Contributions
to
Forestry Accounting

Compiled by
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University of Natural Resources and Applied Life Sciences Vienna
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IUFRO as the International Union of Forest Research Organisations was founded in 1892 and is now 105 years of age. It is an independent NGO comprising 724 member institutions from 115 countries around the globe (data end-1996). Its main objective was and is to promote research in forestry sciences around the world. Every 5 years a world congress brings together, some 4,000 forest scientists. The latest congress was held in 1995 in Tampere (Finland), while the next congress in 2000 will bring the congress for the first time to a developing country – Malaysia. In the inter-congress period the divisions and working units carry out everyday work. Today IUFRO is organised in 8 Divisions – from Silviculture (D1) over Inventory, Growth, Yield, Quantitative and Management Sciences (D4) through to Forest Environment (D8) – and these are again subdivided into overall 63 research groups and 203 working parties (Table 1). Furthermore 5 task forces are addressing interdivisional issues of currently high importance (IUFRO, 1997).

Table 1: IUFRO’s divisional structure

<table>
<thead>
<tr>
<th>IUFRO Division</th>
<th>Research groups</th>
<th>Working parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1 Silviculture</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>D2 Physiology and Genetics</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>D3 Forest Operations and Techniques</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>D4 Inventory, Growth, Yield, Quantitative and Management Sciences</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>D5 Forest Products</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>D6 Social, Economic, Information and Policy Sciences</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>D7 Forest Health</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>D8 Forest Environment</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>63</strong></td>
<td><strong>203</strong></td>
</tr>
</tbody>
</table>

Following are some essential remarks on the aims and tasks of IUFRO, which are consequently also objectives of the two working units (BUCKMAN, 1995):

- to promote international cooperation in forestry related scientific studies,
- to facilitate exchanges of information and ideas globally among individual scientists,
- to encourage establishment of common research programs and cooperation,
- to promote the dissemination and application of research findings,
- to assist forestry research and application in developing countries, and enhance the capacity to conduct such research,
- to work toward uniformity of nomenclature and standardisation in matters such as information storage and retrieval.

Among others, the subsequent means seem particularly suitable to achieve these objectives:

- Encouragement of communication,
- Distribution of newsletters in various forms (with the Internet being a powerful tool for this purpose),
- Organisation of periodic conferences and study tours on a variety of scientific and technical subjects,
- Publication of conference proceedings,
- Fund-raising to assist active participation from developing countries,
- Establishment of common research programmes.

The working group Managerial Economics, which already exists since 1981, has – besides being a forum for the exchange of scientific ideas, findings and experiences within the international research community – the aim to take up present issues of forest economics, to encourage their discussion and thereby to con-
tribute to the solution of economic problems in forestry. A particular mission is assisting the countries in transition in their efforts. The function as bridge between east and west was always of high relevance. Alternating conferences were organised in east and west. Nearly every year a successful meeting took place (Table 2).

The first chairman, Prof. Ruprich, came from Czechoslovakia. The first convention was organised in 1985 in Brno (now Czech Republic) – as contacts between east and west were still very difficult. Easterners could not travel to the West due to political and financial constraints. Particularly some Westerners thought the differences between managerial economics in the eastern planned economies and in the western market economies were so different, that there could be virtually no mutual inspiration and understanding. The situation has changed considerably since 1990.

The issues addressed so far and the venues of conferences are also shown in Table 2. We started off in 1985 in Brno with a kind of survey of technical problems and current research efforts, had the first meeting in the West in Austria in 1988 on the evaluation of forest damage. In 1990 considerable western participation could already be recognised in the East and finally in 1995 the sessions on accounting established the beginning of the new research group accounting. All the time we dealt with current issues:

- Planning models and decision support systems
- EDP in management and administration
- Evaluation of forest damage
- Evaluation of non-market benefits
- Marketing
- Accounting.

More information can be found in the book "Contributions to Managerial Economics in Forestry" (JÖBSTL, 1995).

Table 2: IUFRO S4.04-02 and 4.13.00 – Meetings and Publications

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Title of the meeting / publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>Czechoslovakia</td>
<td>Current Problems of Managerial Economics in Forestry</td>
</tr>
<tr>
<td>1986</td>
<td>Yugoslavia</td>
<td>Monitoring of Environmental Impacts by Forest Management Planning</td>
</tr>
<tr>
<td>1987</td>
<td>Czechoslovakia</td>
<td>Production Possibilities of Forests, their Optimal Utilization and Management of Forest Enterprises</td>
</tr>
<tr>
<td>1988</td>
<td>Austria</td>
<td>Economic Assessment of the Damage Caused to Forestry by Air Pollutants / Forest Decline</td>
</tr>
<tr>
<td>1989</td>
<td>Hungary</td>
<td>Computer-Based Automated Management Systems in Forestry</td>
</tr>
<tr>
<td>1990</td>
<td>German Democratic Republic</td>
<td>The Interlacement of Enterprise Management and Forest Management Planning in Forest Enterprises</td>
</tr>
<tr>
<td>1991</td>
<td>Germany</td>
<td>Evaluation of the Unpriced Social Benefits Provided by Forest Enterprises</td>
</tr>
<tr>
<td>1992</td>
<td>Germany</td>
<td>Forest Management Planning and Management Science – Guarantors of Sustainability</td>
</tr>
<tr>
<td>1993</td>
<td>Russia</td>
<td>Forest Product Marketing and Non-market Usage of Forests</td>
</tr>
<tr>
<td>1994</td>
<td>Poland</td>
<td>Marketing in Forest Enterprises</td>
</tr>
<tr>
<td>1995</td>
<td>Finland</td>
<td>Accounting and Finance in Forestry and Timber Industries</td>
</tr>
<tr>
<td>1996</td>
<td>Scotland</td>
<td>Non-Market Benefits of Forestry</td>
</tr>
<tr>
<td>1997</td>
<td>France</td>
<td>Recent Developments in Accounting and Managerial Economics for an Environmentally-Friendly Forestry</td>
</tr>
</tbody>
</table>

So far the history, and now some words about the future:

- Institutional aspects of managerial economics in forestry,
- Managerial economics of forests within nature parks or
- Managerial economics in plantation forestry have been defined as prospective topics for the Managerial Economics group by the current coordinator Prof. M. Merlo. While earlier the members of the group came mainly from Central, Eastern and Northern Europe, it is Prof. Merlo's merit, that the romanic countries of the Mediterranean region and also of South-America are now included and involved in the activities of IUFRO working party 4.04.02.
The research group Accounting strives to resume the international activities in forestry accounting, after some thirty years of inactivity in this field, following the last initiative in the sixties by the successful IUFRO group around Prof. Brabänder. Especially the manifold developments in social and environmental accounting need to be examined, but also the unsolved problem of the valuation of the growing stock or decision oriented accounting issues require further attention.

This group is interdisciplinary and encompasses essentially the four fields of expanded management accounting shown in Figure 1: financial accounting, cost accounting, social and environmental accounting, and also national accounting.

According to this expansive field it is intended to subdivide the research group into four working parties:

1. Management Accounting,
2. Financial reporting and Tax Accounting,
3. Environmental (and Social) Accounting

Details on the plans and projects and the structure of the group can be seen on the Internet (under the URL: http://iufro.boku.ac.at/iufronet/d4/wu41300/ab41300.htm).

The most important results so far are the current survey on the state of accounting in Europe (and world wide).

It is obvious, that the circumstances in the different countries are highly diverse, especially concerning the legal situation and the manifold influence factors on accounting and the information needs, such as type of ownership, size of forest holdings, organisational forms of the enterprises, etc. All this has a major effect on official accounting. Furthermore the economic situation – the enterprise being profit-oriented or subsidised – has considerable impact. In internal accounting there are some common features, and there we consider that calculatory and decision-oriented accounting, but also reports to the general public, should gain greater importance and be dealt with in the context of international cooperation.

A very important issue – a prerequisite – is the harmonisation in the field of terminology. A very important and indispensable starting-point is to ensure that we are talking about the same objects and matters. The standardisation of terminology is also obligatory to be able to compare economic data.

In a questionnaire directed to all members of IUFRO 4.13.00 the members were asked to state their views concerning the future research programme of the group. As of April 1997 37 members have stated their views so far.

The ranking according to what the members consider to be topics of particular importance and in need of further research attention is presented in Table 3.

According to the willingness to actively participate in joint research activities of the research group the topics shown in Table 4 can be considered most important.
A joint research project should essentially deal with "Accounting as tool for forest management", a topic that was favoured by most of the members.

After the joint foundation session in Tampere 1995, both groups have now conducted two meetings together – one in Edinburgh 1996 on non-market benefits and accounting and in 1997 in Nancy – and will also continue the close collaboration in the future. In this year's meeting we are going to discuss recent developments in accounting and managerial economics for an environmentally-friendly forestry.

In this sense I hope that this meeting will get us somewhat further and enables us to distinguish the main topics for our future work. I look forward to a fruitful congress and wish you all a pleasant stay in Nancy.

References


IUFRO 4.13.00 "Managerial, social and environmental accounting" (Internet Homepage) URL: http://iufro.boku.ac.at/iufronet/d4/hp41300.htm

ON THE STATE OF FORESTRY ACCOUNTING
IN SOME EUROPEAN COUNTRIES*

Hans A. JÖBSTL and James N. HOGG

Abstract
A survey on the present state of forestry accounting in a number of European countries shows disparities mainly in the field of financial accounting/reporting due to a multitude of external factors, beginning with the legal environment right through to structural characteristics of forestry in a particular country. The sizes and ownership types of the forest enterprises, their legal forms and taxation of income from forestry are the most important determinants.

Cost accounting as a major internal information source is, in principle however, more homogenous, as the subjective information needs display greater similarities in the various European countries. Different stages of development have been achieved within the branches of management accounting. Many forest enterprises do not have any cost accounting, some none beyond that for retrospective statistical information from annual cost and profit accounting, as is frequently carried out for accounting data networks. Prospective, planning and decision-oriented cost accounting and controlling are reported in very few cases.

New demands on information needs lead to new branches of accounting, using established as well as new tools. Due to these changes, the efficiency of traditional management accounting, where applied, is considered to be decreasing. The variety of products in multifunctional forestry, altered strategic success factors and additional constraints require modified information technology, as the production process and the interchange relations to the business environment are getting more complex.

Key words: forestry, financial accounting, cost accounting

1 Introduction
Following repeated requests for general recommendations on forestry accounting (e.g. WEEBER, 1923; PELLETER, 1933), and some initial assays, the first major attempts to harmonise forestry accounting date from the 1950s. Starting at national level, recommendations for uniform charts of accounts (e.g. the first recommendation for a chart of accounts adapted for forest enterprises in Austria was published in 1962) and cost centre frameworks were intended to provide a minimum of standardisation, which in the 1960s was also transferred onto the European level. The aim of these efforts towards harmonisation was the comparability of profitability data, which was used in reporting on the economic situation of forestry, and the promotion of accounting tools and cost awareness in forest enterprises.

The IUFRO working group Forest Accountancy of former Section 31 (Forest Economics) was the main driving force behind this initial striving for harmonisation in forestry accounting, primarily dealing with terminology, the conception of forestry charts of accounts and performance accounting (BRABÄNDER, 1996). Also in the 1960s, a group of European forest economists drafted a report on the cost and revenue situation of forestry in seven countries (STRIDSBERG and ALGVERE, 1967).

A new surge in international cooperation in the field of forestry accounting was initiated with the sessions of IUFRO S 4.04-02 (Managerial Economics) during the World Congress at Tampere in 1995, which resulted in the establishment of a discussion forum. The problems of forestry accounting will be studied by this newly installed research group 4.13.00 (Managerial, social and environmental accounting). Objectives of the group are the exchange of experience, improvement and, in parts, harmonisation of accounting in forest enterprises.

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1 Weebear wrote in 1923: “The person who succeeds in finding a uniform book-keeping and control system that could be taught as a standard system in schools and universities and be introduced in most of the enterprises, should receive immortal credit. This, however, is not likely to be feasible, due to the great variety in forestry.” [translated from the German].

2 Pelleter was a member of a working group on book-keeping, installed by the in the Austrian Forest Society in 1931, that tried to give general recommendations for accounting and book-keeping in forestry.
A prerequisite for this undertaking is seen in an analysis of the present situation in the various countries. This paper will attempt to describe briefly the state of forestry accounting in some European countries, to compare important characteristics and influence factors, and to emphasise new developments and advances towards new methods and instruments.

As compared to externally oriented and legally determined financial accounting, which is comparatively well documented and provided most of the material in the survey, management accounting – decision-oriented preparation of economic information – which is the main concern of the ongoing efforts, has been somewhat neglected up to the present. Particular attention is given to the treatment of growing stock and consideration of growing stock changes in forestry accounting.

Besides the analysis of the current state, the harmonisation or accordan of terminology (earlier attempts by IUFRO; ABETZ, 1963) – as basis for any joint work, further comparisons and harmonisation of profitability surveys – is going to be one of the issues the new IUFRO research group will have to deal with. Due to the structure of forest holdings with many small and medium sized forest enterprises and few companies, a harmonisation or even standardisation of financial reporting in forestry is of little relevance for forest business economics. From the viewpoint of managerial economics the improvement and development of tools and techniques in forestry accounting are issues of greater significance for activities involving international cooperation. It should be possible to improve accounting by observing how other countries are reacting to problems, which may not differ markedly from the situation in the observer's home country.

2 Overview on forestry accounting

In order to be able to describe and analyse the present situation of forestry accounting in different countries a comprehensive model with four principle branches of management accounting, shown in Figure 1, was devised as the ideal and visionary conception. In addition to the traditional components of management accounting – financial and cost accounting –, this broad conception includes recently much discussed social and environmental accounting.

This (ideal) model was the yardstick used in the questionnaire of the survey on the state of forestry accounting in 21 countries in 1996. Coming straight to one of the general conclusions, only a few elements and instruments specified under cost, social or environmental accounting were found to be in operation in forestry enterprises.

3. Materials and Methods

The following elements created the basis for studying the current situation of forestry ac-
counting in the different countries:

• **Survey – essentially based on the questionnaire**
  Starting from the comprehensive view of management accounting mentioned above, basic data on forestry accounting from 21 countries (world-wide) was recorded by means of the questionnaire distributed.

• **Survey of literature**
  The survey of relevant literature is limited to publications that are written in comprehensible languages (essentially publications in German, English or French) and available (either directly in Austria or, in isolated cases, supplied by members of the research group). Due to the business economics tradition, the material in German is comparatively extensive, whereas, for example, Anglo-American economists are traditionally largely involved in micro- and macro-economics.

• **"Research on-the-spot" – Case studies**
  Many aspects cannot be explained by solely studying the available literature and analysing the results of the questionnaire. Visits to study solutions on the spot and discuss situation and concepts with experts and users of accounting information are indispensable.

4 Comparative aspects in forestry accounting

If forestry accounting were identical in all countries of the world, there would be little point in studying the comparative, international issues of forestry accounting. The fact is that this is not the case and this constitutes the raison d'être for the following analysis of influence factors, state and implications of the present diversity in forestry accounting.

4.1 **Analysis of important influence factors on the organisation of accounting**

According to NOBES and PARKER (1995) general accounting identifies four groups of influence factors and reasons for international differences in accounting:

<table>
<thead>
<tr>
<th>Influence factors and reasons for international differences in accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Culture and historical development</td>
</tr>
<tr>
<td>• Politics</td>
</tr>
<tr>
<td>• Legal system</td>
</tr>
<tr>
<td>• Economy</td>
</tr>
</tbody>
</table>

The differences in accounting are hence not accidents of history, but induced by disparities in the economic, legal and social environment. The variance can therefore be described by referring to the **socio-economic context** (MACHARZINA, 1981; NOBES and PARKER, 1995). Among others, the influence factors shown in Overview 1 can be identified in detail.

4.2 **Influence factors on the organisation of forestry accounting**

For forestry accounting we consider the following influence factors particularly relevant and significant for characteristic variances between different countries (see also Figure 2):

![Figure 2 – Influence factors on forestry accounting](image)

Important influence factors on forestry accounting as shown in Figure 2 include the structure of forest ownership and the size structure of forestry holdings as well as other features of the socio-economic environment, in this context especially the development of the national economy, business economics and forestry tradition and relevant decrees and laws.

It is important to note that from the 45 countries in Europe only general data on forest area, standing volume and annual removals are available from all countries (UN-ECE/FAO, 1992; Kuusela, 1994). Socio-economic data on characteristics, such as forest ownership, number and size of forest enterprises, are lacking from many states. Only
Figure 3 – Percentage of forest land in regard to total land area in six European countries (KJUSELA, 1994)

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of total land area</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>9%</td>
</tr>
<tr>
<td>France</td>
<td>23%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>28%</td>
</tr>
<tr>
<td>Germany</td>
<td>30%</td>
</tr>
<tr>
<td>Austria</td>
<td>47%</td>
</tr>
<tr>
<td>Finland</td>
<td>66%</td>
</tr>
<tr>
<td>Average &amp; EU</td>
<td>33% (excl. Ex-SU)</td>
</tr>
</tbody>
</table>

from six European countries (Austria, Finland, France, Germany, Great Britain, Switzerland) do we possess sufficient data on relevant influence factors and detailed information on forestry accounting and from a further 10 European countries we have some information. The following analysis will therefore be essentially based on those six countries yielding adequate information and will give more general overviews concerning the other countries.

Actual figures for some of the influence factors mentioned, such as the relative proportion of forest area, the forest ownership structure and the size structure of forest holdings, are shown in Figures 3-5. The illustrated criteria are only indicators, as the relevant data on the effective influence factors – for example, for the obligation to keep books, the rateable [tax] value, turnover or profit – are not available.

Figure 3 shows the percentage of forest land in regard to total land area for the six countries analysed in this paper. The UK with merely 9 % forest cover is one of Europe's tail-lights concerning forest percentage, while Finland with 66 % is at the other end of the scale Europe's relatively richest land concerning percentage of forest cover.

The forest ownership structure of the six countries reviewed is shown in Figure 4. Whereas in Switzerland 68 % of the forest area is owned by the state, local communities or other regional authorities, this percentage of publicly owned forests drops to 58 % in Germany, to 43 % in the United Kingdom, to 27 % in France, to 26 % in Finland and finally to only 18 % in Austria. Therefore on average more than 60 % of the forest area in the six countries is privately owned.

<table>
<thead>
<tr>
<th>General influence factors on accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Historical development</td>
</tr>
<tr>
<td>Attitude towards accounting</td>
</tr>
<tr>
<td>Status of accounting in public</td>
</tr>
<tr>
<td>Property – forms of ownership</td>
</tr>
<tr>
<td>Acceptance of state interference</td>
</tr>
</tbody>
</table>

**Overview 1 – Influence factors on general accounting**
- Culture
- Politics
- Law
- Economics

**Significant influence factors on forestry accounting**
- Ownership structure – Categories of owners – Legal types of business organisation
- Size of forestry holdings (general structure, joint ownership, ...)
- Forestry tradition (sustainability, investment, forest enterprise – silviculture enterprise, ...)
- Development of national economy (importance of forestry for the national economy, ...)
- Forestry – Timber Industries (integration, delimitation, sale of cut or standing timber, ...)
- Law (esp. accounting law and tax law)
- General accounting (tradition, basic accounting principles, ...)
Figure 5 shows data on the size of private (incl. industrial) forestry holdings for all European countries, where such information is made available. Considering the average size, the Scandinavian countries have the largest entities, while the Netherlands and Switzerland have the smallest. Enterprises larger than 500 ha comprise a considerable proportion of forest land in Sweden, Finland and Austria.

5 Analysis of specific aspects/characteristics of forestry accounting in different countries

As mentioned above, the six countries (Austria, Finland, France, Germany, Great Britain, Switzerland) that will be compared in the following sections and tables have been chosen due to accessible and – comparatively – well prepared information on forestry accounting. Apart from Finland, forestry in these countries is characterised by a general absence of industrial forest ownership characteristic for North America, Australia and other parts of the world. Regarding other aspects, such as forest area, yield, ownership structure, size of forestry holdings and forestry accounting, the six countries are diverse.

5.1 General

Starting from a more general description of the influencing factors, certain characteristics of forestry accounting are described. In the section dealing with financial accounting (accounting as prescribed by law), special reference is made to the aspects of legal obligations for accounting, forestry specific recommendations for charts of accounts, methods of financial accounting used in forest enterprises, the treatment of growing stock and its changes according to law, and some other relevant and specific aspects of financial accounting.

The focus of the research is, however, in the field of the internal information system. Due to the more harmonic information needs in forest enterprises across Europe the situation of cost accounting corresponds more closely than that of financial accounting. Nevertheless, there are some differences in methods and instruments, due to divergent business economics traditions or differing characteristics of forestry.

In nearly all countries social accounting and especially environmental accounting are regarded with increasing interest and are becoming more and more relevant for forestry. Besides adapting concepts applied in accounting of industrial enterprises, specific methods for integrating the non-market outputs of forest enterprises are being developed (e.g. MERLO and JÖBSTL, 1997).
### Influence Factors

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Great Britain</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest area [m ha, %]</td>
<td>3.9 (47 %)</td>
<td>20.1 (68 %)</td>
<td>13.1 (23 %)</td>
<td>10.5 (30 %)</td>
<td>2.4 (9 %)</td>
<td>1.2 (29 %)</td>
</tr>
<tr>
<td>Growing stock [m³/ha]</td>
<td>290</td>
<td>76</td>
<td>139</td>
<td>270</td>
<td>92</td>
<td>333</td>
</tr>
<tr>
<td>Increment [m³/ha/a]</td>
<td>6.6</td>
<td>3.6</td>
<td>5.5</td>
<td>6.5</td>
<td>5.1</td>
<td>5.5</td>
</tr>
<tr>
<td>Public forests [%]</td>
<td>18 %</td>
<td>26 %</td>
<td>27 %</td>
<td>55 %</td>
<td>43 %</td>
<td>68 %</td>
</tr>
<tr>
<td>Industrial forests [%]</td>
<td>0 %</td>
<td>9 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Private forests [%]</td>
<td>82 %</td>
<td>65 %</td>
<td>73 %</td>
<td>45 %</td>
<td>57 %</td>
<td>32 %</td>
</tr>
<tr>
<td>Av. Private holding [ha]</td>
<td>14.1</td>
<td>28.0</td>
<td>2.6</td>
<td>n.a.</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Private estates &gt; 100 ha</td>
<td>2.750 (1.2 %)</td>
<td>17.000 (6.2 %)</td>
<td>9.300 (0.3 %)</td>
<td>2.450 (0.6 %)</td>
<td>1.656 (43 %)</td>
<td></td>
</tr>
<tr>
<td>[Number, % of priv. estates; m ha, % of private forests]</td>
<td>1.8 (57 %)</td>
<td>2.7 (23 %)</td>
<td>2.4 (25 %)</td>
<td>1.3 (35 %)</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td><strong>GENERAL ACCOUNTING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting principles</td>
<td>Principles of proper book-keeping (GoB); prudence, uniformity, conservatism, authoritativeness (&quot;Maßgeblichkeit&quot;)</td>
<td>Authoritativeness: dependence of taxation on commercial accounts; income statement predominant</td>
<td>Prudence; centralised, focused towards national accounting (modular SNA); uniformity</td>
<td>Principles of proper book-keeping (GoB); prudence, uniformity, conservatism, authoritativeness (&quot;Maßgeblichkeit&quot;)</td>
<td>Fairness (true and fair view), relevance, consistency, substance over form; flexibility</td>
<td></td>
</tr>
<tr>
<td>Recommendations for charts of accounts</td>
<td>OPWZ (Balance sheet principle); research institute of auditors and accountants (Balance sheet principle)</td>
<td>No general recommendation, charts may follow either principle; format of income statement is standardised</td>
<td>Plan comptable général (PCG, Balance sheet principle); adaptations for branches of industry (obligatory)</td>
<td>Gemeinschaftskontenrahmen (GKR, Process principle); Industrie-kontenrahmen (IKR, Balance sheet principle)</td>
<td>—</td>
<td>Process principle</td>
</tr>
</tbody>
</table>
5.2 Forest environment and general accounting

Overview 2 contains some key figures characterising forestry in the six European countries with emphasis on those characteristics that are considered important in respect to forestry accounting. In addition, Overview 2 outlines the distinctive attributes of general accounting.

Criteria describing the relevant aspects of forestry are the forest area, growing stock, annual increment, ownership structure, average size of private forestry holding, and the number of private forest holdings larger 100 ha and their relative proportion of the overall forest area. Due to the data problems caused by, for economic purposes, insufficient statistics, the factors compared in Overview 2 are only indirect criteria for those value or turnover related determinants influencing accounting directly.

The features of general accounting are described under the headers: "principles", "charts of accounts", "relationship of accounting and business economics", and "standard-setting institution".

Principal differences can be seen, in particular, between the German-Austrian (or even continental) approach to accounting and the Anglo-American approach. The emphasis of the various accounting principles is entirely different: prudence vs. true and fair, form vs. substance, etc. (NAIR and FRANK, 1980).

Overview 3 shows that the principles of financial accounting and the professional and legal environment of accounting are very similar in Austria and Germany, due to much of the basic legislation originating from the 1930s and 1940s. France's financial environment was also influenced strongly in this period and the striving to avoid another depression, as in the 1930s, led to a very centralised and strictly regulated accounting environment. Accounting in Finland – including the legal framework – was strongly influenced by accounting theories and, for a long time, in particular by German accounting theories. Switzerland has always aimed to provide a flexible financial environment in order to attract international companies. Similarly in Great Britain, where state interference was strongly resisted in the economic environment. (NOBES and PARKER, 1995)

The relative position of the six countries within the influence-triangle practice-legislation-business economics is shown in Figure 6. On the one hand the difference between the Continental European and the Anglo-American traditions can be discerned, on the other hand it is also obvious, that there are major differences within Continental European accounting.

5.3 Financial accounting in forest enterprises

5.3.1 Legal obligations for financial accounting

One of the most obvious distinguishing criteria of financial accounting in forestry enterprises is the differing influence of accounting law or tax law. As shown in Overview 4, European countries can roughly be grouped in two categories: Firstly, those countries where accounting for agricultural and forest enterprises is regulated in specific sections of the tax legislation. Forest enterprises greater than a specified value or judged by turnover related criteria are here obliged to keep records and larger ones to use double-entry bookkeeping. The second group comprises a
greater number of countries, where accounting for forestry enterprises is not regulated differently from other business entities. In this latter group book-keeping is frequently only obligatory for those forest enterprises that are either owned by the public (state, regional authorities, …), commonly owned (jointly-owned forests) or are organised as a company. Overview 5 shows the sources and regulations for financial accounting for forest enterprises in the six European countries dealt with in this study in detail. Frequently tax legislation is the primary source for regulating accounting in forest enterprises.

In both Germany and Austria there are specific criteria for recording and book-keeping requirements of forest enterprises. Although the criteria and the legislation are very similar, the category of forest enterprise, as related to surface area, affected by the book-keeping obligation is quite distinct. While in Germany the book-keeping obligation for forest enterprises already commences with an area of 250 to 300 ha, the book-keeping obligation for Austrian forest enterprises does not start below 700 ha on average. In Germany over 1.000 forest enterprises are obliged to keep books (SPEIDEL, 1981), whereas in Austria approx. 200 (reverse estimation from the rateable [tax] value statistics published by ÖSTAT, 1993) are legally required to keep books.

In France and Great Britain a simple recording obligation is determined by the value-added tax legislation. The criterion to be registered for value-added tax is turn-over. Beyond this there are virtually no obligations for forest enterprises owned by a sole proprietor. The latter is also true for forest enterprises in Switzerland, although, in order to be eligible for grant funding, records must be maintained. In Finland all enterprises subject to the so-called "forest tax", which is levied on the surplus of receipts, have to keep records on payments and receipts. In all countries there are additional recording and book-keeping requirements for companies, societies and other types of business organisation prescribed in the commercial code or in corresponding legislation (see Overview 5).

In certain countries (as shown in Overview 6) accounting and taxation are closely interlinked, whereas in others they are strictly independent. Where accounting is regulated in tax legislation, the accounts will be drawn up according to tax laws, which frequently have rigid schedules for the computation of values, depreciation, etc., allow certain deductions, and are usually governed by a maximum expenditure and minimum income postulate. If the tax accounts and the commercial accounts are dependent (authoritativeness, "Maßgeblichkeit"), the commercial accounts will reflect the striving for low taxation and the economic information of the statements of accounts will be limited. The accounting principle of the "true and fair view" is severely impeded. Countries with such a dependence are essentially Germany and Austria, but also, less rigorously, Finland, France, Sweden and others.

Although accounting in forest enterprises may be regulated entirely in tax law, the general accounting legislation and the commercial code will have considerable influence on reporting principles, valuation matters, etc. and can hence be considered of subsidiary importance. This general framework is in-
### Primary legal sources and regulations of recording and book-keeping obligations in forest enterprises

<table>
<thead>
<tr>
<th>Country</th>
<th>Tax legislation</th>
<th>Commercial code</th>
<th>Other legal sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>For agricultural or forestry enterprises: [Lump-sum (&lt; 900,000 ATS rateable [tax] value)] Registration of Receipts and Payments (900,000 - 2 m ATS rateable [tax] value)</td>
<td>For enterprises entered in the register of companies and private trusts, double-entry book-keeping is prescribed by the <strong>commercial code</strong> (HGB). The commercial accounts are also the basis for taxation (Maßgeblichkeit) (§ 5 EStG, § 124 BAO)</td>
<td>Extended accounting requirements for joint <strong>stock companies</strong> and limited liability companies for cooperatives: act on cooperatives for jointly-owned forests: general statutory obligation to keep records</td>
</tr>
<tr>
<td>Finland</td>
<td>Forest tax for farmers and small woodlands based on payments and receipts</td>
<td>Commercial code for registered companies and traders</td>
<td>For industrial forests commercial code, corporation tax act (EVL), accounting act (KPA, KPL) and stock company act (OYL) Jointly-owned forests: law on societies</td>
</tr>
<tr>
<td>France</td>
<td>For <strong>Value Added Tax</strong> (from 600,000 FF)</td>
<td>Commercial Code Plan Comptable Général (PCG)</td>
<td>Accounting law and decrees; jointly-owned forests (incl. investment forests): law on societies state forests (ONF): act concerning state-owned enterprises (EPIC)</td>
</tr>
<tr>
<td>Germany</td>
<td>For agricultural or forestry enterprises: [Averages (§ 13 EStG)] Registration of Receipts and Payments (§ 4 (3) EStG)</td>
<td>For enterprises entered in the register of companies, books and records that need to be kept to fulfil other legal requirements (HGB, ) are also the basis for taxation (Maßgeblichkeit) (AO § 140)</td>
<td>For companies: stock-companies act, limited liability companies act; for cooperatives: act concerning cooperatives; for public forest enterprises: budgeting laws</td>
</tr>
<tr>
<td>Great Britain</td>
<td>For sole traders and partnerships: free choice of method for <strong>Value Added Tax</strong> (from £ 45,000)</td>
<td>Forestry is entirely outside the Income and Corporation Tax schedule; Other legal sources</td>
<td>For companies: Companies Act; principle regulation through accounting standards issued by the profession</td>
</tr>
<tr>
<td>Switzerland</td>
<td>(For grants registration of receipts and payments)</td>
<td>For enterprises entered in the register of companies (traders, cooperatives, …) free choice of recording method according to <strong>OR (Code of obligations)</strong></td>
<td>For public forest enterprises: federal and cantonal budgeting laws; budgeting decrees of the municipalities</td>
</tr>
</tbody>
</table>
creasingly influenced by European and international harmonisation. (KÜTING and HAYN, 1994)


<table>
<thead>
<tr>
<th>Formal independence of accounting and taxation</th>
<th>(Strict) dependence of taxation on accounting (Authoritativeness and reverse authoritativeness principle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark Great Britain Ireland</td>
<td>Germany Norway (Spain) Austria Belgium Finland France</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Italy Portugal</td>
</tr>
</tbody>
</table>

Since the early 1970s the European Union has attempted to implement a certain degree of uniformity in the presentation of financial accounts of registered companies (SCHMITZ, 1988; NIEHUS, 1993). Means of this harmonisation were several directives that were implemented in the commercial and accounting laws of the European Union member states. These changes affect only few forest enterprises directly, but others will be influenced indirectly by the changed accounting environment (for example, a new recommendation for a chart of accounts, as in Austria). In future the European Commission is going to collaborate closely with the International Accounting Standards Committee (IASC) to reach further harmonisation of company accounts.

5.3.2 Organisation of financial accounting in forest enterprises

Overview 7 outlines further differences in organisation and substance of legally determined financial accounting in forest enterprises for the six countries compared.

In nearly all countries – only excepting Great Britain and Ireland – charts of accounts are used as organisational framework in financial accounting, and are either arranged according to the process principle or the balance sheet principle (FLOWER, 1997, RICHARD, 1995a, b). The charts of accounts used in European countries, their organisation principle and existing adaptations for forestry are indicated in Overview 8.

State owned forest estates, community forests and forests of other regional authorities are usually obliged by budgetary laws and guidelines to use parliamentary accounting (government or resource accounting, Kameralistik). Frequently these parliamentary records of payments and receipts (actual and target) in public forest estates are supplemented by a full commercial double-entry book-keeping system and cost-centre accounting.

There are justified scientific objections to double-entry book-keeping in forest enterprises, as the main asset of the estates – the growing stock – is not included and variances are not accounted for. Doubts about the reasonableness of double-entry book-keeping in forest enterprises were raised as early as the late 19th century (e.g. GUTTENBERG, 1891) and are still valid today (e.g. MOOG, 1995). The meaningfulness of the comparison of assets and stocks is consequently seriously reduced, and the completeness of recorded data is forfeited (JÖBSTL, 1997b). Double-entry book-keeping is however being promoted in public enterprises due to the stronger engagement in the private sector or even possible privatisation and also due to the ongoing European harmonisation of financial statements. Furthermore there are considerable advantages (flexibility, updating, ...) through application of standard accounting software packages in connection with standard double-entry book-keeping.

In general, only companies are obliged to include values for the growing stock in their annual accounts (Overview 7). The valuation methods and values used are frequently radically insufficient and misleading. The information presented by the financial statements is rather diminished than improved by the inclusion of these values.

5.4 Internal information systems and new accounting branches

Overview 9 gives an impression of the actual state of cost accounting and social and envi-
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Great Britain</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal obligation for forest enterprises to keep books</td>
<td>Recording obligation; above certain rateable [tax] value or turn-over double-entry book-keeping; approx. 250 private forest enterprises are obliged to keep books</td>
<td>Single-entry book-keeping compulsory; jointly-owned forests and companies are generally obliged to have double-entry book-keeping</td>
<td>Recording obligation for jointly-owned forests (special legislation for investment forests); book-keeping obligation for companies</td>
<td>Recording obligation; above certain rateable value, turn-over or profit double-entry book-keeping; approx. 1,000 private forest enterprises (&lt; 0.5 %) are obliged to keep books</td>
<td>Only companies are obliged to keep books; altogether only few estates are obliged to keep books (forestry is outside income tax); (Hogg, 1995) single-circuit systems</td>
<td>Only companies are obliged to keep books; many public forest enterprises with book-keeping obligation</td>
</tr>
<tr>
<td>Recommendations for using forestry charts of accounts</td>
<td>By HVLF (1962, revised 1974); balance sheet principle based on the ÖPWZ chart of accounts (1951)</td>
<td>Process principle chart of accounts for those enterprises participating in accounting network</td>
<td>—</td>
<td>By DFWR following the process principle corresponding to IUFRO proposal!</td>
<td>—</td>
<td>Process principle; special recommendations for municipal forests</td>
</tr>
<tr>
<td>Financial accounting in public forest enterprises</td>
<td>From 1997 the federal forest enterprise (ÖBF) is a joint-stock company with corresponding legal obligations to have double-entry book-keeping. Other public forests: budgeting regulations – usually government accounts and double-entry book-keeping; (Zimmel, 1996)</td>
<td>Application of Business Economics Theory concepts in state forest enterprise; governmental accounting (budget) and double-entry book-keeping</td>
<td>State forest enterprise is subjected to dirigism; by law same accounting system as other industrial state enterprises (double-entry book-keeping and budget accounting); municipal forests included in municipal accounting systems</td>
<td>In state forests (Landesforstverwaltungen) according to budgeting regulations; government accounting; municipal forests included in municipal accounting systems</td>
<td>Double-entry book-keeping (single circuit) and resource accounting (budget)</td>
<td>Federal and cantonal budgeting regulations, municipal decrees; special recommendation for chart of accounts; municipal forests included in municipal accounting systems</td>
</tr>
<tr>
<td>Growing stock in financial accounting</td>
<td>Inclusion of growing stock in financial statements only for companies and state forests obligatory (frequently insufficient and misleading values)</td>
<td>Legal obligation only for companies and jointly-owned forests; usually cost of acquisition is used as value; state forests include the average of market value and rateable tax value in their accounts</td>
<td>Legal obligation only for investment forests administered by banks or insurance companies; values used are insufficient for financial or internal reporting (historical costs)</td>
<td>Legal obligation only for companies and state forests (frequently insufficient and misleading values)</td>
<td>Companies and state forests legal obligation; state forest include open market value established by a group of valuation experts (revaluation every 3-5 years); companies use expectation value or historical costs</td>
<td>No legal obligation to include growing stock in financial accounting</td>
</tr>
</tbody>
</table>
environmenal accounting in the six countries included in this study.

Frequently larger forest estates and publicly owned entities with an openminded management are using cost centre accounting. Individual development and importance in the internal information systems vary, however. Only very few use integral controlling concepts, including planning elements and variance analysis (i.e. standard costing). In several forest enterprises, including those of some German Landesforstverwaltungen as well as the Austrian Österreichische Bundesforste (ÖBF-AG), controlling systems based on comprehensive cost and performance accounting are currently being developed. Other instruments of cost accounting, such as the recently much discussed activity-based costing, have only been applied in individual case-studies.

The public forest estates and connected forest administration frequently have to address multiple objectives (timber production, forest authority, general welfare, recreation resort, ...) leading to problems in overhead allocation. Cost allocation is here frequently in the focus of interest (e.g. BITTER et al., 1994). For some time there has been considerable interest to separate expenditures and revenues of the forest enterprise as timber producer from the expenditures incurred by providing goods and services to the general public without adequate remuneration. The main objective of this differentiation has been to show better economic results.

Although social and environmental accounting are discussed frequently in the scientific community, only very few applications, usually in the state forests, have been under-

taken and published (see MERLO, 1996, MERLO and JÖBSTL, 1997). As shown in Overview 9, the most common form is a report on providing non-market benefits to the general public. In regions where forestry is profitable, the focus will usually be on efficiency and profitability information and hence in the field of traditional cost accounting, whereas in those regions where forestry runs at a financial loss the accent is more on reporting social and environmental benefits provided by forestry.

Overview 10 attempts to group the six countries in relation to the business economics tradition and the role and organisation of cost accounting. The group including Germany, Austria and Switzerland has a strong relationship through common language and traditions and is, in respect to the orientation of business economics, closely interlinked. Instruments and tools used in cost accounting of the three countries are very similar. New advances originating once here and once there, depending on research and development objectives and needs. Finland's business economics and cost accounting are strongly influenced by theories of business economics, most recently by the Anglo-American theories. In cost accounting for forest enterprises, however, the advanced instruments used in the Central European countries have been studied closely and been adapted for use in Finland. Both Great Britain and France have in common that micro-economics rather than business economics constitutes the focus of forest economics. Cost accounting in forestry is often copied and adapted from industrial management accounting, with few forestry-specific developments.

Forestry accounting data networks of various European countries are specified in Overview 11. Their value as internal information for those enterprises participating in the survey is diverse and largely based on the application of cost centre accounting and a cost distribution sheet.
## Overview 9 – Cost accounting and accounting for non-market outputs in forest enterprises (Part 1)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Great Britain</th>
<th>Switzerland</th>
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</thead>
<tbody>
<tr>
<td><strong>Cost accounting</strong></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>In larger forest enterprises; harmonised system for those enterprises participating in the accounting network (JÖBSTL, 1981)</td>
<td>In enterprises participating in cost survey; but focus is on income statement</td>
<td>Sparsely; primitive internal accounting in investment forests; silviculture rather than forest enterprises</td>
<td>In larger forest enterprises; recommendations by Deutscher Forstwirtschaftsrat (DFWR)</td>
<td>Detailed and of major importance (management accounting, single circuit); in larger estates a great variety of costing units</td>
<td>In forest enterprises participating in the forestry accounting network (BAR)</td>
<td></td>
</tr>
<tr>
<td><strong>Standard costing – Controlling</strong></td>
<td>Application: very few estates</td>
<td>Apart from the controlling system in state forests only very few applications</td>
<td>Application: very few estates</td>
<td>Few applications; concepts for controlling in state forests and in few large private estates</td>
<td>Application: very few estates</td>
<td>Application: very few estates</td>
</tr>
<tr>
<td><strong>Cost accounting in public forest enterprises</strong></td>
<td>Federal forest enterprise: cost centre accounting (same model as private forest enterprises); job (operation) calculations; in municipal forests: often only rudimentary cost accounting (ZIMME, 1996)</td>
<td>Cost centre accounting in state forests a controlling system using a catalogue of indicators based on cost and resource accounting in operation</td>
<td>Cost centre accounting since 1989 — dual circuit system with bénéficiaires as primary cost centres; comparatively advanced job costing system (Devis — Travaux — Facturation, DTF)</td>
<td>Cost centre accounting; problem of overhead allocation in state forests (unity of forest enterprise and forest authority; e.g. BITTER et al., 1994); controlling concepts in development</td>
<td>Detailed cost centre accounting; job (operation) costing for single operations</td>
<td>Cost centre accounting in many municipal forests participating in the accounting network (BAR)</td>
</tr>
<tr>
<td><strong>Cost and revenue surveys — Accounting data networks</strong> (see also Overview 11)</td>
<td>Several networks: larger private estates (since 1963, based on harmonised cost distribution sheet; JÖBSTL, 1981), jointly owned forests, farm forestry</td>
<td>Recent development of forestry accounting data networks following Central European models; since 1962 simple network on farm forestry within agricultural data network</td>
<td>—</td>
<td>Several accounting data networks for forestry (farm forestry, forest enterprises and public forests); partly based on harmonised cost distribution sheets, partly only statistical information</td>
<td>Statistical survey of costs of operations and survey of income and expenditure carried out by universities (now discontinued)</td>
<td>Forestry accounting data network with BAR cost distribution model in approx. 700 mainly public forest enterprises; currently under revision</td>
</tr>
</tbody>
</table>
### Growing stock in internal accounting – Social and environmental accounting

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Austria</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Great Britain</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment of growing stock (variations) in internal accounting (performance analysis)</td>
<td>Comparison of actual cut and allowable cut; in very few enterprises in cooperation with the university calculatory concepts (incl. inventory valuation and comparisons; Jöbstl, 1987, 1996b, 1997b)</td>
<td>Comparison of actual cut and allowable cut; concept with annual inventory resp. computed inventory and valuation of stock and timber balance for inclusion in income statement and balance sheet (realised in some enterprises)</td>
<td>In general no valuation of growing stock in connection with forestry accounting; audit of the asset development usually based on physical inventory; primitive valuation in investment forests for calculating the rate of return</td>
<td>Comparison of actual cut and allowable cut; in very few enterprises calculatory concepts (incl. inventory valuation and comparisons)</td>
<td>Audit of the asset development usually based on physical inventory only; valuation in state forests also based on market or expectation values (Hogg, 1995)</td>
<td>Audit of the asset development usually based on physical inventory only; no recognition in internal accounting</td>
</tr>
<tr>
<td>Social and environmental accounting</td>
<td>First attempts; general reports on provision of non-market benefits from state forest enterprise</td>
<td>Separate calculations of the state forest enterprise</td>
<td>Social report (Bilan social, obligatory) and environmental report for the state forests</td>
<td>Achievement reports (Leistungsberichte) from state forests since the mid 1970s</td>
<td>Separate addendum to the annual report showing costs and revenues incurred in providing non-market benefits</td>
<td>Reports on costs of providing non-market benefits (protection, amenity, …)</td>
</tr>
</tbody>
</table>
6 Conclusions and outlook

At present these results of the survey provide a reflection of our currently existing information status and the development demands in accounting of forest enterprises. In regard to the information status there is still considerable need for further research, as there are many countries which were so far unable to furnish information or data. Concerning the state of forestry accounting, it is evident that many forest enterprises do not engage in any accounting or, if they do, their records are designed to merely fulfil the rather modest legal requirements for financial accounting. Larger forest enterprises frequently maintain retrospective cost accounting, but no prospective management accounting. Modern controlling systems integrating planning are only to be found in a few progressive enterprises.

The practical application or the general utilisation of devised, and partly already tested, tools and concepts – especially concerning performance accounting, recognition of growing stock changes and non-market outputs in forestry accounting, but also in regard to instruments for improved decision-making, such as cost accounting or controlling – will be major tasks in the future.

In the international arena of financial accounting, following the experiences of New Zealand (DAVY, 1987), Australia (ROBERTS et al., 1995) and certain other countries with major industrial forests, the International Accounting Standards Committee is preparing an accounting standard on Biological Assets that might also lead to further consideration of forest assets in annual accounts of companies (IASC, 1996). Similar to the harmonisation efforts of the European Union, no direct influence on the typical, small or medium-sized European forest enterprises is to be expected.

<table>
<thead>
<tr>
<th>Country</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Private forest estates &gt; 500 ha</td>
</tr>
<tr>
<td></td>
<td>Jointly-owned forests in Tyrol and Vorarlberg (discontinued?)</td>
</tr>
<tr>
<td></td>
<td>Farm forestry (additional data from state forests ÖBF)</td>
</tr>
<tr>
<td>Denmark</td>
<td>Private forests – Regnskabsoversigter for dansk privatskovbrug</td>
</tr>
<tr>
<td>Finland</td>
<td>Profitability of non-industrial private forestry (NIPF)</td>
</tr>
<tr>
<td></td>
<td>Farm forestry</td>
</tr>
<tr>
<td>Germany</td>
<td>Private forests Westphalia-Lippe</td>
</tr>
<tr>
<td></td>
<td>Farm forests Baden-Württemberg</td>
</tr>
<tr>
<td></td>
<td>BML-accounting network for agriculture (separate analysis for farms with forests)</td>
</tr>
<tr>
<td></td>
<td>BML-accounting network forestry (approx. 300 private and public forest enterprises)</td>
</tr>
<tr>
<td></td>
<td>State forests</td>
</tr>
<tr>
<td>Great Britain</td>
<td>Economic Survey of Private Forestry – Income and Expenditure (discontinued)</td>
</tr>
<tr>
<td></td>
<td>Survey of Private Woodlands Costs (The Private Woodlands Survey) (discontinued)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Private and public forest enterprises – Bedrijfsuitkomsten in de Nederlandse particuliere bosbouw</td>
</tr>
<tr>
<td>Norway</td>
<td>Accounting for Norway's agriculture and forestry – Regnskapsresultater</td>
</tr>
<tr>
<td>Switzerland</td>
<td>BAR – mainly forests of municipalities</td>
</tr>
<tr>
<td>Europe</td>
<td>European Confederation of Agriculture (CEA)</td>
</tr>
<tr>
<td></td>
<td>Farm Accounting Data Network (FADN)</td>
</tr>
<tr>
<td></td>
<td>University of Bangor EU-Project (Analysing costs and revenues of private forestry in the EC)</td>
</tr>
<tr>
<td></td>
<td>Small-scale forestry: EU-FAIR-Harmonisation Project MOSEFA (coordinated by EFI)</td>
</tr>
</tbody>
</table>
There are efforts to supplement the national surveys on costs and revenues in forestry (see Overview 10; also ROCHT, 1984) with a European network or to improve existing networks (FADN, CEA). A prerequisite for reliable and utilizable data is the practical application of cost accounting concepts nationally and a harmonisation of terminology and data collecting procedures.

The new IUFRO research group

4.13.00 "Managerial, Social and Environmental Accounting" (JÖBSTL, 1996a, 1997a) is expected to deal with forestry accounting in a comprehensive way, thereby promoting forestry accounting and giving guidance for further research. The international cooperation will inspire research and promote new developments and practical applications in forestry accounting. One or more international research projects should provide the frame for the development of new instruments and the improvement of the present mechanisms of forestry accounting.

In the process of designing a management accounting system the concentration on providing decision-relevant information is vital rather than registration of all data. Recent developments in the European context, however, seem to focus on enhanced comparability of statistical profitability data provided by accounting data networks, rather than conceptual improvements, new tools or empirical applications of theoretical methods.

It is a matter of fact that forestry accounting is frequently seen as scarcely popular, disregarded or even as a despised subject by forestry students, foresters and even forest economists (BRABÄNDER, 1996). Yet, the problems encountered and the ever growing need for information should be reason enough for more colleagues to become involved in this comprehensive and important topic. Ongoing research activities may succeed in attracting more scholars to this interesting field of forest economics, to make them well disposed to forestry accounting, or even to fascinate them sufficiently to immerse themselves in the subject.

7 References

IUFRO 4.13.00 "Managerial, social and environmental accounting" (Internet Homepage) URL: http://iufro.boku.ac.at/iufronet/d4/hp41300.htm


Forest business accounting has long proven its positive contribution to management of forest enterprises. Accounting supports the management in monitoring the success of fulfilling the business strategy be it continuation of the business or shareholder value creation. Due to the high proportion of small-scale holdings only a small part of forest management units utilise accounting to support decision-making and information.

The variety of business accounting systems around the world is also reflected in the accounting of forest enterprises. While most rules and regulations of standard business accounting can be applied in forest enterprises, some particularities of forestry have posed problems for both foresters and accountants: The nature of the forest asset as appreciating, self-regenerating asset and the long time horizons involved in forestry can be considered as the two most important specific problems.

The valuation of the forest assets and treatment of growing stock changes through growth, management and removals and the reflection of these values in accounts has not only engaged the minds of leading forest economists since the last century, but is also facing forest enterprises and corporations around the world. While the treatment in internal operating accounts is up to the information requirements of the enterprise and therefore developed individually to the demands of management, the financial reporting legislation determines the reflection of forest assets in external accounts.

Globally a number of methods have been developed to capture forest values and their change in accounting, but a both accurate and feasible method remains elusive.

The different methods contrasted using examples from Europe, North America, Asia and Oceania show the interdependencies of forestry accounting practices with cultural traditions, forestry practices, legislation, economic theory, etc. Differences as paramount as the distinctions between Central European small-scale forestry, tropical concession forestry or large-scale plantation forestry in Oceania also exist in the different methods of accounting for the growing stock and its changes.

While international accounting harmonization aims at improved comparability and the emergence of multinational forest industries results in increased attention from the accounting profession, the task of finding more accurate and workable methods will remain a challenge for the next millennium.

**Keywords:** accounting systems, harmonisation, accounting standards, information, decision support

**Introduction**

Forest business accounting has long been a core element in forest management (e.g. WESSELY, 1870). Documents of forestry accounting date back into the middle ages and the last two centuries saw significant efforts of forest economics research invested into systematising and improving this science (e.g. ABETZ, 1959; BRABÄNDER 1961; IUFRO, 1966). The objective of forestry accounting has always been to provide management with relevant, reliable, consistent and comparable information on status and flows in forest enterprises.

Maybe more so than ever before in its history forest business accounting has now emerged from its specialist status. The uniqueness of the business means – the self-generating forest resource – has gained attention also in general financial accounting and bookkeeping. This reflects the trend where more and more forest holdings are listed on public stock exchanges as part of forest industry corporations or standalone. The listing and reporting processes require accuracy and transparency in monitoring value and value changes of all assets including the standing timber, representing the main asset in forestry. Standardisation and international harmonisation of forest accounting practices have aimed to improve transparency, distribution, compa-
rability and reliability of the financial forest information presented to shareholders. Also public accountability is increasing requiring state or local government owned forest operations to be accountable to their stakeholders.

Beyond its use for external reporting forest business accounting fulfils a key role in internal control, operational management and strategic planning for forest enterprises. Smaller and privately owned forest companies utilise accounting practices more focussed on their internal needs. In these smaller entities the external reporting functions are primarily addressed to tax authorities thereby generating a totally different objective for external representation (URBAN, 2000).

The international dimension of accounting is becoming increasingly important and is impacting not only the multinationals or tax havens (e.g. NOBES and PARKER (1998)’s Comparative Financial Accounting is amazon.com’s No. 1 bestseller in the Netherland Antilles), but also for forest enterprises as accounting harmonisation and internationalisation of the capital markets are progressing.

This paper attempts to analyse the interdependencies of forestry accounting systems with respect to the business environment or the "forest culture" of a country or region. Forestry accounting is here defined as forms of monetary business accounting as opposed to national accounting or non-monetary resource accounting practices (Figure 1). The framework underlying this analysis is the forest enterprise as an economic entity, ignoring the policy or (inter)governmental levels of national economics where not relevant to the forest companies’ business accounting. The working hypothesis is that differences in business culture and operating environment around the world have a significant impact on forest business accounting and related aspects of business management in forest enterprises.

**Components of the Business Environment Impacting the Forest Accounting System**

Culture as a common set of ideas, beliefs and values shared by a group is a complex phenomenon. Culture affects how a society organises itself, which will affect businesses and accounting in a variety of ways (HOFSTEDE, 1984). The influence of culture on accounting cannot easily be captured or measured. An analysis of the different underlying dimensions, aspects and components can provide an improved understanding of the cultural dimension and its impact on forestry accounting. The influences of culture on an accounting system are summarised in the flow chart shown in Figure 2.

Business and management culture in forest enterprises encompasses several relevant components as illustrated in Figure 3, which shape forestry accounting in particular. Management accounting as a tool to support management in its strategic decision making as well as facilitating the making of choices in everyday op-
erational decisions faced by the management of forest enterprises interacts strongly with different managerial cultures around the globe. Differences in the importance or substance of the influence factors between countries are therefore the reason for differing accounting systems and practices around the globe. Business culture shapes forestry accounting and vice versa.

Forest traditions and practices including the nature of the resource (i.e. virgin, natural or plantation forests) are a key factor shaping forestry accounting. The idea of sustainable forest management, which is largely based on a constant forest area, and more or less constant volume of the growing stock has shaped most parts of central and northern Europe. In North America and the tropical and subtropical areas forest practices have for a long time been tailored to the utilisation of old growth forest and their conversion to secondary forests or non forest lands. Today the emphasis is generally shifting towards plantations. Together with Oceania the subtropics and tropics have some of the world’s most productive plantation areas utilising modern forest management techniques in all their facets.

Closely interlinked with the forest management practices, silviculture regimes and growth area is the time horizon of forestry. The duration of the rotation has been a key feature of forestry distinguishing it from other businesses. Annual accounting and reporting has found it difficult to capture the natural growth processes.
through the length of a rotation, which in extremes may exceed 100 years significantly. The differences in average rotation cycles around the world depending on the timber species, the climate and the growth area impact the time element relevant to accounting and thereby forestry accounting. Cost recording practices, which are suitable and accurate for 10 or 20-year rotations such as fast growing eucalyptus plantations, are inconceivable in the production of high value oak logs for veneers over a rotation exceeding 200 years.

The resource ownership is another key determinant for forest accounting practices. Third parties as licensees or concessionaires manage large tracts of the world’s forests. The perspectives of such concessionaires vary considerably from the resource owner and require a very different treatment in accounting, as the contractual agreement is the asset and not the resource.

Beside resource ownership, the legal ownership form of the forest enterprise is of high significance for the accounting system, as different legal forms require different systems and levels of financial accounting. The requirements differ from country to country, but in general an increasing number of owners increases the onus of financial accounting. Single private owners such as a farmer have different perspectives from large forest corporations, which again differ from the public sector. Joint-stock companies wishing to raise capital through public exchanges face additional requirements imposed through the listing criteria of these stock exchanges as well as the scrutiny of institutional and private investors. Different accounting systems and practices frequently go hand in hand with the legal ownership form.

The size (i.e. area, timber volume, turnover) of forest holdings around the world predetermines the level of accounting system and the information requirements in a significant way. The level of refinement of the forestry accounting system is to a large extent dependent on the size of the forest enterprise and therefore on the cost vs. benefit of accounting information.

The role of forestry in the national economy is relevant in determining the importance of the forest sector and the public attention it gets. Where forestry is very important to the economy the likelihood for the development of specific guidelines and conventions to deal with forestry accounting issues is higher. The level of codification is usually higher in countries where forestry has a high profile.

Financial and tax legislation has a significant impact on financial accounting as well as the structure and content of forest accounting information. Depending on the size and legal structure of the forest enterprise income or corporation tax are frequently key recipients of accounting information and the financial accounts form part of the tax declaration. The dilemma of satisfying the need for objective information (true and fair view) while avoiding a high tax burden is evident. In some cases (e.g. in Central Europe) accounting malpractices have de-facto been codified through tax measures and levels.

In many countries financial accounting has to fulfil external information requirements beyond taxation. With the opening of borders, the development of multinational companies, global trade and the internationalisation of the financial markets legislation and accounting, standard setting has become the subject of increasing harmonisation efforts to promote the development of free markets and ensure their transparency. Prominent among these harmonisation efforts are the development of International Accounting Standards (IAS) by the International Accounting Standards Committee (IASC) and the European Union directives on accounting matters. While the EU directives have shaped forestry accounting only indirectly, the IASC has taken up the specific challenges posed by forestry in accounting and aims to address the main forestry specific issues regarding the treatment of the growing stock in a specific standard.

Forestry accounting as a specialist branch is largely embedded in the framework of general accounting. Many works have analysed the different schools and approaches in general accounting (e.g. NOBES and PARKER, 1995). JOBSTL and HOGG (1998) have analysed the interrelationship between general and forestry accounting in some detail and shown that general accounting is a key determinant for forestry accounting. Most accounting conventions used in forestry accounting in any one specific country are determined by general business accounting in that country. The treatment of the growing stock is the only key feature distinguishing forestry from other businesses covered in general accounting.

In recent years the rapid growth of the stock markets has given rise to the Anglo-American approach to general accounting which is characterised by professional regula-
tion and standard setting, a strong emphasis on investor information and the key principles of "true and fair" and relevance. This has resulted in a much bolder and quite pragmatic approach to provide relevant investor information. This drive is now also extending to the establishment of comparable values for forests in financial accounts, whereby some methodical problems may be pushed aside for the sake of providing a comprehensive and relevant picture of the forest enterprises financial status and performance.

Within forest corporations in all parts of the world the supply chain and the role of forestry within the supply chain as either independent or integrated element plays a key role in understanding the role of forests and forestry. Processing industries such as pulp and paper can be the main business driver, making forests to raw material feeds with no own profit responsibility and thereby little incentivisation and accountability. The transfer pricing rules between the different business areas (forest, harvesting, saw milling, pulp, paper, etc.) render any transparency or comparability on a business division or supply chain level useless. If an adequate internal management accounting system is also absent, the controlling of the forest operations is largely based on non-monetary and market-unrelated performance measures (JÖBSTL, 1981; KARISCH, 1999; BORCHERS, 1999).

Related to this issue of the outputs from forestry, many public forest enterprises are partially abandoning economic accountability of timber production for the even less measurable image of the environmental and social benefits of forestry. With the rising concern over environmental issues and the material balance of the planet Earth, interest has grown in developing a better understanding of environment-related costs and benefits. Advances in social and environmental accounting have so far had narrative, essentially qualitative character or focussed on the monetary valuation of the positive benefits or externalities, while attempts to a comparable consolidation with existing management accounting information have been rare (MERLO and JÖBSTL, 1999). Most other at-
tempts in valuing non-market benefits have remained outside the four distinct approaches identified in BARTOLOMEO et al.’s (2000) taxonomy of environmental accounting: external financial reporting, social accountability reporting, energy and materials accounting and environmental management accounting. In future increasing public and market pressures are likely to boost the need for environmental accounting information beyond the mention of tonnes of carbon stored in the growing stock and amenity facilities provided in many corporate environmental reports.

The level of research and education in forestry accounting shapes the everyday accounting practices to a significant extent. Research determines how refined accounting theories and models are and what practical adaptations have been developed. Education is required to transform research into practice. HOGG (2000) showed the significant differences in the extent and content of forestry accounting education offered to undergraduates at European forestry universities and colleges. Where forestry specific accounting education is insufficient, general accounting will fill the gap at the cost of understanding the forest business and catering for its specifics. Where general accounting is dominant the interrelationship of forest business management and forestry accounting is limited and the two run more alongside than form an integrated system.

As outlined above the socio-economic business environment plays a unique role in shaping forestry accounting. For the countries covered in the case studies some of the key features and differences in the business environment shaping forestry accounting are summarised in Table 1 on a general level. In interaction these factors shape the business and management culture, which in turn affects forestry accounting as part of this culture. Differences in the European sphere have been analysed in detail by JÖBSTL and HOGG (1998) and in the following more emphasis will be put on the most relevant feature – the self-generating forest resource – but in a global context.

Establishment of Performance Measures for Forest Enterprises

Forest stands are the key asset of the forest enterprise representing frequently over 80% of all assets. The computation of annual results reflecting the performance of the enterprise is one of the key elements of accounting. Meaningful performance measures for forestry cannot be based solely on annual returns (in terms of earnings and investments), but must take account of value added in the forest stands. The measurement of these value changes has been one of the long-standing problems in forest economics (LEMMEL, 1956; FRAUENDORFER, 1958; ABETZ, 1959; BABBÄNDER, 1965; JÖBSTL, 1980; KARISCH, 2000) and a simple and yet accurate solution has so far proven elusive. The most discussed methods are summarised in Figure 6 including the more recent extension to also capture the non-market externalities of forestry within the performance assessment.

The objective of performance accounting is to measure and control performance including...
deviations from management plans or the equilibrium status (sustainability as more far-reaching going-concern principle). These deviations have a direct impact on current and future asset value and revenue streams of the forest enterprise. The complexity of these value changes deriving from natural growth, non-linear price/size relationships, quality/grades, market price fluctuations of timber and other factors has so far led forestry practice to shy away from full accountability. Only slowly conventions are being introduced to abate this main shortcoming of forestry accounting. These conventions to include realistic forest values in financial reporting (e.g. Davy, 1987; Roberts et al., 1995; IASC, 1999; Borchers, 1999) give rise to discussion about the accuracy and value-relevance of inventories (Gierer, 1997), yield models or valuations and the separation of the different influence factors to determine management achievement.

Case Studies Illustrating the International Interdependencies between Forestry Accounting and the Business Environment

In the following case studies we have aimed to select illustrative examples, which are used to describe the impact of the business environment on forestry accounting and the existing interdependencies between forest management and accounting. As they are all routed in their local or regional cultural context they do not purport any evaluation or recommendations.

Classifications have been a key element on the way to understanding differences and ultimately to harmonisation (Roberts et al., 1998). A detailed comparison of differences between accounting legislation and practices in European countries has been part of earlier work (Hogg and Jöbstl, 1997) while a systematisation of the different approaches to forestry accounting has been attempted by Hogg (2000) using a classification scheme with key criteria relevant to forestry accounting. Key results from the following case studies are summarised in Table 1.

Central European Forest Enterprises

Across Central Europe forestry accounting in line with general accounting has traditionally been using a two circuit approach differentiating between taxation-oriented financial accounting and management-oriented cost accounting. Tradition in forestry accounting is well routed in forest economics of the German speaking countries with many noteworthy scholars dedicating research efforts to this subject (e.g. Abetz, Brabänder, Fraudendorfer, Guttenberg, Jöbstl, Lemmel).

Smallholders represent the majority of the forest owners and also a high share of the forest area. By law these smallholdings require only a minimum of accounting information.

For the larger forest enterprises there is a clear distinction between those in private and those in local or national government ownership. The larger private forest enterprises – i.e. those with holdings above 500-1,000 ha – use the two-circuit approach where tax is dominant in external financial accounting. In accordance with principles of (volume) sustainable forest management, conservatism and protection of creditors as well as the tax legislation the growing stock (i.e. standing trees) is in general not accounted for in the financial accounts.

The growing stock represents a significant hidden reserve, which when uncovered through calamities or utilisation above sustainable averages requires exceptional treatments in taxation (Urban, 2000). This convention of ignoring the growing stock and its changes over time renders the financial accounts virtually useless for purposes of evaluating the financial position and determining the profitability of a forest enterprise. Classical ratios such as return on assets cannot be correctly applied and make comparisons to other industries impossible.

The development of a voluntary cost/profitability data network for larger private forest enterprises led to largely improved cost centre/cost type accounting with allocation of costs to the main activities in the forest enterprise (e.g. Jöbstl, 1981, 2000). Unfortunately only in rare cases does the internal cost accounting circuit, which should support management in their decision-making, provide useful information on the status and changes in the growing stock. Physical volume maintenance through comparisons of the undifferentiated allowable cut vs. the actual cut is widely used to gauge the sustainability equilibrium, but provide inadequate insights into the value maintenance. Suitable adaptations of the forest inventory and cost accounting methods have only been made in few exceptions (Jöbstl, 1987, 1996).
Table 1: Summary table of the regional comparison including reference to the proposed International Accounting Standard for Agriculture

| Importance of forest sector | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Medium-High | High | Low | Medium | High | Medium | -- |

| Principle accounting system | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|

| Main drivers on financial accounting | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Tax Conservatism; specific legislation in tax code | Conservatism | Tax | True and fair | True and fair | True and fair | True and fair |

| Main drivers in internal cost accounting | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Decision-making for management | Decision-making for management | Extension to financial accounting to facilitate management decisions | Extension to financial accounting to facilitate management decisions | Extension to financial accounting to facilitate management decisions | Extension to financial accounting to facilitate management decisions | -- |

| Growing stock in accounting of private non-listed entities | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Largely not recognised; actual vs. allowable cut comparison to monitor sustainability widespread | Largely not recognised; actual vs. allowable cut comparison to monitor sustainability | Recognised at cost (at stand level); NPV internal | Recognised at cost (at stand level); NPV internal | Only recognised for plantations at cost | Recognised at cost (at stand level); NPV internal | Recognition at net market value – indirect impact via legislation changes only |

| Growing stock in accounting of stock listed entities | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Rare; Recognised at different values (very conservative values) | Recognised at cost | -- | Recognised at cost | Only recognised for plantations at cost | Traditionally recognised at cost but shift towards valuation (net market value) | Recognition at net market value (market valuation or NPV assessment); cost for establishment phase |

| Growing stock in public forest enterprises (incl. Commercial operations in public ownership) | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Not recognised or recognised only at historic cost; increasingly recognised with valuations | Recognised at cost; increasingly recognised with valuations | Recognition based on cost less depletion or on expert valuation of net market value; Changes in forest asset are shown separately, but not booked as profit/loss | Traditionally recognised at cost but shift towards valuation (net market value) | Traditionally recognised at cost but shift towards valuation (net market value) | Recognition at net market value (market valuation or NPV assessment); cost for establishment phase |

| Remarks | Central Europe | Nordic Europe | British Isles | North America | South East Asia | Oceania | IAS Draft |
|-----------------------------|----------------|--------------|--------------|---------------|----------------|---------|
| Improved models for performance accounting available as extension to cost accounting | Issue is attracting attention especially regarding the assetisation of forest assets | Forests are shown as a separate tangible asset with no depreciation other than depletion and sales | Many forest corporations operate through timber licences; Assetisation has been an issue | Natural forest is largely in ownership of the states who license it to timber companies for management | Oceania has been driving the development of full inclusion of forest assets in financial reporting | Standard still in review phase; most critical is the treatment of market value fluctuations |
Many of the forests in public ownership follow government accounting rules and practices ("Kameralistik"). Recently increasing autonomy and accountability of the public forest administrations has led to an increasing interest to develop reporting methods that incorporate value creation from a holistic perspective including both the growing stock and externalities such as recreation, biodiversity or protection from natural disasters. While interest and research are widespread, practical advances have been made in this direction especially in Bavaria and Rhineland-Palatinate.

Forest processing industries such as the manufacture of pulp and paper, sawn wood or wood-based panels are rarely linked directly with forest ownership. Only very few publicly listed companies have notable forest holdings that require financial reporting on the growing stock. Although the Austrian, Swiss and German accounting laws now allow presentation of accounts following International Accounting Standards (IAS) the implications for forest holdings are at best indirect and long-term. In line with tradition advances are more likely to come through tax legislation, research or education.

**Private and State-owned Forest Enterprises in the British Isles**

Several key principles of general accounting shape forestry accounting in the British Isles, where an established tradition of a strong accounting profession with self-regulation dominates. The principles of true and fair view and relevance have been dominant in general accounting. The IAS is fully accepted in financial reporting and accounting is more loosely linked with taxation than in Central Europe. This relative independence from tax has also given room to facilitate the use of a single circuit accounting system where cost
accounting is an extension of the financial accounting system, which is widely used in private forest enterprises. For private forest estates the use of single circuit systems with focus on relevant information is further facilitated by the enduring preferential treatment of forestry in taxation instigated by the very low forest cover.

In larger private forest enterprises the issue of accounting for the growing stock and its changes has been discussed repeatedly since the 1950s and the recommendations have changed and developed significantly over time (HOGG, 1995), but only few private forest enterprises include variations of the growing stock in their accounts. The reluctance is based on the perceived complexity of the issue and the absence of reliable inventory data or (localised) yield models.

The public sector has been keen to demonstrate their achievements in planting vast tracts of land and achieving government set hurdle rates on financial returns. Hand in hand with this agenda went the development or adoption of new methods including the assessment of non-market benefits. Since the 1970s the two main approaches to forest valuation for accounting purposes have been the assessment of the market value based on the NPV and the stand cost valuation, which have increasingly been used together. The inherent problems of complexity and sheer volume of compartment/stand accounts, infrequent revaluations, choice of interest rate or transition from cost to expectation value have of late led to the promotion of open market valuation based on expert assessment of comparable sales on a stand basis. This open market value is reassessed in intervals of several years and readjusted annually by fellings, sales or acquisitions.

Public sector accountability for profit-making activities outside the mandate of a government department has increased significantly and the financial reporting standards reflect this change by adopting private sector standards and formats. While the UK Forest Enterprise has adopted the aforementioned expert panel open market value assessment approach for the forest asset the Irish Forestry Board Coillte uses a different combination of historical cost and value approach. Due to the absence of appropriate standards covering the special nature of the forest asset within the reporting requirements (FRS 3) the Irish state forests Coillte have opted to show only historic cost of plantations in their accounts and to clarify the value of the growing stock and its changes in notes and a statement of change in forest asset. The Northern Ireland Forest Service on the other hand is proposing to use a value based on the replacement cost to replace the previous NPV based method (HARLEY, 1999). In future the majority of the forests in the British Isles – if they remain under full state ownership or are privatised in some form – are expected to be accounted for under the IAS regime.

Nordic Forest Corporations
The Nordic accounting tradition resembles the main two neighbouring interest spheres – the Central European model which influenced Nordic accounting for many years before the influence of the British Isles/American accounting sphere become stronger and shaped Nordic accounting in recent years. Finnish accounting standards have a high compliance with IAS standards. Several forest corporations provide references to IAS standards in their annual reports or have adopted IAS as reporting standard for the consolidated group accounts. While the Swedish accounting standards remain distinct from the IAS, many of the Swedish forest corporations (e.g. Assi-domän) refer to IAS standards in their statements of account.

The treatment of the growing stock in the financial accounts has been less of an issue in the Nordic countries than in the British Isles or Oceania. This is understandable regarding the long tradition of sustainable forest management and the equilibrium status, which is by and large maintained. The user of these financial statements is, however, deprived from assessing the actual (annual) performance of forest management other than in physical volume terms, which is frequently part of the annual review.

The Swedish forest corporations show the forest value at book value (i.e. original acquisition value) in their accounts. This value bears little resemblance to the actual value of the forest estate. The usually higher tax assessment value is also shown in the notes to the accounts, but still underestimates the value of the forest asset. Felling rights (e.g. SCA) are shown as inventories. StoraEnso, Europe’s largest forest corporation, or UPM-Kymmene do not even specify the value of their substantive Nordic forests separately in the annual statements of accounts. Forests are part of the non-depreciating land and water assets. Norway’s Norske Skog states the book value of the forest properties and its "write-up" in the
analysis of value estimates, but similar as in Sweden this value does not reflect the true value of the forest asset.

The issue of monetisation of forest assets is becoming a key driver for an improved understanding of forest values in accounting. The foundations for the monetisation debate lie in the fact that some of the Nordic stock-listed corporations find that their market capitalisation is lower than even relatively conservative estimates of their forest value alone. The release of the forest assets into a legally separated stock-listed entity is expected to increase transparency and provide forest corporations holding sizeable forest areas with improved access to capital.

The realisation of the proposed IAS 65 covering the inclusion of the growing stock in the financial accounts will bring about significant changes for the numerous Scandinavian forest corporations which have already adopted the IAS as reporting standard or are thinking to do so in the next years.

Iberian Forest Corporations

The Iberian accounting tradition is similar to the central European accounting tradition with significant state interference (including a compulsory accounts plan), conservatism, high influence of taxation on accounting and a two-circuit approach.

Beside a significant proportion of small holders with very limited accounting requirements, pulp and paper dominated forestry corporations shape forest plantation ownership. From the perspective of integrated forest corporations with an emphasis on processing rather than forestry, forests – including owned plantations and deferred harvesting contracts, but excluding the land – are accounted for as work in progress at historical cost which is estimated to be lower than the net realisable value. International harmonisation efforts beyond the European Union directives have so far shown little impact. The issue of capturing the self-generating forest resource better in accounting is currently not high on the agenda.

North American Forest Corporations

For small North American forest holdings tax – in particular income tax – is a major driver in forestry accounting, while the larger forest holdings are owned either by the federal states or provinces, the central government or forest corporations.

All joint-stock companies follow the US or Canadian Generally Accepted Accounting Principles (GAAP). IAS can be used with reconciliation to the US or Canadian GAAP, but very few companies do so and IAS are not an issue in the forest sector currently. The general accounting practices and business culture resembles the British Commonwealth system (used in the British Isles and former British colonies), but the importance of the forest sector in North America is higher and forest ownership is more dominated by large private forest industry corporations.

Many forest industry corporations manage both own timberland and forests belonging to public authorities. The majority of plantation owning companies in North America capitalise their timberland purchases and reforestation costs. These costs can include original acquisition cost, real estate taxes, lease payments, road construction costs, site preparation and reforestation costs such as site preparation or planning. The timberland cost stands unamortised in the accounts and is eliminated at harvest (unit of production method representing the accumulated depletion). The exact scope of capitalised and non-capitalised, annually charged costs varies between companies.

The cost of timber harvested is based on the value of the timber harvested, the capitalised cost and the total timber volume estimated to be available over the growth cycle. Gains on sales of timberlands are reflected as a reduction of the cost of sales in the profit and loss account. In the balance sheet forest forms part of fixed asset and in most occasions the value of the timber and timberlands can be seen in either the balance sheet or notes. Timber rights on the other hand are recorded as intangible assets and depreciated on a straight-line basis.

There appears to be very little activity to change from the now widely used cost-based approach to forest valuations in accounting, but the developments in Europe and Oceania will ultimately impact on North America as key financial market and arena for global consolidation in the forest industry.

Latin American Forest Corporations

Due to the financial links with the United States most large Latin American forest corporations follow North American accounting practices. Many of these large companies are also quoted on North American stock exchanges and follow the generally accepted account-
ing principles of the United States (US GAAP) as basis of presentation which also allows all foreign companies to report in US Dollars rather than local currency, reducing the direct impact of inflation. Frequently reconciliation to local (e.g. Argentina, Brazil, Chile) accounting practices is required and the acceptance for the IAS is still very low. Timber resources are stated at cost, less accumulated depletion on a production unit (stand) basis.

**South East Asian Plantation and Concession Forest Holdings**

Malaysia’s or Singapore’s accounting system follows largely the British Commonwealth model and many of the accounting standards are based on the IAS with modifications to reflect the particular local situation. The later is also true for Indonesian and Thai accounting standards. In general one accounting circuit is used for both financial and cost information.

There are significant differences between the forest management practices in virgin/natural tropical forests and the plantation forests (esp. rubber wood). For the natural forests the existing forest inventories can only provide very limited input for value-based assessments of the forest resource and the time horizon with respect to "rotations" is largely undefined. Most of the region’s natural forests remain in state ownership and are licensed to concessionaires for harvesting and management over a licence period. Where forest assets exist their value is shown under other assets. The timber concessionaires include the rights in timber licences or land use rights at cost as a separate category under the fixed assets. These timber licences or land use rights are depreciated using the straight-line method over the lifetime of the licence or if their duration is unlimited they are not depreciated.

For the increasing areas under plantations, which include rubber wood and fast growing species such as Acacia for pulpwood, inventories and management plans exist in some detail. Plantations are treated as fixed assets, which are capitalised at cost of its initial establishment. Formerly most of these assets where not amortised, but written-off to the profit and loss account at harvest. Today the Malaysian Accounting Standards Statement No. 8 from 1997 requires all plantation cost to be capitalised and amortised over the useful life, which is relevant to rubber wood and oil-palm plantations where timber or fibre is only a by-product.

The venture of Malaysian-based Kumpulan Emas, a conglomerate listed on the Kuala Lumpur stock exchange, into buying forest plantations/concessions on the Solomon Islands in 1994 provides a rare example showing the threats of misrepresentation of forest assets in the accounts. The massive write down of overvalued timber assets only two years after acquisition caused significant damage to (minority) shareholders who were partly attracted by the values shown in the balance sheet. The episode underlines the importance of basing values on accurate inventory data and forest models.

**Oceanian Forest Corporations**

General accounting in Australia and New Zealand follows the British Commonwealth accounting model, reflecting the dominance of the accounting professions and the pragmatism underlying the key accounting principles. Taxation and fiscal rules have little or no impact on accounting profits and financial reporting. The Australian Accounting Standards (AAS) and the New Zealand GAAP are very close to the IAS, but due to the importance of the forest sector in Oceania the standard development specific to forestry has already advanced further than elsewhere.

Australia and New Zealand still have significant natural forest areas as well as an important and growing plantation resource including especially fast growing pine species and eucalypts. For the private and state owned forest enterprises in the region the inclusion of values of growing stock in the financial accounts has become important in understanding their returns to the shareholders (McBRIDE and PEIRSON, 1996; ROBERTS et al., 1995; ADAMS, 1994).

Most of the productive forest estate has been planted in recent years, with significant proportions of the forestland only coming into full production during the next years. This again is important to understanding some of the accounting practices. Up to now a variety of measurement bases and techniques have been employed ranging from historic cost to market value estimations have been used (HARGREAVES, 1980, DAVY, 1987). Equally the forest asset has been treated differently in the balance sheet, where it was sometimes entered as current inventory, fixed asset or special regenerative asset. Not necessarily are these values also used for stand-based man-
agement, which utilises an extension to the main accounting circuit to control the stand related performance.

New Zealand’s large forest corporations (e.g. Fletcher Challenge Forests or Carter Holt Harvey) have traditionally shown a carrying value of plantation forest crop at the original acquisition/establishment cost of the standing forests plus capitalised costs for each stand until mature for harvesting. Under this approach the capitalised costs of each stand are written off to the profit and loss account at the time of harvesting. Cost capitalisation and carrying value are limited such that the total cost capitalised cannot exceed the estimated recoverable amount of the stand assets taking into account age, condition, location, intended end use and management regime. Revenues from harvesting are taken into the profit and loss account when realised and the related capitalised costs are then written off to the profit and loss account as depletions. In some cases there is a distinction between development forests (i.e. no substantial harvest to date), where all cost is capitalised and production forests (i.e. after the first commercial harvest) where all costs of harvesting and re-establishment are taken directly to the profit and loss account. Until recently the Australian practices of accounting for forest assets have been similar.

The limitations of the cost-based approach such as the indifference to price changes and value accretion in the growing stock have rendered the results of this accounting approach irrelevant in the eyes of many accounting information users. In New Zealand the additional disclosure of net present value calculations has only partly been able to address scepticism and today substantial annexes with supplementary forest information aim to address the assumptions and sensitivities of the used valuation approaches.

In recent years Australia has been at the forefront of capturing the forest asset and its changes in the financial statements of forest enterprises. The striving for a pragmatic solution providing relevant and comparable information on the performance of forest management has led to a paradigm change. Most of the large forest corporations and also the different state forests had largely adopted a historical cost approach to the forest assets which is now replaced by a net market value established through valuation on the basis of comparable transactions or, if that is not possible, using the net present value method. The forest assets are shown in the balance sheet as a special category of assets. The unrealised gains and losses connected with changes in the forest asset are equally recognised.

Australia has developed an accounting standard for self-generating and regenerating assets (Australian Accounting Standard AAS 35). The formulation of standardised practices can, however, not solve the fundamental problems of valuation and uncertainty in absence of readily available net market values. The realisation of these problems as outlined above has led to a deferral of the envisaged operative date in 2000. The transition phase has its own problems where value differences between historic cost of forest assets and the net market value are distorting profit measures considerably.

The State Forests of New South Wales use this valuation-based approach in their annual accounts. Softwood plantations are valued annually using a market valuation model calculating the net change in value resulting from price and volume movements. Plantations younger than 12 years, or before first commercial operations are valued on the basis of establishment cost. The native forests under sustainable management are also recognised in the accounts at market value. Sample inventories are carried out with a five-year interval to check the modelled growth estimates. Adjustments to the growing stock value are recognised in the balance sheet under the separate category for Self Generating and Regenerating Assets, while the market value increment/decrement is recognised in the profit and loss account as a corrective to the operating profit. In 1998 the size of the valued market value decrement was roughly twice the size of the operating profit showing the possible impact of such a valuation approach.

Important in the new approach are the distinction of market-driven value adjustments due to price fluctuations (booked as reserve changes) and the wealth-creating effects of biological growth (booked as revenue) for physical capital maintenance concept. Value changes due to changing market conditions have shown to be sometimes substantial and very transitory.

IASC Exposure Draft 65 Agriculture

The development of an International Accounting Standard (IAS) covering forest assets has been under way for several years and is expected to result in the release of a standard during 2000 which will act as a recommendation for all countries accepting IAS as re-
quirement or option for financial reporting. The exposure draft follows largely the developments in Oceania (IASC, 1996, 1999). The familiar key problem is the valuation and the distinction of realised and unrealised gains or losses resulting from increments, harvest and market value fluctuations in the forest stands, which has long been discussed in forestry accounting (JACKLE, 1934; BRABÄNDER, 1965). The requirements for interim reports on a quarterly basis only exacerbates the problem and requires market price changes in cyclical industries such as the forest industry to be examined with significant care.

The pragmatism of the IASC’s approach is well summarised in the IASC Framework that states "in many cases, cost or value must be estimated; the use of reasonable estimates is an essential part of the preparation of financial statements and does not undermine their reliability". This also identifies the IASC’s belief that the market valuation is an improvement on cost-based values. The envisaged standard IAS 65 requires also the disclosure of physical quantities in the annual report, which reinforces the need for improved inventory schedules and constantly re-calibrating growth models for the inter-inventory period. This "return" to physical quantities and the envisaged requirement for a sensitivity analysis of the net market value underlines the difficulties in measurement and reliability of forest asset information, which is the main shortcoming of the pragmatic solution.

Conclusions

- Considerable differences in the business environment and cultures around the globe are reflected in forestry accounting practices.
- Forests and forestry are perceived very differently around the globe. Through the different organisation of accounting information management and stakeholders understand forests differently depending on the information presented.
- Forestry accounting also shapes the perspective society has on forestry and forests. Accounting provides not only a tool supporting management in its decision-making, but also makes information available to external addressees.
- For small holdings tax and legislation are usually the most relevant influence factor shaping forestry accounting, while for the larger entities the framework becomes wider and the network of influences affecting forestry accounting is more complex.
- The valuation and accounting treatment of forest assets remains the core problem for forestry accounting, reflecting also the largest differences in systems utilised and perspectives taken.
- Regarding the significant value bound in the growing stock, comparatively less important issues enjoy much higher coverage in annual reports and also more attention in forest-relevant accounting literature and standard setting. In many cases it is hard to find a discussion of the value and valuation method for the growing stock in annual reports of major forest industry corporations.
- In most cases the incomplete inclusion of the forest assets in the accounting system is more confusing than helpful in measuring and reporting performance of the forest enterprise. Cost-based approaches are still widespread, but in terms of relevant information on the performance of forest enterprises these measures have to be considered as largely useless. Values reflecting some historic value or a tax value are equally misleading for external users. The striving for (market) value-based measures of performance including stocks and flows of the forest enterprises main productive asset – the forest stands – is beneficial to improve comparability and relevance of accounting information.
- The development of multinational forest holdings through the rapid globalisation of the forest industry requires practical conventions to present the forest holdings in their entirety – i.e. including the value fluctuations of the value of the growing stock – to investors and to a management which will be in less contact with everyday developments on the ground.
- Existing harmonisation efforts including the latest IASC initiative do not take the different business environment and forest management practices sufficiently into account. Accounting practices, which may appear practical, relevant and reliable in one place, cannot be transposed one to one around the world. Adaptations to local circumstances are necessary – e.g. highly productive plantation forests, multifunctional temperate natural forests or tropical concession forestry – to provide both management and other stakeholders with meaningful information.
- The draft IAS 65 covering self generating and regenerating assets such as forests will in-
crease awareness and discussion, but will neither bring a scientific solution nor – due to limited coverage (e.g. in the Americas) – a common global approach to the longstanding problem of forest assets in accounting.

- The quality of inventories remains the most crucial element in all value-based approaches to include forest assets in accounting and thereby performance measurement. The ongoing downsizing efforts effecting inventories in particular also increase the need to improve the dynamic modelling of forests.
- The identified differences in forestry accounting systems and practices together with the significance of the shortcomings in most utilised systems provide significant need for further international research.

Sample

The sample of company accounts and accounting policies reviewed includes: private forest estates (Austria), communal forests (Austria), Österreichische Bundesforste AG OeBF (Austria), Forste der Gemeinde Wien MA 49 (Austria), Bayerische Staatsforstverwaltung (Germany), Staatsforstverwaltung Rheinland-Pfalz (Germany), private forest estates (Scotland), Coillte Teoranta (Ireland), Forest Enterprise (UK), Assidomän (Sweden), SCA (Sweden), StoraEnso (Finland, Sweden), UPM-Kymmene (Finland), Metsä-Serla (Finland), Norske Skogindustrier ASA (Norway), Sociedade Portugese de Papel SA Soporcel (Portugal), Ence (Spain), Abitibi Consolidated (USA), Champion International (USA), Domtar Inc. (Canada), Abitibi Consolidated (Canada), Plum Creek Timber Company Inc (USA), Rayonier (USA, New Zealand), Tembec Inc. (Canada), The Georgia-Pacific Timber Company (USA), Willamette Industries (USA), Araucruz Celulose S.A. (Brazil), Lingui Developments Bhd. (Malaysia), Jaya Tiasa Holdings Bhd. (Malaysia), Golden Hope Plantations Bhd. (Malaysia), Kumpulan Guthrie Bhd. (Malaysia), Kumpulan Emas Bhd. (Malaysia), Ta Ann Holdings Bhd. (Malaysia), Asia Pulp and Paper Co Ltd. (Singapore, Indonesia), PT Barito Pacific Timber Tbk. (Indonesia), Amcor Ltd. (Australia), Forestry Tasmania (Australia), The State Forests of New South Wales (Australia), Carter Holt Harvey (New Zealand), Evergreen Forests Ltd (New Zealand), Fletcher Challenge Forests (New Zealand), Winstone Pulp International Ltd (New Zealand)

Literature


MEDIUM-TERM PERFORMANCE ANALYSIS IN FOREST ENTERPRISES
A Calculatory Approach
(Findings from applications in practice)*

Hans A. JÖBSTL

Abstract
The assessment of periodical performance is an old and still unsolved problem of forestry accounting. The main problem is that the changes in forest assets cannot be taken into account at all or only very inadequately. The difficulties of forest asset valuation for financial statements (balance sheet, profit and loss account), and therefore the ascertainment of the annual profit, has neither been solved in terms of theory nor of practical application and a solution is not in sight (BRABÄNDER 1965; HENNE 1973; TZSCHUPKE 1992). The calculatory approach presented here as a proxy solution lies outside the scope of bookkeeping. A concept in three steps developed by the author (JÖBSTL 1980, 1981, 1987a) was tested recently in respect of its feasibility in several forest enterprises. In the following a short description of the concept, extracts from the results of its application in an existing forest enterprise, and some findings from practical applications will be presented.

Key words: Forest accounting, assessment of performance, changes in forest assets, comparison between actual and target (standard) values, forecast of the business development

Problem definition
Starting points of the study were:
• the impossibility of registering changes in forest assets through conventional accounting,
• the common, although most insufficient, procedure in forest operational accounting (cost and profit account), wherein those positive and negative profit components resulting from changes in forest assets are eliminated from the annual profit account by relating the expenses (harvesting costs) and returns that depend on the quantity of timber harvested to a sustained cutting quantity, and the
• inefficiency in the practice of conducting forest inventories.

As early as 1980 the author presented an overall concept as an approach to a distinct solution (JÖBSTL 1980): firstly, the annual profit and cost statements were to be improved by relating the expenses and returns to a differentiated allowable cut and silviculture programme; and secondly, a comprehensive analysis of performance should be achieved in connection with the forest inventory and medium term planning. In order to assess the practical feasibility of this approach the concept was tested in a research project funded by the Austrian government.

The basic ideas are that every comparison of assets requires inventories (in forestry these are carried out only at greater intervals in the course of forest management planning) and that harvesting the allowable cut, provided that it represents the annual production capacity correctly, leads to no changes in forest assets. Silvicultural measures maintain the production capacity. The production capacity represented by the allowable cut can only be kept up to the extent to which the necessary silvicultural measures are taken. Deviations from the plan (target) lead to a decrease (reduced input) or increase (increased input) of forest assets. These deviations, as well as those of the actual cut, have to be recorded in detail (i.e. split into tree species, assortment, harvesting sites, treatment types etc.) and valued. Furthermore, the chosen allowable cut also influences forest assets in the long run. This has to be integrated into the performance assessment as an additional differential.

The process concept for medium-term performance analysis
(see figures pp. 2 and 3) is essentially based on the fundamental ideas of an actual-actual- and a target-actual-comparison as well as an analysis of deviations and causes, and comprises the following components:
1 Comparison of two consecutive inventories (Actual – Actual; Target – Actual)
2 Analysis of the past medium-term planning period (period analysis)
3 Plan assessment and long-term development preview (forecasting)

Part 1: Comparison of two inventories (Actual-Actual; Target-Actual)

The comparison of actual states based on two consecutive inventories is carried out with the help of a series of characteristic indices (e.g. age class structure, tree species composition, volume, damage, performance value, etc.). Absolute and relative differences are determined. The changes of physical quantitative indices should at least allow a verbal qualitative assessment of changes in forest assets which, ideally, is supported by monetary values. The prerequisites for the comparison of "actual-actual" are carefully planned and detailed data recording and especially uniformity within the inventories in order to ensure comparability of the determined indices.

In addition, a comparison of target and actual states is carried out for specific aspects (e.g. growing stock, state of tending and regeneration). The actual state of the forest is compared with a target state, to be obtained by the activities planned for the medium-term period, and deviations are determined. The reasons for deviations are essentially analysed in Part 2 (period analysis). In addition to planning errors and unforeseeable natural disasters, in the first place differences between actual and planned measures have to be considered.

The harvesting and silviculture activities as well as the financial results are represented in time series and as total of the period or as annual average. The difference between the actual execution of measures and the target is valued according to standard costs (representing the normal costs for this operation), and serves as a means of correcting the annual operational results. Another correction factor is derived from determining the deviations between actual cut and allowable cut, both sub-divided into tree species, timber assortments, and harvesting sites, and valuing them with timber prices and harvesting costs. The financial results are shown as tables and graphs over time and can hence be interpreted in connection with the tendencies of timber prices, purchasing power, labour cost per hour, and other influencing factors.

Part 3: Plan assessment and long-term development preview

The third part of the concept is concerned with medium and long-term planning and its effects on the long-term changes in forest assets and on the sustainable production capacity of the enterprise. This comprises the two following components:

1. the prospective investigation of the long-term trends in forest assets (increase or reduction).

2. the estimation of the relation of the medium-term (period 1) economic output to the long-term average.

The differences derived from these two comparisons (long-term increase or decrease of forest assets on the one hand; and deviations of the first medium-term planning period from the long-term average on the other hand) are then positive or negative correctives in performance ascertainment.

Part 2: Analysis of the past medium-term planning period (Period Analysis)

In Part 2, harvesting and silvicultural operations and the financial results of the past medium-term period are processed and analysed.

Overall assessment

The results and correctives derived from the above-mentioned three parts of the concept can be used to improve the quite problematic process of traditional profit and loss account-
The medium-term plan (expressed as detailed allowable cut and silvicultural programme) and its deviations from the long-term performance potential are both basic references for an improved annual profit and loss assessment (correction by means of the allowable annual cut divided into the various species, timber assortments and harvesting sites, and an evaluation of the deviations from the silviculture plan; see JÖBSTL 1995, p. 17 ff).

Application of the concept in Austrian forest enterprises

The study was conducted in 4 private Austrian forest enterprises (including 5 organisationally autonomous units) in:

1. the Waldviertel, Lower Austria (4000 ha),
2. the Styrian Central Alps (8000 ha),
3. the eastern fringe of the Alps in Styria (5000 ha)
4. the Weinviertel (Lower Austria) including high, coppice, coppice with standards, and swamp forests (2000 ha) and the Wienerwald (700 ha).

A precondition for including a forest enterprise in the study was a forthcoming forest inventory, the design (random sample inventory) of which could be influenced (elaborated or improved) by the concept originator.

Three projects concerning inventory comparison and period analysis were finished in the first phase of the study, lasting from 1988 – 1990. (authors: DAMM, FÜRST, STRASSER). For the period analysis, these 3 studies were able to draw on annual key figures from the annual master summary sheet (operational accounting) that had been prepared and arranged by the author for decades. (These key figures include costs, revenues, cost influencing factors as well as production and performance data) (JÖBSTL 1981). To support value calculations an EDP-program (applying SUPERCALC 4) for forest-related calculations of Norway spruce (FLASCH) was developed. Now a more powerful, flexible and user-friendly version programmed in C is available (JÖBSTL 1995).

Two further projects were finished in the second phase (HÖBARTH and MATITZ). They deal with the most diverse forest enterprise (swampwood, coppice forest, and low-production high forest – two separate organisational units). Difficulties in this forest enterprise did not only arise from the great number of different tree species – an especially high percentage of broad-leaved trees – but also...
from the fact that the time series of operational accounting (BAB) were not available and the related indices had to be put together from various sources with great expenditure of time.

The last project of this kind was carried out in another Styrian forest enterprise in 1993 and had to be finished with intermediate results only (Pircher), which have since been refined in a number of relevant points. Peculiarities of that enterprise were that the previous inventory was hardly usable, and that we could not influence the design of the new inventory directly.

The catalogue of indices for the inventory comparison

Focal element and basis of all projects is a catalogue of indices created for the phase of the inventory comparison, where predominantly non-monetary quantity components are included, which, ultimately, will lead to monetary values (see page 6). The overall total of indices allows a general quantitative and verbally qualitative assessment of changes in forest state and (financial) performance capacity.

Three types of monetary values providing compact information on changes in forest assets, are derived in the calculation:

The stumpage value, as market value (timber sales revenue minus harvesting and replanting costs) of the growing stock of all stands over 60 years, supplemented by the production value of the younger stands, the expectation value as discounted net revenue (determined in the long-term forecasting) and the sustainable production capacity, as long-term average of the expected annual revenues. Standard prices and standard costs are used in order to separate (eliminate) influences (deviations) due to changes in timber prices or factor prices as well as cost reductions in consequence of improved technical methods. The differences of the monetary values (from two set dates) are compact indicators of changes in forest assets.

The changes in the forest assets can be deduced directly from the differences of the monetary values.

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1 In a sustainably managed forest enterprise, where there is no intention to sell the entity or parts of it, open market values of forests are of little use and can hardly be determined from the small number of transactions (sales). Furthermore they do not allow conclusions on changes in value caused by good/bad management. Cost values on the other hand are equally unsuitable for judging performance as there is no measure for the appropriateness of inputs (costs). In the last consequence, the market price of goods and services is the benchmark for economic objects.

Most important findings

and criticism of practiced forest management planning and accounting

Inspite of various problems this approach has stood the test in practice. The difficulties in the practical application – not considering the relatively high amount of work and the requirement for improved tools – are nearly exclusively due to quantitatively and especially qualitatively insufficient data and records from the past.

Because of inferior past inventories, execution records and planning that were not sufficient for planning, valuation and control purposes, parts of the concept could not yet be completed, at least not entirely. Above all, a lack of assessment-related data from past inventories is evident. The main problem, however, is the relative impossibility of comparing data from different inventories, one reason being that documentation of the procedures of data survey, the data processing and the analysis of data is poor (e.g. there is a lack of information from former inventories on measuring height, applied stem-form models, treatment of collected field data etc.).

Faults in the available data

Faults concerning former inventories can be summarized as follows:

1 inconsistent data-recording in successive inventories and, as a consequence, limited comparability,
2 insufficient attention paid to value-related criteria (not recorded or not sufficiently detailed; recorded but not analysed and interpreted),
3 blurred definition of features or indices, so that room for discretion was too large allowing different assessments of one and the same situation. Freedom of choice within the assignment of specified characteristics, for example, in case of multiple damage on one single stem, is an evident consequence of badly defined surveying instructions,
4 lack of detailed, comprehensive documentation on how forest inventory recording and/or data analysis was carried out. Ignorance of the fact that the procedures applied in the two inventories to be compared were different, automatically leads to misunderstandings, and consequently, to mistakes in interpretation (regarding heights, volumes, site classes),
5 inexact recording instructions and/or lack of documentation of abnormal or unusual characteristics or of deviations from given proce-
dures (insufficient reports, or lack of reports regarding inventory design).

In the case of enterprises with several (three or more) main tree species, the analysis proved to be very labour-consuming. There is a lack of support from the forest management planning and the growth and yield sciences. Growth models and yield tables, which are now available, have so far only been prepared for monocultural stands (primarily for spruce).

Faults concerning accounting data (non-monetary and monetary) predominantly comprise:

1. missing data, faults in recording,
2. insufficient differentiation of data,
3. lacking compilation in time series (enterprises participating in the Austrian cost survey project (Jöbstl 1981) have better documentation than other forest enterprises).

Accordingly, the possibilities and validity of time series analysis (performance analysis for the previous planning period) were reduced. Nevertheless, this part of the scheme provided important results and insights; and it provided an essential improvement upon former financial statements and economic assessments. The latter serve as important fundamentals for planning.

Assessment of the concept and the results

Under the conditions given in practice, with insufficient data recording, the most important benefits of this study for the individual forest enterprise were: the purpose-oriented design of the sampling instructions; the goal-oriented formulation of the necessities for a demand-oriented forest inventory; and, the determination of the requirements to be covered by book-keeping (recording of physical and financial quantities).

The new inventory, in combination with the recording concept, ensures an informative achievement analysis and forest state comparison for the forthcoming period. Thus, the prerequisites for the future application of the procedure are created. They are as follows:

- a target-, decision-, planning- and evaluation-oriented forest inventory
- current recording of cost and (monetary) performance data as well as the documentation of relevant influence factors.

Conclusion

The trials have clearly confirmed the suitability of the approach for practical use as well as the usefulness of the approach as such. For the general practical application of the concept, however, there is still need for further research and development:

1. further research on stand growth models and yield tables for specific situations (e.g. mixed species stands),
2. improvement of forest-related computer-aided calculation models,
3. training of foresters in demand-related inventory procedures (goal-oriented thinking etc.),
4. finally, the development of forest-stand-based, computer-aided comprehensive information systems (including GIS).

Whereas item 1 is a research request for the colleagues in growth and yield science, managerial economists and forest management planners will have to become engaged in items 2 – 4 (see above) in the future.

It is not necessarily the supreme target of the application of the proposed concept to ensure complete and detailed numerical implementation of single components, but rather to make foresters familiar with a useful thinking scheme, by which their work is guided and the results are examined. The basic ideas of the concept comprise valuable guidelines/gauges, outlines and a framework for a comprehensive consideration of forest operational management planning and controlling.

Thinking in terms of the concept and deriving (recording, analysing, comparing) a few central key values (indices) already constitutes a big step towards consideration of forest assets and their sustainable performance capacity within economic reflections.

So, the main purpose of the concept framework is to integrate forest assets into the forester's pattern of thinking, rather than its complete realization in a computer-aided calculatory program.

Bearing these goals in mind, the fruitfulness and usefulness of the approach are clearly proven.
I. Catalog of indices of forest state – Comparison of two forest inventories

Random Sample Inventory for Forest Estate "High Forest" 1990
Comparison of some characteristics 1990 to 1974

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>1974</th>
<th>1990</th>
<th>Alterations to 1974</th>
<th>relative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Forest area (hectares)</td>
<td>571</td>
<td>561</td>
<td>-10</td>
<td>-2</td>
</tr>
<tr>
<td>2. Growing stock total (solid cubic metres)</td>
<td>95,400</td>
<td>58,700</td>
<td>-36,700</td>
<td>-38</td>
</tr>
<tr>
<td>3. Growing stock per hectare (solid cubic metres)</td>
<td>167</td>
<td>105</td>
<td>-62</td>
<td>-37</td>
</tr>
<tr>
<td>4. Final mean annual increment (s.c.m.)</td>
<td>1,643</td>
<td>1,480</td>
<td>-163</td>
<td>-10</td>
</tr>
<tr>
<td>5. Stocking index</td>
<td>0,82</td>
<td>0,76</td>
<td>-0,06</td>
<td>-7</td>
</tr>
<tr>
<td>6. Yield class (mean annual increment at age 100 years)</td>
<td>Pine 5,8</td>
<td>5,5</td>
<td>-0,3</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td>Spruce 6,6</td>
<td>9,1</td>
<td>+2,5</td>
<td>+38</td>
</tr>
<tr>
<td></td>
<td>Other Coniferous 5,2</td>
<td>5,0</td>
<td>-0,2</td>
<td>-4</td>
</tr>
<tr>
<td></td>
<td>Oak 4,9</td>
<td>4,4</td>
<td>-0,5</td>
<td>-10</td>
</tr>
<tr>
<td></td>
<td>Other Broadleaves 4,8</td>
<td>4,5</td>
<td>-0,3</td>
<td>-6</td>
</tr>
<tr>
<td>7. Percentage portion of species area</td>
<td>Pine 62,0</td>
<td>37,2</td>
<td>-24,8</td>
<td>-40</td>
</tr>
<tr>
<td></td>
<td>Spruce 3,0</td>
<td>3,6</td>
<td>+0,6</td>
<td>+20</td>
</tr>
<tr>
<td></td>
<td>Other Coniferous 6,0</td>
<td>4,1</td>
<td>-1,9</td>
<td>-32</td>
</tr>
<tr>
<td></td>
<td>Oak 16,0</td>
<td>14,5</td>
<td>-1,5</td>
<td>-9</td>
</tr>
<tr>
<td></td>
<td>Quercus cerris 5,0</td>
<td>18,0</td>
<td>+13,0</td>
<td>+260</td>
</tr>
<tr>
<td></td>
<td>Other Broadleaves 8,0</td>
<td>22,6</td>
<td>+14,6</td>
<td>+182</td>
</tr>
<tr>
<td>8. Average age of stands (years)</td>
<td>47</td>
<td>49</td>
<td>+2</td>
<td>+4</td>
</tr>
<tr>
<td>9. Unstocked area (hectares)</td>
<td>74</td>
<td>18</td>
<td>-56</td>
<td>-76</td>
</tr>
<tr>
<td>10. Regeneration under cover (in stands &gt; 60 years old) (hectares)</td>
<td>n.a. 34</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>


Explanations (argumentation): . . . . .

11. Damages: Area of damaged stands in % of total forest area (\[\] = Table)  
12. Bark peeling (damages) in stands \(\leq 60\) years (in percentage of stems)  
13. Damages: Stem characteristics in age class III+ (% of growing stock)  
14. Area (hectare) and yield class (EKL) of main tree species by age classes  
15. Growing stock per hectare (solid m\(^3\)) and stocking-degree by age classes  
16. Diameter at breast height (cm) and average age (years) by age classes  
17. Damage situation (areal characteristics) in % of area by age classes  
18. Damage situation (stem-related) in % of growing stock by age classes  
19. Stand density (stem number per hectare) (BHD \(\geq 4\) resp. 8 cm) by age classes  
20. Tending state and required measures (in hectare) by age classes
21. Comparison of forest assets (values in million AS)

<table>
<thead>
<tr>
<th>Value types</th>
<th>1974</th>
<th>1990</th>
<th>Alterations to 1974</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Annual performance (value) (Sustained Output Capacity)</td>
<td>0,90</td>
<td>0,77</td>
<td>- 0,13 - 14</td>
</tr>
<tr>
<td>b) Production-/ Stumpage value (Linear Model Jöbstl 1978, p. 169)</td>
<td>41,0</td>
<td>28,5</td>
<td>- 12,5 - 30</td>
</tr>
<tr>
<td>c) N.D.R. 4 % (Net Discounted Revenue: contribution II minus overhead)</td>
<td>7,4</td>
<td>4,8</td>
<td>- 2,6 - 35</td>
</tr>
</tbody>
</table>

The presentations of results are supported by graphic charts. The following show some examples from the "High Forest" Estate:

Comparison of forest inventories by age classes

Data not available Bias: Same percentages as in 1990
II. Analysis of execution and results for a practical example – some selected figures

Cutting Control

Silviculture Control

Operating Result per Hectar
related to actual felling quantity

III. Plan assessment and long-term development preview

FOBSI Simulation – State Parameters

FOBSI Simulation – Result Parameters
Ad I catalogue of forest state indices

For the period 1974–1990 (16 years) the Actual-Actual comparison of the analysed forest enterprise shows major shifts in the species composition from more valuable (pine, oak) to less valuable species (Q. cerris, other broad-leaved trees). Furthermore, it documents a considerable decrease in forest assets: 38% in volume, 30% in stumping value, 14% in sustained output capacity and 35% in net discounted revenue (N.D.R.). This means a reduction in stumping value of ATS 1,400.– per hectare and year.

The Target-Actual comparison shows strong negative deviations in stocking density, growing stock, tree species composition, age class structure and tending condition. The preview from 1974 into the future was carried out ex post. The set allowable annual cut was sustainable (inspite of a 4% reduction in growing stock) the monetary value of the allowable cut (contribution margin) lay 9% over the long-term average.

Ad II period analysis

The period analysis shows an overcutting (mainly caused by calamities) of nearly 100% of the allowable cut. The deviation of the final cutting area is +61%, of the intermediate felling area it is +240%, and in silviculture activities it is +70%. In monetary terms the actual cutting exceeds the target by 80% (including not-incurred expenses). Of the bookkeeping profit (related to the actual cut) of ATS 1,990.– on average per hectare and year, ATS 1,720.– result from excess cutting and neglected silvicultural measures (i.e. reduction of growing stock value). Hence the true profit is ATS 270.– per hectare and year.

Ad III development preview

The long-term preview shows a sustainable output potential of ATS 0.77 million per year, an increase in growing stock of 5%, and a further reduction of stumping value of 40%. The 1990 N.D.R. (4%) is 12% above the long-term average.

The plan for the next medium-term period includes an allowable cut, which is sustainable regarding volume, but has a contribution margin that is 33% higher than the long-term production capacity. This difference has to be attributed as a corrective (reduction in growing stock value) to the allowable cut results of period 1.

References


Executive summary

Medium-Term Performance Analysis in Forest Enterprises

A Calculatory Approach

(Findings from applications in practice)*

Traditional accounting is not able to determine the periodic performance of a forest enterprise correctly. The registration and valuation of periodic changes in forest assets face both theoretical and practical problems (i.e. accuracy and costs of inventory, forecasts, valuation approach, money values, inflation etc.). Not even computer models and computer-aided forest stand databases allow a sufficiently reliable determination of those changes in value that could be relevant to taxation. In any case, the consequences of stockpiling for the income tax of the forest owner would not be at all justifiable.

Even without the liability to render account or present tax statements the managers will require information about the effects of their management on forest assets (e.g. for purposes of planning, control, comparison between the planned and the actual states of the forest). Normally, this information is obtained by calculations that are not part of bookkeeping. Usually, the results from the operating account are translated into the allowable cut in order to determine those parts of the profit shown in the balance sheet that are a consequence of changes in assets. This simple calculation is not more than a first step, which has to be followed by a translation into the detailed allowable cut (in regard to the structure of tree species, wood assortment, harvesting sites) as a second step. Silvicultural activities must then be considered in yet another calculation (comparing the planned and actual results of the measures).

The author has developed a method for the medium-term analysis, which has been tested in several forest enterprises. In combination with the forest inventory, a comparison of the states of the forest (actual state – actual state), a comparison between the planned state and the actual state of the forest, an examination of the sustained performance capacity on the basis of a long-term forecast of the business development, and an assessment of the medium-term plan with regard to its long-term effects on assets, are carried out. The measures defined in the medium-term plan (wood harvesting, silviculture etc.) are compared with the actual situation (execution), and the variances are valued by means of standard costs.

The results of the analyses are a catalogue of physical and monetary characteristics of the forest state and the periodic results (absolute, relative and differential figures). Their combination allows an assessment of the asset-creating effects of the expired period. As far as possible and reasonable, the physical data will be complemented by monetary values. This approach is supported by a set of calculation and development simulation models.

In addition to its practical use, this concept can also render useful services to improve the (forest-related) thinking of both economists and foresters.

The paper submitted briefly describes this concept and informs about experiences and conclusions from case studies. The most important prerequisite for its application in practice is the improvement of data recording in the course of forest inventories and current accounting. Here further steps have to be made. Proposals as to how to do this are an important intermediate result of this study.

Abstract

This paper introduces the dynamic transition model, a conceptual approach to describing and representing the temporal dimensions of a forest enterprise or management class, initially formulated in 1972 (JÖBSTL 1972, 1973) and developed further in recent years (JÖBSTL 1997).

Analysts can use the model to evaluate alternative management strategies, carry out yield prognoses and valuations, and study changes and transitions in forest states. Results obtained from the model are a measure for the performance of the individual forest enterprise.

Keywords: Transition model, long-term simulation, forest asset valuation, sustainable performance capacity, forest regulation, normal forest and target forest, measures of performance.

1. Introduction

In economics, models are of major theoretical and practical importance. They help to formulate and clarify theories and are essential for establishing forecasts and assessments. In practical decision making, the main purpose of models is to analyse and evaluate alternatives by anticipatory determination of possible consequences. In addition, they are of major significance in teaching, i.e. thinking in terms of systems and interrelations.

From a business point of view, a model that includes forest assets could be based on the following concept of a forest enterprise. Factors of production, such as land, growing stock (forest stands), forest roads, machinery, equipment, labour, services, and technology are invested, combined and transformed into products and services with the help of nature. The resulting outputs are either external output and as such sold on the market (timber, minor forest products, services) or consumed by society free of charge (non-market benefits), or internal output which is reinvested as long-lived assets, such as growing stock, buildings and roads, which in turn become an input for the following period. Time is the most important dimension. Processes need to be seen in relationship to time, which is divided into time segments called also time periods. Plans, reports on the implementation of activities, physical and financial statements of account and inventories are given for the time segments. In business management, the usual time horizon is one year, and in forest management planning, medium and long-term plans frequently cover a period of ten years and more. Short, medium and long-term plans are closely interconnected.

Activities in forestry are economic in nature and are, therefore, principally goal-oriented. We may distinguish between forest state objectives and output objectives. The latter are the business management objectives in the narrower sense. However these objectives are multiple and interlinked. Output objectives have an impact on forest state objectives and vice versa. This is true regarding short, medium and long-term perspectives. Timber production involves a lengthy span of time between input and output. Traditional accounting systems deal inadequately with forest-related changes and actual-state parameters.

As targets concern the future, forecasts are of vital importance. The future performance of a forest estate (e.g. increment, yields, etc.) is mainly determined by the forest structure, and by the future management activities. The forest structure is characterised by age-class distribution, volume of growing timber, species, site class, stocking index, state of health, etc.

Because of the long time span between input and resultant output, any economic evaluation of a forest enterprise or of silvicultural measures and strategies must be seen from a long-term perspective. Input/output relations have to be considered explicitly.

2. Materials and Methods

Fig. 1 outlines the actual state of a management unit, a distant target state and, in between, the transition period, consisting of several time periods, each characterized by its periodical results or output objectives. Analogously, interim forest state targets can be
defined for the end of each time period. The ACTUAL state is determined by forest inventories, the TARGET is predetermined by establishing objectives and plans; thus ensuring OUTPUT results of the transition period.

The figure illustrates a conceptual framework for developing the "forest estate" system over time. Instruments for its quantified computation are mathematical programming and simulation (see e.g. Dijkstra 1984; Jöbstl 1978; Leuschner 1990). The so-called "utilization plan" is of central importance since it embraces the advance and final fellings in the course of time and all other production measures and is reflected in parameters, such as size of area to be treated, volume of timber harvested, labour and machinery requirements, returns, expenditure, and profit contribution.

2.1 Models and calculation experiments

Objectives are the guidelines that provide orientation. The task is to find means by which the objectives can be attained. Conceptually the question is "What happens, if..." (IF-THEN). Basically, there are two types of questions to be distinguished:

- Type 2. Given (IF): actual state plus target state. To be determined (THEN): the means (measures and external output) required to arrive at the aim.

The target state can be studied statically in its structure and sustainable future output by means of the normal forest model or its modified forms, designed as target model, which have been adapted to reality (Jöbstl 1987; Kiraly 1986; Kurth et al. 1978; Suzuki 1983). This study provides information on average values of growing stock, annual increment, fellings (yields), contribution margins, and net income per hectare. These parameters are measures for the sustained output capacity of a forest management class (see e.g. Table 1; Note: Examples are included in this text to illustrate the function of the model and to show how results can be presented in graphs and tables. The actual figures are of minor importance in this context).

In practice one is hardly ever confronted with a normal forest, but with real ones subjected to dynamic changes. Seen in terms of business management, the transition period, its management activities and economic results (woodflow, costs, revenues, etc.) are, therefore, of primary interest. Consequently, additional tools are needed. The problem of modelling the transition period has been addressed by several authors in the past three decades (e.g., Gerold 1989; Jöbstl 1973, 1978; Kouba 1989; Kurth et al. 1978; Möhring 1986; Navon 1971). The transition phase, i.e. the phase from existing forest to desired future forest is to be analysed dynamically over time, as for instance in the sense of dynamic programming (Zadnik 1990). It is characterized by an original state and different transitional situations (states, events, interferences) and as well as the changes thereby effected. The results allow for the development of objectives and management patterns over time.
The output and, consequently the economic value of an individual forest enterprise or management class, are determined from the combined results of both analyses that have been introduced. The actual value of a management class is determined by forthcoming results during the period of transition, on the one hand, and by the results of the normal forest model, on the other.

Total output $O_{tot}$ is calculated as:

$$O_{tot} = O(N) + O(T),$$

where

$O(N)$ is sustained output after at the end of simulation (derived from normal forest model) and $O(T)$ is output of transition period (derived from dynamic transition model).

Depending on the course of graphs of the relevant parameters and on the given time preferences (rate of interest), different forest values will may result (see for example, Table 2). By means of a simulation model, the values of the relevant parameters (physical and monetary, actual-state and output) can be determined in the transition period. Table 2 shows, for example, several results of two computation variants for an actual forest enterprise in Austria, created with help of the model "FOBSI" (Acronym for the German word ForstBetriebsklassenSimulator, meaning forest management class simulator).

### Table 1: Normal forest management class (Rotation period = 110 years) - Results of two variants: [W] with and [R] without game damage

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Variant WITH DAMAGE [W]</th>
<th>Variant WITHOUT DAMAGE [R]</th>
<th>Loss due to damage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROWING STOCK</td>
<td>m³ u.b. 245</td>
<td>m³ u.b. 257</td>
<td>12 5</td>
</tr>
<tr>
<td>INCREMENT / year</td>
<td>m³ u.b. 7.0</td>
<td>m³ u.b. 7.1</td>
<td>0.1 1</td>
</tr>
<tr>
<td>Final Felling Volume / year</td>
<td>m³ u.b. 4.6</td>
<td>m³ u.b. 4.7</td>
<td>0.1 2</td>
</tr>
<tr>
<td>Advance Felling Volume / year</td>
<td>m³ u.b. 2.4</td>
<td>m³ u.b. 2.4</td>
<td>- -</td>
</tr>
<tr>
<td>TOTAL FELLING VOLUME / year</td>
<td>m³ u.b. 7.0</td>
<td>m³ u.b. 7.1</td>
<td>0.1 1</td>
</tr>
<tr>
<td>Contribution Margin Final Cut / year</td>
<td>ATS 2,732</td>
<td>ATS 3,024</td>
<td>292 10</td>
</tr>
<tr>
<td>Contribution Margin Advance Cut / year</td>
<td>ATS 399</td>
<td>ATS 645</td>
<td>246 38</td>
</tr>
<tr>
<td>TOTAL CONTRIBUTION MARGIN / year</td>
<td>ATS 3,131</td>
<td>ATS 3,669</td>
<td>538 15</td>
</tr>
<tr>
<td>NET INCOME / year</td>
<td>ATS 1,131</td>
<td>ATS 1,669</td>
<td>538 32</td>
</tr>
<tr>
<td>VALUE of GROWING STOCK (stumpage)</td>
<td>ATS 89,000</td>
<td>ATS 104,000</td>
<td>15,000 14</td>
</tr>
<tr>
<td>PRESENT VALUE of NET INCOME (4%)</td>
<td>ATS 28,275</td>
<td>ATS 41,725</td>
<td>13,450 32</td>
</tr>
</tbody>
</table>

* In this example of a forest enterprise, a high percentage of stems were damaged by game. As a consequence of bark-peeling by red deer in young and middle-aged stands, rot frequently occurs, stems are devaluated, stability is reduced and stocking is diminished. Along with problems in regeneration this leads to increased costs and decreased revenues.

$1$ Euro = 13,7603 ATS

### Table 2: Transition model (Transition period = 120 years) - Results of 2 variants from a forest enterprise: [W] with continuing infliction of damage (continued damage) and [R] after reducing the game population (reduced damage)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Variant CONTINUOUS DAMAGE [W]</th>
<th>Variant REDUCED DAMAGE [R]</th>
<th>Difference Absolute (ATS)</th>
<th>Difference Relative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVERAGE FINANCIAL CONTRIBUTION MARGIN (F.C.M.)</td>
<td>transition years 1 - 40</td>
<td>transition years 1 - 120</td>
<td>3,347 3,337 -10 -</td>
<td>1811 15</td>
</tr>
<tr>
<td>PRESENT VALUE OF FUTURE F.C.M.</td>
<td>t₀ 4 % (time preference)</td>
<td>t₀ 4 % (time preference)</td>
<td>83,874 146,300 -6263 4</td>
<td>13450 15</td>
</tr>
<tr>
<td>PRESENT VALUE OF FUTURE F.C.M. (dynamic sum accoring to KRIEGER, 1966)</td>
<td>t₁₂₀ 4 % (time preference)</td>
<td>t₁₂₀ 4 % (time preference)</td>
<td>78,275 155,560 -7725 15</td>
<td>26900 15</td>
</tr>
<tr>
<td>COEFFICIENT of sustainable PERFORMANCE CAPACITY</td>
<td>Interest rate (I.R.) 4 %</td>
<td>Interest rate (I.R.) 4 %</td>
<td>3,355 3,387 32 1</td>
<td>32 1</td>
</tr>
</tbody>
</table>

$1$ Euro = 13,7603 ATS
2.2 Long-term simulation model FOBSI

Basically, FOBSI consists of a module for inventory, one for strategy and one for updating. Management strategies, growth models and a time controller change the present state of the management class in the direction of the target state (JÖBSTL 1978, 1987, 1995).

The procedure is roughly as follows. Based on the forest inventory, describing the actual state of the forest, and by simultaneously respecting the constraints (representing periodic targets and restrictions), the mature stands are "harvested" unit by unit (0,1 hectare each), applying certain priority rules (e.g., distribution pattern of final felling age, transition probabilities, eldest stands to be felled first, value increment related preferences). Then, the economic consequences of the "felling", the connected activities (e.g., silvicultural measures) and economic results (timber, costs, revenues) as well as the resulting changes in the forest states are calculated. At the end of each time period, the stands are updated by one decade, and a calculatory inventory is carried out. This inventory is the starting point for the next time period, and the felling rules are applied to the new inventory. This procedure is carried out repeatedly.

The conditions and economic results of the transition period are described by a set of indicators and are presented graphically and in tables. These results, in combination with the results of the target forest, are a measure for the actual asset value of the real management class, and as such, an assessment based on expected future results (type and volume of activities, costs, returns).

2.3 Development of parameters according to time, and the present worth (NPV)

The development curves of the parameters over time are taken as the basis for valuation and assessment of alternatives. The values of the output parameters are then transformed into average values as characteristic figures of a partial period. Furthermore those output parameters, which have been evaluated in monetary terms are used to calculate net present values by means of discounting (interest rate as an expression of time preference of the owner). [Attributing monetary values (value ratios) to physical state and output variables is necessary in order to render different timber species, grades and qualities etc. comparable, and thereby addable, although future prices, costs etc. are unknown.] The discounted value represents the present value of forest returns, assuming stability of price and costs over time. The curves of the financial contribution margin and its discounted value show notable differences.

Fig. 2 gives examples for question type 2 (see paragraph Models and calculation experiments), pertaining to different ways, represented by three different felling rate formulas, of attaining a predetermined target. Note that all three variants lead to sustainability in the long run. Although the total results in the overall transition period are almost equal, the felling strategy of variant 3 reaches only 77% of the discounted present value of the forest returns in variant 1. The differences are the consequence of diverging occurrence of receipts and payments over the course of time and the chosen interest rate, expressing the time preference of the owner. The lower the interest rate is, the smaller is the difference.

By using a computer, models can be calculated in several variations. It is, for instance, possible to account for uncertainties and risks such as calamities, timber price variations, forest damage, etc. in the simulations. Calamity variables can be estimated on the basis of historical data; and risks can be delineated by calculating optimistic, probable and pessimistic variants.

3. Conclusion and Discussion

The model presented allows for a wide range of applications, and is particularly useful for analysing alterations, changes and transitions of a forest estate which should only be done dynamically. Therefore, it is especially of benefit for:

1. Forest valuation: valuation of the actual forest state on the basis of future output, that is, discounting of the financial yield series plus additional evaluation of other target components according to their long-term development.

2. Evaluation of plans as a basis for decisions making: design of alternative utilization plans and their evaluation as a basis of medium and long-term planning; analysis of long-term strategies; examination of plans as to sustained yield; complex regulation to ensure sustained yield while taking a variety of factors into account. Other management functions (purchasing, funding) and forest social benefits can - at least partly - be included, evaluated and accounted for as constraints.

3. Identification and specification of objectives: apart from evaluating plans and long-
term strategies as for example game and peeling damages, identification and specification of objectives are facilitated. Developments and correlations (cause-effect) are clearly depicted, which paves the way for a decision as to which aims and results are to be striven for (sustained financial yield, supply, reserves, growing stock, etc.).

4 Providing foresters with a better understanding of the forest enterprise (thinking in terms of systems and long-term cause-effect relationships): such models illustrate the relationship of forest and business management in an enterprise and their relation to other management functions such as the effects of different felling rate formulas on growing stock, increment, harvest, forest value; the problems of short-term budget-oriented thinking (implementation or omission of cultivation and tending measures, damage inflicted to forests, over-cutting and under-cutting) and their long-term economic effects. Such illustrations promote long-term thinking in terms of sustained yield which is geared to the needs of a forest enterprise.

5 Regional forestry scenario analyses: examples include examining certain effects of damage caused by air pollutants; investigating the long-term consequences of changes in production objectives and rotation periods (e.g. timber of large versus small dimension); analysing the market potential of increased intermediate felling.

6 Retrospective medium-term performance analysis of the forest enterprise: determination of medium-term alteration in forest state by means of two forest state inventories (original at $t_1$ and actual at $t_0$); comparison of physical and monetary performance capacities of the two inventories; comparison of planned and actual performance capacity of the forest; identification of deviations and analysis of causes.

In the practice of Central-european forest enterprises medium and long-term forest management planning - dealing exclusively with physical terms - and business management - taking up monetary values - are customary more or less separated fields of enterprise management with little connection and coordination. From a system point of view, however, they are interconnected in medium and long-term targeting, planning, and performance evaluation. The specifying of objectives and the ensuring of a sustained yield require a prospective analysis of possible future enterprise developments through long-term simulation of operations. Static and dynamic sustained-yield models for management classes are thereby the key element.

The actual forest state is compared or conceptually related to the normal forest model or its sub-forms, which have been adapted to reality through positively skewed age-class distribution, varying stocking density, different species distribution and yield classes. By means of normal forest model calculations it is possible to analyse management alternatives such as rotation cycles, cultivation measures, thinning intensities, game densities, etc., to establish yield forecasts and to perform evaluations. The transition phase from the current forest state to the normal or target state can be illustrated and calculated in the dynamic transition model. (Note: It is appropriate to attribute monetary values to physical actual-state or output parameters, in order to correctly depict the economically-relevant relationships between different objects relative to the objectives). The results derived from the transition period are both the basis of

![Graph 1](image1.png)

**Fig. 2:** Comparison of three simulation variants created by FOBSI (different felling rate strategies, identical actual and target state)
and measure for plan evaluations and management valuations. The "normal" and the "transition" models, taken together, supply data for strategic decision making, planning alternatives and forecasts of their impact as well as and evaluating management, forest estates, etc.

The dynamic transition model illustrates most clearly the relationship between forest management planning, usually focused on physical parameters, and forest business management, which uses evaluation criteria based on economic rationality and financial targets. Business management considerations that fail to include the resultant changes in the structure of a forest do not make sense and will lead to misdirected judgements. The model helps to overcome the problem of inadequate accounting for the most important forest asset, i.e. forest stands, in book-keeping. However, forest management planning can only be part of medium and long-term economic planning in forestry. This ranking of subjects is not a question of delimiting disciplines and their representatives. It is a question of holistic thinking and global approaches from a system-oriented perspective. As subjects, both disciplines are equally legitimate and important. In practice, however, they must not be dealt with or implemented independently of each other.

4. References


INCORPORATING NON-MARKET VALUES INTO THE ACCOUNTING SYSTEMS OF PUBLICLY AND PRIVATELY-OWNED FOREST ENTERPRISES: AN OPERATIVE STEPWISE APPROACH

Maurizio Merlo* and Hans Jöbstl

Abstract
This paper shows that financial accounting is mainly used in large private forest enterprises (e.g. Austria, Germany, Finland) and also in public forest estates. Sometimes, cost-centre accounting is also implemented. Almost no accounts for forestry activities are kept in farm accounting systems (e.g. EU-FADN). Meanwhile, 'parliamentary' accounts apply to public forests in several countries. Without adaptation, these accounts are not particularly useful for management decision-making. In any case, little attention is paid to 'environmental accounting', which is a fairly new concept, or even to separating expenditures for stewardship practices like landscape and environmental maintenance from timber production.

The paper will propose a framework to improve forest accounting including environmental non-market values. Several options can be advanced which represent progressive steps:

1. identification of direct environmental expenditures;
2. addition of hidden environmental liabilities/assets together with the imputed and/or the opportunity costs to provide environmental goods and services;
3. consideration of non-market goods and services, valued also through consumer surplus measures.

The steps for environmental accounting should be reflected in both the balance sheets and the profit and loss accounts, though the most advanced steps can be shown by 'satellite' accounts and/or addenda rather than being integrated into the traditional accounting system. In this context the valuation of forest assets, including natural resources stock, should be linked to forest inventories, extended to cover factors such as biodiversity and landscape qualities.

The conclusions of the paper show how a functioning system of environmental accounts at forest level can become an instrument for the marketing of 'non-market' goods and services. Additionally, it can assist the design of public forest measures, such as incentives and compensation, which do not give undue consumers’ or producers’ rents. The appendix to the paper shows examples of the approach from a public forest in Northern Italy and a private forest enterprise in Austria.

Keywords: forestry, environment, accounting

1 The state of the art in forestry accounting
Management of forests – for whatever purposes – requires a variety of information. The central element for providing this information is the accounting system. Hence accounting is a means necessary for managing businesses (planning, decision-making, controlling), for reporting to the economic and social environment (owners, tax office, etc.), and for policymaking. Data provided by accounting are not only important for the individual business, but also at wider levels: regional, national, supranational.

Schematically a forest enterprise can be represented by states, flows (input and output), and transformation processes (Figure 1), which need to be controlled according to goals. Production factors, such as land and labour, are employed and transformed into output. Among the outputs one must distinguish: marketable goods and services (timber, other forest products), non-marketable goods and those not-for-sale (increase in growing stock), and non-market benefits like recreation and protection. The concept of positive and negative externalities may be emphasized in this context. Incidentally the latter could be treated as an input. The task of accounting is to give a quantitative picture of stocks and flows – in physical or monetary terms. Evaluations have to be carried out in cases where the goods are not, or cannot, be priced by the market.


1 Maurizio Merlo acknowledges suggestions and help from Edi De Francesco and Stefano Destro. The Venetian Azienda Regionale Foreste (ARF) has kindly provided data and information. Further elaborations, including several estimates, are however his responsibility.
From the business organisation's point of view, it is imperative to record all the relevant inputs and outputs and their relationships. Of course non-market outputs have to be included as well as changes in forest stands. This issue has always been, and still is, a weak point in forestry accounting systems. Input-output relationships (e.g. asset-profit, cost-benefit) are a most important measure of performance.

Various branches of accounting have evolved to suit the different subjects, aims, tasks and perspectives, as well as legal requirements. Specific systems have to be set up and different methods need to be used. The size of the business plays a key role, as there are size-dependent legal obligations for book-keeping in many European countries. Traditionally, accounting can broadly be classified into financial, cost and management accounting (Figure 2).
Financial accounting records flows of money, goods and services from and to the enterprise in monetary terms, and the resulting state and changes in assets and liabilities. Monetary profit is the basic measure of results. Cost accounting analyses internal processes, factor consumptions and performances in detail, and is characterized by efficiency criteria. Both systems of accounting cover the production of goods and the provision of services as far as they contribute to monetary profit. Management accounting comprises all accounting activities aimed at providing data relevant for management purposes. Its core element is cost accounting.

Financial accounting is compulsory and regulated by law in the case of larger firms according to their legal status. Usually smaller business units do not have any accounting, while medium-sized ones often keep records of receipts and payments. Public forest enterprises commonly apply parliamentary accounts according to government rules. Receipts and payments are registered and compared with the budget. Parliamentary accounts, as well as book-keeping based on receipts and payments, are not well suited for management purposes. Financial accounting of the larger estates is on the whole well developed in several European countries. A major shortcoming, however, is neglecting or incorrect registration of changes in growing stock. Reductions in forest assets as a consequence of overcutting or neglecting necessary maintenance, lead to higher ‘book’ profit, whereas building up forest assets reduces profit. In some countries the open-market value is used, which is also problematic. Consequently balance sheet and profit and loss accounts are incomplete or incorrect. Some 30 years ago, an international working group of IUFRO (1967) looked for a common solution and tried to achieve harmonisation. The results, however, were limited, as it was difficult even to agree upon common terminology. The problem is still there and should hopefully be dealt with by joint European forestry research efforts. Management accounting is carried out in the majority of larger forest enterprises, including some which are publicly owned. It is important for detailed reporting and economic efficiency analysis, and frequently includes cost-centre accounting, cost-unit accounting, product calculations, job-order costing, budgeting, and sometimes standard costing, process costing, etc.

Forest assets recording is part of natural resource accounting. Inventories are carried out usually at 10-year intervals. Book-keeping needs annual data. Although EDP-data bases and computer-based models allow for continued recalculation and consequent updating of forest-related data, in practice this has not been applied so far. Due to problems of measurement, evaluation, and the conservative attitude of forest owners, changes in forest assets are often considered in separate calculations. In central European countries the allowable (sustainable) cut – being the expression of the performance capacity of the forest enterprise – is used as a reference measure for carrying out simple corrections of the book profit outside of financial accounting.

Some decades ago, social accounting, and more recently environmental accounting, were added as new categories of accounting (Figure 2). Social accounting aims at extending traditional accounting by considering qualitative aspects such as quality of living and welfare. Usually it consists of a social report, value-added statement and social balance sheet (MÜLLER, 1995). Originally, social accounting included employees’ working conditions, services provided, residential houses, sports facilities, nurseries, etc. Accounts for welfare expenditures can already be found in a publication from 1920 (HOFFMANN). Environmental accounting reports enterprises’ use of the natural environment which is a provider of environmental goods (material and energy flows of all kinds), and a receiver of enterprises’ pollution or undesired outputs – material and energy residues of all kinds. It must be noticed that today environmental accounting is taking over more and more topics from social accounting.

To promote forestry accounting, IUFRO recently established a working unit on ‘managerial, social and environmental accounting’. Of course, registering non-market benefits in forestry accounting is only at an early stage. Cost-centre accounting can, however, record the expenditures and revenues of non-market benefits and other non-timber activities, separating them from those directly linked to timber production. Allocation of administrative overheads to various business fields is possible, as well as calculation of the forest enterprise’s real result based on the allowable cut. Besides the changes in forest assets, the revenues foregone caused by providing non-mar-

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2 On a higher level other social issues like income distribution in a certain region are to be considered. Following national accounting, it could also include national resource accounting.
Market benefits can be assessed by means of separate calculations.

This is the present state of forestry accounting in some European countries. There is, however, a clear demand to proceed to incorporation of non-market values, even those measurable only through consumer’s surplus such as landscape quality and free recreation. Environmentally adapted reports on forest enterprise performance are also required. Of course, in any case, it is necessary to question the purpose of accounting: what are the advantages for the enterprise managing the forest resources? Accounting is a tool to assess efficiency and profitability. Consequently accounting activities themselves have to be appraised. In other words the cost of obtaining information must not exceed the likely advantages. In other words the cost of obtaining information must not exceed the likely advantages.

To be realistic, however, one must consider the state of forestry accounting in many countries, and often this is lacking. Even the EU-FADN (European Union Farm Accounting Data Network) in several countries does not take account of forestry undertaken within farms. In these cases, for example, growing stock inventories are not reported. Often accounting is limited to public forests where financial control predominates over managerial objectives. The substantial lack of traditional accounting certainly does not favour its enlargement to non-market values. However, public interest in the non-market values of forestry in recent years has been such that new methods of environmental valuation have been accepted and promoted. Quite paradoxically, this may be the main reason for starting traditional forestry accounting where it is still lacking.

2 Developments in environmental accounting: relationship with forestry

The issue of including the environment in enterprise accounting has only arisen recently. Previously it was thought that non-market public 'goods' and 'bads', being part of social welfare, should have been considered in national accounts at a macrolevel rather than in individual enterprises. However, the growing awareness that environmental problems should be tackled at the base (individual production and consumption sites) has encouraged the development of micro-environmental accounting – at the firm or area scale. The market itself (green consumerism) appears to be pushing in this direction. Legislative support comes from European Union (EU) Regulations for eco-labels (Reg. 880/92) and eco-auditing (Reg. 1836/93), or from recent proposals for stewardship certification in forestry (e.g. Forest Stewardship Council, 1995). Additionally, environmental auditing is now considered to be an essential condition for all enterprises aiming to maintain the confidence of shareholders, customers, financial institutions, insurance companies, and the general public (Club de Bruxelles, 1993). Competitive advantages seem to arise for economic systems and companies adopting environmentally friendly codes of practices (Porter, 1991). There is also a debate on introducing tax declaration schemes able to identify the environmental impact of economic activities.

It is rather interesting to note that the development from traditional to environmental enterprise accounting has followed the same path as national accounts and as cost-benefit analysis (CBA). More specifically, traditional net income is transformed into environmental adjusted net income. This process could be stepwise, initially including identification of environmental costs, then extended to resource accounting and to imputed costs, and finally considering off-site and non-market costs and benefits.

With reference to existing literature, e.g. the recent proposal by FEEM (1995a), the following four approaches to environmental accounting, ranging from 'mild' to 'dark green', according to Gray's definition (1993), could be mentioned:

1 Identification and reclassification of environmentally aimed expenditures, already present in traditional accounting. Separate records are kept of expenditures undertaken for environmental improvements (new plants, mitigation, stewardship, conservation, etc.), paying environmental fines and taxes, meeting standards or coping with conflicts promoted by green movements. This approach – strictly based on market values – only calls for adjustment of existing accounting systems in line with a 'mild green' option. Of course the approach is helped by the creation of specific cost centres where each type of environmental expenditure must be grouped.

2 Identification of hidden environmental liabilities/assets, such as future expenses for

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3 Systems of National Accounting (SNAs) have developed into Systems of integrated Environment and Economic Accounting (SEEAs). Sinscalco (1995) underlines the striking similarities of SEEAs. Additionally, environmental auditing (Reg. 1836/93), or from recent proposals for stewardship certification in forestry (e.g. Forest Stewardship Council, 1995). Additionally, environmental auditing is now considered to be an essential condition for all enterprises aiming to maintain the confidence of shareholders, customers, financial institutions, insurance companies, and the general public (Club de Bruxelles, 1993). Competitive advantages seem to arise for economic systems and companies adopting environmentally friendly codes of practices (Porter, 1991). There is also a debate on introducing tax declaration schemes able to identify the environmental impact of economic activities.

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restoration, to meet more stringent legislation or to prevent future environmental damage, as well as the imputed costs necessary to provide environmental goods and services. This approach highlights possible losses in natural capital (depletion and/or degradation), but also gains (e.g. increased growing stock), which have monetary value. The approach can require some use of 'satellite' accounts and/or addenda to traditional book-keeping. Both the balance sheet and profit and loss account can be modified, directly or indirectly, by values linked to the market.

3 Inclusion of non-market values, as natural stock depletion/degradation shown by forest inventories enlarged to quality of stands, biodiversity, landscape impacts, etc. Also welfare variations measured through consumer surplus can be taken into account. Satellite accounts and addenda become essential because non-market values are not generally acceptable and integrable into the accounting systems. The physical and/or monetary information are therefore attached to the accounting system mainly through addenda and/or satellite accounts which supplement traditional accounting, without altering its structure. This approach has the inherent advantage of ensuring continuity of traditional accounting systems and the relative information system. However, it must be clear that managerial objectives are extended to include a public view of forestry.

4 Full integration of environmental and financial data, where an integrated information system aimed at complete environmental valuation of the enterprise is set up according to a 'strong' sustainability. In practice, this calls for complete readjustment of accounting procedures and is the most radical, or 'dark green', approach. However, approach 3 can lead to the same results, whenever account is taken of natural capital depletion/degradation, along with environmental damage, as well as benefits.

Alongside the options mentioned, the realisation of a system of environmental accounting could include an 'environmental report', i.e. a commentary, containing qualitative information and a presentation of the most important items regarding the relationships between the firm and the environment (FEEM, 1995b). This report can be compared to the standard annual report where the financial statement is accompanied by a description of the enterprise's policies, programmes and objectives.

2.1 Natural resources depletion/degradation as the main focus of environmental accounting: peculiarities of forestry

Reviewing the most recent developments in environmental accounting both at national and at enterprise level, however, it is clear that environmental 'bads' are the main issue: i.e. depletion and degradation of natural resources with all their non-market and/or off-site negative effects. This focus is justified by the environmental impact of many modern processes of production and consumption. Little or no emphasis is placed on environmental goods and services, which are taken for granted according to existing property rights. At most they are mentioned when they become a scarce resource.

The fact that environmental accounting largely deals with the negative effects of production/consumption processes places forestry in a rather peculiar situation. Standard environmental accounting applies when depletion/degradation of natural capital is involved: e.g. deforestation or pollutant release and harm to biodiversity as in the case of plantation forestry. However, forestry began centuries ago in order to face the problem of timber depletion. The correspondence between

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5 Of course rapid and obvious depletion and degradation of natural assets (e.g. forest fires or dramatic cases of pollution), being immediately expressed by market values, are generally included in traditional accounts. Meanwhile less evident non-market depletion (such as gradual aquifer use) and degradation of natural assets (e.g. water pollution) or improvement of natural assets (e.g. a fallow year, green manure production and increase of forest growing stock) should be included in satellite accounts (DESTRO and Olson, 1995).

6 Accounting can also be supplemented by production process accounts, such as Ökobilanz and life cycle assessment, including records of a product's environmental impact, from extraction of the raw material to its abandonment or recycling.

7 It is quite interesting to note that satellite accounts and the various possible addenda can be to a certain extent assimilated to the memorandum accounts foreseen by EU Directive IV n. 660/78, including risks, obligations and warrants affecting the enterprise's assets (Brunetti, 1989). Memorandum accounts are therefore supplementary to balance sheets and should highlight items that do not affect the profit and loss account but are important for the overall impact and image of the firm.

8 See Victor's (1991) distinction between weak and strong sustainability.

9 At least since forests have been considered a renewable rather than a non-renewable resource. Historical origins date back to the Italian Renaissance, especially in the Venetian Republic, to the forest policies applied in France in the era of Colbert, and above all to the German and Middle European Schools of Forestry (Devèze, 1973).
timber as a product and its main production factor meant that, more than any other activity, forestry had to take account of a natural resource, i.e. the growing stock or timber capital. The so-called 'normal' forest requires conservation of the resource itself, along with sustainable timber production. The problem of 'living off your capital' as expressed by Repetto et al. (1990) and modern environmental economists, was solved by maintaining detailed inventories, what is now called satellite accounts. The best balance between harvest and timber capital, and the relative management schemes, has always been a major issue in forestry theory and practice. Of course, it may be claimed that this constitutes environmental accounting to the extent that the growing stock is a real natural stock, as is the case with nature-oriented forestry. It has therefore been proposed to enlarge traditional forest inventories to variables such as biodiversity, landscape quality, etc.

Another aspect making forestry an exception is the size of non-market and off-site benefits. These benefits, until recently ignored, are now appreciated since they are becoming in demand and scarce. Services such as watershed management, recreation, carbon dioxide sequestration, soil protection, and maintenance of biodiversity can be valued and accounted for. However, it is surprising how these services are not always attributed to the forest ecosystems actually performing them, e.g. plantation forestry (producing negative externalities) and nature-oriented forestry (producing positive environmental externalities) often appear to be confused with one another, and existing statistics often support such misunderstandings. Certainly consideration of the different services provided by forests is not an easy task. The many re-elaborations by well-known economists of the optimum stocking problem through the Faustman formula, originally referring to even-aged stands, are perhaps significant of the difficulties in understanding the real environmental role of forestry (Hartman, 1976; Samuelson, 1976; Hartwick, 1993; Van Kooten, et al. 1995).

It may therefore be claimed that environmental accounting finds forestry in a rather peculiar situation, quite a special case, for the following reasons:

1. For centuries account has been taken of depletion/degradation of natural capital, generally quantified by inventories in terms of area and growing stock.
2. There are problems in valuating and accounting off-site non-market benefits that have always been intrinsic to multipurpose forestry.
3. The benefits, at least in nature-oriented forestry, largely exceed the costs, therefore environmental accounting, unlike many other productions, generally gives more favourable results than traditional financial accounting.

2.2 To what extent traditional forest management accounting can include non-market values

It may be interesting to examine how the traditional procedures of forest management accounting may respond, or be adapted, to the four different approaches to environmental accounting, outlined above:

1. Identification and reclassification of environmentally aimed expenditures. Regarding this first approach, aimed at pointing out the forest firm's costs for conserving/improving the environment, it may be noted that many forest enterprises, particularly public ones, now generally distinguish between the expenditure connected with environmental maintenance and the provision of recreational facilities, from those directly linked to timber production. Under certain legislations for mountain areas, there is an obligation to reinvest a part of the revenue from timber sales in works aimed at improving the forest's protective function. Consequently there is an obvious need to keep separate accounts. An example of separate accounts is reported by Bartelheimer (1991) who calculates in Alpine forestry the costs stemming from recreational and protective functions as 35 ECU per

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10 Quite obviously there are contexts outside developed countries, and this means the majority of the earth's forests, where the depletion of timber capital as such is still a serious issue, involving problems of accounting that are comparable with 19th-century Europe. In this regard certain misunderstandings found in recent approaches to national environmental accounting appear surprising. For instance, the United Nations Handbook of National Accounting (1993) refers to wild biota set production equalling consumption without considering natural growth, off-take or stock. Natural growth in excess of off-take is not regarded as production, but neither is any allowance made for off-take in excess of natural growth. 'The manifest error in this assumption' is underlined by Harrison (1993), 'especially with regard to tropical rain forest'.

11 In identifying the non-market value of such benefits, forestry has played a pioneer role. Methodologies such as travel cost, contingent valuation and hedonic pricing, have often seen forests at the focus of the valuations. It should be pointed out, however, that though these methods have become widespread in recent years, they have not had an impact in forest management accounting, being mainly confined to CBA of investments and policies.
ha. Specific cost-centres and the related methodology are not however always applied, and this certainly does not help the process.

2 Identification of hidden environmental liabilities/assets and imputed costs. Regarding the second approach, it has always been emphasised by forest management with respect to timber capital. Forest inventories have been developed, making it possible to value changes in timber capital as variations in capital assets that can be registered as a plus/minus value in the profit and loss account, rather than a typical revenue/cost. However, the state of the art is such that variations often remain relegated to inventories, or satellite accounts, which are not reflected in the accounting system. It should be pointed out, in any case, that depletion or degradation of smaller amounts over the short term, such as the loss of biodiversity due to plantation forestry, has not been given emphasis. Rather, these aspects have been ignored as they do not have sure, immediate market effects on timber production. Forest deperishment – which has become evident over the past 20 years – and the apparent scarcity of goods and services connected with forestry, make it advisable, however, to take account of hidden environmental values in the balance sheet. The problem may be dealt with, for instance, in terms of increased value in growing stock and risk of its collapse and related costs, as well as annual insurance to cover the costs of forest restoration. The relative values should be accounted even if an actual specific fund is not operative.

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3 Attempts toward a stepwise inclusion of non-market values in forest management accounting

In order to exemplify the above approaches to environmental forestry accounting, two applications are reported in appendices 1 and 2.
The first refers to a public multipurpose forest: the Cansiglio in Veneto Region (North-Eastern Italy), while the second concerns a private forest in Styria (Central Austria). In the first case, management objectives favour recreation and nature conservation rather than traditional timber production, while in the second the timber production objective is predominant.

In both cases the applications are reported following a stepwise procedure of sequential balance sheets and profit and loss accounts, reflecting growing attention to environmental issues.

### 3.1 Application to Cansiglio public forest

The values shown in the sequence of balance sheets and profit and loss account (Appendix 1) have as a starting point the existing accounting system, which is based on parliamentary accounting. This requires numerous estimates from the first step onwards, not to mention non-market natural stocks and flow valuations in the most advanced steps. In practice the existing accounting system has been shifted from public to private, and then to environmental accounting. Of course there is room for debate and discussion, especially with regard to the most advanced steps which are heavily based on the public objectives of forestry and on non-market values expressed in monetary terms.

In particular Table 1 gives the traditional financial accounting while the following Tables 2, 3 and 4 modify and enlarge the balance sheets and profit and loss accounts adopting the first three approaches mentioned above, ranging from 'mild' to 'dark' green.

1. The first balance sheet and profit and loss account (Table 1) refer simply to financial data and are closely connected to the existing public accounting system. Nevertheless, substantial modifications have been made. Firstly, a private approach has been followed requiring a balance sheet recording assets and liabilities. Valuations have been made with reference to real markets; values, however, are rather conservative (almost half the market price) given the public property status of all the assets. Secondly, a complete reclassification of revenue and expenditure items has been made in order to follow EU rules, posing at the same time the basis of the new environmental accounting, i.e. a distinction between the traditional activity (timber production) and the new production of environmental goods and services. From the balance sheet of Table 1 one can see that the assets, mainly given by forest stands (11 million ECU), create an annual production value: timber and market services largely lower than management cost as shown by the profit and loss. The result is very negative, with a loss of around 0.6 million ECU, and only scarcely improved by the increased value of fixed assets, growing stock and estate value. The profit and loss account is, however, balanced by what are called compensations, i.e. various contributions coming mainly from the regional administration, justified on the ground that the forest provides a large amount of free public goods contributing to people's welfare. It must be remarked, however, that the profit and loss account of Table 1, although reclassified, does not allow a clear distinction between the traditional activity (timber production) and the new recreational-environmental products that are now the dominant feature of the forest management. This is largely due to the lack of a proper cost-centre accounting, a development badly needed both for traditional accounting and the new environmental accounting.

2. The balance sheet and profit and loss account (shown by Table 2), refer to the first approach where the traditional activity (timber) is separated from recreation and environmental functions. It should be noticed that the approach does not require new values external to the existing accounting system, being based just on a different aggregation of revenue and expenditures. Nevertheless, it must be remarked that the new approach implies a revision of the accounting system where ordinary accounting is accompanied by a sort of cost-centre accounting that should represent the first step toward management accounting (JÖBSTL, 1995). Both results are negative. It is, however, possible to distinguish the heavy losses due to recreation and environmental activities. On the contrary, the traditional activity presents a positive result whenever the increased value of 'cutable' growing stock is taken into account. The profit and loss account also shows that the negative financial results of recreational-environmental activities are balanced mainly by public compensation. Marketing of environmental goods and services remains sporadic and scarce. The results, however, clearly pose the problem in terms of forest management and marketing. It has also
to be noticed that satellite accounts like forest inventories, although essential, do not appear in any way in the balance sheet.

3 Table 3 expresses hidden environmental values; both positive and negative, and specifically marked with $\textcircled{1}$. It requires more radical options compared to the previous schemes, according to a 'greener' approach. In particular the non-marketable increase of growing stock (35,000 ECU) – shown by forest inventories, mandatory according to environmental regulations – can be included in the balance sheet as a non-marketable fixed asset. Of course prudential valuation has been made. This increase also appears in the profit and loss account. Analogously, it is possible to show the risks affecting existing artificial stands of spruce, which are liable to disease in plantation forestry since they lack biodiversity and natural protection. The artificial stands risk, shown in the profit and loss account as an annual depreciation, should be covered by a specific fund (artificial stands risk accrual) to be incorporated as a liability in the balance sheet. This fund should be used in case of actual collapse of the artificial stands. It should be noticed, however, that in this specific case the risk is also covered by annual management expenditures aimed at artificial stands improvement, through planting of indigenous broadleaved species like beech. The growing stock increase, imposed by management rules, can also be seen as the concrete realisation of a fund against the environmental risk of artificial stands collapse. The results of satellite accounts, namely inventories based on stand quality, appear in the balance sheet as shadowed values.

4 The previous tables take into account forest assets/liabilities and products that have a market or can be easily expressed in market values. Meanwhile Table 4 highlights non-market values, typically public goods. Therefore the balance sheet and the profit and loss account assume a public connotation open to welfare considerations. Public objectives are incorporated into the management objectives. This means an enlargement of the balance sheet through new boxes addenda where natural resources received from society are indicated. Resources are reported both in assets (being factors employed to produce public services) and liabilities (being public goods borrowed from society). These items are not quantified in monetary terms, but only physically according to the satellite accounts logic. Another addendum integrates the profit and loss account of Table 4. It represents an adjusted (or enlarged) profit able to account for the non-market and off-site flows of services. The operation seems acceptable to the extent that recreation and watershed management increment social welfare, i.e. constitute a flow of utilities recorded in the time span covered by the profit and loss account. It should be noticed, however, that net social profit/loss calculated through addenda (and based on welfare estimation) derived from consumer surplus measures are reported as separated items in a specific box. In addition this flow of benefits is considered net of compensation, and taken as an indemnity for the expenditures met to provide public goods and services. This implies a double entry of compensations in the profit and loss account: firstly as a sort of revenue to obtain net profit/loss for the year, and secondly as expenditure to be deduced from the total value of recreational-environmental services. This means that public compensations are omitted from the environmental-adjusted final net profit reported in Table 4. In this specific case the adjusted social profit is equal to around 0.6 million ECU, taken as an intrinsic component of the social welfare function. Registration of this value in the balance sheet, although as an addendum, can cause perplexities at least as far as the amount is concerned. It seems, however, very important to include it, in order to show how the increased flow of services (annual welfare) contributes to society's capital, which in the end constitutes human capital. Some authors tend to argue that only welfare variations matter. For instance, Lindall (1995) referring to Danish forestry, states that 'a wide range of unaccounted environmental resources is not a reason for including these benefits'; what counts is significant deterioration that can be avoided or enhancement that can be encouraged. On the opposite side, Adger and Whitby (1993) propose modifying British agricultural products by adding the value of carbon fixation and non-marketed service flows, while deducing defensive expenditures. The overall results indicate a 20 % increase in net product.\(^{14}\) The arguments therefore are about consideration of total flows or limitation to

\(^{14}\) This attempt has been, however, commented upon as 'allow for the pleasure given by the green belt and national parks, and throw in something for the effect of tree planting on mopping up global warming carbon dioxide and, presto, a sustainable net product is 25 % bigger than net product'. (The Economist, 18 January 1992)
variations. Apart from arguments having a certain rationale at nationwide level, and for services provided by natural resources as such, it must be remarked that in the specific case outlined in Table 4 inclusion of total yearly public benefits seems acceptable because they correspond not only to resources but to environmental goods and services that would be jeopardized by lack of forest management. Meanwhile variation of stocks necessary to provide these services is reported as assets variation in the balance sheets.

### 3.2 Application to a Styrian private forest

The private forest enterprise selected for this case study is situated on the eastern rim of the pre-Alps and high-Alps of the most densely forested province of Austria, Styria, with some 60% of land covered by forests. Beside forestry the enterprise is also involved in several other businesses like sawmilling, letting houses, and quarries. It is situated near a medium-sized city and is spread out over 35 kilometres in length.

The estate belongs to a size-class 5,000 – 10,000 ha. The main species is spruce, mixed with some 15% larch and pine, and 7% broadleaves. Sustainable income and resource conservation are the main objectives. As financial data is largely confidential, reference has been made to a basis of 1,000 hectares of forest land. ATS has been converted to ECU (appendix 2).

1. The starting point is the financial accounting system. As prescribed by law it is double-entry book-keeping with balance sheet and profit and loss account. The main shortcoming is that forest assets are not shown – or shown only by the purchase value of acquired areas. Consequently, changes in forest assets are not recognised in the financial result – profit/loss. In contrast to the widely used approach, in this particular enterprise, however, financial reserves are formed from excess cuttings and special provisions are set aside for neglected maintenance and tending measures. Table 1 shows a balance sheet profit of 114,000 ECU which, by using the recently introduced total cost method – in accordance with EU regulations – can be split up into an operating result of 140,000 ECU, a financial result of 46,000 ECU, an extraordinary result of 103,000 ECU, and diverse allocations. 136,000 ECU revenues from land sales and excess cuttings were allocated to capital reserves. The resulting net profit of the year is 152,000 ECU. After deduction of 14,000 ECU for timber and firewood supplied to owners and of 24,000 ECU in retained earnings, 114,000 ECU are distributed to the owners. Further splitting of the result is not possible, as the revenues are categorised by products, cost-incurring items, or types of revenue; whereas expenditures are shown by expenditure categories – types of input factors. Attribution of expenditures to specific products is lacking. So the performance of the different operations and/or fields of business such as sawmilling, farming, hunting, house-letting, services, non-market benefits etc. cannot be shown. The information value of these statements is therefore limited. In the notes to the balance sheet, timber volume, timber prices, timber deliveries to the owners, investments, etc. are described. Excess- or under-cuttings are normally shown in physical terms, but not as values. In our case the value is estimated at 31,500 ECU and added to the financial reserves from excess cutting. A market value for the land is stated in a footnote to the balance sheet.

2. Further analyses require cost-centre accounting, where revenues and expenditures are assigned to cost-centres and allocated to cost-incurring items – products and services. Finally, expenditures are converted into costs. As a basis there are proposals for cost-centre frameworks from 1962 and 1974 (HVLF) and an EDP-based operational accounting system (JÖBSTL, 1981). Cost-centre accounting allows registration of the expenditures for non-market benefits, separation of the expenditures and revenues of non-forest activities from those of the forest enterprise, allocation of administrative overheads to the other business fields, and calculation of the real result of the forest enterprise based on the allowable cut. Some calculatory items are included in the operational accounts, as there is the replacement of tax allowances by calculatory depreciation, or the inclusion of the cost of the proprietor working in the company or calculatory interest. The results of the expenditure-cost conversion and the allocation of costs to cost-centres are presented in the form of a master summary sheet.

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15 A rather interesting point was made by Daly (1988) opposing Fisher's old national dividend approach to Keynes' national income: 'had the national accounts developed in accordance with Fischer's concepts, their extension to cover environmental services and ecological and geological capital depletion would have been obvious and easy, except for valuation problems for services without markets. As it is now, incorporation of ecological services and natural capital must be very ad hoc, and in fact it may ultimately be necessary to adopt Fischer's approach'.

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Assigning the revenues and expenditures to cost-centres (fields of operations) gives the following operating result (ECU):

- Forest enterprise 63,800
- Other main activities (sawmilling, letting) 60,300
- Net compensation for management restrictions in protection forest 300
- Hunting 12,200
- Mushroom and berry picking 700
- Forest buildings let for recreation 6,100

The so-called allowable-cut correction (i.e. modification of profit/loss components due to changes in forest assets by relating expenses and returns dependent on the felling quantity to an allowable-cut quantity) gives an operating result of the forest enterprise of 32,300 ECU and a negative change in forest assets of -31,500 ECU. This is the state of the art, as applied in numerous Austrian forest enterprises.

In Table 2 some further attributions are carried out. In the cost-centre of non-market benefits, direct expenditures (signs, fences, closing of roads, cleaning, etc.) are recorded. In a further step, overheads are to be added and some other positions to be included. Essentially two items: an appropriate share of overhead costs allocated according to time records kept by the personnel, and amounting to 1,200 ECU; and particular additional expenditure for environmentally better adapted road building, greening of road embankments, environmentally friendly silviculture and logging technologies (single stem harvesting, smaller clear cuts) etc., which is calculated to be 2,000 ECU. The total expenditure is 3,700 ECU.

Non-market benefits (recreation + environment). Summary table.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct expenditure</td>
<td>500</td>
</tr>
<tr>
<td>Overhead costs</td>
<td>1,200</td>
</tr>
<tr>
<td>Additional expenditure in road construction for the period</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td><strong>3,700</strong></td>
</tr>
</tbody>
</table>

Taking all recreational and environmental activities together the overall operating result from recreation and environment is positive (15,600 ECU).

3 In the next step hidden values and other imputed items are considered, in order to improve the performance analysis. The following refinements are calculatory in nature and only applied in a few, progressive forest estates like the one under scrutiny. These hidden changes in asset values and increased or decreased revenues are taken into account:

- Changes in growing stock as a consequence of deviations from the structure of the allowable cut are determined by relating expenses and returns to a detailed allowable cut differentiated by species, assortments, silvicultural systems, and logging sites. Generally, forest enterprises are quite flexible in structuring their actual annual cut – not only in terms of volume, but also as to species, assortments and logging sites. Obviously this has an impact on harvesting costs and timber revenues as well as on changes in forest assets. In the example more valuable assortments were harvested from easily accessible sites. The consequence on forest assets is a reduction of -14,000 ECU.

- Changes in the state of the young stands and treatment areas (drop-out, losses, growth, quality of the thinnings, damages inflicted on the remaining stems) are registered permanently by district forester (audit in natural terms), and then need to be evaluated for the annual report. The changes in value are determined from comparisons with normal-forest calculations. The result is a decrease in forest assets of 900 ECU.

- Damage caused by calamities, game, etc. is evaluated similarly by means of opportunity costs. This amounts to -2,200 ECU. Another component is risk from damaged stands, i.e. 2,000 ECU per year.

- In a further step the allowable cut is evaluated against the long-term performance capacity of the forest. This evaluation is done by means of a long-term simulation of the management class. The effects of the allowable cut on forest assets (positive or negative) have to be added to the operating result as a positive or negative corrective. As to volume, the allowable cut set for the period 1992-2001 is 6% above the felling potential in the long run (i.e. the sustainable production capacity), whereas in terms of value it is only 1% over the long-term average, equal to a minor reduction in growing stock value.

Over the same period an improved growing stock structure and performance capacity is aimed at obtaining a higher financial contribution margin from cuttings in the long run. Hence the reduction in growing stock volume and value during the current period is more than compensated for by the long-term enhancement of production capacity. The chan-
Changes in forest assets amounting to 0.5% are equal to 7.5 ECU per hectare per year.

- As far as necessary, maintenance and silviculture measures are not implemented, the resulting reduction in expenditure is to be considered as neglected costs – provisions. Meanwhile treatments carried out in excess of the plan are to be regarded as additional performance. The effect on forest assets is expressed as a rise in liabilities of 7,200 ECU.

The calculatory real operating result of the forest enterprise comes down to 15,500 ECU. Apart from opportunity costs, all the above corrections for hidden values are included in the balance sheet of Table 3. Opportunity costs are only shown in the annex to the profit and loss account.

The valuation of damages caused by hunting takes two components into account:
(a) current losses affecting timber production caused by previously inflicted damages;
(b) future losses as a result of damages occurring in the present period. A loss in the annual forest production capacity of 18,100 ECU is shown. Taken together with risk-costs and revenues forgone from ‘openings’ the result from hunting is consequently negative (-9,100 ECU).

Corrected results from infrastructural services – marketable goods and services with remuneration. Summary table.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hunting</td>
<td>-9,100</td>
</tr>
<tr>
<td>2. Regulated forests with protective functions</td>
<td>300</td>
</tr>
<tr>
<td>3. Forest buildings let for recreation</td>
<td>6,100</td>
</tr>
<tr>
<td>4. Mushroom and berry picking permits</td>
<td>700</td>
</tr>
<tr>
<td><strong>Result</strong></td>
<td><strong>-2,000</strong></td>
</tr>
</tbody>
</table>

When adding the loss in forest production caused by hunting as an opportunity cost to the result of the forest enterprise, the corrected operating result is consequently 36,800 ECU.

To depict the expenditures and revenues from providing non-market benefits correctly, the expenditures recorded so far (Table 2) have to be supplemented by reduced revenues in forest production – opportunity costs. Losses in timber production as a consequence of recreation-oriented species selection, extended rotation period, reduced stocking density, etc. are also calculated on the basis of the normal management class. The estimated value is 3,800 ECU (68 hectares with special treatments, rotation period is extended from 100 to 130 years, species selection is 30% beech, value difference per hectare is 56 ECU). The total amount of environmental and recreation cost is 7,500 ECU.

Another – in this case negative – environmental aspect to be considered concerns the quarry. Provisions for environmental damage mitigation at the end of quarrying need to be calculated. This comes to -1,500 ECU per year. To complete the calculation of the annual result, the depletion in stock (-5,000) and the loss in timber production (-800) is added. Hence the real operating result of the quarry amounts to 19,200 ECU. Similar calculations are carried out for forest roads.

At this stage the calculations on an enterprise level are completed. Outside of the area of the enterprise, but still a matter of managerial economics, is the evaluation of the protective function (erosion, landslides, torrents, avalanches, watersheds) in the vicinity and further afield. The protective value can be priced roughly with alternative costs for protective constructions.

Other functions are not evaluated. Approaches using consumers’ surplus are not considered useful from the business economics point of view as long as money is not paid by the consumers, tourist councils, boroughs, local governments, etc. However, in order to show the achievements and services provided, a separate report lists the relevant characteristics of the forest enterprise as well as the various effects qualitatively and quantitatively – carbon dioxide fixation, replacement of protective constructions, etc. Values can only be incorporated as far as the necessary evaluations have been made and supplied by institutions outside the enterprise. A short-cut catalogue of such indices can be seen in Appendix 2, Table 4.

4 Some comments and conclusions
A number of comments concerning economic, managerial and political issues may be drawn from the analysis and the tentative applications.

At the economic level, it can be remarked that:
- Environmental accounting allows internalisation in the balance sheet of various near-market and non-market values connected with forestry.
- Such internalisation may be achieved stepwise, producing sequential balance sheets and profit and loss accounts, ranging from ‘mild’ to ‘dark green’ options.
• Options, however, can be separated allowing a clear demarcation between financial and environmental accounting. Addenda to balance sheets and profit and loss accounts can be used to make clear differences, while satellite accounts can supplement the accounting system.

• In any case the various possible steps should reflect growing emphasis on environmental and social values connected with forestry, making it possible to account for use-, option- and non-use values, the so-called Total Economic Value.

• In the most advanced step of environmental accounting, assets borrowed from society and services provided to society can be highlighted within the logic of the most traditional accounting system: the balance sheet and the profit and loss account.

At the managerial level:

• A functioning environmental accounting could allow a comprehensive analysis of the various aspects inherent to multipurpose forestry and the related management objectives: stewardship actions, including protection and recreation.

• Financial ratios, cost-centres and environmental indicators can be jointly developed according to the same logic allowing appropriate scrutiny of the different outputs of forestry; in addition modern management techniques based on multicriteria optimisation models can be better supported.

• A complete listing of forest outputs within the same balance sheet and profit and loss account opens up an opportunity to explore potential markets for near-market or non-market outputs.

• The overall marketing strategy of the forest enterprise can therefore be re-examined, suggesting the best measures to achieve remuneration and/or compensations of all forest benefits.

• Amongst such measures, appropriate means to capture consumer surpluses (forest products development) can also be devised, in order to take full advantage of 'green consumerism'.

• The management of public forests and parks whose governing bodies consist of local authorities, amenities societies and various lobbies can be better informed in order to find compromise solutions.

• Of course at management level it must be acknowledged that public and private forest enterprises have different objectives – as shown by the two case studies – therefore environmental issues may find different places in the balance sheet and profit and loss account; nevertheless wide scope for environmentally oriented accounting remain in both cases.

At the political and administrative level environmental accounting:

• Can improve public control of forestry and help give technical assistance to multipurpose forestry.

• Facilitates the definition of compensations, grants, and incentives such as those foreseen by EU Regulations 2078 and 2080/92.

• Can provide substantial support to the application of eco-label, eco-audit and stewardship certifications in forestry.

• Can help define option and non-use values, suggesting regulations and incentives for those forest services lacking any potential market and direct remuneration from the consumers.

• Can contribute to better informed definition and application of forest policies, also through consolidation of different balance sheets of forestry enterprises operating in a certain region.

Finally it should be remarked that boundaries between financial and environmental accounting (Figure 2) cannot be strictly defined. They overlap and have to be seen as continuous rather than discrete categories. Incidentally some environmental issues have always been incorporated to a certain extent in financial accounting. This development from financial to environmental accounting can be seen, and accepted, at different steps according to the private or public status and objectives of forest enterprises. Institutional issues and the state of property rights also contribute to defining boundaries and steps. The real world development is such that environmental non-market outputs, and even traditional inputs to forestry like environmental maintenance, are now becoming market outputs as far as payments are made, or can be made, by consumers. Accounting broadly speaking has the task to register, to promote, and to support this process.

References


Hartman, R. (1976): The harvesting decision when the standing forest has value. Economic Inquiry 1.


APPENDIX 1 – CANSIGLIO PUBLIC FOREST APPLICATION

Table 1: Financial report of Cansiglio Forest, 1992-94, average values (ECU)

<table>
<thead>
<tr>
<th>BALANCE SHEET</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS</strong></td>
<td><strong>LIABILITIES</strong></td>
</tr>
<tr>
<td>Fixed assets</td>
<td>Creditors 17,500</td>
</tr>
<tr>
<td>High standing forest ha 3,197</td>
<td>Provision for pensions 105,000</td>
</tr>
<tr>
<td>Meadows and pastures ha 550</td>
<td></td>
</tr>
<tr>
<td>Buildings 1,725,000</td>
<td>Capital and reserves 10,165,500</td>
</tr>
<tr>
<td>Technical equipment and machines 254,000</td>
<td>of which Net profit/loss for the year -30,000</td>
</tr>
<tr>
<td>- Depreciation provisions of fixed assets 560,000</td>
<td></td>
</tr>
<tr>
<td><strong>Net fixed assets</strong> 10,236,500</td>
<td><strong>Total liabilities</strong> 10,288,000</td>
</tr>
<tr>
<td>Raw materials/finished goods 40,000</td>
<td></td>
</tr>
<tr>
<td>Debtors 6,000</td>
<td></td>
</tr>
<tr>
<td>Cash 5,500</td>
<td></td>
</tr>
<tr>
<td><strong>Total net assets</strong> 10,288,000</td>
<td><strong>Total liabilities</strong> 10,288,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROFIT AND LOSS ACCOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A) Revenues</strong> 414,500</td>
</tr>
<tr>
<td>Timber 280,500</td>
</tr>
<tr>
<td>Hay and grazing 10,500</td>
</tr>
<tr>
<td>Mushroom picking permits 17,000</td>
</tr>
<tr>
<td>Rents from tourism buildings 21,500</td>
</tr>
<tr>
<td>Guided visits and green weeks 10,500</td>
</tr>
<tr>
<td>Building concessions and land rents 48,500</td>
</tr>
<tr>
<td>Increase/decrease in exploited timber 7,500</td>
</tr>
<tr>
<td>Others 18,500</td>
</tr>
<tr>
<td><strong>B) Expenditures</strong> 1,073,000</td>
</tr>
<tr>
<td>Wages, salaries and social security 323,000</td>
</tr>
<tr>
<td>Consumption, materials and energy 37,500</td>
</tr>
<tr>
<td>Depreciation of fixed assets 79,500</td>
</tr>
<tr>
<td>Landscape maintenance/improvements, botanical gardens 167,500</td>
</tr>
<tr>
<td>Roads/hydraulic works maintenance/improvements 37,500</td>
</tr>
<tr>
<td>Buildings maintenance/improvement 138,500</td>
</tr>
<tr>
<td>Protection forest maintenance/improvements 172,500</td>
</tr>
<tr>
<td>Production forest maintenance/improvements 111,000</td>
</tr>
<tr>
<td>Risk depreciation (insurance) 6,000</td>
</tr>
<tr>
<td><strong>OPERATING RESULT (A-B)</strong> -658,500</td>
</tr>
<tr>
<td><strong>C) Financial expenditures and revenues</strong> -4,500</td>
</tr>
<tr>
<td><strong>D) Increase/decrease market value of fixed assets</strong> 100,000</td>
</tr>
<tr>
<td>Growing stock 35,000</td>
</tr>
<tr>
<td>Estate value 65,000</td>
</tr>
<tr>
<td><strong>PROFIT/LOSS PRE-TAXES/COMPENSATIONS (A-B±C±D)</strong> -563,000</td>
</tr>
<tr>
<td>- Compensations (grants, subsidies and incentives) 533,000</td>
</tr>
<tr>
<td><strong>NET PROFIT/LOSS FOR THE YEAR</strong> -30,000</td>
</tr>
</tbody>
</table>
Table 2: Economic environmental report of Cansiglio Forest, 1992-94 average values (ECU)

### Approach 1: Revenues/expenditures ordinary activity (timber) separated from recreation and environment

#### BALANCE SHEET

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>10,796,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets</td>
<td>10,796,500</td>
</tr>
<tr>
<td>High standing forest ha 3,077</td>
<td>7,992,500</td>
</tr>
<tr>
<td>Meadows and pastures ha 550</td>
<td>825,000</td>
</tr>
<tr>
<td>Buildings</td>
<td>1,725,000</td>
</tr>
<tr>
<td>Technical equipment and machines</td>
<td>254,000</td>
</tr>
<tr>
<td>- Depreciation provisions for fixed assets</td>
<td>560,000</td>
</tr>
<tr>
<td>Net fixed assets</td>
<td>10,236,500</td>
</tr>
<tr>
<td>Raw materials/finished goods</td>
<td>40,000</td>
</tr>
<tr>
<td>Debtors</td>
<td>6,000</td>
</tr>
<tr>
<td>Cash</td>
<td>5,500</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td>10,288,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIABILITIES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Creditors</td>
<td>17,500</td>
</tr>
<tr>
<td>Provision for pensions</td>
<td>105,000</td>
</tr>
<tr>
<td>Capital and reserves</td>
<td>10,165,500</td>
</tr>
<tr>
<td>of which</td>
<td></td>
</tr>
<tr>
<td>Net profit/loss for the year</td>
<td>-30,000</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>10,288,000</td>
</tr>
</tbody>
</table>

#### PROFIT AND LOSS ACCOUNT

A) Revenues from ordinary activity 347,000

B) Expenditures for ordinary activity 351,500

**OPERATING RESULT FROM ORDINARY ACTIVITY (A-B)** -4,500

C) Revenues from recreation and environment 67,500

Mushroom picking permits 17,000
Rents from tourism buildings 21,500
Guided visits and green weeks 10,500
Building concessions and land rents 18,500

D) Expenditures for recreation environment 721,500

Wages, salaries and social securities 200,000
Consumption, materials and energy 20,000
Depreciation 49,500
Landscape maintenance/improvements 167,500
Roads and hydraulic works maintenance/improvements 17,500
Buildings maintenance/improvements 88,500
Protection forest maintenance/improvements 172,500
Production forest maintenance/improvements 6,000

**OPERATING RESULT FROM RECREATION AND ENVIRONMENT (C-D)** -654,000

E) Financial expenditures and revenues -4,500

Interest and similar expenses (timber) 1,500
Interest and similar expenses (recreation and environment) 3,000

F) Increase/decrease of market value fixed assets 100,000

**PROFIT/LOSS PRE-TAXES/COMPENSATIONS (A-B+C-D±E±F)** -563,000

- Compensations (grants, subsidies and incentives) 533,000

**NET PROFIT/LOSS FOR THE YEAR** -30,000
Table 3: Economic environmental report of Cansiglio Forest, 1992-94 average values (ECU)

**Approach 2: Hidden environmental values (marked with □)**

### BALANCE SHEET

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed assets</strong></td>
<td><strong>Creditors</strong></td>
</tr>
<tr>
<td>10,796,500</td>
<td>17,500</td>
</tr>
<tr>
<td>-Depreciation provisions of fixed assets 560,000</td>
<td><strong>Provision for pensions</strong> 105,000</td>
</tr>
<tr>
<td><strong>Provision for risk of artificial stands</strong> 90,000</td>
<td>□ Provision for risk of artificial stands* 90,000</td>
</tr>
<tr>
<td><strong>Net fixed assets</strong></td>
<td><strong>Capital and reserves</strong> 10,110,500</td>
</tr>
<tr>
<td>10,236,500</td>
<td>of which</td>
</tr>
<tr>
<td>□ Non marketable fixed assets 35,000</td>
<td>Net profit/loss for the year adjusted for hidden environmental values 500</td>
</tr>
<tr>
<td>Raw materials/finished goods 40,000</td>
<td></td>
</tr>
<tr>
<td>Debtor s 6,000</td>
<td></td>
</tr>
<tr>
<td>Cash 5,500</td>
<td></td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td><strong>Total liabilities</strong></td>
</tr>
<tr>
<td>10,323,000</td>
<td>10,323,000</td>
</tr>
</tbody>
</table>

### PROFIT AND LOSS ACCOUNT

A) Revenues from ordinary activity 347,000  
B) Expenditures for ordinary activity 351,500  
**OPERATING RESULT FROM ORDINARY ACTIVITY (A-B)** -4,500  
C) Revenues from recreation and environment 67,500  
D) Expenditures for recreation and environment 721,500  
**OPERATING RESULT FROM RECREATION AND ENVIRONMENT (C-D)** -654,000  
E) Financial expenditures and revenues -4,500  
F) Increase/decrease market value of fixed assets 100,000  
**PROFIT/LOSS PRE-TAXES/COMPENSATIONS (A-B+C-D±E±F)** -563,000  
- Compensations (grants, subsidies and incentives) 533,000  
G) NET PROFIT/LOSS FOR THE YEAR -30,000  
□ H) Risk of artificial stands depreciation □ -4,500  
□ I) Non-marketable growing stock increase □ 35,000  
**NET PROFIT/LOSS FOR THE YEAR ADJUSTED FOR HIDDEN ENVIRONMENTAL VALUES (G-H+I)** 500  

* Provision for risk of artificial stands covers ha 300 of spruce artificial stands, even aged, 50 years old. Similar stands (ha 200) were attacked years ago by an insect (Cephalcia harvensis), making early felling necessary with a loss/ha of 1,500 ECU, early cut and plantation of a mixed forest. The probability of this occurrence within the next 20 years has been estimated at 20%, meaning that risk depreciation amounts to 1% (0.20:20=0.01), so that the annual quota for ha 300 amounts to 1,500×0.01×ha 300 = 4,500 ECU annual risk depreciation. Although not applied, the accrual can express the risk to existing stands due to the lack of biodiversity and natural protection.
Table 4: Economic environmental report of Cansiglio Forest, 1992-94 average values (ECU)

**Approach 3: Linkage of financial accounting to environmental values through addenda**

### BALANCE SHEET

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net assets 10,236,500</td>
<td>Creditors 17,500</td>
</tr>
<tr>
<td>Non marketable fixed assets</td>
<td>Provision for pensions 105,000</td>
</tr>
<tr>
<td>(growing stock increase) 35,000</td>
<td></td>
</tr>
<tr>
<td>Raw materials/finished goods 40,000</td>
<td></td>
</tr>
<tr>
<td>Debtors 6,000</td>
<td>Capital and reserves 10,110,500</td>
</tr>
<tr>
<td>Cash 5,500</td>
<td>of which Net profit/loss for the year adjusted for hidden environmental values 500</td>
</tr>
<tr>
<td>Total net fixed assets 10,323,000</td>
<td>Total liabilities 10,323,000</td>
</tr>
</tbody>
</table>

### ADDENDA

#### SOCIAL ASSETS

| Protection forest ha 160     | Environmental debts towards society (protection and recreation forests, wildlife, game, etc.) |
| Recreation forest ha 800     | .....                                                                                   |
| Wildlife (no of species/quantity) | .....                                                                 |
| Game (no of head)            | .....                                                                                   |

#### SOCIAL LIABILITIES

**Net profit/loss for the year adjusted for non-market environmental benefits** 500

### PROFIT AND LOSS ACCOUNT

| A) Revenues from ordinary activity 347,000 |
| B) Expenditures for ordinary activity 351,500 |
| RESULT FROM ORDINARY ACTIVITY (A-B) -4,500 |
| C) Revenues from recreation and environment 67,500 |
| D) Expenditures for recreation and environment 721,500 |
| RESULT FROM RECREATION AND ENVIRONMENT (C-D) -654,000 |
| E) Financial expenditures and revenues -4,500 |
| F) Increase/decrease market value of fixed assets 100,000 |
| PROFIT/LOSS PRE TAXES/COMPENSATIONS (A-B+C-D±E±F) -563,000 |
| Compensations (grants, subsidies and incentives) 533,000 |
| G) NET PROFIT/LOSS FOR THE YEAR -30,000 |
| H) Risk depreciation of artificial stands -4,500 |
| I) Non-marketable growing stock increase 35,000 |
| L) NET PROFIT/LOSS FOR THE YEAR ADJUSTED FOR HIDDEN ENVIRONMENTAL VALUES (G+H+I) 500 |

### ADDENDA

#### SOCIAL PROFIT AND LOSS ACCOUNT

| M) Non-market benefits* net of compensations 649,000 |
| Recreation (388,655 visits 5,000 lire) 971,500 |
| Mushroom picking without permits 50,500 |
| Protection ha 160 160,000 |
| - Compensations -533,000 |

**NET PROFIT/LOSS FOR THE YEAR ADJUSTED FOR NON-MARKET ENVIRONMENTAL BENEFITS (L+M) 649,500**

* Non-market benefits have been valued since 1975 using travel cost and contingent valuation methods.
## APPENDIX 2 - STYRIA PRIVATE FOREST APPLICATION

Table 1: Financial report of Styria Private Forest 1995 (ECU)\(^{16}\)

### BALANCE SHEET as at 31 December 1995

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets*</td>
<td>Creditors</td>
</tr>
<tr>
<td>High standing forest ha 1,000</td>
<td>325,900 Creditors</td>
</tr>
<tr>
<td>Meadows and pastures ha 62</td>
<td>15,000 Provision for pensions, etc.</td>
</tr>
<tr>
<td>Road net</td>
<td>84,600 Capital and reserves</td>
</tr>
<tr>
<td>Buildings</td>
<td>224,700 of which</td>
</tr>
<tr>
<td>Technical equipment and machines</td>
<td>69,600 Increase of capital reserves**</td>
</tr>
<tr>
<td>Financial assets</td>
<td>220,700 Net profit/loss for the year</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td><strong>Total liabilities</strong></td>
</tr>
</tbody>
</table>

* The open-market value of the forest and meadows can be indicated by a value of 9,000 ECU per hectare for high forest and 5,000 ECU for meadows and pastures. This would result in the following increase in assets and equity (presented as an additional row of the balance-sheet):

| Hidden net assets          | 8,969,000 Hidden capital reserves | 8,969,000 |

### PROFIT AND LOSS ACCOUNT

A) Revenues from ordinary operating activities 666,400

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber and other forest products</td>
<td>571,100</td>
</tr>
<tr>
<td>Quarry</td>
<td>28,700</td>
</tr>
<tr>
<td>Tenement buildings, land rents</td>
<td>40,400</td>
</tr>
<tr>
<td>Sawmill</td>
<td>1,100</td>
</tr>
<tr>
<td>Hunting</td>
<td>14,000</td>
</tr>
<tr>
<td>Increase /decrease in exploited timber</td>
<td>6,000</td>
</tr>
<tr>
<td>Others</td>
<td>5,100</td>
</tr>
</tbody>
</table>

B) Expenditures for ordinary operating activities -526,700

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages, salaries and social security</td>
<td>221,400</td>
</tr>
<tr>
<td>Administration</td>
<td>25,500</td>
</tr>
<tr>
<td>Consumption, materials, energy</td>
<td>108,000</td>
</tr>
<tr>
<td>Services consumed</td>
<td>82,200</td>
</tr>
<tr>
<td>Depreciation of fixed assets</td>
<td>52,800</td>
</tr>
<tr>
<td>Allocation to provisions</td>
<td>18,600</td>
</tr>
<tr>
<td>Taxes</td>
<td>18,200</td>
</tr>
</tbody>
</table>

OPERATING RESULT (A-B) 139,700

C) Financial result 45,600

D) Extraordinary result 103,300

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales of land</td>
<td>116,000</td>
</tr>
<tr>
<td>Book value of sold assets</td>
<td>-10,800</td>
</tr>
<tr>
<td>Extraordinary expenditures</td>
<td>-1,900</td>
</tr>
</tbody>
</table>

PROFIT/LOSS PRE ALLOCATION TO RESERVES (A-B±C±D) 288,600

Transfers to capital reserves (decreased market value of fixed assets)** -136,700

PROFIT/LOSS PRE TAXES/COMPENSATIONS 151,900

- Compensations (grants, subsidies and incentives)

NET PROFIT/LOSS FOR THE YEAR 151,900

Transfer to free capital reserve (Retained earnings) -23,700

Timber and firewood supplied to owners -13,900

BALANCE-SHEET PROFIT - devoted to be paid to owners 114,300

** The transfer to capital reserves consists of three parts: (1) An increase from excess cutting (890 scm) amounting to 31,500 ECU (this equals a decrease of market value of growing stock). (2) An increase in reserve from land sales 105,200 ECU (this equals a decrease of market value of fixed assets). (3) An increase in free capital reserve 23,700 ECU. While items (1) and (2) reduce the net profit of the current year, (3) is a retained profit.

\(^{16}\)For reasons of confidentiality all values from the original balance sheet are related to 1,000 hectare of forest land and converted from Austrian Schillings to ECU (1 ECU = 13.3 ATS).
Table 2: Economic environmental report of Styria Private Forest 1995 (ECU)

Approach 1: Revenues/expenditures ordinary activity (timber) separated from recreation & environment

BALANCE SHEET as at 31 December 1995

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets</td>
<td>Creditors</td>
</tr>
<tr>
<td>High standing forest ha 1,000</td>
<td>42,500</td>
</tr>
<tr>
<td>Meadows and pastures ha 62</td>
<td>Provision for pensions, etc.</td>
</tr>
<tr>
<td>Road net</td>
<td></td>
</tr>
<tr>
<td>Buildings</td>
<td></td>
</tr>
<tr>
<td>Technical equipment and machines</td>
<td>1,392,500</td>
</tr>
<tr>
<td>Financial assets</td>
<td>of which</td>
</tr>
<tr>
<td>Raw materials/finished goods</td>
<td></td>
</tr>
<tr>
<td>Debtors</td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>Total liabilities</td>
</tr>
<tr>
<td></td>
<td>1,702,000</td>
</tr>
</tbody>
</table>

Total net assets 1,702,000

PROFIT AND LOSS ACCOUNT

A) Revenues from timber and related activities 529,000
B) Expenditures for timber production and related activities 455,200
RESULT FROM ORDINARY ACTIVITY (A-B)* 63,800
C) Revenues from other main activities (sawmilling, letting, etc.) 122,100
D) Expenditures for other main activity 61,800
RESULT FROM OTHER MAIN ACTIVITY (C-D) 60,300
E) Hunting Revenue 14,000
   Expenditures 1,800
F) Mushroom and berry picking Revenue 700
   Expenditures 1,000
G) Forest buildings let for recreation Revenue 6,100
   Expenditures 300
H) Particularly regulated forests with protective function Revenue 300
   Expenditures 1,500
I) Non-market benefits Revenue 0
   Expenditures 3,700

OPERATING RESULT FROM RECREATION AND ENVIRONMENT (ΣE....I) 15,600
J) Financial result 45,600
K) Extraordinary result 103,300

PROFIT/LOSS FOR THE YEAR (A-B+C-D±E±F±G±H±I±J±K) 288,600
   Transfers to capital reserves (decreased market value of fixed assets) -136,700

PROFIT/LOSS PRE TAXES/COMPENSATIONS 151,900
- Compensations (grants, subsidies and incentives)

NET PROFIT/LOSS FOR THE YEAR 151,900
   Transfers to free capital reserves (retained earnings) -23,700
   Timber and firewood supplied to the owners -13,900

BALANCE-SHEET PROFIT - devoted to be paid to the owners 114,300

* The apparent operating result of the forest enterprise based on the actual cut (7,611 Scm) is 63,800 ECU. Taking the reduction of forest assets due to excess cutting of 31,500 ECU into account, the operating result based on the allowable cut (6,720 Scm) is 32,300 ECU.
Table 3: Economic environmental report of Styria Private Forest 1995 (ECU)

Approach 2: Hidden environmental values and other imputed items

**BALANCE SHEET as at 31 December 1995**

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed assets</strong></td>
<td>Creditors</td>
</tr>
<tr>
<td>940,500</td>
<td>42,500</td>
</tr>
<tr>
<td><strong>Not for sale marketable fixed assets</strong></td>
<td>Provision for pensions, etc.</td>
</tr>
<tr>
<td>20,400</td>
<td>267,000</td>
</tr>
<tr>
<td><strong>Raw materials/finished goods</strong></td>
<td>Provisions for neglected silvic. measures</td>
</tr>
<tr>
<td>32,500</td>
<td>7,200</td>
</tr>
<tr>
<td><strong>Debtor</strong></td>
<td>Capital and reserves</td>
</tr>
<tr>
<td>105,000</td>
<td>1,345,700</td>
</tr>
<tr>
<td><strong>Cash</strong></td>
<td>of which</td>
</tr>
<tr>
<td>624,000</td>
<td>Profit/loss for the year adjusted for hidden values</td>
</tr>
<tr>
<td></td>
<td>133,100</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td><strong>Total liabilities</strong></td>
</tr>
<tr>
<td>1,722,400</td>
<td>1,722,400</td>
</tr>
</tbody>
</table>

**PROFIT AND LOSS ACCOUNT**

A) Revenues from timber and related activities 529,000
B) Expenditures for timber production and related activities 455,200
RESULT FROM ORDINARY ACTIVITY (A-B) 63,800
C) Revenues from other main activities (sawmilling, letting, etc.) 122,100
D) Expenditures for other main activity 61,800
RESULT FROM OTHER MAIN ACTIVITY (C-D) 60,300
E) Hunting 12,200
F) Mushroom and berry picking 700
G) Forest buildings let for recreation 6,100
H) Particularly regulated forests with protective function 300
I) Non-market benefits -3,700
RESULT FROM RECREATION AND ENVIRONMENT (ΣE...I) 15,600
J) Financial result 45,600
K) Extraordinary result 103,300

PROFIT/LOSS FOR THE YEAR (A-B+C-D±E±F±G±H±I±J±K) 288,600

Transfers to capital reserves (decrease market value of fixed assets) -136,700

**PROFIT/LOSS PRE-TAXES/COMPENSATION**

151,900

**NET PROFIT/LOSS FOR THE YEAR**

151,900

Not-for sale growing stock increase/decrease -9,600
Risk of damaged stands depreciation -2,000
Provisions for neglected maintenance and silvicultural measures -7,200
**NET PROFIT/LOSS FOR THE YEAR ADJUSTED FOR HIDDEN VALUES** 133,100

* In the balance-sheet the annual rates of change in production capacity since the last forest inventory (1990) are summed up as a fixed asset accrual. Value at end of 1994: 30,000 ECU.
Annex to Profit and Loss Account

Improved estimation of performance (including report on environmental impacts)

A. Timber production

| Operating result from forest production related to allowable cut | 32,300 |
| ± Not-for-sale growing stock increase/decrease | -9,600 |
| 1. Deviations in timber harvesting from structure of allowable cut | -14,000 |
| 2. Deviations in state of young plantations from planned (based on physical survey) | -900 |
| 3. Damages caused by calamities and game (based on physical survey) | -2,200 |
| 4. Long-term effect of allowable cut on forest assets (increase/year) | + 7,500 |
| ± Excess/Less expenditures (performance) from maintenance and silviculture measures - deviations from planned - Provisions to be added | -7,200 |
| 5. Neglected tending measures in silviculture | -7,200 |
| Calculatory real operating result of the forest enterprise | 15,500 |

B. Hunting - Damage to forest (loss in timber production)

| Operating result | 12,200 |
| ± Losses in timber production capacity due to hunting (opportunity cost) | + 19,300 |
| Damage to forest stands old Loss in production capacity p.a. (140 ha high forest) | 17,300 |
| new Bark-peeling (6 ha at 113.-) + browsing (1 ha at 126.-) | 800 |
| Timber revenues foregone (3 ha open meadows, 7 ha low density stands) | 1,200 |
| ± Risk depreciation (40 ha severe damaged stands; 50% risk/50 years; 0.4 x 4,600 ECU) | 2,000 |
| Real operating result of hunting | -9,100 |

C. Non-market benefits (recreation + environment)

| Operating result (expenditures) | -3,700 |
| - Imputed revenues foregone from timber production | -3,800 |
| Result on providing non-market benefits | -7,500 |

D. Quarry

| Operating result | 26,500 |
| - Loss in forest land (revenues foregone) | -800 |
| - Depletion of stock (depreciation) | -5,000 |
| - Provisions for landscape repair (greening etc.) after exhaustion of stock | -1,500 |
| Real operating result | 19,200 |
Table 4: Environmentally and socially relevant characteristics of the forest enterprise and its management in the year 1995 [flow parameters (activities) and state parameters] - outline of a catalogue

### A. General characteristics of forest assets

**Medium-term inventories**

- Forest area split up by functions (timber production, protection, recreation, etc.), age classes, tree species composition, growing stock, …
- State of tended areas, state of young plantations, state of regeneration, …
- Health condition, …
- …

Catalogue of indices (JÖBSTL, 1995)

### B. Forest roads and buildings

- Forest roads (length, width), machine tracks and landings
- Newly built forest roads in reporting period, greening of road cuts

### C. Management activities in current period

**Technical book-keeping - permanent observation**

- Felling quantity divided by species, assortments, silviculture systems (intermediate and final felling), felling sites etc./actual felling quantity above or below allowable cut (detailed)
- Cutting types: Clear cuts, natural regeneration (marginal strip cutting, group selection felling etc.) - number, areas
- Tending measures and areas in tending (Target and Actual)
- …

Catalogue of indices (JÖBSTL, 1981)

### D. Marketable non-timber production and services

- Cycling routes (mountain-biking), cross-country skiing tracks, fitness parcours
- Drinkable and other water (number of springs, m³ over time)
- Forest houses
- …

### E. Protection, recreation and welfare activities and facilities

- **Recreation:** Recreation forests, benches, paths, fitness parcours, cycling routes, resting meadows, shelters and refuge huts, playgrounds, meadows, biotopes (number and area) …
- **Protection:** Protection forests, forests with regulated protective functions; torrents, avalanche strips (number, area) …
- **Nature conservation:** Conservation areas, openings (fields, wetlands, etc.), national parks, virgin forest cells (area)
- Sites of special scientific interest, natural heritage sites …
- **Water:** Watersheds (non-market) of drinkable and other water (number of springs, m³ over time), water conservation areas with largely restricted forest management …

### F. Employment

- Employees, conditions of labour, facilities

### G. Negative external effects

- Environmental damage caused by the forest enterprise
CAN TRADITIONAL FORESTRY ACCOUNTING CONTRIBUTE TO MEASURING THE SUSTAINABILITY OF A FOREST ENTERPRISE?*

Hans A. JÖBSTL

Abstract
Since Rio (1992) various sustainability processes on the international level have been aiming at securing sustainability on national and/or regional levels. Criteria and indicator indices for sustainable forest management, for instance, were established as a result of the so-called Pan-European Process.

As forest management takes place in the institutional framework of forest enterprises, which have - at least in Central Europe - a long tradition of sustainability, it is necessary to define the indicators also at the operational level. Sustainability on the operational level has always been focussed on resources; however, it has substantial deficits, in particular, with regard to the value aspects of the forest assets and the non-market products. Thus, the following questions arise: Which of the Pan-European indicators are of relevance for securing sustainability in an enterprise, and which can be provided by the accounting system (being the fundamental instrument for information supply and controlling)? Which data does accounting supply? What can it contribute to? How would it have to be developed further?

A study at the Vienna Institute for Silviculture, including expert inquiries and case studies in forest enterprises in connection with the L2 project, assessed 43 indicators on the basis of different properties. Its outcome could be used to establish a catalogue of indicators for the individual company. The main problem of an accounting system is the lack of consideration of annual changes in forest assets and the dissatisfactory recording of the environmental services. These problems are aggravated by serious weaknesses of forest surveys in practice. In this paper a list of operationally relevant criteria and indicators is presented, the shortcomings of the accounting system are briefly addressed, and concepts for their overcoming are dealt with.

Key words: forest accountancy; sustainability control, performance measurement; forest assets; management accounting

1. Introduction
Since the United Nations Conference on Environment and Development in Rio 1992, several processes have been initiated to develop indicator systems (C&I) for sustainable development. The concept of sustainability in forestry, which had manifested itself until then in the principle of not harvesting more timber than would regrow, has been extended decisively, and the integration of social, economic and ecological elements has been requested.

In order to solve the problems of operationalisation that have arisen in this context, six criteria have been selected for the forest that cover both the classical sustainability as well as the social and economic aspects and ascribe an important role to the biological conditions of the forest ecosystem. The determination of indicators on the international level was followed by numerous studies on the national and regional levels. After all, it was a matter of narrowing down the criteria to the individual organisation unit of forest management: the enterprise. The enterprise level has hardly been thought over and covered so far, although it is originally the sole centre of sustainability. It is there where sustainable forestry management is taking place – originally with a view to the sustainable yield of timber, and today with a wider view considering aspects of multiple use, etc.

2. Objective
Our deliberations are focussed on the forest enterprise, the requirements of management and the questions of what is needed by the individual enterprise to determine its goals, to operationalise them, and to implement them in practice, and what is needed to monitor the attainment of objectives and control it continuously.

The following questions need to be clarified: Which criteria of sustainable forest management (SFM) are of interest to the individual enterprise? Which criteria do forest and environmental policies want to have fulfilled on the enterprise level? Which data are needed from the enterprise for its manage-
ment and reporting tasks? Which data do the authorities require from the enterprise, which of these data can be provided by accounting? How can the fulfilment of the requirements for sustainability be proved? Operationalisation requires the definition of goals, the determination of criteria, the derivation of indicators, and the examination of the means necessary for obtaining the required information. Thus, the questions arise as to what accounting can contribute and which improvements are necessary, or which possibilities do exist.

One can depart from the following assumptions:

- SFM takes place within the institutional framework of forest enterprises.
- Enterprises should be managed in a target-oriented way. Managerial decisions require clear targets and operational criteria or indicators.
- Targets and plans need to be controllable and to be controlled. Measurability is necessary; where no quantifiable targets exist they need to be compensated by indicators.
- The accounting system is the core instrument of the internal information supply.
- Reporting to the public gains increasingly in importance especially in connection with the concept of multiple use.

The following goals are aspired at:

- Key figures as tools for sustainable management of forest enterprises
- Correct statements about the success of management in any one period
- Reporting on sustainability by the forest enterprise (internally and externally)

These goals shall be achieved by the following means:

- Establishment of a set of indicators on the basis of SFM criteria for the individual forest enterprise from the point of view of the management while considering at the same time the expectation of the public.
- Analysis of the state of data availability and of proposals for its improvement (accounting system, forest inventory).
- Drafting of an internal sustainability report of the individual forest enterprise.
- Drafting of an external sustainability and performance report of the individual forest enterprise.
- Analysis of the deficiencies/problems of the current annual accounting (profit & loss and operational statements) and reporting, and proposals for an improvement (change in forest assets).
- Completion of existing studies in terms of managerial economics.

3. Criteria and Indicators (C&I)

Indicators are used to measure the objectives defined by the criteria and are, thus, the operational elements of these criteria. They are a strong tool to collect and report information within a system (e.g., SFM), which is usually characterised by a lack of knowledge, uncertainties and missing information about impacts, dependencies and feed-backs (Rametsteiner 2001). The criteria catalogue of the Ministerial Conference on the Protection of Forests in Europe (MCPFE) includes six criteria with 35 indicators in total. Each criterion is characterised by several indicators (MCPFE 2003). They aim at the maintenance (and enhancement) of forest ecosystems and their contributions to the quality of human life, and include forest resources, health and vitality, productive functions, biological diversity, protective functions and socio-economic functions.

Based on these six criteria, the Pan-European Operational Level Guidelines (PEOLG) have been elaborated to further promote sustainable forest management in Europe by translating the international commitments to the level of forest management planning and practices. They have also been adopted in the framework of Resolution L2. They represent a common framework of recommendations to be used on a voluntary basis and as a complement to national and/or regional instruments to further promote sustainable forest management at the field level, on forest areas in Europe (MCPFE 1998).

Within Resolution L2 European countries commit themselves, inter alia, to promote the PEOLG and to adapt them to the specific national, sub-national and local economic, ecological, social and cultural conditions.

Apart from these guidelines, there are several individual studies on an operational level such as the PEFC study and the L2 study of the Vienna Institute for Silviculture, in particular, and a case study by Giugni (2005). These studies form the basis for the establishment of the set of indicators.

The study at the Vienna Institute for Silviculture assessed 43 indicators on the basis of different properties. By means of a Delphi survey, an expert panel consisting of representatives from science, administration, forest en-
Table 1: List of indicators with expert ratings and results from three case studies (based on Wolfslehner et al. 2004)

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Criterion</th>
<th>Relevance</th>
<th>Practicability</th>
<th>Importance</th>
<th>Availability</th>
<th>Measurability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>consideration of SFM in forest management objectives</td>
<td>C 1</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>2</td>
<td>evaluation of forest management plans</td>
<td>C 1</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>3</td>
<td>monitoring of forest resources</td>
<td>C 1</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>4</td>
<td>mapping of forest resources</td>
<td>C 1</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>5</td>
<td>controlling of forest resources</td>
<td>C 1</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>6</td>
<td>harvest plans and rotation period</td>
<td>C 1</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>7</td>
<td>amount and change of growing stock</td>
<td>C 1</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>8</td>
<td>balance of growth and harvesting rates</td>
<td>C 1</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>medium</td>
</tr>
<tr>
<td>9</td>
<td>composition of tree species</td>
<td>C 2</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>10</td>
<td>use of suitable tree species</td>
<td>C 2</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
</tr>
<tr>
<td>11</td>
<td>use of soil-fertilizing methods</td>
<td>C 2</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>12</td>
<td>prevention of waste deposit</td>
<td>C 2</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>13</td>
<td>amount of damaged wood</td>
<td>C 2</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>14</td>
<td>use of pesticides and herbicides</td>
<td>C 2</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>15</td>
<td>activities of biological pest prevention</td>
<td>C 2</td>
<td>medium</td>
<td>low</td>
<td>high</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>16</td>
<td>stems damaged by harvest</td>
<td>C 2</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>17</td>
<td>stems damaged by bark peeling</td>
<td>C 2</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>18</td>
<td>impact of grazing</td>
<td>C 2</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>19</td>
<td>forest management practices causing bare forest soil</td>
<td>C 3</td>
<td>medium</td>
<td>low</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>20</td>
<td>amount of full-tree harvesting</td>
<td>C 3</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>21</td>
<td>net present value</td>
<td>C 3</td>
<td>medium</td>
<td>low</td>
<td>high</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>22</td>
<td>returns from wood production</td>
<td>C 3</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>23</td>
<td>non-wood products and services</td>
<td>C 3</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>24</td>
<td>access to forests by forest roads</td>
<td>C 3</td>
<td>medium</td>
<td>high</td>
<td>low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>25</td>
<td>final opening up by skid tracks</td>
<td>C 3</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>26</td>
<td>laying-out of drainages</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>27</td>
<td>amount of natural regeneration</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>28</td>
<td>use of local provenances</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>29</td>
<td>vertical structure within stands</td>
<td>C 4</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>30</td>
<td>number of old trees</td>
<td>C 4</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>31</td>
<td>percentage of coarse woody debris</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>32</td>
<td>consideration of key ecosystems in SFM</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>33</td>
<td>consideration of rare species (trees, shrub) in SFM</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>34</td>
<td>damage of regeneration by browsing</td>
<td>C 4</td>
<td>high</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>35</td>
<td>use of soil preparation methods</td>
<td>C 5</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>36</td>
<td>quality of forest infrastructure</td>
<td>C 5</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>37</td>
<td>training of staff with regard to SFM</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>38</td>
<td>safe working conditions</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>39</td>
<td>willingness to join cooperations</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>40</td>
<td>consideration of specific sites in forest management</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>medium</td>
</tr>
<tr>
<td>41</td>
<td>use of traditional forest management practices</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>42</td>
<td>role of local staff for regional employment</td>
<td>C 6</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>43</td>
<td>meet legal regulations</td>
<td>C 6</td>
<td>medium</td>
<td>high</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
</tbody>
</table>
enterprises and non-governmental organisations evaluated the C&I set with regard to **validity, practicality, relevance** and **importance** of indicators. Possible threshold values for the quantitative indicators and the relative importance of the indicators had been derived from expert opinions. The results show that several indicators are easy to derive, but insignificant, whereas others are important but difficult to derive. (see Table 1). Finally, a set of 12 key indicators has been selected from the whole list (see Table 2).

**Table 2: Key indicators for an SFM analysis (Wolfslehner and Vacik 2004)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NPV annual net present value</td>
</tr>
<tr>
<td>2</td>
<td>growth/harvest non-wood balanced ratio of timber growth/harvest economic returns from non-wood products in relation to total incomes</td>
</tr>
<tr>
<td>3</td>
<td>Browsing area of natural regeneration damaged by browsing</td>
</tr>
<tr>
<td>4</td>
<td>Damage timber volume of damaged wood in relation to the total timber production</td>
</tr>
<tr>
<td>5</td>
<td>forest roads density of forest roads</td>
</tr>
<tr>
<td>6</td>
<td>natural regeneration area of natural regeneration in relation to total regeneration area</td>
</tr>
<tr>
<td>7</td>
<td>tree species forest area with a close to nature tree species composition</td>
</tr>
<tr>
<td>8</td>
<td>woody debris amount of coarse woody debris of standing volume</td>
</tr>
<tr>
<td>9</td>
<td>Planning quality and extent of planning instruments and tools</td>
</tr>
<tr>
<td>10</td>
<td>Ecosystem area with conservation measures for ecosystem protection</td>
</tr>
<tr>
<td>11</td>
<td>Training amount of money spent for professional training</td>
</tr>
</tbody>
</table>

**4. Data sources and deficiencies**

The central instruments of information in an enterprise are the accounting system and the forest inventory.

The **accounting system** is the principal quantitative information system in any company. It can be broadly classified into financial accounting, cost and management accounting. **Financial accounting** records flows of money, goods and services from and to the enterprise in monetary terms, and the resulting state and changes in assets and liabilities. Monetary profit is the basic measure of results. **Cost accounting** analyses internal processes, factor consumption and performances in detail, and is characterised by efficiency criteria. Both systems of accounting cover the production of goods and the provision of services as far as they contribute to monetary profit. **Management accounting** comprises all accounting activities aimed at providing data relevant for management purposes. **Environmental** and **social accounting** have emerged recently – all these facets of accounting together result in the so-called extended management-oriented accounting.

**Forest inventory** serves for recording the properties of forest stands relevant for planning, controlling and assessing purposes. It is partly carried out as stand inventory, and partly as sampling inventory at larger intervals.

Accounting and forest inventory as measurement tools and control instruments of sustainability have to provide information on such criteria and indicators that are suitable for characterising sustainability.

In practice, the major part of the desired data for the representation and proof of sustainable forest management is missing. There are weaknesses and deficits with regard to the condition of the forest (inventories), present and future performance (products and services) and the indicative figures. Apart from missing physical data to be provided by forest inventory, there is a lack of adequate values for profit and forest assets in financial accounting. In any case, the customary measure of the undifferentiated cubic meter over bark is insufficient without considering tree species composition, timber quality, assortments, qualities and terrain conditions. Basically, financial accounting can only contribute to the certainly important sustainability goal of **liquidity**. However, forest enterprises usually have a big share of assets that can be liquidated in the short run, which implies that this financial key figure is not really important in the forest enterprise. A well-developed cost accounting system can, however, deliver a great number of interesting indicative figures. The Austrian forestry accounting data network, for instance, has provided an abundance of data from financial and cost accounting of forest enterprises for 40 years, but their shortcoming is the lack of non consideration of the changes in forest assets. As a first step, the so-called adjustment to the allowable cut has been practically introduced.

The main shortcomings of forestry accounting consequently are: neglecting or incorrectly registering changes in growing
stock, and not or inadequately representing other services, especially with respect to the environment in a wider sense. The consequence is that results shown by accounting are to a certain extent incomplete or wrong.

Many approaches have been proposed over time to evaluate forest assets and to consider changes in forest assets, but none of them has been accepted in practice so far. Currently, there are several new and promising approaches to solve these problems. Whereas there are hardly any legal regulations concerning forest asset records in external accounting, it is indispensable for internal accounting to have correct records of forest assets and to examine if targets have been reached. With regard to the non-market or environmental benefits that cannot actually be assessed with a monetary system, so-called performance reports that show primarily physical factors are being examined.

The approaches can, for instance, be roughly classified into balance sheet and calculatory approaches. Balance approaches try to quantify changes in forest assets like a balance sheet or profit and loss account. They are known from public forest enterprises in Great Britain, New Zealand etc. Recently, scientists from Central Europe have also dealt with the attempt to fully integrate forest assets into financial accounting. The approach of a German research group (Borchers 2000) has been developed on the basis of IAS and the local commercial law. Forest assets appear as “growing stock” in the balance sheet. A similar study was recently presented for Scandinavian forest enterprises. Joint-stock companies that are publicly quoted are to show forest assets in their balance sheets. Enterprises run by state and provincial governments also strive at this goal. For smaller forest enterprises, however, it is more reasonable to opt for calculatory approaches that avoid the evaluation of assets. In the following, a calculatory approach for the periodical performance assessment shall be presented that considers changes in forest assets, avoids the problem of evaluation, and integrates environmental services.

5. A two-stage calculatory approach to improved economic performance assessment of the forest enterprise

In Central European forest enterprises the so-called allowable cut calculation has been generally introduced. The allowable cut is used instead of annual increment as a measure and benchmark of the sustainable timber production potential. Deviations between allowable (AC) and actual cut (AH) are considered to be an expression of changes in the value of growing stock.

\[(AC - AH) \times CP = \text{change of forest assets}\]

where CP is the contribution margin (stumpage price) per m³ of the actual harvest.

This AC-calculation is only one step into the right direction, which has to be improved by other means for the following reasons:

- problematic determination of allowable cut (average of different formula)
- re-calculation of the actual felling quantity - disregarding tree species, timber quality, logging site etc.
- lacking consideration of the execution of silvicultural operations
- proof of changes only in relation to the management plan (allowable cut)

In order to improve this calculation, a calculatory approach for a better periodic performance assessment was developed by Jöbstl (1981, 1996) – starting from the balance sheet and the income statement (see Figure 1).

Stage 1. The Improved Short-Term Performance accounting approach

comprises – starting from the allowable cut method - the following components/assessments:

- Deviation of actual cut (AH) from allowable cut (AC) subdivided into tree species, assortments, logging sites, etc. (i)
  \[(AC_i - AH_i) \times CP_i = \text{change of assets} \quad i = \text{timber species, …}\]
- Deviation of planned (p) and actual (a) silvicultural measures (m)
  \[(FM_p - FM_a) \times c_m = \text{change of assets} \quad c_m = \text{standard cost of measure m}\]
- Changes in the state of young stands and tending areas
  \[(FS_p - FS_a) \times c_s = \text{change of assets} \quad c_s = \text{difference in standard contribution margin of s}\]
- New damage caused by calamities and game
- Maintenance of forest roads and buildings
- Long-term effects of allowable cut on forest assets
- Loss of timber production due to hunting, recreation, etc.
In order to eliminate or separate the influence of fluctuations in market prices, standard prices and standard costs are used. Expenditures and receipts from infrastructure services (IS); non-timber services etc. are separated by proper cost centre accounting and adequately loaded with overhead costs. Losses and damage caused by calamities and game and the provision of IS are calculated on the basis of opportunity costs. While environmental economists have developed a number of techniques to estimate the value of non-market goods and forest services, we consider these techniques as difficult to apply and usually not useful on the enterprise level in their current form. My approach works without monetary evaluation of IS services. However, a quantitative and qualitative description of environmentally and socially relevant facilities and services of the forest holding is proposed to be presented on a separate sheet.

Stage 2. Medium-term performance analysis

In combination with the forest inventory (carried out only at greater intervals in the course of forest management planning) a comparison of the states of the forest (actual state \( t_0 \) - actual state \( t_1 \)) and further analysis can be carried out. The process concept for medium-term performance analysis is essentially based on the fundamental ideas of an actual-actual-and a target-actual-comparison as well as an analysis of deviations and causes. It comprises the following components:

1. Comparison of two consecutive inventories (Actual – Actual; Target – Actual)
2. Analysis of the past medium-term planning period (period analysis – control of plan execution and analysis of financial results)
3. Medium-term plan assessment and long-term development preview (forecasting)

 Preconditions for this approach are a purpose-oriented design of the forest inventory, derived from a carefully created evaluation model, and the determination of the requirements to be covered by book-keeping (recording of physical and financial quantities). The results of the analyses are a table of physical and monetary characteristics of the forest state and the periodic results (absolute, relative and differential figures). Their combination allows an assessment of the value-creating effects of the expired period. As far as possible and reasonable, the physical data will be complemented by monetary values. This approach is
supported by a set of calculation and development simulation models.

**Perspectives for the Future:** A promising future approach for a continuous internal audit of forest assets changes has been developed by Karisch (2003): a forest stand data base with annual updating of forest inventory data. Combined with plan-actual comparisons for harvesting and tending, simulation of forest stand development as well as monetary valuations, the annual observation of forest assets development should be made possible.

6. Environmental accounting

A step-by-step approach to environmental accounting on the enterprise level in forestry and agriculture was proposed by Merlo (1996). It starts with conventional financial statements: balance sheet, profit and loss account of the forest enterprise following conventional accounting principles. The second step separates environmental/recreational activities from conventional ones, i.e. agricultural products and timber, from recreational environmental services. A third step outlines near market values as perceived by the entrepreneurs. These are hidden values – assets and liabilities (changes in growing stock, risks due to natural hazards, ...). A fourth step aims at incorporating non-market benefits and costs (externalities), or, at least, providing a framework for their incorporation, as far as they can be shown in monetary terms, or by other means. Therefore satellite accounts and addenda including physical/biological aspects can be used.

Several publicly owned enterprises, e.g. the Austrian federal forest estate, are concerned with the elaboration and publication of so called “Environmental Performance Reports” that have been expanded recently to Sustainability Reports, including different aspects of SFM (ÖBf AG 2004).

On the international level, first Guidelines to adjust National Accounts in order to provide data on the real social costs and benefits of forestry for society were provided in 1968 and renewed and improved in several steps (SNA, SEEA, EEAf). The basic idea here is to take the environmental services and the changes in forest assets in physical dimensions and describe them in annexes or on satellite accounts, respectively, as in the enterprise model described above. The SEEA includes both physical accounts and, to the extent possible, monetary accounts. The EEAf follows the SNA and SEEA, but expands the presentation of forest accounts to non-market forest products, forest services to non-forestry sectors, distribution of forest benefits, and accounts at the regional and forest level.

7. Some comments

Finally, it has to be admitted that the traditional accounting system is not even able to provide sufficient information for the Sustainable Timber Management and that adequate further developments with regard to forest resources are needed. The traditional accounting system cannot contribute much to meeting the new major challenges of SFM such as recording other forest services apart from providing information about expenses, costs and direct revenues. Therefore, it needs to be complemented by new approaches. In this context, forest inventory plays a central role. Currently, there is a lack of data, especially of those that allow a monetary assessment. Forest inventories are planned inadequately. More mental input is needed. Data collection and processing are expensive and not feasible for small enterprises. Models and calculation aids are missing. Financing the further development of existing models has a very low priority, since they seem not to be indispensable for the current management. Nevertheless, further efforts are necessary, since the provision of information about the state of the forest, forest services and economic outcomes relevant for sustainability is the manager’s duty, whereas the stakeholder needs to go and get the information.

8. Concluding remarks and summary

Accounting has for a long time been an important information instrument for enterprises both internally (management – controlling) and externally (reporting). Beyond that accounting provides information for the national income estimation and policy.

The picture of the actual conditions and processes in forest accounting in physical and financial dimensions is incomplete, and partly even wrong and misleading. The periodic changes of forest assets and the environmental achievements of the forest enterprises are missing in particular, while wood harvesting is relatively well captured. An extension is necessary for internal and external purposes.

Though the forest, which constitutes the centre of forestry activities, covers 80-90% of the assets of the forest enterprises, it is to a large extent ignored by traditional financial
accounting. Yet, planning and control of forest management require to observe and to judge the stocks and their changes with a view to the future yields.

1. In National Accounting, which also shows serious shortcomings, international organisations are elaborating proposals of procedures that aim at standardisation, harmonisation and, thus, comparability – including the natural resources, forest development and the non-market benefits of forestry.

2. While first suggestions on the valuation of the changes of forest assets (physical sustainability) are more than 100 years old – but have never attained acceptance in general practice – proposals for the inclusion of the environmental benefits into management accounting (sustainability in a wider sense) are hardly 10 years old.

3. Approximation solutions are commonly used: on the one hand, improved performance estimation without evaluation of the forest assets on the basis of comparisons of planned (standard) and actual values (e.g. actual cut - allowable cut), and, on the other hand, the creation of so-called performance reports, recently extended to sustainability reports.

4. In enterprise accounting we have preferences for the calculatory method of accounting for changes in value. Environmental services as well as changes of forest assets are not to be entered into financial accounting directly, but recorded in satellite accounts and/or described in the appendix to the balance sheet. This avoids the mixing of different qualities of information.

5. The criteria and indicators of the various SFM processes can be used as a basis for the assessment of the necessary contributions of accounting to further support the measurement of sustainability. This concerns mainly physical data made available by carefully planned and accomplished forest inventories and based on development prognoses. In the ideal case monetary evaluations can be added.

6. It is a fact that the majority of the forest enterprises do not have any systematic accounting system, while others maintain the bare legal minimum. In addition, also the accounting systems of progressively led enterprises do not cover substantial aspects. Significant development is still ahead.

References


MCPFE Liaison Unit Vienna 2003. Background Information for Improved Pan-European Indicators for Sustainable Forest Management. Vienna. 45 p.


Introduction

In this symposium 49 scientists from 18 different countries took part and 28 papers were presented. The majority of the papers focused on the main theme of the symposium. However, the conference contents were far from being homogeneous, but reflected various ways of thinking, different approaches, concepts, methodologies and perspectives, etc. It is believed that this variety and complexity has added to the symposium value.

Science, or more precisely, scientists’ gaps and shortcomings, were at the centre of the first group of papers presented on theory and practice in decision making. The issue of different points of view in methods to solve problems was considered (Oesten). Actually, debate is part of the Scientific Community’s way of life, it is the rule of the game: a thesis needs an antithesis in order to find a synthesis through investigation and research. If the synthesis is called joint co-responsibility or co-operation, the result does not change.

It is not surprising that currently important forestry issues like certification, conflicts between groups of interest, goals and opinions are opposing each other. For instance, multi-criteria models can be used to reach compromise solutions when conflicting objectives must be pursued. Several well updated papers were presented at the theoretical and applied level (Zadnik, Kazana, Proctor, Hitrec et al., Gajo et al.).

Is there a gap between these models and the practice? Yes, was the answer (Hitrec et al.). It was hinted that the gap could appear to increase after this conference. Are models useless? This was also asked. No, absolutely not, was the answer. It has been mentioned that models are now recognised (this does not mean accepted) by some forest managers. They offer an ‘intellectual background for a general learning process’ and help foresters to develop ‘a systematic way of thinking’ about the problems at hand (Zadnik, Peyron, Kazana, Proctor).

It has been observed that systematic thinking and rationality are particularly needed when public forests are concerned. Decision making is particularly stressful for ‘elected’ people and so help is demanded. It is even better if from the help, i.e. clear transparent presentation of what is at stake, comes support. Here, however, comes the ethic of the scientist and even more the neutrality of science. Some doubts have been cast on possible confusion with politics, manipulation and even honesty (Jöbstl), reflecting the recent debate on the media.

It was pointed out that there are many types of models (Kazana), from yield tables, growth models (Kouba), stand structures (Novotny et al.) to the various MCDM with a higher degree of complexity. Generalisation does not help. Another question has been posed: is it a matter of ‘decision making’ or ‘decision support’ models that helps decision making? From this point of view the symposium has revealed clear opinions. Model builders should be realistic and also humble, open to suggestions and able to cooperate with practitioners, stakeholders; in other words, the people.

Other papers have coped with more classic economic models aimed at welfare improvement in general, rather than at a multiplicity of specific objectives. The social goals of forestry, the changing rationality, the influence of factors almost blundering with ideology (e.g. the green ideology) were discussed (Veh-
Far from traditional forestry new systems are re-emerging from the past (e.g. the Dehesa) and environmental accounting is there to help decision making at enterprise and policy level. In any case a clear cut distinction has to be made between private and public objectives (Campos et al.).

Should environmental accounting be a mere addendum to accounting, maybe just a qualitative annual report, or should it become an integral part of accounting? (Nyquist). The issue is certainly not new to this IUFRO group, it has been discussed several times since the Tampere Conference (IUFRO, 1996).

However, how should we supply data to environmental social accounting? For instance, what can the role be for the Contingent Valuation Method, which is now an established economic methodology. There is evidence from the Czech Republic survey, made by Sisak, which casts serious doubts on the method. The question asked was if non wood forest products only have a market price or do they have something more? Experts' valuation techniques are therefore proposed as an alternative and/or as an integration to economic valuation of environmental recreational values. Also forests and forestry contributions to the national income and welfare had been considered (Pabuayon), an issue rather familiar to this IUFRO groups (IUFRO, 1996 and 1998).

Coming to the main subject of the symposium it has been stressed that gaps and failures often occur due to attitudes, difficult communications and misunderstandings. ‘The art is to find the border between what is simple and what is simplistic’ (Peyron). However, it was pointed out that models are not easily accepted, because they are trans-disciplinary (Oesten). In addition forest models are by definition simplified images of the real system and therefore they normally should not be deterministic, but stochastic and probabilistic. However most models are - still - deterministic. Nowadays they should include an important social component, but it has been observed that social rationality changes (Vehkamäki). Models are built just to show these changing interests, to give transparency to a complex world, as argued by Proctor. However, the question of what would happen if the rationality of today was different from that of next Monday, was asked by Gadow.

Perhaps one should remember that the symposium was concerned with gaps between theory and practice, and not between models and practice. After all models are not pure theory, but they often just try to represent theory, or at most to develop a theory on the sound evidence provided by a model well founded on real world facts. Nobody can question Forest Economics as far as it is concerned with well established chapters like the market theory, the capital theory, welfare economics and business management. It has also been said, incidentally, that often practice is determining the theory (Vehkamäki), and this is rather common in Economics. Maybe this can open another area of discussion: from practice to theory.

Publication of the research results does not help communication. Scientific quality, or supposed quality, sometimes prevents dissemination. Model building exercises, and the related efforts and enthusiasms, may recall the well known book by Hermann Hesse, Das Glasperlenspiel. Are we the élite, Castalia, living in our turris eburnea, and outside the rest of the world of the ordinary people, the practitioners? Perhaps each scientist should look at his own behaviour; it is a kind of personal responsibility towards the real world. Compromises between articles for the scientific community (and academic promotion) and articles for practitioners could provide the balance. This attitude could help our scientific community, after all, as members of IUFRO are ‘applied people’, aren’t we?

Accounting and valuation

The roots of managerial economics must not be forgotten, was another message coming from several papers and the discussion. In this symposium there were several contributions attempting to bridge the gap between theory and practice. Accounting is a key instrument and is even better when applied to a network of enterprises, as in the cases reported by Möhring and Sekot. It is an important tradition in Austria that goes back to the seminal work of FRAUENDORFER (1967). The Austrian tradition is similar to the German one (Brabänder, 1996). On the basis of established network evidence has been given of the profitability of forest enterprises in the former German Democratic Republic (Möhring) compared to Western Germany traditional farm forestry. Even coppices, according to Italian accounting data, have shown remarkable improvements in their profitability (Bernetti et al.) thanks to new market development of firewood and biomass.
It would have been beneficial to compare the continental Europe rate of return with that of New Zealand (Manley), the United States (Klemperer et al.), and also Northern Ireland (Harley). The remarkable rate of 6-10%, as reported, marks the difference with European rate that is at most around 3-5%.

Accounting is of course a useful tool for defining best forest management and practices. The financial and social profitability of uneven aged forestry needs accounting support and evidence for this was shown by Hille et al. and Klemperer et al. Faustmann meanwhile remains a cornerstone in our profession, whatever the management is, as shown by Chang. Accounting can also be a useful instrument for possible future development of certification (Plesha). Whatever the development will be in this field, accounting will remain an essential tool. In wood processing industries accounting and cost centres are more established tools, as shown by Sjöström and Zahvoyska analysing, respectively, added value/contributing margins of the paper industry in Finland, and the multistage transfer line systems of the wood processing industry of Ukraine.

Australia and New Zealand seem to be very keen on definition and classification: (i) forest valuation standards (Manley); (ii) accounting standards (Austin).

Manley reported the development of the forest valuation standards in New Zealand as defined by the Institute of Forestry and by the body of forestry professionals. The similarity of approaches with the Continental European forest appraisal experience is amazing. Flexibility is advocated: the standard methodology is a 'combination of transaction evidence and the expectation value'.

Austin considered forestry within the more general accounting rules, e.g. accounting for self generating and re-generating assets, maintenance of productive capacity as seen in terms of market effects as well as biological growth. Is it not sustainability in the broader sense of the term? Is it not that foresters should learn from accountants? After all accountancy was founded by a fine mathematician, Pacioli, using mathematical logic, and so it is not surprising that enterprise accounting and national accounting is coming back when considering stocks of natural capital and flow of public goods and services, as underlined by the well known paper of Daly (1988), and remembered by Pabuayon.

Conclusions

The two aspects of the symposium, model building and operational research, and accounting and valuation with reference to real cases, have been seen by Bartunek et al. as the changing emphasis of research in transition countries. It was stressed that yesterday the emphasis was on organisation and optimisation and today it is on budgeting, taxation and valuation. One could have added another question: where was the emphasis on at this symposium? The question posed to the participants has been answered, underlining that the mix of papers, after all, has reflected current ongoing research and debate amongst scientists and practitioners. New issues, facts, evidence have emerged both in the field of organisation and best solutions as well as in accounting and valuation. The symposium in this way has shown its validity, and balanced approach, thanks to the papers presented and the stimulating debate.

References

(Authors of papers presented at the symposium are quoted in italics characters, and not reported in this list of references).


On the State of Forestry Accounting in some European Countries
James N. Hogg and Hans A. Jöbstl

First notable attempts to harmonise or accord forestry accounting on the national level date from the 1950ies. In the early sixties first significant activities on the international level are reported (IUFRO working group "Forestry Accounting", Cost Studies in European Forestry, ...). The objectives of these efforts were to further develop forestry accounting, to disseminate knowledge on accounting matters and to make outputs comparable both nationally and internationally. Some 30 years later by initiative of the IUFRO-group "Managerial Economics" at the XX. World Congress 1995 in Tampere a discussion forum was created, that was institutionalised from 1996 as IUFRO-group "Managerial, Social and Environmental Accounting". Main objectives for the work of the new IUFRO-group are 1. accordation of terminology, 2. survey and analysis of existing or realised concepts and 3. the further development of instruments in forestry accounting.

This paper gives an overview on the state of forestry accounting in several European countries. It is the intermediate outcome of an ongoing survey carried out by the University of Agricultural Sciences Vienna as part of an EU-HCM-research project on "New solutions in accounting of forest enterprises" and should also result in basic information for the future work of the IUFRO-group on accounting. After a general discussion on harmonisation, comparability, influence factors on accounting, book-keeping obligations, applied charts of accounts etc. the situation in six countries (Austria, Finland, France, Germany, Great Britain and Switzerland) is described in greater detail.

By means of a questionnaire based on a comprehensive model of forestry accounting - comprising 1. Financial accounting, 2. Cost accounting, 3. Social accounting and 4. Environmental accounting - basic data on forestry accounting were obtained from 21 countries, including 16 European countries. This survey is supplemented by a review of literature and (in single cases) case studies. On this basis a comparison of several aspects for the six countries could be drawn up.

The ownership structure, the sizes of forestry holdings, the accounting and tax law, the organisation of general accounting, the forestry tradition and the relationship of forestry and timber industries were identified as major influence factors and reason for differences in financial accounting.

In spite of major differences between the stage of refinement reached in various forest enterprises and presumably due to similar subjective information needs, cost accounting as primarily internally-oriented information system is more harmonious between different countries. Many, and in particular smaller forest enterprises, do not have any cost accounting, while many larger entities, if at all, only maintain retrospective cost centre accounts. Information or controlling systems with application of plans and targets and the provision of decision-relevant information are usually lacking.

As consequence of the difficult financial situation and the growing importance of non-market outputs of forestry, social and environmental accounting have evolved as new branches presenting information on the economic connections of the enterprise apart from flows of money and goods depicted in traditional enterprise accounting. A trend can be noted: With profitable timber production the major focus is usually directed towards profitability and efficiency information, while mainly negative economic results lead to a higher interest in reports on environmental and social achievements.

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On the Quality of Information from Performance Measurement in Forestry
Hans A. Jöbstl and Günter Karisch

Business management and reporting require various control information, which is to be derived from the targets. Main source are the enterprise accounts. However, in most (smaller) enterprises accounting is not employed.
and utilised at all, in larger enterprises – especially as far as they are obligated to keep accountant books – only to minor degree. Following an analysis of the manifold term “success” and the derivation of success criteria from the target system, different results are discussed and a success evaluation model is established in this paper. Deficiencies of traditional success information such as the missing consideration of forest assets changes, of depreciation and of the existing evaluation of financial accounting are dealt with and an approach for an improved assessment of economic performance in the frame of external reporting as well as internal reporting is discussed.


On the Honesty in Science
Hans A. Jöbstl

Science is made by scientists who nowadays are facing more and more different socio-economic conditions and situations of competition than in the past. According to FEYERABEND some of them are honourable persons, but some are not. Man is able to commit an error but also to use tricks deliberately. Occurrences of lapses are increasing, the ability of the system of scientific community to separate black sheep on the other hand is decreasing. Competition for money and - undeserved - honour is leading to diverse tricks, from little lies, fakes, deceptions, even to plagiarism. Detection of all these offences is getting more difficult. Obviously it is easier for a tricky one to make money and to have a brilliant career than for an honest person. Recently several books have been published according to this theme. In the United States of America commissions have been set up to get deception in science under control.

This paper is a reflection on some kinds of failure from swindle to fraud, on the reasons therefore, on the deny of supervision mechanisms and on possibilities and arrangements to uncover and stop dishonesty. Particularly lack of factual discussion and of culture of discussing are lamented.


Fundamental Problems of Forest Asset Valuation and Forestry Performance Accounting - An Introduction
Hans A. Jöbstl

Starting from the aims and purposes of forest valuation and forest asset accounting, some basic problems and methods of forest asset valuation and forestry performance accounting are introduced. The elements of a valuation situation and the components of a valuation model are illustrated, problems, methods and relevant aspects of forest asset valuation derived and internal and external aims addressed. A pragmatic approach for the short and medium term performance calculation refraining from forest asset valuation is presented. Finally, the papers are classified into thematic groups and it is attempted to point out, to which questions answers can be expected by this workshop.

Fundamental Problems of Forest Asset Valuation and Forestry Performance Accounting
Hans A. Jöbstl and Günter Karisch

The missing consideration of forest asset changes in forestry performance accounting is one of the oldest, practically unsolved problems of managerial economics in forestry. Although this topic has often been dealt with in scientific publications, a generally accepted solution remains still missing. In a pre-study to the prevailing research work about 60 historic and actual approaches/methods for forest asset accounting were investigated, described, analysed, grouped by different aspects as time horizon, method etc. and finally evaluated by a set of various criteria. In the applied part of the research work – starting from a multi-part approach of the first author – an EDP-model based on a forest stand data base has been developed. Central components of the model are (1) the extension of the traditional allowable cut based performance calculation to a detailed comparison of planned and actual measures in the fields of harvest (differences of allowable and actual cut regarding size, structure and value) and silviculture (plan-actual-differences regarding area extent and value), (2) forest asset valuation with four different value approaches and (3) the updating...
of forest inventory data and forest value on the basis of annual increment and annual cut. In the prevailing article the model is outlined and a pattern for a financial report extended by forest asset changes is introduced.


**Sustainable Forest Management in Accounting**  
Hans A. Jöbstl

Management of forests - for whatever purposes - requires a variety of information. The central element for providing this information is the accounting system. Hence, accounting is a means necessary for managing businesses (planning, decision-making, controlling), for reporting to the economic and social environment (owners, tax office, etc.) as well as for policy-making. Nowadays, the communication of sustainability indicators as well as social and environmental aspects to the society is growing more and more important.

An accounting system supporting management should depict the relevant economic reality correctly and completely. From the SFM point of view forest accounting is not sufficiently developed as in most cases it does not measure and record relevant parameters connected with sustainability. While many small forest holdings do not have any noteworthy accounting, even enterprises with established accounting systems suffer from widespread deficiencies as reality is only represented inaccurately or incompletely, e.g. changes in the value of forest stands, non-market outputs as well as social and environmental information are normally not included. The generally applied allowable cut concept is indeed a first step to consider these changes regarding volume sustainability, but it has to be improved by further steps. A similar problem is the broadly acknowledged collection of specific expenditures resulting from the provision of non-market-benefits (with the help of cost centres), but ignoring their opportunity costs and their value (performance) for the consumer. Improvements are necessary.

Starting with a brief overview on the state and development of forestry accounting in European countries the paper proposes a framework to improve forestry enterprise accounting and reporting, e.g. by including annual changes in growing stock values and environmental non-market values.