means of financial accounting, which provides a picture on the overall profitability, the financial situation as well as the asset value of an enterprise. Like in any other firm, a farm forestry enterprise's accounting procedure will comprise a profit and loss account, a balance sheet, as well as cost accounting.

Accounting is based on postulates, theoretical concepts and principles, which are applied to guarantee a solid business economic basis. In addition to the general rules stemming from this theoretical foundation, financial accounting has to comply with specific rules set up by the respective national tax and accounting regulations. The standardisation of any accounting rules thus induced is valid only on a national basis. Furthermore, as the rules for accounting are subject to frequent alterations, inter-temporal comparisons are sometimes difficult to make. The models for the profit and loss account and balance sheet presented in this chapter were formulated on the basis of the theoretical principles for accounting. This emphasises the goal to harmonise farm forestry accounting on the basis of general accounting methodology.

Accounting is normally limited to information expressed in terms of a monetary unit (the monetary-unit postulate), where revenue is generated when goods are sold (the revenue principle) (see Belkaoui, 1985). General accounting principles do not recognise changes, which do not generate business transactions, such as the growth of the trees in forestry.

The most important sources of revenues in forestry are the sales of timber and other forest products and the value of forest products used for the owners' own purposes. Revenues are also obtained through hiring out the estate for hunting or some other purpose. The forest owners may themselves hunt, but the value of this is usually difficult to appraise. State allowance given to the forest enterprise should be also considered as a revenue (Hyder and Lönnstedt, 1993). The most important costs in forestry are administration costs, silvicultural costs as well as forest improvements costs and taxes.

Accounting of only the realised revenues and costs is not sufficient for the assessment of the overall result of a farm forestry enterprise. The changes in the value of the growing stock should also be taken into consideration to evaluate the changes in the value of current assets. The capital impairment rule recognises the changes of the property values as part of profit or loss. According to this rule, revenue contributes to the increase of the net assets, and loss to the decrease of the net asset.

If the unrealised values are not measured or accounted for, this can be considered as a deviation from the general accounting principles (Ashby and Funk, 1980). Accounting practices, however, recognise only the realised business transactions and stocktaking of current assets. In order to draw up a true profit and loss account, even the capital valuation of the woodland should be undertaken (Openshaw, 1980).

The term financial profitability is used to assess the monetary profits, determining the relationship between the values of outflows and inflows of goods and services. Financial profitability is assessed from the viewpoint of a specific entity involved in the business. In farm forestry this normally means an individual private land owner, sometimes including his/her family.

Traditional forestry accounting has been limited often to single entry bookkeeping. Ijiri (1986) proposed triple-entry bookkeeping with debit, credit and trebit, the last one used to measure the force of the entity. The double entry bookkeeping principle is, however, perhaps most often applied in forestry accounting. It satisfies the minimum condition to fulfil the requirements for accounting where 'the objective of financial statements should be to provide useful information about an entity for those who make decisions based on such information' (Anthony, 1987). For some purposes, the basic profit and loss account information must be modified. In double entry bookkeeping, the profit and loss account is used to calculate the profit or loss resulting from business activities, and is achieved by deducting expenses from income. The profit and loss account also indicates the result for an accounting period.

Hyder et al. (1994) have proposed another deviation from a normal profit and loss account for forestry accounting by including after the realised profit, the unrealised items of 'change in the value of standing timber' and 'value of the owner's own work'. The value of standing timber and its change as well as the owner's own work are normally

Table 4. Example of an information needs for profit and loss accounting ('income statement' in the US) for private forestry (see Aho and Rantanen, 1994; Committee for Corporate Analysis, 1990; Laitinen, 1992; Hyder et al., 1994, 1995).

+	Stumpage sales revenue
+	Delivery sales revenue
+	Other sales revenue from wood
−	Sales adjustment items
1.	TIMBER SALES REVENUE
+	Sales revenue from other than wood
−	Sales adjustment items including value-added tax (VAT)
2.	NET TURNOVER
	Variable costs
−	Marketing costs
−	Harvesting costs
−	Silvicultural costs exceeding (−) or undercutting (+) the reserve for regeneration
±	Change in the reserve for regeneration
−	Other variable costs
3.	GROSS MARGIN ON SALES (MARGIN AFTER VARIABLE COSTS)
−	Fixed costs
4.	OPERATING MARGIN
+	Interest income
−	Interest expenses
−	Direct taxes
−	Ordinary other expenses
+	Ordinary other income
5.	INCOME BEFORE DEPRECIATION AND EXTRAORDINARY ITEMS
−	Depreciation
6.	NET PROFIT (LOSS)
−	Extraordinary expenses
+	Extraordinary revenues
7.	OVERALL RESULT
±	Increase/decrease of reserves
±	Increase(−)/decrease(+) depreciation
−	Income taxes
8.	PROFIT (LOSS) OF THE PERIOD
±	Adjustment of net interest
±	Change in the value of standing timber
−	Value of owner's own work
9.	ADJUSTED PROFIT OF THE PERIOD

such large items in farm forestry enterprise that their exclusion from the profit and loss account may falsify the true picture of an economic performance of the enterprise. Table 4 outlines the information needed for the profit and loss account for a forestry enterprise following the terminology of 4th and 7th EU directives (see Teränne, 1993).

The items after the profit (loss) of the period (level 8 in Table 4) suggested by Hyder et al. (1994) do not belong to traditional bookkeeping. Although other reserves and over/under depreciation are located after the overall result, as in other businesses, they are hardly needed in forestry (Table 4).

5.1.2 Accounting of changes in forestry assets

The balance sheet shows the financial situation of a business at the end of an accounting period. In order to ensure the requirement of consistency (Belkaoui, 1985), the balance sheet for the next accounting period should be based on the balance sheet of a previous accounting period. The balance sheet can thus be viewed as a transition account between accounting periods and used to transfer funds and items of both liabilities and equities to the next accounting period (Hakkarainen, 1996).

Assets can be grouped in a balance sheet in a away so that the least liquid funds come at the beginning and the most liquid funds at the end. Fixed assets (such as machines, forest roads, etc.) have their depreciated values included as assets. The closing value of the forest is the most significant item in the assets and is calculated at the end of the financial year.

The grouping of liabilities and equity follows the same pattern as for the assets. Short-term liabilities are those payable within one year. Long-term liabilities in forestry include mainly bank loans, as well as silvicultural liabilities, which are a reserve. They arise as a consequence of final cuttings. The costs of those silvicultural treatments are duly charged in the profit and loss account for the financial year to show a justified profit. The amount of the cost is a liability of the forest enterprise, since the cost is not paid until the silvicultural treatment is carried out (Penttinen and Hakkarainen, 1998). A proposed balance sheet format for farm forestry accounting is shown in Table 5.

If the 'change in the growing stock' is ignored in the balance sheet, the results may be misleading: this has been empirically demonstrated in Kinnunen and Penttinen (1995), Hyder et al. (1994, 1995) and

Table 5. Example of an adjusted balance sheet applicable for a farm forestry enterprise (see Teränne, 1993; Committee for Corporate Analysis, 1995; Penttinen and Hakkarainen, 1998).

1	ASSETS	2	LIABILITIES AND CAPITAL
10-12	Fixed assets and other capitalised expenditure	20	Capital
10	Intangible assets		2000 capital at the beginning of the accounting period
	1000 intangible assets		2010 capital investment
11	Tangible assets		2020 value of own work
	1100 timber-growing land and water areas		2030 profit (loss) for the period
	1110 buildings and construction		2040 capital return
	1120 plant and equipment		2050 private return
	1130 silvicultural improvements		2060 revaluation
	1140 advances paid	21	Capital correction
	1190 other tangible assets		2100 capital correction
12	Securities and long-term investments	22	Reserves
	1200 bonds and shares		2300 afforestation reserve
	1210 other long-term investments		2310 difference from deprecations
13	Valuation items	23	Long-term liabilities
	1300 valuation items		2300 interest subsidy loans
14	Current assets		2310 other loans from banking establishments
	1400 timber reserves		2390 other long-term debt
	1410 growing stock	24	Short-term liabilities
	1420 advances paid		2400 trade payables
	1490 other current assets		2410 advances received from stumpage sales
15-16	Financial assets		2420 advances received from sales at delivery price
15	Receivable		2430 advances received from other timber sales
	1500 stumpage sale receivable		2440 other advances received
	1510 sales at delivered price receivable		2450 accrued liabilities and prepaid income
	1520 other timber sales receivable		2460 value added tax liabilities
	1530 other trade receivable		2490 other short-term liabilities
	1540 loans receivable		
	1550 prepaid expenses and accrued income		
	1560 value added tax receivable		
	1590 other receivables		
16	Cash on hand and in bank		
	1600 cash-on-hand		
	1610 bank giro account		
	1620 bonds and shares		
	1690 other securities		

Hakkarainen et al. (1995). Therefore in forestry, additional items such as 'change in the value of the standing timber', are needed. This change can arise from: (i) changes in the timber volume; (ii) changes in the proportions of timber assortment; (iii) real changes in the market value of timber or from; (iv) changes in money value, i.e. inflation.

The problems with accounting for the change in the value of the standing timber include (Penttinen and Hakkarainen, 1998):

- whether or not to include the change in the value in the income statement;
- where to place it;
- how to determine the roundwood assortment volume and change in the mix of the amount of standing timber;
- what prices should be used and how the value of the change should be determined;
- how to split the value change; and
- whether to take the calculated change in the value of standing timber as such or to adjust it by a risk factor.

Whether or not to include the change in the value in the income statement is not self evident. Both ways have their interpretations and both ways have been applied. If a highly theoretical 'normal forest' concept is assumed, the consideration of the change in the value of the standing timber is not needed (normal forest calculations, see Hämäläinen, 1973).

With regard to the placement of the change in the value of standing timber, there are also two alternatives: (i) to place the change in the value of standing timber in the variable costs like other changes in the inventory; or (ii) to place it after the overall profit and include it only to the adjusted overall profit (see Hyder et al., 1994, 1996). The realised overall result is disclosed at the end.

The change in the amount of standing timber could be exactly determined by measuring the trees at the beginning and the end of the period. This would obviously be too expensive in most cases. One solution that has been used is to calculate the difference between the actual cut and the planned cut, and use this as an estimate for the change in the volume of standing timber (Tiilikainen et al., 1992). In this case, the estimate based on the growing stock at the beginning, the increment, and the amount harvested can be applied if the forest

inventory data files for the farm forests are available (see Hakkarainen et al., 1995).

The value of the change can be estimated by using the average local timber prices and costs, or by using the prices and costs per timber unit of the forest holding in question. Both are approximations. Valuing timber according to current prices, produces considerable variations in the asset's value from year to year. These variations will be based on unrealised and often unrealisable expectations. Jöbstl (1981) has proposed that the same prices both at the beginning and at the end of the period should be used. Timber could be also be valued by the average price for a number of years.

To keep the variation more realistic, the price and volume changes should be reported as separate items. It is possible (for example, the method is used in Australia) to treat the value change due to volume increase or decrease as a capital maintenance adjustment, while the value change due to price increase or decrease is treated as income adjustment (Herbohn and Herbohn, 1999).

To be accurate, the definition of the value of the growth should always be based on an actual inventory. Recall that paralleling the growing stock with the current forestry assets, the annual change (i.e. the timber balance) can be entered in the variable expenses column. However, it is reasonable to regard the timber balance as non-realised income or expenses after the results of the accounting period (see Table 5).

The timber balance value of the growing stock in the current assets can be formulated as follows (Hakkarainen et al., 1995). However, this is only one example of how to handle a problem of the value of the growing stock:

$$T_t = \sum_{i=1}^{n}\left[\left(V_{t-1_i} + \Delta V_{t_i}\right)h_{t_i}\right] - \sum_{i=1}^{n}\left[\left(V_{t-1_i} + \Delta V_{t_i}\right)k_{t_i}\right]$$

where T_t = current asset value of the growing stock in financial statement t

V_{t-1} = volume of the growing stock in financial statement $t-1$ by roundwood assortment

ΔV_t = volume increment for the accounting period by roundwood assortment

h_t = stumpage price in financial statement t by roundwood assortment
k_t = probable selling expenses by roundwood assortment cost/m^3
i = roundwood assortment
t = accounting period

One weakness of the assessment of the change in the volume of growing stock on the basis of the difference between the actual cut and the planned cut, is the dependence of the timber balance value of the growing stock on a somewhat subjectively determined felling plan. However, the objective of this felling plan is to develop the forest holding towards the targets outlined by the decision-makers, not to measure the actual results of the accounting period or change in value of the property (Hakkarainen et al., 1995).

5.1.3 Cost accounting

Cost accounting and costing techniques are most closely identified with the production of goods and services, but they are also necessary functions in other areas of activity such as bidding for contracts, making cost-benefit analysis before projects, etc. Cost accounting provides information about costs, which the management accountant then uses to plan, control and make decisions. Cost accounting, therefore, is the basis for management accounting (Jöbstl, 1995a).

The requirements set for both financial accounting and cost accounting have been taken into consideration in the account system introduced in these guidelines. Multiple accounting, where it is possible to divide cost accounts to cost centres and cost types, facilitates the monitoring of profitability and cost structure in farm forestry. In order to be able to establish a master balance sheet, costs are to be recorded separately for each cost centre. The main cost centres and types of costs as recommended by Hyttinen et al. (1997, pp. 77–83) are:

Cost centres:
- harvesting;
- regeneration;
- cleaning, pruning and pre-commercial thinning;
- protection;
- road construction;
- forest improvement;

- administration;
- taxes and fees; and
- other costs.

Types of cost:
- material;
- wages;
- social costs;
- deprecations;
- administration;
- contractors; and
- owners' own work.

For reasons of flexibility, however, it is advisable not to stick to a rigid concept, but to arrange the types of cost as well as the cost centres in a hierarchical structure. In this way, two or even three levels of aggregation can be provided and the system is open for further adaptation on the one hand and for different levels of sophistication on the other. For instance, at the highest level of aggregation only four cost centres could suffice (instead of the nine proposed by IUFRO; see Hyttinen et al., 1997): (i) harvesting; (ii) silvicultural measures (including forest protection); (iii) forest roads and buildings; and (iv) administration.

On a second level, the primary cost centres could be differentiated further. As an example, silviculture could be split up into: (i) regeneration; (ii) cleaning, pruning and pre-commercial thinning; (iii) forest protection; and (iv) forest improvements (such as drainage and fertiliser application). Certain cost centres may justify even a third level of differentiation. For example, regeneration could be split up into: (i) production of forest plants; (ii) planting; and (iii) weeding. The same principle applies to the structure of types of cost. A closer description of how to apply this concept along with the design of a database system is provided in Chapter 6.

A crucial question of cost accounting for farm forest enterprises is the imputation of costs and revenues. Imputation means, that one cannot take respective figures out of ordinary bookkeeping, but that such an item, be it a cost or a revenue, has to be calculated separately according to the rules of cost accounting. In general, the smaller the enterprise, the greater the significance of such imputations will be (compare Sekot, 1998a). This is due to the fact, that the value of

family labour as well as the value of self supply (e.g. for fuelwood or wood for construction) is quite high with small farm forests and tends to decrease with increasing size of the forest enterprise. For instance, the costs reported in the Austrian network of farm forest enterprises are up to 80% imputed ones (see Sekot, 1998c). The most important cost item to be imputed is the unpriced labour input of the farmer and his family. Also depreciation along with the input of machinery and vehicles may rely on imputations. With regard to the revenues, self supply e.g. in terms of fuelwood or wood for construction is the major element for imputation. The following is an outline of the major items that need to be determined by imputation.

(1) Value of family labour

As a basis for any such imputation the respective working hours are to be recorded. The following approaches may be considered for pricing the farmer's labour input:

- **Opportunity costs:** In this case, the value of one hour of work is to be derived from the average agricultural income per working hour on the farm. The underlying hypotheses of this approach states that the farmer could achieve an additional income of that magnitude in agriculture when investing labour there instead of in the forestry business. However, there are quite some practical problems associated with this concept, the respective values varying between different farms as well as between particular years.
- **Worker's wages:** Along with this common approach the value per working hour is derived from the wage rate of forest workers, as for example, defined by a collective agreement. In practice, the application of this approach involves some methodical considerations and decisions. For instance, it has to be decided whether and how the respective level of skill and education of the farmer has to be taken into account. Further aspects refer to the level of non-wage benefits to be calculated as well as to a possible differentiation of the value of a working hour according to cost centres (see e.g. the description of the Austrian scheme in Sekot, 1998c, p. 17).
- **Unit costs:** As an alternative to pricing the working hour spent with forestry activities one can think of adjoining a respective cost item to the unit of work achieved (e.g. harvesting of 1 m^3 of

timber, planting of 1 ha) by referring to the costs of such work when performed by contractors. The advantage of this approach would be, that the productivity of the farmer's work would not influence the costs. This could be of importance in a case where the forestry work is, at least partly, to be considered as some kind of leisure time activity. However, this approach would have to rely on a comprehensive database encompassing respective unit costs for all kinds of forestry work under various conditions.

(2) Costs of machinery and vehicles

Especially at the farm level, machines like farm tractors or vehicles (e.g. farmer's car) are not used exclusively for forestry purposes, but also (or even mainly) for agricultural or private purposes. According to the principles of cost accounting, the effective costs of each machine or vehicle should be recorded and adjoined to the forestry business proportional to its use in forestry. Alternatively, one can just record the respective forestry input in terms of working hours or kilometres and calculate the costs by referring to standard prices per unit as tabulated for various types of agricultural machines. In this case, the actual input in terms of fuel, maintenance and so forth can only be assessed by average figures, which affects the structure of the types of machinery costs.

(3) Depreciation

As common in cost accounting, depreciation is calculated according to certain rules, which may well differ from those applied in tax accounting.

(4) Self supply

In small-scale forestry, self supply is usually a major part of the forestry output. In order to assess the profitability of the forestry business as well as the efficiency of the forestry activities, this output has to be valued accordingly. The valuation should be done by applying the market prices of respective timber assortments.

(5) Interest costs

Interest charges are those that are incurred in employing funds, both owned and borrowed, to operate an enterprise. In cost accounting for assets like machines, interest costs are based on the undepreciated

balance of the cost or residual value of all assets. Imputed interest rates are determined by the general conditions of the capital market. For borrowed funds, the minimum rate to be used is the actual rate of the loan plus all charges. For internal capital, the minimum rate is the one necessary to maintain the asset value in the face of inflation.

(6) Joint overheads

For a farm comprising agriculture, forestry and maybe even more lines of business, some scheme for allocating overheads to two or more businesses has to be developed and applied. For instance, the forest business may have to be allocated a share of the costs associated with the farmhouse to the extent that it is used for administrative purposes of the forestry business. The same applies for the costs of a telephone, which may be used privately but also for the agricultural as well as the forestry business. In most cases it will not be possible to account for those items specifically, and therefore some general rules are required. There are various measures available that could be used as a scale for deriving the share to be allocated to the forestry business, e.g. standard net return, labour input, standard unit value or turnover.

(7) Joint costs

In analogy to the joint overheads between lines of business at the farm level, there may be costs within the forestry activities that cannot be clearly allocated to a particular cost type or a specific cost centre. Such costs may for instance, refer to a tractor or machinery used in more than one cost centre. In principle, there are two ways of dealing with joint costs. One approach is to define a specific cost centre for documenting those costs pertaining to more than one cost centre. The alternative way is to split the joint costs and allocate respective shares to the original cost centres. The disadvantage of the first approach is that one cannot derive comprehensive cost information for the different cost centres so that respective unit costs are incomplete and potentially misleading. An artificial breakdown of joint costs, however, has to be based on more or less arbitrary percentages, which can at best be derived from individual judgement. In this case also, the resulting unit costs are prone to distortion. One should at any rate address the question of joint costs in the protocol for data collection so that they are generally dealt with in the same way.

(8) Value-added tax (VAT)

In most countries, VAT does not directly affect the profitability of an ordinary business, as the VAT paid on purchases is to be deducted from the VAT accrued along with the proceeds, the difference to be settled with the tax office. However, at least in some countries, there are special tax regulations for small farms that mean VAT is not to be accounted for separately and need not be delivered to the tax office. Consequently, the VAT balance affects the profitability of the business. Two alternatives for dealing with this are that the VAT on proceeds is treated as part of the revenues, and VAT on purchases as part of the costs. Alternatively, both costs and revenues are recorded net of VAT, the net gains resulting from such tax regulations to be accounted for separately outside of the forestry profit and loss account.

5.1.4 Management accounting

Management accounting is the application of accounting techniques to the provision of information (for management) that is not provided by conventional accounting records. It involves producing and interpreting accounting and statistical information in order to assist management in its function of optimising efficiency and achieving goals (Jöbstl, 1995a).

Cost accounting provides information about costs, which the management accountant then uses in order to plan, control and make decisions. Cost accounting, therefore, provides the basis for management accounting. Cost accounting and financial accounting can be separate functions, yet they are interdependent (Penttinen et al., 1995).

Management accounting is the application of accounting techniques to the provision of information that is not provided by conventional accounting records. Cost and management accounts formulate a management information system, which assists management in its task of planning, controlling and decision making (Jöbstl, 1995a).

The principal aim for management accounting is to provide information to improve decision making (Drury, 1996; Jöbstl, 1995a). Financial statement analysis is one part of management accounting, where information-processing system is based primarily on external information sources developed to offer relevant data for decision-makers. The major tool for financial statement analysis is financial ratio

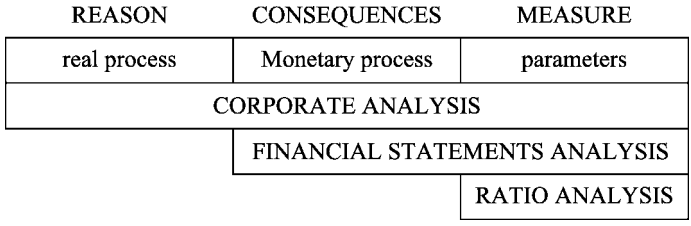

Figure 6. Relationship between the monetary and real process of an enterprise and different types of analysis (Laitinen, 1996).

analysis. Figure 6 clarifies the relationship between corporate analysis, financial statements analysis and ratio analysis.

Financial ratios are defined as the relations between two items of accounting information – one number is divided by another to provide a percentage or a ratio (Backer et al., 1988). Either one, or both of these items may itself be a sum, a difference, a product or a ratio. A proposal to classify the financial analysis figures is to use groups such as: (i) original physical items like an area or a planned cut; (ii) derived physical items such as sums, differences and averages; (iii) ratios such as disaggregated figures (e.g. silvicultural costs divided by total costs, ratios such as hours per cubic metre wood); or (iv) indices describing the trend in silvicultural costs (e.g. see Sagl, 1981; Jöbstl, 1995b).

In addition to yearly figures, financial ratios are calculated as continuous and moving averages. The use of moving averages is a way to cope with the variations in the activities from year to year. They are not always applicable, however, because they do not necessarily show the correct underlying trend without a delay.

In forestry, the definition of a financial ratio is somewhat broader. Ratios may also contain information that is not financial information in the strict sense. Figures describing the size of the forest holding (e.g. area, cutting volume, the change in the value of the standing timber), can be used as factors of ratios as well as financial accounting figures. Financial ratios can be used to compare farm forestry enterprises with other similar enterprises and with the past development of an enterprise itself (Penttinen and Hakkarainen, 1998).

Penttinen and Hakkarainen (1998) listed some of the typical differences between small-scale forestry (including farm forestry) and large-scale forestry. These differences include:

- the ownership of the small-scale forest holding is not on a security basis and its price is not quoted;
- the managers and owners of small-scale forest holdings are the same;
- the small-scale forest holding receives little or no external financing. Non-industrial private forest holdings typically have only subsidised loans granted by the state for forest improvement purposes; and
- the volumes and growth of small-scale forestry businesses are limited mainly by natural production limitation of the fixed area and the resultant cutting opportunities in forestry as well as by the markets.

It is normal to group financial ratios under categories that represent the properties to be measured, such as profitability, liquidity and solvency. As the scope of these guidelines is on the farm forest enterprise, the following grouping of ratios of forestry is proposed: *(i) volume indicators* including growth; *(ii) profitability indicators* consisting of the net profit and dividends per share (the last grouped according to Foster (1986)), share related ratios, return on assets (ROA) and return on equity (ROE); *(iii) financing indicators* covering liquidity and solvency; *(iv) forestry specific ratios*; and *(v) efficiency ratios* consisting of the productivity ratios and the forest owner's own work. Note that the key point of the efficiency ratios is the turnover ratios such as total asset turnover (see Kanto and Martikainen, 1991), which are not dealt with here because of their limited time horizon (Penttinen and Hakkarainen, 1998).

An example of *money flow analysis* is the Finnish Cash Stream System, first put forward by Prihti (1969). It is based on the concept of funds, quick assets and net working capital. The cash flow analysis uses information about the activities of a firm, which are not presented in the accrual-based financial statement (Artto, 1978). Different cash stream types can be classified as:

- cash streams based on payments;
- quick flows based on the accruals principle in accounting; and
- working capital flows based on the accruals and the matching principle.

The distinction between the quick flow and the working capital flow is the current assets, which are included in the working capital flow.

Table 6. The cash flow statement for farm forestry enterprises (Hakkarainen, 1996).

Cash from sales (Sa+)
− cash based direct materials (Ma − c)
− cash based direct labour (La − c)
− cash based direct travelling costs (Tr − c)
− other short-term expenses (OS − c)
− other cash based expenses (MC − c)
= Cash margin Ia (Cas Ia) (cash operating income)
+ other cash based net income (CI + c)
= Cash margin Ib (Cas Ib)
− cash based interest (In − c)
− cash based direct taxes (Ta − c)
− cash based dividends (Di − c)
= Cash margin II (cash net income) (Cas II)
− cash based investments (In − c)
= Cash margin III (Cas III)
± cash-on-hand and in banks (Ca)
= Cash margin IV (Cas IV)
± changes in long-term liabilities (Ltl ± c)
± changes in short-term liabilities (Ltl ± c)
= Cash margin V (Cas V)
± changes in invested capital (Cap ± c)
= 0

Because the *money flows* of an enterprise describe the financial side of the enterprise's operations, it is natural that their utilisation is directed towards describing the enterprise's financial operations such as short-term profitability and financing (Artto, 1978). The cash flow statement for farm forestry enterprise can be defined as presented in Table 6 (Hakkarainen, 1996).

In Table 6, cash margin ratios Ia and Ib are cash-flow-based operating margins related to forest area and the volume of sold timber. The cash margin Ia reveals how much cash from sales are left for paying debts and for the forest owner, after the short-term cash expenses for developing the activities of an enterprise have been covered. The net margin for capital reveals the funds that are left for the forest owner. It includes cash based dividends, changes in cash-on-hand and money in banks, and also changes in invested capital.

Quick flow is based on the accrual principle of accounting. Quick funds are calculated by deducting short-term liabilities from financial assets. In addition to money, quick assets include expectations of future incomes and expenses (i.e. accounts payable and accounts receivable)

Table 7. The quick flow statement for farm forestry enterprise (Hakkarainen, 1996).

Net sales (NS)
− direct material costs (Ma − q)
− direct labour costs (La − q)
− direct travelling costs (Tr − q)
− other short-term expenses (OS − q)
− other costs (MC − q)
= Quick flow margin Ia (Quick Ia) (quick flow operating income)
+ other income (CI + q)
= Quick flow margin Ib (Quick Ib)
− interest costs (In − q)
− direct taxes (Ta − q)
− dividends (Di − q)
= Quick flow margin II (quick flow net income) (Quick II)
− investment costs (In − q)
= Quick flow margin III (Quick III)
± changes in quick assets (Q)
= Quick flow margin IV (Quick IV)
± changes in long-term liabilities (Ltl ± q)
= Quick flow margin V (Quick V)
± changes in invested capital (Cap ± q)
= 0

(Artto and Torkko, 1973). The quick flow statement for farm forestry enterprise can be defined as in Table 7.

The quick flow ratios defined above are operating margins related to forest area and the volume of sold timber. The quick margin Ia reveals how much income from net sales are left for paying debts and for the forest owner, after the short-term expenses for developing the activities of an enterprise have been covered.

Because the quick flow statement is an accrual based statement, the differences between accrual operating margin and quick margin Ia are calculated items such as the value of the owner's own work. These calculated items are not included in quick flow ratios. The ratio is defined accrual based quick flow profit for the accounting period. Quick flow based net margin includes quick-basis dividends, changes in quick assets and also changes in invested capital.

The final aim of management accounting at the farm level should be the enterprise model, where the ratios of financial and management accounting explain the real process of the forestry enterprise. The ratios should therefore be integrated and included

in actual forest management planning. Efficient strategic financial planning and budgeting require *ex post* accounting information.

5.2 Non-Monetary Information

Together with the monetary information that is to be derived from the bookkeeping, also various kinds of technical and qualitative non-monetary information are to be recorded for each test farm. For this, certain typological features will be required as grouping variables, allowing for the distinction of different categories of enterprises that are to be described and analysed separately. Further items may be target variables of the investigation themselves, extending the monetary documentation to a socio-economic one.

It has to be kept in mind, however, that accountancy networks may not be the appropriate approach for collecting non-monetary data. As pointed out also by Abitabile et al. (1999, p. 36), other sources of respective data and alternative methodological approaches should be considered as well. Only under conditions where the interrelations between the economic performance and environmental characteristics are to be analysed together, is it useful to collect respective data along with and by the means of an accountancy network.

Non-monetary data recording requires also some kind of measurements. As with the monetary data, operational definitions are required for all of the items to be collected at the level of the enterprise. Taking the ultimate information needs as a starting point, one has to define the relevant characteristics as well as those measures that are to serve as respective criteria or indicators. For instance, it might be of interest to distinguish several size classes of farms for analytical purposes. The size of the farm can be described by different measures like area, total standard net return or number of people living on the farm. In order to apply any such indicators, appropriate definitions and rules for measurement are required. The general scheme for establishing a comprehensive set of definitions and rules is shown in Figure 7.

According to the type of information, three main categories of non-monetary information may be distinguished:

(i) Quantities of input and output

Information on the input and output in physical terms may be a target in itself supplementary to the monetary information on costs

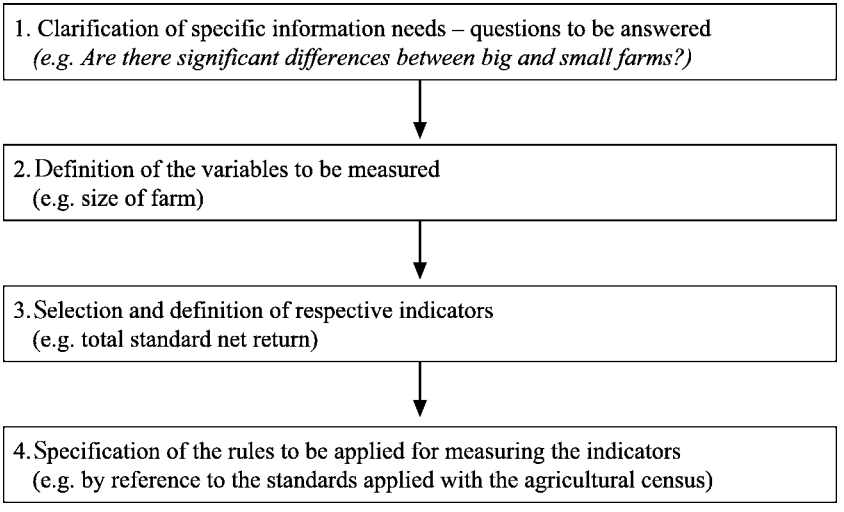

Figure 7. Bridging the gap between information needs and protocols for data collection.

and revenues and describing the economy of farm forestry. Such information may for example refer to the working hours of family labour, the operating hours of machinery or the number of forest plants planted as regards the input. The output can be characterised by items such as the annual cut, the volume of various assortments harvested or sold but also by intermediate measures like the respective area covered by various kinds of treatment (ground preparation, planting, tending, weeding, etc.) or the number of trees pruned. Quantitative information of that kind may also be required for various calculations such as:

- calculating unit costs of productive agents;
- costing of family labour;
- imputing average costs of various management activities;
- calculating average revenues per unit of output; and
- calculating the income per working hour.

(ii) Quantitative measures describing the forest resource

Various typological features may be of interest for further statistical analyses such as testing of hypotheses and also for questions of (post-)stratification and statistical inference. Such features may be characteristics of the forest such as average yield class, composition

according to tree species, allowable cut, area, age class distribution, average altitude or density of forest road network. They may also be socio-economic features of the enterprise such as the working capacity (maybe differentiated according to labour force of the household (family) and employed labour on the farm), size of the household, structure of the agricultural and non-agricultural income, age of the farmer or capacity of forest machinery.

(iii) Qualitative information

Examples of this kind of information are the levels of skill and education, the category of holding (e.g. as defined by the agricultural census), the type of forest, the geographical context (e.g. production region, NUTS level II or III), other uses of the forest (forest land use classification) or management goals.

Whereas the quantities of input and output are clearly associated with the respective accounting period, many of the other features may remain constant over a longer period of time, so that only effective changes have to be recorded once the whole data set has been established. In practice, providing a comprehensive set of definitions and rules for measuring all those items is likely to be a complicated task and in some cases one may even have to refer to expert judgement. For example, it is not always possible to apply a general rule for determining the allowable cut. Nevertheless, one should try to minimise the subjective element of measuring and, above all, avoid any kind of systematic error.

5.3 Accounting for Forest Services

Originally, the main interest of accountancy networks lies in monetary data derived from bookkeeping and referring to various kinds of expenditure and revenue. Such data allow the profitability and efficiency of the business to be assessed. This classical view is clearly oriented towards the income to be derived from forestry. However, depending on the respective information needs, a more general documentation of all kinds of economic as well as non-economic impact brought about by farm forestry may be requested, thereby extending the scope from income to categories such as employment, pollution and so forth, encompassing all relevant economical, ecological and social aspects associated with farm forestry. Comprehensive environmental and social

accounts should comprise all respective effects, the negative as well as the positive ones. Most industries are causing environmental costs so that general approaches to environmental accounting concentrate on impacts on the environment. Those impacts are usually described in physical terms such as quantity of wastes, consumption of energy and input of material. Social accounts, on the other hand, usually concentrate on jobs, training, social benefits, etc. in monetary or non-monetary terms.

Forest services are currently of minor importance for forestry, and especially farm forestry, but could be of more interest in the future. Respective information needs would require a considerable extension to the currently operating systems, but could at least in principle be met by general concepts, which forestry has in common with other industries. However, the positive externalities brought about by forestry in terms of forest services such as forest recreation and protective functions, would not be covered by such approaches so that they would have to be accounted for separately. The value of the forest services for society is likely to exceed the monetary output of timber production considerably. Therefore, accounting for forest services may be an important issue to consider when establishing farm forest accountancy networks.

There may be different reasons for dealing with forest services in this context. Examples for such possible purposes in addition to the ones necessary for environmental and social accounting are:

- correcting the accounts for timber production (e.g. by separating the accounts for timber production and hunting or nature conservation);
- monitoring the profitability of the service businesses (e.g. hunting, forest recreation);
- justification of subsidies for the sustainable provision of those services; and
- public relations for forestry by documenting the public benefits brought about by farm forestry.

In essence, accounting for forest services can be performed at three different levels of sophistication as proposed by Defrancesco et al. (1998). The first and simplest level would be to record respective financial data separately. Expenditures or costs as well as related revenues and subsidies should be stated explicitly. For that purpose,

specific cost centres are introduced into bookkeeping so that direct costs can be calculated. Such an approach was introduced into the Dutch network in 1996 (see Berger et al., 1997). Where there is a low level of forestry activities, the results are likely to indicate a marginal significance of the forest services because very few direct costs will be documented.

The economic input for providing forest services is not restricted to direct expenses; the expenses can also be indirect. At the second level, accountancy information is provided by extended cost accounts where overheads are split up or combined depending on circumstances. Blum (1994) proposed a scheme for calculating the total costs for each line of production separately. A basic requirement of this scheme is an exact record of working hours for each cost centre encompassing all of the personnel. In relation, to the financial accounts, an expense classification allows differentiation between individual costs and overheads. The overheads are further classified into certain cost centres and into general overheads. Those cost centres, which are not to be charged with a particular overhead are identified by means of a negative selection before allocating the remaining overheads. Finally, imputed costs are derived from cost accounting, the sum of all the items giving the full costs for each line of production. Another extension of ordinary cost accounting to include indirect expenses is the calculation of opportunity costs. As documented for example by the German study of Bartelheimer and Baier (1991), forest enterprises forego revenues and increased management costs in wood production in favour of forest services, sometimes amounting to a considerable sum. Such opportunity costs stem for instance from the choice of tree species being determined not just by the maximum net present value obtainable, but also by considerations as to the scenic value of the forest. Further examples include the extension of the rotation or the renunciation from a further opening up of the forest in favour of nature conservation. Opportunity costs may be derived from model calculations where the standard net returns of different management schemes are compared with each other (e.g. Bartelheimer and Baier, 1991; Moog and Brabänder, 1992).

Whereas the first two approaches are to some extent refinements of ordinary cost accounting aiming at a delimitation of the costs and revenues of different lines of production, the third alternative is a wholly different one. It switches the focus of accounting from the point

of view of the enterprise to the one of society. At the third level, in order to establish environmental and social accounts with respect to forest services, two different approaches are possible. In the first approach, changes with respect to the capitalised value of the forest services are determined, and in the second approach, current costs and benefits associated with the forest services are accounted for.

For comparison, Herbohn (2000) divides environmental reporting of an enterprise into four categories, starting from descriptive performance reporting (first category) and ending into financial environmental reporting:

- descriptive performance reporting, where the disclosure of short qualitative statements of external standards, environmental policies and any environmental-related awards;
- quantitative environmental reporting, where an attempt is made to illustrate how efficiently an enterprise uses resources to produce an output;
- inventory style reporting, where a separate environmental report to the financial statement, that lists an inventory of an enterprise's environmental input and outputs, is prepared; and
- financial environmental reporting, where it is attempted to provide an overview of an enterprise's performance, in which environmental and financial impacts are considered jointly.

So far, there are no standards for environmental and social accounting available, either in forestry or in other sectors of the economy. The valuation of respective benefits to society is a very complex matter, involving environmental economic techniques like CVM (Contingent Valuation Method), TCM (Travel Cost Method) and HPM (Hedonic Price Method), which could hardly be applied on a regular basis along with a forest accountancy network. However, respective studies could be valuable or even turn out to be a prerequisite for deriving a framework of values, which then can be referred to in individual cases. The Forestry Commission's (UK) bulletin (1999) provides an up-to-date overview of the issues.

Although the transferability of environmental benefits can (and even should) be questioned on methodological grounds, such a framework would allow the pragmatic application of a lump-sum approach. For instance, a certain value per hectare could be used as a standard value of a forest service (e.g. recreation). Such a valuation could

be differentiated according to various indicators like forest land use category or growing stock, which could be applied at the farm level. Forest land use classification may provide a ranking of forest functions. Each function could be evaluated by adjoining a standardised value per hectare to the appropriate level of significance of that function (e.g. see the approach of Bergen et al., 1998, p. 49, along with national accounts for forestry). Furthermore, the ratio of actual growing stock per hectare to the growing stock resulting from the calculation of an optimal rotation as indicated by the maximum soil rent could serve as a measure for assessing the compound significance of the local forest services (Freist, 1989).

The decision whether or not to account for forest services, and if so then in what way to account for forest services within the framework of a forest accountancy data network, is primarily a political one.

5.4 Accounting of Total Economy of Farm

Accounting systems must have the capacity to serve different purpose and different people. They should have capacity to provide the information managers need to establish objectives – and to monitor and control operations – to compare actual performance with the objectives, and they must be able to provide information to groups outside the firm or farm such as banks and government agencies. Accounting is for internal and external purposes, and requires different types of activities.

An accounting system is in principle the quantitative information system of an enterprise. It can be broadly classified into financial accounting, cost accounting and management accounting, as mentioned before. The key word in each definition of accounting is information that in principle can originate from anywhere in the organisation (Jöbstl, 1995a).

In farm forestry, a system of integrated economic accounts should provide an overview and systematic description of economic activities that are comparable as far as possible, and that serve as a basis for analyses, forecasts and political planning. The vast number and variety of economic transactions and units covered by the system therefore have to be classified according to general criteria and set out clearly and simply in a coherent system of accounts and tables (Eurostat, 1998).

In order to analyse the flows of income, capital, financial transactions and assets, it is essential to select units that depict the interaction between economic operators. Generally, the forestry accounting data have been collected and used for particular research projects aimed to calculate the net revenue of farm forestry (Hyttinen and Kallio, 1998a), rather than as part of a permanent data collection and accounting system.

Forestry should be considered as a non-agricultural activity of holdings. In this way, the basis of the survey is a total entity, but all different activities, like forestry, are included in the classification and in the total income of holdings. Farm forestry is usually defined as a part of active farms. However, to investigate the socio-economic changes in rural areas necessitates wider definition. It will be one important base for international comparisons between holdings of full-time farms producing traditional agricultural products.

The system to be recommended for data collection and analysis for the total economy of a farm should separate and distinguish the forest entities from the owner's other entities, e.g. agriculture. However, in practice, these different entities often form one single enterprise farm enterprise. In order to enter the items between the different entities within a farm, there has to be an accounting system covering the whole economic unit. Therefore, requirements set on the accounting system and framework could serve also as the minimum requirement for farm forestry.

If the method is limited solely to the forestry part of the farm, problems may occur in the practical implementation. After all, agricultural and private funds, debts, expenses and income have also an effect on forestry even through there is no accurate information on them. In addition, fixed assets may be assets other than forestry assets, which means that forestry uses production from other economic units such as agriculture.

When a list of accounts for the total economy of a farm are formulated, the accounts have to be divided into account classes, account groups and into actual accounts according to the selected decimal system. By this way, it is possible to add or take out accounts for national and local needs without altering the whole account framework. The chart of accounts for monitoring of the performance of a farm forestry enterprise is more extensive than normally used in business accounting. Transactions, such as the value of own labour

and changes in the value of land and the growing stock, which are not direct business transactions, have to be registered in this system as well.

At the farm level, the information needed is recorded mostly manually in books prepared specifically for this purpose. They should include at minimum a list of property, a cash based accounting book and a book for working hours. Also forestry income and expenses should be recorded. The obvious lack in the current systems is how to estimate the volume of the growing stock or the annual change of the growing stock (i.e. the annual growth of forests).

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6 Outline of a Database System

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Key points:

- A database system is usually a part of a larger information system.
- Initiating a database system involves four stages: information strategy planning; business area analysis; business system design; and technical development.
- A farm forestry database comprises processes associated with system maintenance and updating, as well as data processing, and includes three key elements: temporal partitioning of data; an input screen; and a report engine.
- By storing the data at a disaggregated level there is no immediate need to harmonise the database management systems, as the case would be when the data is stored at aggregated level.

6.1 Initiating a Database

The objective of this chapter is to highlight the key issues that have to be considered when establishing a farm forestry database. For practical reasons, the chapter cannot provide a comprehensive specification of a database for the storage and analysis of data relating to the physical and financial performance of a farm forestry enterprise. Those who are initiating a database system should supplement the overview given in this chapter with more detailed descriptions on database initiation and management.

When initiating the development of a database the first step is to undertake a stakeholder analysis. In brief, such an analysis should identify the key actors involved and their role as related to the information problem. The list of key actors in farm forestry who most likely would need the accountancy information are defined in Chapter 2 and the organisational arrangements necessary for collecting the initial data from farm forest owners are described in Chapter 4.

In any operational situation, there are four key personnel involved in database development, or if less people are available their tasks are combined with the tasks of the others. In principle the four key personnel involved are:

- the primary user;
- the enumerator;
- the database manager; and
- the information technologist.

The key personnel do not necessarily operate and work in the same organisation, for example, when a contractor is used for a task such as programming. The four key personnel can be perceived as interacting with each other in a number of ways. The *primary user* as a key client has to make clear to the database manager the information needs of his organisation. The *enumerator* has to identify specific problems associated both with the logistics of data collection and communication with the primary user. The enumerator discusses these problems with the database manager, and in turn, the *database manager* communicates the purpose of the database with the *information technologist.*

Some processes involved in the database initiation are technical such as the calculations required, whereas some are logistical such as the scheduling of data capture storage and retrieval. Examples of process-decomposition diagrams are given in Beers (1995, 1996). The initiating processes can be expected to be identified, evaluated and revised at any time within an established information system. The development of the information system can itself be considered as a process that follows four clearly defined stages:

(i) Information strategy planning. This stage is sometimes referred to as a 'quick scan' or 'feasibility study' where key data items are described and where the analysis of stakeholders' needs is undertaken;

(ii) Business area analysis. At this stage, the information technologist prepares the first conceptual data model. The structure, content and potential output of the model is modified together with the database manager. Process identification is also implemented at this stage;

(iii) Business system design. In the development of any database system it is important to be aware of a number of key principles. Above all, it is essential to define the structure of the database in detail, as it

determines many of the features of the final product. To be effective for all actors involved the following features are desirable for a functioning database:

- ease of accessibility;
- transparency, especially with respect to working methods and procedures;
- a robust integrity within the system thus ensuring a high degree of reliability in the retrieved data; and
- speed of processing and reporting.

(iv) Technical development and construction (purchasing hardware and software, installing and programming). At this stage the information technologist is ready to provide a prototype of the database system. It will be pre-tested in a laboratory by the database manager and the enumerator to identify technical problems and to initiate improvements before a final version is made available.

When it comes to the structure of the database, two major forms can be distinguished: *object oriented data models* and *relational data models*. The object oriented data models are more sophisticated but their application requires a highly trained staff. In addition, they are more time-consuming to develop. The relational models are therefore more widespread at the moment. The database of an information system introduced in this chapter is of the relational type (Figure 8).

The process of database initiation has recently been undertaken with respect to the FADN in a wide-ranging review of its information

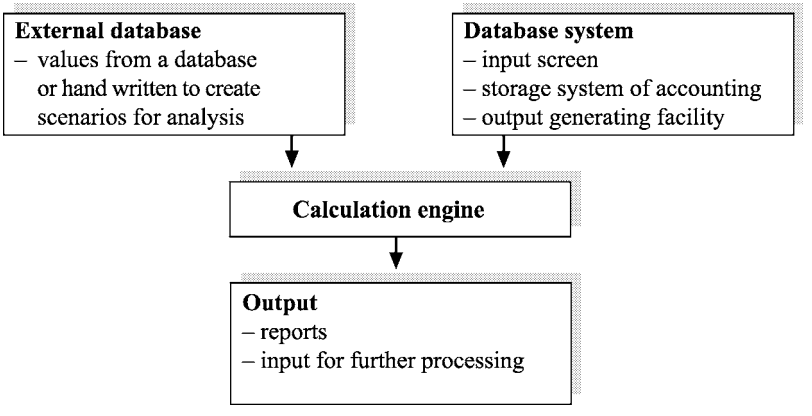


Figure 8. The basic set-up of an information system.

system. Whereas that review relates specifically to the agricultural sector, the system has potential to be applied also in other sectors including forestry. A more detailed coverage of the database initiating processes and stages involved can be found in Abitabile et al. (1999, p. 66). The next section presents an example of the possible structure of a farm forestry database.

6.2 A Farm Forestry Database for Monitoring Costs and Revenues

The database system described here as an example, is operational in the Netherlands, although similar characteristics can be found in the Austrian database system underlying the network of larger forest enterprises. The defined system was developed in response to the needs of various stakeholders including forest owners' associations and representatives from the Dutch Ministry of Agriculture. Even when the database system is fully operational, it is continuously under development because of changing needs of the stakeholders. In constructing the Dutch database, decisions as to which processes can be automated within the information system have been made by an information technologist in consultation with a database manager. These two key actors mirror the needs of the stakeholders and comprise a core of functions relating to the monitoring of the economic performance of farm forestry. This core comprises processes associated with:

- system maintenance and updating; and
- meta data handling.

These, on the other hand, include a standard lists of three elements:

- temporal partitioning of data;
- the input screens; and
- the report engine.

System maintenance and updating. The window (c) in Figure 9 shows the choices of the database manager in order to maintain the system on a general level. Through this menu, the database manager can open windows for registering new users, changing passwords,

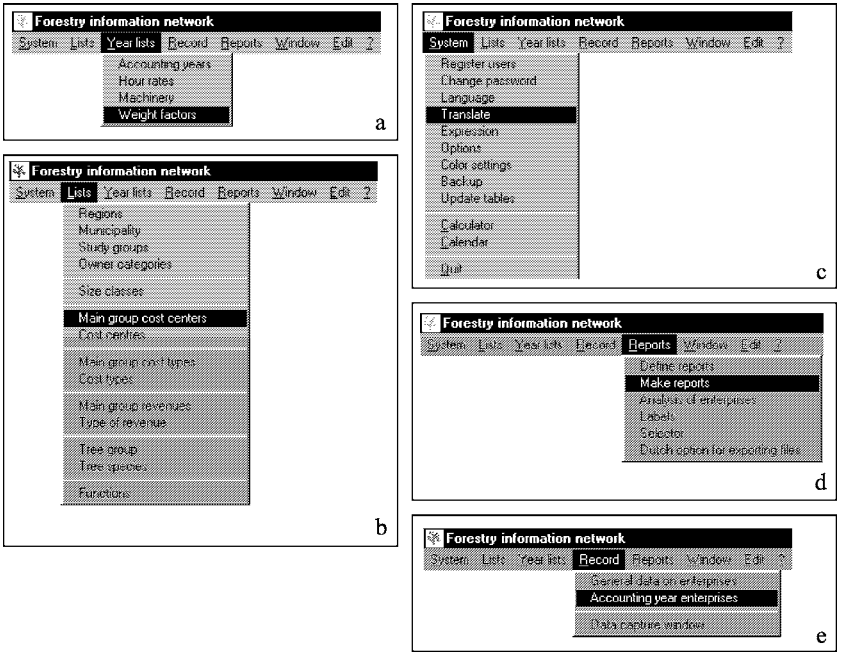
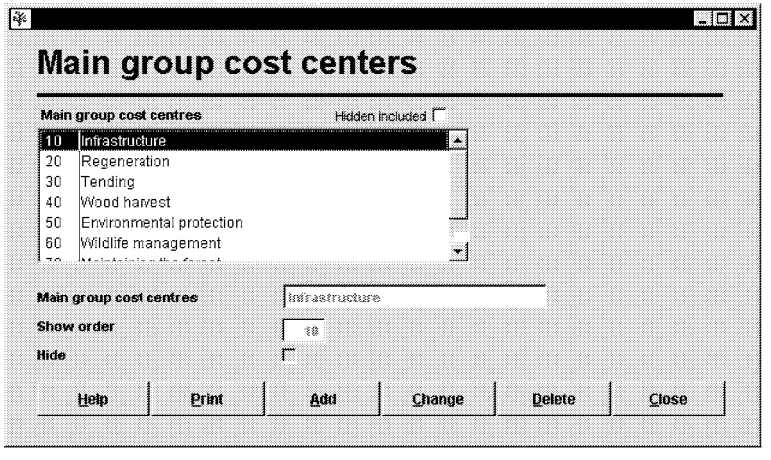


Figure 9. a-e. Screen capture windows from the Dutch database in the farm forestry network showing the five main drop-down menus. See text for explanations.

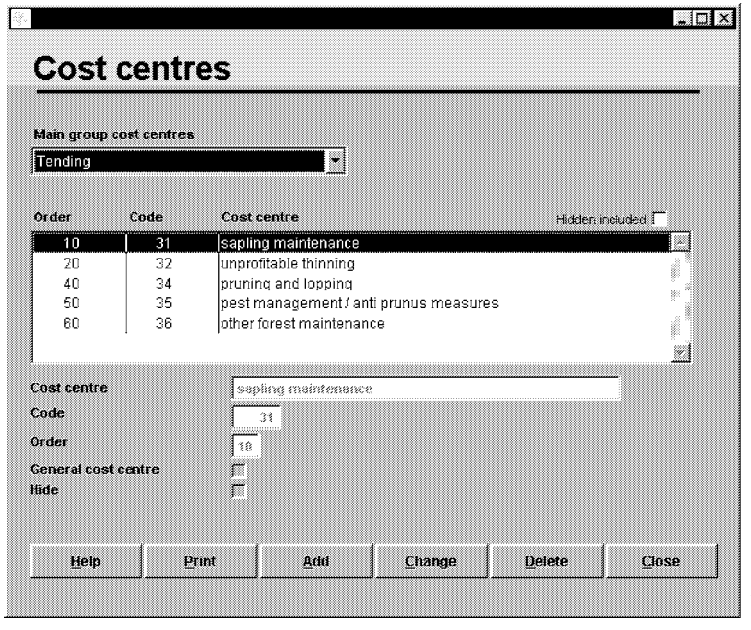
translating the whole system into another language and for various other options. The enumerator will lack the first three choices.

Meta data handling. The window (b) in Figure 9 is more important for the database manager. In this section all of the standard lists to be used in the database can be defined and maintained. This includes for instance the items mentioned in the income statement of Chapter 5. The top five items in this menu can be used to define the stratification variables. Regions, municipality, study group, owner categories and size classes are all possible stratification variables. Up to a certain limit, the database manager is free to change the meaning of those variables (e.g. type of forestry enterprises instead of study groups or size based on the farm income instead of the land area). If the database manager selects '*size classes*' a window will open with a feature to change the limits of the land area classes. In doing so, it is quite easy to adapt the limits of the size classes to a different stratification or for comparison

ones country to another with different size classes. In the latter case, this shift would obviously lead to increased bias in final results as the original sampling technique is changed (see Chapter 3). Underneath



a



b

Figure 10. a-b. Two captured active window screens showing the main group of costs centres (top figure a) at the first level and a specific group of cost centres at the second level (bottom figure b).

the five mentioned items are three groups of two lists representing a two level system. This feature is illustrated in Figure 10.

Figure 10a shows a list of main cost centres and types of costs that are in a hierarchical order as introduced in Chapter 5. The database manager can add, delete, change items in the list. Items can also be hidden, for example, if an item in the list is no longer valid in a new accounting year. The third item in the list of main cost centres '*forest tending*' is divided in Figure 10b. If a transaction is marked as '*forest tending*' but it is not clear to which category of forest tending the transaction belongs, the booking can be done on the category '*other maintenance*' or '*not specified forest tending*' being the category of the higher level.

Temporal partitioning of data. The window (a) in Figure 9 is for the yearly changing items. With the first option here a new year will be defined by copying the standard lists of the previous year. Next there is an option to adapt the current working hour rates for different workers. The list of machinery can also change yearly (e.g. the purchasing values). The last option is to give in the number of enterprises and the surface area of the population per stratum. This is needed for calculating the weight factors.

The input screens. The window (e) in Figure 9 is where the actual data recording is done. There is an input window for general information of the enterprise, with name, address and telephone number of the forest owner. As this information includes personal data it needs maximum protection. Therefore, it would be best not to have this part of data in the same computer as the other parts of the data. However, for practical reasons the personal data is often stored on the same computer as the rest of the data. In the input window 'c' enterprises can be selected for entering in the accounting year and the last item opens the data capture window. The data capture window provides input screens for what can be seen as the heart of the database. Figure 11 presents the structure of the proposed database in a simplified form. The basic idea is to have equal number of tables to the input screens. The tables are linked to an administration system of enterprise numbers and booking year, which are not represented in the figure. The figure shows all the basic variables needed for calculating output such as a profit and loss account, balance sheet and financial ratios.

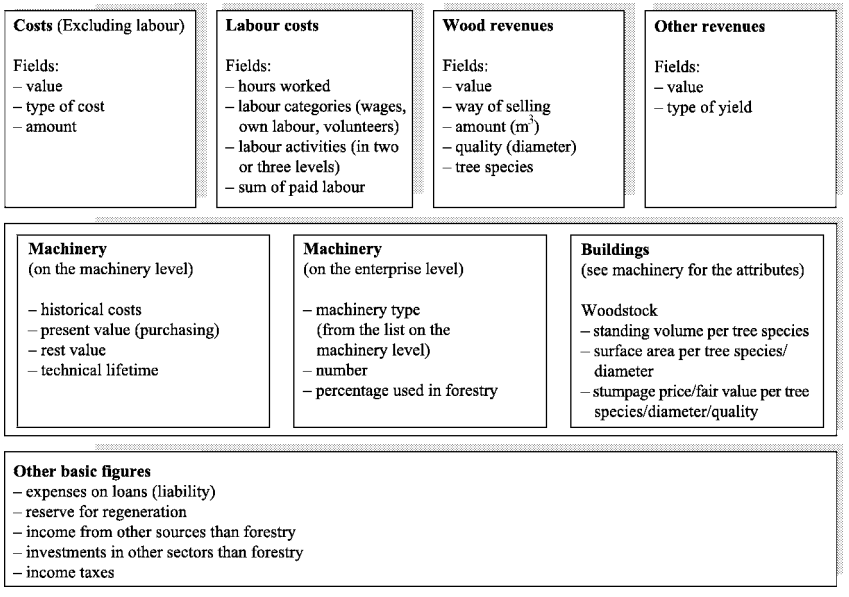


Figure 11. Structure of the database (core).

The data capture window consists of tabulator sheets corresponding to the tables of Figure 11, and in addition to this there is a tabulator sheet dealing with some general data of the enterprise.

The report engine. The report engine has facilities to define reports freely from the standard list of items, it can transform all values into different currencies (especially EURO), convert values into real values using necessary deflator and export data into spreadsheet programmes and statistical packages. It is also possible to generate a profit and loss account with a full breakdown of the cost types and cost centres at the level of an enterprise as well as at the aggregate level (see Chapter 7). The report engine can also prepare standard letters to accompany the economic report, which is available to the forest owners participating in the accounting network. Each defined report has its own specific settings and can be addressed by its own name. Along with this, it is possible to select reporting for regions, size classes and dimensions (amount, amount per hectare, etc.).

6.3 Database Management

There are a number of specific requirements to a harmonised database system at the European level, stemming from the country specific characteristics of farm forestry. Missing data are a common problem and results for a particular farm are not comparable to other farms in the sample. This problem can partly be overcome by grouping farms with the same lack of information, or the other way around, by grouping farms with some additional information. The solution involves a special administration and separate sets of weighting factors because the created sample is actually a sub-sample of the initial sample. The second problem is that information is only available on a higher level of aggregation than expected.

It would be beneficial to store data at a disaggregated level, to prevent the need to harmonise the database management systems, as the case would be when the data are stored at the aggregated level. For instance, if an income statement is stored physically in a common database, an integrated harmonisation on how the statement is built up would be highly desirable, including a detailed description or prescription of the statement, the bases for valuing assets, and historical costs or replacement value, with or without specific taxes. In the case of a database system where data are stored in as disaggregated a form as possible, harmonisation is reached simply by gathering the basic values from the database and computing the income statement with a unified set of assumptions.

The organisation of and access to a common database can be arranged at least in the following ways:

- like in FADN, a central organisation gathers all individual data of enterprises and produces reports from it. Research can then be done through that organisation;
- aggregated results are exchanged between different countries; and
- authorised researchers of participating countries have access to a central database.

The key focus of a database storage system is on the recording of the farm level transactions over an accounting period. Various transactions are distinguished and separately recorded, allowing one to cluster the similar transactions. This flexibility is one of the major advantages of the introduced database system over the more traditional ones that

are based on double entry bookkeeping systems. In the introduced database system it is possible that each individual transaction can be stored as a record in a database. It is also possible to store a group of transactions of the same kind from a farm or even from a group of farms as one single record in the database.

The database system outlined above is quite different from a conventional bookkeeping system. A serious pitfall may therefore occur if the database manager asks the information technologist to develop and run traditional bookkeeping programs within the database system. A forestry accounting specialist may provide useful help for developing the specific bookkeeping programme for farm forestry.

7 Output

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Key points:

- The individual output provided to the farmer should not be too technical, but should still provide the farmer with understandable information for management purposes.
- Whereas former concepts provided only a rigid set of standardised reports, modern database applications allow for a flexible design of the output so that it can be customised according to the changing needs of all users of respective information.
- The significance of averages, statistical inferences and extrapolations is highly dependent upon the statistical design of the sample and should be indicated clearly.
- An accountancy network is a most valuable source of empirical information for the economic research on farm forestry, its scientific significance being influenced but by no means being ultimately determined by the statistical quality of the sample.

7.1 Results at the Level of the Enterprise

Usually the farmer as a participant in the network will be the major if not the only addressee of the individual results for a particular farm. As has been outlined in Chapter 4, this kind of individual feedback is meant to motivate the farmer for continued participation by providing the farmer with useful information on the forestry business. For that purpose, it is critical to design the output in such a way, that the farmer is able to understand the message and derive the relevant information to make management decisions. The information has to be topical, accurate and accessible for the farm management. Thus it should be made clear to any farmer joining the network what kind of benefits they might expect and at what costs. Ultimately, the gains of participating in the accounting network must exceed the costs.

One possible way a farmer can control their business is by applying management accounting. Management accounting is a way of reporting farm results that goes beyond bookkeeping for taxation purposes. It provides the manager with information for two main purposes:

- supporting planning decision like adapting the farm size; and
- supporting control decisions like determining the amount of wood harvesting for the current year.

The basic concept of management accounting is cost accounting. Nowadays management accounting is used on many European farms, especially in the larger ones. Along with the question of accountancy networks, this implies that the output on the individual farm level should be available in terms of management accounting information that can be used by the farmer as a management tool.

Therefore, the individual output should not only provide a standardised documentation of the data collected, but also various computed results such as different ratios derived from the data. As determined by the concept of accountancy underlying the networking activities (see Chapter 5), the main output at farm level may consist of a balance sheet and a profit and loss account, and/or a master balance sheet.

If a master balance sheet is provided, the main management information provided refers to the value of the input as differentiated simultaneously according to type of cost and cost centre, the proceeds and the resulting profit. In addition to absolute figures, ratios, such as those incorporating forest area and the volume of timber cut, could be of major interest to describe such things as harvesting costs per cubic metre or the silvicultural costs per hectare. However, the significance of such ratios must not be confused with unit costs. Real unit cost accounting requires additional information not only on the specific costs associated with a certain kind of measure (e.g. planting or logging) but also on the respective amounts of output (e.g. in terms of hectares planted or cubic metres logged). At least the most important activities should be documented in such a way that unit costs can be derived, as they are of great significance for management decisions.

One major piece of information associated with the individual feedback is the profitability of forestry as an individual line of business. Farms, being enterprises encompassing more than one line of business, tend to be regarded as a whole, without consideration of

the profitability of the individual business units. Consequently, as long as the overall result is still satisfactory, unprofitable activities may still be carried on, thereby diminishing the profitability of the farm and wasting resources.

Given the significance of imputed costs and revenues at the farm level, the profit as shown by the profit and loss account is likely to differ considerably from the monetary result obtained by detracting the expenses from the receipts. Along with this, the approach of cost accounting allows productivity of the farmer's labour input to be assessed. For that purpose, the forestry income statement should clearly separate the earned income as calculated by pricing the input of working hours on the one hand and the resulting profit or loss of the forestry business on the other. Such a breakdown of the family income within one line of business indicates what hourly income can be earned in forestry and whether the forestry business would be profitable when having all the work done by contractors or paid workers (depending on the way that the owner's own labour input was costed). The way of pricing the units of input for calculating the imputed costs affects the results a great deal. The most important figures (especially the working hours of the farmer and of the machinery) should be documented in detail along with the costs, thus allowing for additional calculations if applying different unit prices.

Given the special conditions of forestry production in general (i.e. an extremely long period of production, high levels of stock as compared to the market output of a period, changes in the value of the growing stock hardly to be accounted for on a yearly basis, output of one year practically independent from the biological production of this year) and farm forestry in particular (i.e. intermittent working predominating, which means that there is no even flow of output every year but that cuttings are performed at irregular intervals), the profit as shown by the profit and loss account or the master balance sheet is greatly affected by the level of cuttings in the specific year and may be quite misleading as to the long-term capability of the forestry business. For instance, when the agricultural income alone is satisfactory and the farmer cuts only fuelwood for self supply and engages themselves in silvicultural measures, the forestry profit of the year will be poor although the stock as well as the value of the forest increased. Conversely, when there is a high cut in one year, forestry seems to be highly profitable although the stock decreased, and also silvicultural measures as well as maintenance

work may have been neglected. As long as the value of the forest is not properly accounted for (see Chapter 5 for respective approaches), some surrogate may be required to deal with this phenomenon.

For the forest property valuation, one can draw up an additional calculation referring to the allowable cut as a measure of sustainable yield of the forest. The simple model underlying this calculation assumes, that all harvesting costs as well as the proceeds from raw wood are directly proportional to the volume harvested, whereas all other costs as well as proceeds are fixed ones, irrespective of the volume cut. Along with such a calculation, the total harvesting costs are still divided by the volume harvested, whereas all other costs are divided by the volume indicated by the allowable cut. (The proceeds are handled accordingly.) The difference between the profit as ordinarily calculated by referring to the actual cut, and the one derived from the calculation using the allowable cut, may then be interpreted as a surrogate for the change in the value of the forest.

Based on the same model, the volume necessary for reaching the break-even point can be estimated. This is the point where harvest revenues just compensate for the costs, leaving a profit of zero. In combination with different values assigned to the farmer's own labour input, such calculations may provide valuable insight into the interdependencies of labour input, cutting volume and profitability.

The value of the information provided along with the individual output may be enhanced considerably by comparing the key results for the current period with the respective values of the previous year or even with those of a series of years. This measure facilitates the assessment of trends as well as the interpretation of the current results and helps in highlighting the effects of management actions.

The individual feedback may further encompass different kinds of aggregated data, allowing for inter-firm comparison. In essence, the individual farm data (expressed as per cubic metre or per hectare) are to be compared with the respective averages of one or several groupings that the individual farm belongs to, as well as with the overall average derived from the sample. Such comparisons show whether the individual farm is more or less part of the mainstream or not, and in which respect specific strengths or weaknesses are indicated by significant deviations. Whereas such comparisons at the level of highly aggregated figures like profit per hectare may hardly trigger any management decisions as they are not specific enough to indicate the

underlying causes, such comparisons may directly provide valuable hints for rationalisation when performed on a more detailed level such as unit costs of harvesting per cubic metre. Irrespective of the level of aggregation, such an inter-firm comparison may well stimulate further cost analyses and thus directly or indirectly contribute to the improvement of the performance of the forestry business.

Providing the principle of anonymity is not violated, the farmer could even be provided with the individual figures of similar farms for the purpose of inter-firm comparison. An example could be a profit and loss account for the enterprise listed together with profit and loss accounts of some similar enterprises in an anonymous setting, so that the manager is able to compare their enterprise not only with averages but also with real data of other farms. On such a basis, the forestry extension service could attempt to stimulate benchmarking exercises, where those participating in them renounce their anonymity and are ready to provide additional background information for interpreting the results.

Besides the individual output at farm level, the network can also contribute to management accounting in some other ways:

> *Planning decisions*: in order to fine-tune their decision supporting models researchers can use data from the database. For instance, this might be the case in predicting the optimum set of management measurements to reach a certain goal. Advisers can then pass this knowledge on to the farmers.
>
> *Control decisions*: certain figures from standard tables from the database can be used as a reference in daily routine decisions, e.g. the prices of specific tasks. The need for topical information means that farmers could be urged to present preliminary results during the accounting year.

The following categories of output are especially important when designing the reports at the farm level:

- balance sheet;
- profit and loss account;
- master balance sheet;
- breakdown of proceeds (for timber and non-timber);

- breakdown of income according to lines of business (such as wood production, amenity, nature conservation);
- average revenue per unit of output (e.g. EURO/m^3 of a certain species and grade of timber);
- unit costs of output (e.g. planting costs per hectare planted);
- prices of input factors (e.g. price of contractor's work per m^3 harvested);
- quantities of input in physical terms (e.g. working hours of the family);
- quantities of output in physical terms (e.g. m^3 of fuel wood);
- ratios of productivity (e.g. m^3 harvested per working hour);
- ratios of efficiency (e.g. cost efficiency);
- ratios of profitability (e.g. gross margin ratio);
- ratios of liquidity (e.g. current ratio);
- ratios of solvency (e.g. dept-equity ratio);
- measures of rentability (e.g. turnover ratio);
- changes in the value of the growing stock (e.g. differentiated according to quantity, quality, prices and costs);
- socio-economic measures (e.g. use of labour force available); and
- averages and other data for inter-firm comparison (e.g. regional price statistics).

7.2 Averages and Statistical Inferences

The main results from an accountancy network are not usually at the level of the individual enterprise, but describe various aggregates of enterprises and ultimately also the population underlying the sample. Therefore, the output on an aggregated level should be customised according to the information needs of the respective addressees. This may involve the computation of additional ratios such as value added ratios. In practice, however, this has not always been the case. In some programmes (especially the older ones) it has only been possible to generate a single type of report. In these programmes, the identical structure of the reports (either at the individual farm level or the aggregated level or even both) represents at best a good compromise between the information needs of the farmer on the one hand, and politicians and researchers on the other. As a result, the addressees are more or less provided with non-optimal information in terms of quantity as well as in terms of quality. Whereas the farmer may criticise

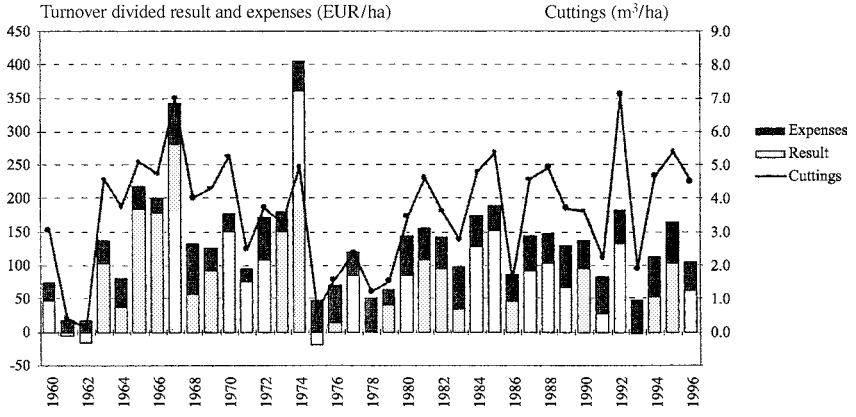

Figure 12. An example of long-term average values of annual turnover (EUR/ha) and annual cuttings (m^3/ha) at farm level in Finland between 1960 and 1996 (Leppänen and Veijalainen, 1999).

the report as being too technical and too general, those interested in aggregated information might prefer very technical and less detailed data. Given modern database technology and the associated flexibility for designing a new application, an adequate presentation of the results at all levels should be incorporated as part of the system.

In principle, there are two ways to derive aggregated values describing groups of enterprises or populations. For one, *averages* may be calculated. Such averages refer to units like 'per enterprise', 'per cubic metre of felling' or 'per hectare of woodland'. An example of the averages is presented in Figure 12, where the annual turnover divided into results and expenses, and annual cuttings at the farm level are presented.

In case there is a statistical sample with all elements of the population having an equal probability of being selected, the averages are to be derived by simply adding the figures of the individual enterprises pertaining to the group under investigation and dividing these sums by the aggregated values of the group in terms of number of enterprises, total volume of felling or total area of woodland. When there is an unequal probability of selection, calculating the averages involves a weighting procedure to compensate for the differences. However, it is common to calculate simple averages whenever the real probabilities of selection are not known, thereby assuming implicitly, that there is in fact a random sample. In the latter case, the results

may suffer from a considerable, but unknown bias. All of these averages describe primarily just the (sub-)sample of farms contributing to the respective database and are not necessarily representative of any larger unit or population. This has to be kept in mind when interpreting the results and comparing such averages, for example between regions. Only when the sample is a representative one (for respective sampling schemes see Chapter 3), is it justified to claim that these averages describe the whole population properly. In practice, even non-representative averages may be sufficient to satisfy certain policy needs. For instance, a systematic bias due to the sampling procedure may affect the level of the results, but does not necessarily influence respective trends, which might be of greater importance. Whether this assumption applies also for a specific case should be investigated.

A great advantage of using averages is that they may be calculated for any sub-sample of the network as their calculation does not require any additional information on a respective population. Thus, any characteristics of the farm recorded along with data collection may be used for deriving respective groupings. However, the potentially very limited significance of such results has to be observed so as not to draw inappropriate conclusions. In an extreme case, such an average will be derived just from a few elements or even stem from one single farm alone. Obviously, such results are by no means reliable and do not allow for any consideration concerning a potential relationship between the grouping variables on the one hand and the target variable(s) on the other. In order to avoid any such misjudgements, the number of individual farms associated with a certain average should be disclosed. Whenever possible, averages should be computed only when the number of elements available out of the sample exceeds a certain limit (e.g. 25 or 50 depending on the statistical quality of the results to be achieved). Such a rule may necessitate aggregation of some of the originally designed groups.

A further recommendation is to provide additional statistical measures such as the standard deviation or the standard error of the average, thereby indicating the significance of the results. Along with the publication of the Dutch results for example, the confidence interval of the main results is indicated graphically (see Berger et al., 1997). However, the significance of this additional information depends once more on the statistical quality of the sample, the underlying calculus

of probability assuming a random selection of the sample. Ideally, the groupings should be designed in such a way that the standard deviation of the target variables lies within certain predetermined limits (e.g. 10% of the mean).

Results referring to the allowable cut, may also be computed on an aggregated level, indicating to what extent over- or undercutting has affected the original results in the specific group. There are two possibilities for specifying the algorithm. One approach is to treat the (sub-)sample as one enterprise so that individual deviations of cutting levels (as given by the difference between actual cut and allowable cut) may compensate for each other. Alternatively, individual values stemming from the calculation referring to the allowable cut are aggregated so that the calculation is not performed just once at the level of the group, but for each element of the group separately. The choice between these alternatives depends on preferences as to the specific assumptions underlying the respective model.

As has been explained above, the averages derived from the network may under certain conditions be interpreted as unbiased estimates of the true means pertaining to the population. Beneath such averages, also absolute figures describing the population may be asked for. Depending on the statistical quality of the sample, either statistical inference or simple extrapolation can be applied for deriving such absolute figures for the whole population represented by the sample. Whereas statistical inference allows for the calculation of measures of accuracy like standard deviation or standard error, the results are associated with an unknown error in the latter case. The algorithm to be used for statistical inference is determined by the respective sampling scheme. Extrapolation on the other hand, simply involves multiplying the averages derived from the sample with a respective measure describing the population (e.g. total number of enterprises multiplied by the average figure per enterprise; total volume cut multiplied by the average figure per cubic metre cut; total forest area of the population multiplied by the average figure per hectare). Straightforward as it is, such an extrapolation is based once more on the implicit assumption, that the averages are derived from a random sample. Consequently, the results may be biased considerably.

Whereas (in case of a random sample of sufficient size) averages may be computed for any set of farms out of the sample, statistical inference has to rely on measures known for the respective (sub-)population.

Therefore, the limiting factor for inferences is the information on the typological features of all farms to be represented.

Aggregated output on a regional, national or even international level can either be delivered on demand or through standard output tables. It is advisable to establish a set of standard tables covering those items that will be asked for regularly and which are to be documented in terms of time series. Standard tables with aggregated results (average and standard deviation per enterprise or per hectare of woodland) could be designed for the following:

- forest area;
- type of forestry (from different viewpoints like: economic size, management systems used management goals, technical);
- size of enterprises;
- wood production (m^3);
- income from forest activity (split into its components); and
- return on capital investment.

Further output should be designed on request. Only where the individual data cannot be stored in a database, should the standard output be as comprehensive as possible to follow the precautionary principle not to lose any of the collected information.

7.3 Scientific Significance of Results

The monitoring scheme of an accountancy network is a powerful tool for research on the socio-economics of farm forestry, the network acting as a valuable source of empirical information. In particular the investigation of developments and trends may benefit considerably from this kind of data collection. Consequently, much of the empirical data on the socio-economics of farm forestry available so far stems from various farm accountancy networks, the scientific literature providing ample evidence as to the significance of this approach. Secondary scientific analyses may combine such data with further evidence gained e.g. by means of interviews or derived from other statistical sources.

Whereas addressees on the political level may tend to disregard the statistical quality of the information provided, this is usually regarded as a key consideration with the scientific utilisation of such data. Unless there is sound statistical evidence, one cannot claim the validity of any results, but may just refer to some hypotheses that have still to

be tested. However, even where the statistical quality of the results provided by the network is rather poor, the scientific process may well profit from such a source of empirical data, especially when considering alternatives. For instance, aggregated values provided by any accountancy network are valuable 'second best' input for models that would otherwise have to be based on 'guesstimates'.

The analysis of cost structures, trends and various relationships may stimulate a great variety of hypotheses, for example concerning the cutting behaviour of farmers or the significance of typological features as to their effect on the profitability of forestry (see e.g. Sekot, 1994). On the other hand, existing hypotheses may be confronted with empirical evidence stemming from the network. For instance, the validity of economic models can be tested on such a basis. However, the capability for the statistical testing of hypotheses will remain quite limited in most cases, because the network covers only a restricted set of variables and possibly does not account for all of the items required for specific analyses. On the other hand, it is worthwhile to try to use an existing accountancy network as a basis for collecting additional specific data relevant for some investigation. At least as far as research institutes are involved in running the network, there are good prospects for such cooperation in research.

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8 Prospects for International Comparability and Harmonisation

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Key points:

- Due to the lack of systematic monitoring, the main problem with the international comparisons on the socio-economic performance of farm forestry has been the lack of long-term and consistent data.
- There is a need for coordination between the statistics from various fields to avoid duplication and overlapping efforts: among the most relevant links are the other statistics related to forestry, agricultural statistics and the general statistics.
- One of the most crucial issues that needs to be addressed in the near future is the potential inclusion of forestry data in the FADN; the most likely solution seems to be a compromise, whereby the recording of forestry and other non-agricultural activities will be made voluntary for the inclusion in FADN records.
- It is not realistic to aim for identical and consistent monitoring systems in all countries, but by adopting the principles and procedures presented here, it is possible to get results that are, at least to a certain extent, comparable with each other.

8.1 Previous Attempts for International Comparisons

During the recent decades there have been numerous attempts at presenting international comparisons related to the socio-economic information on European forestry. Already in 1967 an international group of forest economists published a comprehensive report on "Cost studies in European forestry" (Stridsberg and Algvere, 1967). Since then, several individual studies have been conducted. An example of the most recent studies is the one conducted by the ECE/FAO on profitability, productivity and prices in the forest industries, including forestry primary production (UN-ECE/FAO, 1993).

The main problem with the international comparisons has been the lack of long-term and consistent data. This problem has been addressed in some recent investigations. For example, the European Confederation of Agriculture has published comparisons on the revenues from forestry between selected countries with an aim to draw up time series starting from 1958 (Wurz, 1993). However, the report does not claim to be of scientific accuracy.

Since 1986, the IUFRO Project Group P 3.04-00 "Small-scale Forestry" (since 1996, the IUFRO Working Unit 3.08.00) has had several meetings in which studies on profitability of small-scale forestry have been presented. The most important milestone so far, has been the preparation of the "Guidelines for the presentation of data about the profitability of private forestry" (IUFRO, 1989).

Following the IUFRO Guidelines, Olischläger (1993) conducted a comparative study on the profitability of small-scale forestry including information from Austria, Germany (covering only the state of Baden-Württemberg), Finland and Japan. In addition to the profitability results, the differences and common characteristics between the countries are discussed and the difficulties caused by various factors that complicate the process of making comparisons are highlighted.

In the context of the MOSEFA project, a survey was conducted in 1998 on the compliance of the current national farm forestry monitoring systems with the IUFRO guidelines. Each partner institution was asked to make a comparison between the IUFRO guidelines and existing accountancy networks in their countries in terms of presentation of data on the profitability of private forestry. They also were asked to give proposals on how the IUFRO guidelines should be developed further.

Only six countries were able to make the comparison – mainly due to the fact that in the other countries there were no such monitoring systems existed that could be compared with the IUFRO guidelines. The countries that could make the comparison were Austria, Belgium, Germany, Greece, Norway and the Netherlands. In addition, some countries provided suggestions on how to develop the IUFRO guidelines.

The questions of comparability were addressed to the following details:

- forest holding size classes used;
- use of own labour;
- own consumption of forest products;
- income from products other than timber;
- interest on capital;
- interest rates;
- depreciation rates;
- subsidies;
- value added tax;
- calculation schemes for profitability indicators; and
- presentation of profitability results and other accounting ratios.

In the responses received, in general, the compliance of national monitoring systems with the IUFRO guidelines was considered as good. However, only Germany (in fact, the state of Baden-Württemberg) would be able to produce all the information following the IUFRO guidelines in all of the details listed above. In the other five countries, various adjusting measures would be needed to reach better compliance. Those adjustments were seen as being possible, although, in most cases they would require some adjustment for the present monitoring systems. The application of the size classes proposed in the IUFRO guidelines would probably cause the biggest problems in the comparisons because most of the countries are using some other hectare limits in their classification. Another point that came out in the responses was that in some countries, regional data could be more relevant and useful than countrywide data.

8.2 Links to and Relations with Other Statistics

When establishing a new farm forestry accounting network – or when further developing an existing one – there is a need for coordination with the statistics of other fields to avoid duplication and overlapping efforts on the one hand, and to utilise any synergies on the other. Among the most relevant links are the other statistics related to forestry, agricultural statistics and the general statistics. These all should be explored both at a national and an international level. In addition to the prevailing contents of those statistics, it is important to explore also the future plans for developing the contents and the data collection procedures.

The European forestry statistics are currently compiled by the Inter-secretariat Working Group (IWG), which consists of UN-ECE/FAO, Eurostat and DG VI of the European Commission (Lin, 1998). This is to avoid the overlapping of forestry data collection activities by these organisations. The work has resulted in the preparation of joint questionnaires for the collection of statistical data on forest resources, forest products and forest fire. The definitions used in the joint questionnaires are internationally accepted.

Unfortunately, the availability, and especially the comparability, of the information on European farm forestry are rather limited because there is no official definition for 'farm forestry' in the questionnaire. Finding specified information on farm forestry is, therefore, quite problematic.

As Lin (1998) concludes, it is important to start the process so that a set of harmonised definitions can be used in EU forestry. This process could begin, for example, as a part of the implementation of the European Union Forestry Strategy (Commission of the European Communities, 1998) where the establishment of the European Forest Information and Communication System (EFICS) is among the proposed measures.

In addition to the lack of the common concept of 'farm forestry', another problem is that the forestry statistics are mainly concentrated on the productive function of forests and socio-economic information is almost totally missing. Some principal figures, such as wooded area by holding size, on farm forestry can be found in the 'Eurostat Forestry Statistics 1992–1996'. The figures are derived from Eurostat's 1995 farm structure survey. These surveys are carried out at roughly two- to five-year intervals with the primary objectives of assessing the agricultural situation in the European Union and monitoring trends in the structure of agricultural holdings. The individual data transmitted by the Member States are stored in the EUROFARM database. The 1995 survey was the first occasion on which data from Austria, Finland and Sweden were made available to Eurostat.

Regarding the potential links to agricultural statistics, as discussed in Chapter 2, there is a certain interest in a more detailed collection of forestry data on agricultural holdings within the EU-FADN (Brookes, 1998a). This would be in line with the plan to expand the FADN-system to cover not only agricultural activities, but more broadly also the non-agricultural activities on a farm.

Whether or not the inclusion of forestry data in the FADN will be realised, is a political decision. The most likely solution seems to be a compromise: the EC funded RICASTINGS project, investigating the feasibility of a new farm return to improve the performance of FADN, proposes to make forestry and other non-agricultural activities voluntary data (Abitabile et al., 1999, p. 56). This would mean that these guidelines would be of great value to the countries that decide to include also forestry activities in their FADN. Actually, in the RICASTING project report, the group of experts from different countries of the European Union refers to the ongoing harmonisation work in the field of forestry under a concerted action at the European level (Abitabile et al., 1999, p. 56).

8.3 Standardisation vs. Harmonisation

The introductory chapter of these guidelines concludes that there is a need for creating commonly applied principles and tentative methodological bases for monitoring the socio-economic performance of farm forestry enterprises. This is because the methods for monitoring applied at a national level have been very heterogeneous and often based on specific surveys implemented for solving some specific problems, rather than long-term monitoring.

The experiences gained in the countries participating in the MOSEFA project indicate that the production of comparable and consistent information on the socio-economic performance of farm forestry is a challenging task and involves many practical problems (Hyttinen and Kallio, 1998b). Even the countries with a long tradition of accounting data networks have various problems related to the selection of the sample, and especially to the maintenance of a statistically sound and representative monitoring network. Therefore, when aiming at comparable and consistent information, it is important to realise and pay attention to the various practical difficulties.

In international comparisons, it has to be accepted that the data are not produced in a consistent way among the countries involved. Because of the fact that different countries are at different phases with regard to the adoption and use of the monitoring systems and accounting networks, it is not realistic at this stage to aim at a fully standardised monitoring system at the European level.

Instead of a full standardisation of the monitoring systems, a more realistic approach is to work towards broader harmonisation. This means that it is not realistic to aim to establish identical and consistent monitoring systems in all countries. However, by adopting the principles and procedures presented here, it is possible to get results that are, at least to a certain extent, comparable with each other.

As far as the monitoring of socio-economic conditions of farm forestry is to be implemented in terms of voluntary extension of the FADN, it is recommended that standards should be elaborated and applied by all countries interested in such information. These standards should be included in the FADN handbook so that unambiguous protocols are generally available. Harmonisation of the monitoring of farm forestry socio-economics by following general recommendations should be a general principle also when establishing farm accountancy networks independent of the FADN.

9 Summary and Conclusions

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Key points:

- Monitoring of the economics of farm forestry is needed to assess the profitability of forestry, as well as the impacts of the changes in economic and political environment at the farm level.
- Despite the workload in establishment and maintenance, an accountancy network is suggested as the most appropriate method for estimating and monitoring the economic performance of farm forestry enterprises.
- A functioning database system using farm level or aggregated information can be used to produce standardised reports as well as customised outputs for various interest groups.
- The principal aim of accounting information is to support decision making in farm forestry related issues.

9.1 Why Guidelines?

Monitoring of the economics of farm forestry is needed in order to assess the profitability of forestry as well as the farm level impacts of the changes in economic and political environments. The most recent changes that have or will likely impact on the economics of farm forestry include Agenda 2000, rural development policies, demands for sustainable forestry, changes in national forest policies, forest certification requirements and EU's Common Agricultural Policy reform. The basic problem is that the farm level impacts of these changes are not possible to estimate without a methodologically sound monitoring system.

The principal objective of these guidelines is to provide assistance for developing a generic monitoring system for the assessment of the socio-economic performance of farm forestry enterprises. The guidelines are designed to assist the economic monitoring for farm forestry enterprises

through the compilation and development of monitoring methodology. Implementation of monitoring work and practical application of the guidelines is left for more detailed studies in the future.

The guidelines have approached the objective of monitoring the economics of farm forestry enterprises from the perspective of forestry accounting. Some recommendations are introduced as how to overcome the difficulties of accounting in forestry and how to help to improve the harmonisation of the protocols used for farm forestry accounting in Europe. Since different European countries are in different phases in farm forestry accounting, it is important to maintain flexibility within these recommendations for national applications. Fully synchronised systems are not seen a realistic target at the moment.

In order to be able to achieve a wide application of the principles of these guidelines, the requirements of various stakeholders have to be considered. In doing this, it becomes more possible than previously to provide information on key economic issues for forest owners, forest owners' associations, forest advisory organisations, as well as policy makers and researchers by adopting and implementing the presented farm forestry monitoring principles. In addition, by adopting a broad conceptual definition of farm forestry, a highly diverse set of forestry activities can be considered under the accounting networks.

An example of a well functioning accounting network is the Farm Accountancy Data Network (FADN), where approximately 58,000 agricultural holdings in the EU member countries are systematically surveyed. Unfortunately in many countries forestry data in the FADN system is omitted. Nevertheless, as the FADN network has a high coverage of farms in the sample, it logically provides a basis for developing the farm forestry accounting systems in a generic manner. At present, however, there are two major problems to overcome. These are the exclusion of relevant forestry activities from the current FADN system and a lack of coordinated activities directed at extending monitoring into farm forestry in a systematic way.

9.2 How to Establish a Monitoring System?

To be able to establish a representative sample of farm forestry enterprises, comprehensive and up-to-date information on the total population of the enterprises in question is necessary. As the information on the total population is seldom complete, information deficits need to

be considered together with the costs of improving the sample representativeness. In many cases the optimal approach is not to strive for a total representation of the underlying population, but to reshape the population under investigation by defining respective cut-offs. It may be advisable to leave out of the sample those parts of the population that are of minor importance or especially costly or difficult.

The population being investigated is often selected using a multi-stage stratification procedure, which requires specific information on farm forest enterprises in advance. In the stratification, farm forest enterprises are selected from the population according to, for example: the significance of forestry for the total economy of a farm, forest area, annual felling, etc. After the basic population is defined, the sample for the actual monitoring is selected with the help of various sampling techniques.

Apart from accuracy, validity, reliability and representation, which are key features affecting the quality of results, the statistical quality of an accountancy network is also affected by self selection bias and panel effect. The self selection bias may be of considerable importance if those respondents that agree to participate are more interested in the performance of their businesses than those who are not willing to participate in the sample. The panel effect may affect the results of an accounting network if those farm businesses, which were originally selected for the sample, develop differently to those in the population as a whole.

Despite the workload in establishment and maintenance, an accountancy network is considered the most appropriate method for monitoring the economic performance of farm forestry enterprises. However, the shortcomings of the approach should be explicitly considered prior to the development and establishment of an accountancy network.

Once the sample is established, data are collected from the sample enterprises either by special enumerators or it is reported to a database by a farm forest owner. The benefit of the former approach is that since the data are recorded by a specialist, it usually has fewer mistakes. The benefit of the latter, is that data collection is much less expensive. In both cases, the data collected should be checked before data processing.

The accountancy data itself, is a delicate matter involving questions such as tax secrecy and data protection. To be able to collect accurate data, the prospective participants have to be informed of the kind of data collected and stored, the organisations involved and the intended

use of the data. While it is important to provide this information, the feedback of economic data is the key element for achieving a voluntary participation in an accountancy network.

9.3 What Information Monitoring System Can Provide?

Once collected accountancy data can be processed according to the principles of: *financial accounting* with the objective of determining the financial profitability and asset value of an enterprise; *cost accounting* with the objective of providing information on costs; and *management accounting* with the objective of providing information to assist the management of a farm forest enterprise. Management accounting and financial accounting can broadly be seen as alternatives, cost accounting being the base for management accounting as explained in Chapter 5. Notwithstanding the normal considerations for any enterprise in business, these three accounting approaches involve some special considerations in order to be able to fulfil the goal of monitoring the economics of farm forestry. These include:

The change in the value of standing timber. Changes in timber volume, changes in the proportions of timber assortments, real changes in the market value of timber, or inflation, all impact on the value of standing timber. If the value of standing timber changes over the year, the difference is normally included in the income statement as an income (or as a cost if the difference is negative). The other option is to place the change in the value of standing timber after the overall profit and include it only into the adjusted profit. Even the latter option is not in line with general principles of business accounting, it is often applicable in forestry as the change in the timber volume in practice is not realised annually. This is the case especially when the annual growth is higher than the annual harvests.

Value of forest owners own work. In addition to the change in the value of standing timber, the value of family labour is another major issue in farm forestry that cannot be ignored in the profit and loss account, without distorting the picture of the economic performance of the enterprise. The recorded working hours of farm forest owners and family members, who are not actually paid of their work, can be priced according to opportunity cost of the work, ordinary forest

worker's wage or unit cost of work (EURO per hectare, for example). The value of forest owners own work can be placed after the overall profit when it is included only to the adjusted profit assessment.

Joint costs between agriculture and forestry. At the farm level there may be cost items that cannot be clearly fitted solely into one cost centre. Such costs may for example refer to machinery or overheads that have some cost centres in agriculture and forestry. The problem can be solved by providing separate cost centres for the items in agriculture and forestry, or by sharing the joint costs between agriculture and forestry. A recommended alternative is to consider the joint cost problems in data collection and data recording.

A simplistic system for data collection and analysis for total economy of farm would separate and distinguish the forest entities from the owner's other entities. However, as in practise these entities often form a single enterprise and they share many resources such as funds, debts, expenses and fixed assets, it is sometimes more practical to jointly assess the various entities of a farm forest enterprise.

Often the monetary information collected at the farm level has to be combined with non-monetary information such as physical quantities of input and output (cubic metres, hectares, etc.), measures describing forest resources (age class, etc.) as well as purely qualitative information (skill, education, etc.). In addition, forest services are sometimes of high value for forest owners and various stakeholders, and should be explicitly considered in accounting. Such items as hunting, recreation, amenity values and nature protection may well exceed the monetary value of timber production in specific cases. They should therefore be included in the assessment of the economic performance of a farm forest enterprise as far as possible. Two major problems here are the exclusion of *in-situ* and *ex-situ* consideration, and a lack of standard methods for environmental and social accounting.

Any farm forestry database should be able to provide information meeting the needs of various interest groups. A functioning database system modifies data from an external database for the calculation purposes and produces required reports and/or inputs for further processing. An essential element in a functioning database system is the external database where data are stored at as disaggregated level as possible. By storing the data at a disaggregated level, possibilities for data processing are more numerous than if the data was stored at a more aggregated level. The most essential elements in a database

system are labour costs, other costs, wood revenues, other proceeds, machinery and buildings.

It is possible to derive standardised reports as well as more customised outputs from a functioning database system. To support management decisions, these outputs are possible to estimate at the level of an enterprise, using a balance sheet and a profit and loss account, or with the help of a master balance sheet. In addition to the absolute figures available in the master balance sheet, ratios referring to the relative profitability of forestry that are often of major importance, can be derived. Various ratios can be used for assessing the economic performance of an enterprise in question over a certain time period, or for the comparison of the profitability with other similar enterprises.

The outputs of an accountancy network are often extrapolated to describe various aggregates of enterprises and the population underlying the sample. The accuracy of extrapolated results is determined by the statistical quality of the sample. In the assessment of average figures of profitability, for example, an implicit assumption is made that the sample is randomly selected. As this is seldom the case, presenting only the average profitability figures may over- or under estimate the results. Therefore, at least the standard deviation associated with means should be calculated and explicitly presented alongside the averages (although its calculation also relies on the assumption of a random sample).

In assessing the profitability of forestry and the impacts of various policy changes on farm forest enterprises, the outcomes of an accounting exercise should be considered alongside other available primary or secondary information. These sources of additional information include available statistics, comparable information from FADN, as well as information derived through various forestry accounting surveys and sector model calculations.

Although a network of farm forestry accounting is obviously the most promising system for providing relevant information for various interest groups and comparative analyses, it is important to realise its limitations. Above all are the difficulties relating to the establishment and maintenance of a statistically sound and representative network. In addition, various practical difficulties including organisational arrangements, data processing and reporting, also need to be resolved before implementation of an accounting survey. It is therefore important to adopt a principle of 'realistic optimism' as a starting point. Nevertheless, since the demand for information of the economic performance

of forestry at farm level is increasing, the efforts and resources used for developing of farm forest accountancy networks are justified in order to satisfy the information requirements of various interest groups.

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Glossary

3-P sampling
: Efficiency-oriented approach based on ex-ante available information where the measurements are concentrated on the most significant units

agricultural census
: Periodically updated, official enumeration of farms as stipulated by EU regulations

allowable cut
: Planned felling volume, usually referring to a sustainable level of wood harvest

asset
: Anything having commercial or exchange value that is owned by a business, institution or individual

balance sheet
: Financial report, also called statement of financial position, showing the status of a company's assets, liabilities and owner' equity on a given date

benchmarking
: Approach for deriving management information by comparing specific ratios of the own business with those of the one enterprise showing the best performance in this respect

break even point
: The volume of sales necessary to start showing profit, the sales revenues equalling total costs and there being neither profit nor loss

cash margin
: Liquidity ratio. The measurement of the adequancy of revenue financial of company based on cash flow. Cash flow is an analysis of all the changes that affect the cash account during an accounting period

category of holding
: In the FADN, the typology of holdings is based on the composition of the total standard net return of the farm

cluster sampling
: Two-stage sampling technique, where at first sub-populations (e.g. regional entities) are selected, which are then represented by samples

cost accounting
: Branch of accounting concerned with providing the information that enables the management of a firm to evaluate production costs

corporate analysis
: An information-processing system developed to offer relevant data from both company's real and monetary process for decision-makers

credit
: In general: loans, bonds, charge-account obligations and open-account balances with commercial firms
: Accounting: entry that increases liabilities, owners' equity, revenue and gains, decreases assets and expenses

cut-off
: That part of an original population systematically excluded from an investigation

debit
: Debit balance is account balance representing money owed to the lender or seller

EFICS
: European Forest Information and Communication System

equities
: Excess of security over debit balance in a margin account

FADN
: Farm Accountancy Data Network is a harmonised information system, which provides accounting data on the physical, structural and economic characteristics of farms in the European Union

financial accounting
: Financial accounting gives a picture on the overall profitability, the financial situation as well as the assets value of an enterprise, recording all business transactions of an enterprise

financial statement
: Written record of the financial status of a business organisation. The financial statement includes a balance sheet and an income statement and may also include other statements

fixed cost
: Cost that remains constant regardless of sales volume

fluctuation of the sample
: Unintended changes in the composition of a sample that is used repeatedly for monitoring purposes (panel)

guess estimate
: An estimate based on very little knowledge

imputed costs
: The costs attributed to using an asset, which a producer does not buy or hire, but already owns, e.g. imputed depreciation allowance, imputed interest charge or implicit entrepreneurial wages

income statement
: Profit and loss statement. Summary of the revenues, costs and expenses of a company during an accounting period

inter-firm comparison
: Approach for deriving management information out of the comparison of business results between businesses trading in a similar line of business

intermittent working
: Management regime especially common with small farms, harvesting for selling timber being performed not every year but at irregular intervals

IUFRO
: International Union of Forestry Research Organisation

liabilitities
: Claims on the assets of an company or individual-excluding ownership equity

liquidity
: Ability of an individual or company to convert assets into cash or equivalent cash without significant loss. Liquidity ratio measure of a firm's ability to meet maturing short-term obligations. Liquidity ratios measure ability to pay short-term debt

management accounting
: Management accounting provides information to assist management in its function to optimise economic efficiency and achieve the set goals

master balance sheet
: Comprehensive cost statement for an accounting period simultaneously providing a breakdown of costs according to types of cost for each cost centre

money flow analysis
: An analysis of all the changes that affects the money account during an accounting period. Includes cash flow analysis and quick flow analysis

non-response bias
: Bias introduced by selected units of investigation refusing cooperation

NUTS
: Nomenclature of Territorial Unit for Statistics is the French acronym for the European system of regional classification defining geographical units at different levels for each member country of the EU

opportunity costs
: This is the cost of a good or service in terms of the value of the next best alternative good or service that has been sacrificed to obtain it, that is the amount of money one has lost by taking a certain opportunity

panel effect
: Bias associated with a sample that is used repeatedly for monitoring purposes and that is developing in another way than the true average of the population, e.g. due to the exclusive provision of management information

partial rotation
: Purposive replacement of part of the elements of a sample that is used repeatedly for monitoring purposes (panel)

profit and loss accounting
: Summaries the revenues, costs and expenses of a company during an accounting period

purposive sampling
: Technique, where subjective judgement is applied to identify an especially useful set of respondents

quota sampling
: Two-stage technique of sampling, where the number of units to be sampled within each sub-population is derived from respective statistical analysis

random sampling
: In this case, each element of the population has the same probability of being chosen for the sample. A random sample is a basic condition for the applicability of several statistical measures and techniques

ratio analysis
: The major tool of financial statement analysis, used in making credit and investment judgments, which utilizes the relationships of

figures found in financial statement to determine values and evaluate risks and compares such ratios to those of prior periods and other companies to reveal trends and identify eccentricities

ROA
: Return on assets

ROE
: Return on equity

reliability
: Qualitative characteristic of a measurement describing to what extent successive measurements of the same item show similar results

rotation of the panel
: Partial or total exchange of elements of a sample used repeatedly for monitoring purposes

quick flow margin
: Liquidity ratio measured the going concern approach. The measurement of the adequancy of revenue financial based on quick flow

sampling frame
: A concept based on operational definitions identifying that part of a population to be effectively characterised by a sample as well as the units of investigation

sampling ratio
: Size of the sample given as percentage of the size of the population

self selection bias
: Bias introduced by the individual decision of the respondents whether to participate in an investigation or not, those interested in the topic being more likely to agree to participation and thus being better represented than the others

solvency
: Solvency ratios measure the ability to carry and to raise long-term debt. State of being able to meet maturing obligations as they come due. The two aspects of solvency are the relationship between debt and equity and the ability to pay long-term debt

standard net return
: Standardised farm revenue as derived from models quantifying the profitability per unit of each crop or line of production

stratification
: Measure for enhancing the efficiency of a sample by introducing sub-populations significantly differing from one another in terms of the target variable

surrogate
: A measure or data substituting the original item of interest

systematic sampling
: Technique for selecting units to be sampled by referring to some rule like: 'select every n-th element as represented by a record'

trebit
: Measurement of the force of the entity

UN/ECE
: United Nations/Economic Commission for Europe

unit costs
: The total cost of producing a number of units of a product over time divided by the number of units

validity
: Qualitative characteristic of a measurement describing to what extent the measures and techniques applied are appropriate

variable cost
: Cost that changes directly with the amount of production