Outline of Accounting for Non-Industrial Private Woodlots

Akmal S. Hyder, Lars Lönnstedt and Markku Penttinen

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For non-industrial private forest (NIPF) owners forest land with its timber production is an example of a capital asset. Developments in the asset's value and yield depend not only on forest management but also on other factors that the owner cannot control, for example timber prices and the production circumstances, such as soil and climate. One important basis for decision making related to management strategy and, in the short run, to cutting and silvicultural activities is economic analysis and accounting. The owner has to decide whether to invest more in his property (planting, cleaning, building of forest roads) or disinvest (sell timber or the holding). He has to find ways to increase revenue and cut costs. This is particularly important given the economic conditions facing forestry in, for example, Finland and Sweden in the early 1990s. However, generally accepted accounting practices for NIPF owners are lacking. Applying business economic accounting principles and forestry accounting traditions, we outline a proposal for a profit and loss account and balance sheet for NIPF holdings with a view towards increasing economic awareness among private owners. Key concepts are net profit *of the enterprise* and *calculated profit of the property*. Other profit measurements that are used are *gross margin*, *forestry margin*, *operating margin* and *operating profit*. Calculated profit is based on adjusted net profit. The main concern, however, is to consider the change in the holding's market value caused by changes in stock volume, quality and price. The contents of the accounting framework developed here are applied to three management strategies. The return on investment (ROI) of forestry is compared with other investment alternatives.

Keywords financial accounting, net profit of the enterprise, calculated profit of the property, cost accounting, forest management strategies, non-industrial private forestry.
Authors' addresses *Hyder*, Mid Sweden University, Department of Social Sciences, S-831 25 Östersund, Sweden; *Lönnstedt*, Swedish University of Agricultural Sciences, Department of Forest Economics, S-901 83 Umeå, Sweden; *Penttinen*, The Finnish Forest Research Institute, Unioninkatu 40 A, FIN-00170 Helsinki, Finland.
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1 Introduction and Background

1.1 Why are Accounting and Profitability Studies Important?

Ever since forests have been utilized for industrial purposes, forestry has been a cyclical business. Thus it ought not to be a surprise that the economic environment of the forest sector has changed in the 1990s. However, this time the recession is deeper than usual, partly because of structural changes. It has led to crises e.g. in Canada, Finland and Sweden. Between 1991 and 1993, stumpage prices in Finland and Sweden declined by 25–40 %, depending on the roundwood assortment (see e.g. Aarne 1993). As a result, the profitability of forestry has become a critical issue. Many forest owners are now facing a reduction in forestry activities and investment without an appropriate accounting base.

In Sweden, about 50 % of the forest area belongs to non-industrial private forest owners (abbreviated to NIPF owners in the following). About 60 % of the total roundwood supply derives from this group and the contribution of the respective forest industry products to the country's total exports is around 10 %. In Finland, the corresponding figures are 58 %, 77 % and about 20 % (Aarne 1993). Note that in 1990 the total gross stumpage earnings of NIPF owners in Finland were USD 1,166 million (FIM 6,825 million), of which the total costs of silvicultural and forest improvement work accounted for USD 185 million (FIM 997 million), i.e. 14.6 % (Aarne 1992). For example, in the southern and northeastern parts of the USA, three-quarters of the forest land is owned by NIPF owners (Dutrow 1984). In Germany, negative net profit (Reinertrag) on privately owned holdings has been reported by Ott (1987), among others.

Of critical importance for a business manager trying to improve a firm's profitability is cost consciousness. Influencing, for example, demand and price is a difficult task for most managers, especially for NIPF owners. Most efforts to improve profits focus on expansion of output rather than reducing costs (Warren 1983). However, when a forest owner is aware of the actual costs involved, he has a better basis for taking decisions on investments, cutting intensities and silvicultural treatments. A generally accepted profit and loss accounting procedure can be expected to help improve the profitability of forestry.

1.2 Basics of Forestry Accounting

The American Accounting Association (1977) defines the classic approach to the construction of accounting models for common use. This approach is also applied in this study. The classic approach has two subapproaches: (i) The deductive one focuses on differences in wealth between two points of time; (ii) the inductive one emphasizes realized values during the accounting period and the profit and loss account (Belkaoui 1985 and Lukka 1989). Note that the Finnish tradition introduced by Saario in 1945 (Lukka 1989, Pihlanto and Lukka 1993) is an inductive approach. It means that like a business firm, a forestry enterprise's accounting procedure will comprise a profit and loss account, which will be emphasized here, and a balance sheet, in addition to cost accounting.

Management accounting has three distinct roles: (a) to analyze past performance, (b) to monitor current performance, and (c) to plan future performance (Kerr 1988). However, accounting data only provides a starting point for planning. The accounting system developed here can use values such as actual sales, volumes per roundwood assortment, selections and allocations that are not considered in financial accounts, which are prepared for external users.

1.3 Previous Work

Forestry accounting is far from complete, even though huge investments have been made in private forestry. The profitability crisis and management information needs of forestry call for the development of financial and management accounting as well as studies reporting empirical cost and profit results. The profitability of non-industrial private forestry has been an important research issue in recent years (Kula 1988, IUFRO 1989, Penttinen 1989, Simula and Keltikangas 1990, and Penttinen and Kinnunen 1992). In addition, the basic concepts of forestry accounting have been studied by Saari (1937), Keltikangas (1970), Holopainen (1976), Openshaw (1980), Frauendorfer (1987) and Jöbstl (1990a,b), among others. Some proposals for forestry accounting have been made by Brabänder (1965), Speer (1966), Hämäläinen (1973), Jöbstl (1982, 1987a,b), Eurostat (1987) and IUFRO (1989). Accounting systems have been developed for specific industries. A typical example is the RP-plan, which was developed originally for mechanical engineering. These systems even have different versions for enterprises of different sizes and have been tailored to the needs of different industries (see e.g. Samuelson 1991). Some earlier proposals, such as Brabänder (1965), Speer (1966), Jörgensen (1964), Hämäläinen (1973) and Hermansen (1977) can be used as a starting point in forestry. Recently, attempts at devising accounts for forestry have been made by Lantbrukarnas Riksförbund (1989), Penttinen (1992) and Kinnunen et al. (1993). A comprehensive proposal for forestry accounting has been made by Waldwirtschaft Verband Schweiz (1993). Profitability reports have been provided by Stridsberg and Algvere (1967), Rochot (1984), Enk (1988), Berger (1990), Bundesministerium für Land- und Forstwirtschaft (1992), Hercher et al. (1992), among others. In Ireland, the economics of forestry have been studied by Convery (1988) and Kula (1988). Developments in costs and returns in European forestry in the 1980s have been described e.g. by Rochot (1984), de Legge (1990) and Wurz (1992).

Systematic forestry accounting has been experimented with and applied for a longer period of time, above all in central Europe (see e.g. Ausschuß für Betriebswirtschaft 1980, der Forstliche Bundesversuchsanstalt 1987, Enk 1988 and Hercher et al. 1992). Forestry accounting was applied and bookkeeping farm networks were implemented in western Europe as early as the 1950s (Rochot 1984). Reports have been published on e.g. forestry accounting in Italy (Merlo and Defrancesco 1984). Saari (1929) and Piha (1941) analyzed the profitability of forestry using material on agricultural bookkeeping farms in Finland.

The solutions proposed in this study are based on the scientific tradition represented by IUFRO and the central European institutes. Account is also taken of practical results e.g. Hämäläinen and Sevola (1982), Enk (1988), Lantbrukarnas Riksförbund (1989), Jöbstl (1990a,b) and Penttinen (1992). For example, the three proposed cost centres – direct logging, direct silvicultural costs and overhead forestry costs – are used in cost accounting in Austria (Enk 1988).

1.4 Purpose of this Study

The NIPF owner's decision-making in a changing economic environment benefits from data on (i) profitability (financial accounting), (ii) cost structure (management accounting), including (iii) product costs, and (iv) forest investment/improvement (project accounting). Why, then, has not sufficient effort been made to develop commonly used means – at least profit and loss accounting and a balance sheet – for analyzing the profitability of NIPF owners? Note that a profit and loss account is necessary, and in some cases also a balance sheet, for measuring the profitability of agriculture (Middleton 1985). One important reason is that forestry requires long-term production process, which makes it difficult to calculate profit, product cost and forest value. Forest value will depend on assumptions as to what will happen several generations ahead (Allison 1985). Owing to the absence of a generally acceptable accounting system and to changes in standing timber the NIPF-owner lacks a clear picture of what return he earns on his investment, and different persons making economic calculations about the same enterprise can come up with different results. Even making comparisons between different years for the same enterprise is difficult. Up till now, forest valuation has primarily been studied as a special question without any link to the balance sheet (see e.g. Sagl 1988).

However, some developments in forestry accounting, including program products, have been made e.g in Switzerland (Weber 1984), the results of which, including ready-made program products have been provided by Waldwirtschaft Verband Schweiz (1993). Moreover, comparisons between different forest enterprises have been carried out in central Europe (see e.g. von der Wense 1990).

The purpose of this study is to suggest principles that might serve as a basis for financial and cost accounting of NIPF woodlots and to test these principles in practice. Recall that cost accounting is concerned with meeting the requirements of external reporting (Drury 1992, p. 17), i.e. profit and loss statement and balance sheet. General application of accounting principles would improve capital allocation and investment decisions among NIPF owners. This can be achieved by providing accounting methods and ex post information for NIPF owners and parties interested in financial performance.

Two alternative approaches to the calculations exist: (i) to measure the net margin of the forestry entrepreneur in the spirit of the private enterprise theory, and (ii) to measure the net margin of the forest property, which can be compared with other forest holdings and investments (Schneider 1970). Both approaches are tackled here. The former is subsequently referred to as *net profit of the enterprise* and the latter as *calculated profit of the property*.

In this article, we first present the principles of our accounting method by discussing the revenues and costs of a forestry enterprise and developing a profit and loss account and balance sheet for NIPF owners. Special questions such as depreciation, reserves, inflation and its influence on e.g. interest costs are also commented on. The concepts developed in the method are then applied to a forest enterprise with respect to different cutting strategies in order to make comparisons of financial results. Finally, some general and specific conclusions are drawn from the study.

2 Outline of Principles for Forestry Accounting

Accounting is based on postulates, theoretical concepts and principles (see e.g. Belkaoui 1985). These general principles and rules are applied here in order to guarantee a sound business economics basis and to avoid separate ad hoc accounting implementations.

Ideally, the forestry entity should be separate and distinct from the owner's other entities, including agriculture and the household. In practice, these different entities often comprise one enterprise e.g. a farm estate. The going concern assumes that the entity is not expected to be liquidated in the foreseeable future, which holds in sustained forestry. The unit-of-measure postulate assumes that accounting is limited to the production of information in monetary terms. In forestry, accounting typically also includes volumes needed for profitability, productivity etc. results, e.g. per cubic metre. The accounting period postulate assumes a fixed reporting period, typically a fiscal year, or a "natural" business year such as a cutting season, e.g. in Finland 1 July to 30 June.

The implementation of accounting is based on e.g. (i) consistency, which requires consistency of accounting in subsequent years, (ii) conservatism, in evaluating e.g. assets, (iii) a cost principle, i.e. historical costs in the valuation of goods, and (iv) the timing of the revenue on either a critical-event basis or an accrual basis. The recognition of the revenue of agriculture and also of private forestry is triggered by the critical event, which is the receipt of payment subsequent to sale. However, business firms apply the accrual basis for revenue recognition (see e.g. Belkaoui 1985).

2.1 Revenues of a Forest Enterprise

To develop a profit and loss account for NIPF owners it is, as for any business firm, necessary to calculate realized revenues. However, NIPF owners do not necessarily have revenue, e.g. roundwood sales, every year, although even then the growth of the standing stock generates unrealized revenues. The revenue principle specifies the nature, measurement and timing of revenue. The narrow view of revenue, which is applied here, excludes investment income and gains and losses on the disposal of fixed assets. Revenue is measured as net cash equivalent, excluding e.g. sales tax. The accrual basis of revenue recognition is triggered whenever the price of the product is known with certainty and the goods have been sold. In Sweden, the sales price is paid after the sales agreement regardless of the delivery time, a procedure which has also been applied to some extent in Finland of late. Previously, the practice in Finland was for the main part of the sales price to be paid after the measurement and delivery of the sold roundwood.

The main sources of revenue in forestry are sales of timber and other forest products, as well as the value of forest products used for repairs, maintenance and construction in the forest enterprise. Revenue is also obtained through hiring out the estate for hunting, the monetary evaluation of which has been developed e.g. in the USDA Forest Service by Loomis (1989). The forest owner himself can hunt but it is usually difficult to appraise the value of the benefit.

The net profits rule ignores changes in property values. The capital impairment rule also recognizes changes in property values as part of profit or loss (cf. Schuetze 1987). Capital impairment means that revenue contributes to the increase in the net assets, which are the difference between the assets and liabilities of the firm. Here the capital impairment rule is applied assuming additionally that the growing stock belongs to current assets. The inductive approach introduced by the American Accounting Association (1977) emphasizes the profit and loss statement. In forestry, this approach can be supported for the very reason that the values of the property included in the balance sheet are inaccurate.

We suggest that the net result of financial accounting should be calculated first. Here it is called the *net profit of the enterprise* based on the private enterprise concept (Schneider 1970). Note that it includes the result obtained from the forest property. If the working hours of the owner cannot be included in the accounting, i.e. measured and evaluated, it also consists of e.g. logging and silviculture.

Since NIPF enterprises involve special features, calculation of their results should differ to some extent from that for business firms. Compared with other firms, forest incomes vary significantly from year to year depending mainly on the cutting intensity. During a particular year or even some years in succession there might not be any income in a small NIPF enterprise but there are always certain expenses involved in possessing such an enterprise. It means that when no cutting is made during a certain year, no income is generated. Thus from a business economics viewpoint the firm will show a negative result for such a year. The other side of the coin is that in some years the revenue will be excessive in comparison with the costs.

We argue that such a definition of the *revenues of the enterprise*, here called realized revenues, is not sufficient as the only result. The changes in the value of the growing stock should also be taken into consideration in evaluating the calculated changes in the current assets in order to estimate the *calculated profit of the property*.

Ashby and Funk (1980) argue that if the unrealized values are not measured and included, it would be considered as a deviation from accounting principles. Note, however, that accounting practices recognize only realized business transactions and stocktaking of current assets. In order to draw up a true profit and loss account, a capital valuation of the woodlands must also be undertaken (Openshaw 1980). The inclusion of capital valuation leads to the evaluation of a calculated profit for the property, which complements the result provided by financial accounting. It is defined as the best possible estimate of the net result of the forest property, which can be compared with the results of other forest holdings and other property or investments.

Therefore, two types of revenues, i.e., both *realized* and *unrealized*, constitute the basis of our proposed profit and loss account. The first category arises from sales of wood derived from final cutting and thinning during the accounting period. The value of property may change because of e.g a change in timber (i) volume, (ii) quality and (iii) price. These changes do not generate any business transactions and hence there is no trace of them in the accounting. Here the concept unrealized revenues/losses is used for the changes in the value of property which do not belong to the accounting. The unrealized revenues/losses are caused by the difference between the current and the previous year's value of the forest. The central instruments applied in measuring the net result of forestry are (i) accounting and (ii) a forest survey, the latter of which is a detailed study of forest stands and is typically made for ten years (for a combination of a forest survey and accounting, see e.g. Saari (1937), Holopainen (1976), Hämäläinen (1982) and Jöbstl (1987c)).

2.2 Costs and Expenses

In accounting, there are a number of ways to classify and present costs. Typically, cost types, cost centres and cost-incurring items are applied. Recommended cost types, cost centres and the European Community's costs-incurring items for forestry are presented by Jöbstl (1982), Eurostat (1987), Enk (1988), IUFRO (1989) and Penttinen (1992).

The seven cost types, five cost centres and nine cost-incurring items proposed by Penttinen (1992) might involve too much effort for an individual NIPF owner. In an accounting study of forestry covering the entire country, Enk (1988) applied three cost centres – logging, silvicultural and overhead – and a fourth one for forest road etc. investments. Sekot (1987a,b) suggests five "natural" types of costs and ten cost centres. However, a Finnish accounting system for NIPF owners applies, a more detailed cost centre structure than above (Kinnunen et al. 1993). Some attempts have even been made to calculate the cost of producing one unit per roundwood assortment (Mann 1986).

Recall the basic concepts *variable* and *fixed costs*, which can simply be defined in terms of how a total cost changes when the activity, often called volume, changes. Logging cost is a typical variable cost. If the forest owner refrains from cutting, he avoids incurring such costs. The fixed cost, on the other hand, will remain even if no cutting is done. Concepts such as *direct* materials, direct labour and manufacturing overheads are used when carrying out product costing. Direct costs refer to a cost-incurring item, for example, to products the costs of which are recorded. *Overhead* costs are joint costs, so they cannot be directly allocated to the products. They include all indirect manufacturing labour and material costs as well as indirect manufacturing expenses (Drury 1992). A third type of cost classification distinguishes between *specific* and *common costs*, which are terms based on the proposal of the Swedish Centre of Technical Terminology (1978). Specific costs are similar to variable costs, which arise if a certain product is developed or the volume of a product is increased. Common costs are joint costs, i.e., it is difficult to allocate them to specific products.

In order to structure forestry costs it is important that accounting principles be applied. At the same time necessary adjustments must be made to ensure conformity with the forestry environment, i.e. the production process of the enterprise defines the cost system. We have applied the second type of cost classification relevant to decision-making in presenting forestry costs, i.e., we distinguish between direct and overhead costs (see Drury 1992, p. 236). Table 1 groups the forestry costs centres in a systematic way into three groups. Direct logging and silvicultural costs constitute direct costs while overhead costs are the same as overhead forestry costs including both administrative costs and of those items, which cannot be allocated to the direct costs. In fact, these three cost centres – (i) direct logging, (ii) silvicultural and (iii) overhead costs – and (iv) investments e.g. in forest roads are actually applied in central Europe as well (Enk 1988). However, some researchers divide the third centre into sales, fixed assets and common costs (see e.g. Jöbstl 1982). One suspects that NIPF owners would consider more than three cost centres to be too laborious.

Table 1. Classification of forestry costs.

Forestry costs	
Direct costs	**Overhead costs**
I Direct logging costs	III Overhead forestry costs
1. Felling	1. Administration
2. Processing	2. Bookkeeping
3. Off-road extraction	3. Education
	4. Forest insurance
II Direct silvicultural costs	5. Forest management plan
	6. Forest preservation duty
1. Draining	7. Overhead forestry cost
2. Clearing	8. Maintenance – drain
3. Planting	9. Maintenance – forest road
4. Cleaning	10. Travel
5. Pruning	
6. Fertilizing	

Direct logging costs consist of costs associated with processing and off-road extraction. Processing is usually a combination of limbing, measuring and cross cutting of trees into assortments. Direct silvicultural costs include different forestry measures necessary for the improvement of the state of the forest. As a consequence of final cutting certain regeneration activities need to be undertaken.

One example of an overhead cost is the procuring of a forest management plan for use both during logging and silviculture. Costs for administration, travel, education, etc. are charged to the whole forestry enterprise and so they also belong to this category. It could prove difficult to differentiate travel costs in forestry from other activities if the forest owner uses the same vehicle for private use or for travel in connection with other businesses, for example, agriculture. One common form of insurance in forestry is cover for losses caused by forest fires. In financial accounting these kinds of costs, which are not caused by products but e.g. by administration, are called expenses in the annual reporting.

The share of overhead costs among NIPF owners is low, e.g. around 4.5 % in Finland (Ylitalo 1991). This small share does not support the inclusion of modern cost accounting techniques such as activity-based costing (ABC). The possible application of this recent technique would benefit from the forestry bookkeeping network. Activity-based costing has been developed to eliminate the biases caused by errors in allocating overhead costs (see e.g. Kaplan 1990). All in all, one might say that the cost system applied in NIPF accounting is currently at a stage which focuses on external reporting. Consequently, the enterprise can, in addition to tailored financial reports, produce only limited feedback on operational (management) control and inaccurate product costs (see Kaplan 1990). However, some studies even provide cost and net profit results per produced cubic metre for different species of timber (Brandl 1989).

2.3 Profit and Loss Account

One example of a profit and loss account for forestry is shown in Table 2. This format is based on the amended Finnish Accounting Act and the general framework (first paragraph) of the Accounting Decree, which came into force on 1 January 1993. The profit and loss proposal is supposed to correspond with the layout in Article 23 of the EC's Fourth Council Directive (Teränne 1993). It will be applied in Section 3 when presenting profit and loss accounts for different cases. The figures in the table are yearly per hectare averages based on the balanced strategy of the cases in Section 3.

Gross Margin

The difference between forestry revenues and the corresponding direct logging costs is called the *gross margin*. As mentioned, *forestry net turnover* comprises all incomes from forestry, but excludes e.g. investment income and gains on the disposal of fixed assets. The direct costs in this case are direct logging costs, which are directly related to thinning and final cutting operations.

Margin after Variable Costs (Forestry Margin)

Margin after variable costs (forestry margin) is obtained by deducting direct silvicultural costs from the gross margin. *Direct silvicultural costs* are associated with the maintenance of the forest

Table 2. Proposed profit and loss account for a financial year: average results in USD per year and per hectare, 1987–1991.

Profit and loss account	1 Jan 1987–31 Dec 1991
Net turnover	97.7
Variable costs	
Direct logging costs (–)	30.2
Gross margin	67.5
Direct silvicultural costs (–)	12.9
Margin after variable costs (forestry margin)	54.6
Fixed costs	
Overhead forestry costs and expenses (–)	29.2
Operating margin	25.4
Depreciation (–)	6.7
Operating profit (loss)	18.7
Financial income and expenses	
Interest income (+)	11.1
Interest expenses (–)	15.8
Net profit (loss) of the enterprise	14.0
Adjustment of net interest (±)	4.6
Change in forest value (±)	193.6
Compensation for own work (–)	
Calculated profit (loss) of the property	212.2

and developments in the state of the forest. Since the effects of silvicultural treatments are difficult to measure and they typically do not become apparent until later than the fiscal year of the respective final cuttings, the costs of these treatments are not included together with the direct logging costs in the previous step. However, an estimated amount of silvicultural cost is charged on the result for the financial year as a kind of *operational reserve* so that the calculation does not show inflated income. This estimated amount of cost will be paid out when silvicultural treatments are actually carried out. As long as the cost amount is not paid it is a liability of the enterprise and is shown in the balance sheet.

Operating Margin

As indicated, *overhead forestry costs and expenses* consist both of administrative costs and those items which cannot be allocated either to direct logging or to silvicultural costs. Although the growing stock is the production machinery of a forest holding, it belongs mainly to the current assets as an inventory. The change in the value of this stock is not included in the variable costs here but is instead recognized after the net profit.

Operating Profit (Loss)

Operating profit is obtained by deducting depreciations from the operating margin. As in other business activities, means of production are procured in forestry for use over a long period. Expenditure on these means, for example, machines etc. must be allocated and charged in the profit and loss account at a cost corresponding to the reduction in the assets' value during the year. According to Williams (1980/1981), the purpose of depreciation is to provide an approximation of the loss in value of an item of capital equipment. The amount of depreciation depends on the value of the equipment, its useful lifetime, the way depreciation is calculated and changes in the value of money (Openshaw 1980 and Jöbstl 1984). Note that the Finnish practice applies the expenditure-revenue theory, in which each part of expenditure matches the respective revenue (Pihlanto and Lukka 1993). An example of depreciation is the straight-line rule of 3 % annual depreciation applied to draining and forest roads in Germany (Josten and Püllen 1983). Straight-line depreciation has, under certain conditions turned out to be optimal (Ronen and Srinidhi 1989). In this study, only straight-line depreciation is applied because of its simplicity and convenience in considering annual inflation in

connection with the value of capital equipment. Since other methods are relatively complicated, we think this method is suitable and satisfactory for the NIPF owners in calculating depreciation.

Net Profit (Loss) of the Enterprise

In calculating the profit and loss account of private forestry, interest income and interest cost must also be included. Since this calculation concerns forestry, only loans raised for this activity are considered. There are, however, certain other loans, e.g. for a farm tractor, the allocation of which between farming and forestry usage requires a working hour diary as the basis for calculation.

Calculated Profit (Loss) of the Property

The net profit of the enterprise for the period is first adjusted by eliminating the influence of net interest, i.e. the difference between interest income and interest expense. This is done because NIPF owners go through different financial situations and thus the amount of their loans will vary significantly. If interest is included, it becomes difficult to make comparisons among forest enterprises because differences between NIPF owners could be related more to the person and e.g. his/her consumption habits than to the forest enterprise.

A forest survey and forest management plan are typically made among NIPF owners at ten year intervals. Information on the growing stock can thus be obtained in that connection (see e.g Jöbstl 1987c). Between the surveys, the difference between the actual and allowable cut can be applied using price and cost information as weights in order to calculate the timber balance. The change in the value of the forest holding affects the calculated profit. One option is to use the growing stock (forest inventory) together with standardized prices and costs (Jöbstl 1981). Alternatively, one can use market prices of roundwood in evaluating the growing stock. Moreover, changes in the market value of soil can be recognized. Here, the so-called capital impairment rule is applied to the growing stock, i.e. roundwood market price changes are included both in the changes in forest value in the profit and loss statement and in the closing valuation of forest in the balance sheet. The reason for using current market price in both cases is simply to ensure that the NIPF owner's accounting reflects the real situation. The value of soil is determined using the best local knowhow, but it is assumed to be constant, since the market value change is negligible (see Hyder and Lönnstedt 1993).

A cost adjustment is also necessary if the owner works in the forest himself. The measurement of this cost has been the most difficult problem encountered in implementing a nationwide forestry bookkeeping network (for an implemented network, see Sekot 1990). Note that wood can be used either (i) within the forest enterprise, e.g. for construction of buildings, or (ii) outside the enterprise, e.g as firewood in the consumption of the owner. Theoretically, the former belongs to material and supplies, i.e. variable costs. The latter, on the other hand, is a part of revenue. In the same way, all consumption, such as the value of own hunting, if evaluated in accounting, belongs to revenue (Loomis 1989 and Penttinen 1992).

2.4 Balance Sheet

The problem of timber balance arising in connection with the balance sheet of a forest holding has been solved by applying the normal forest assumption, i.e. the balance sheet is ignored (as is done in some field studies, e.g. in publications; see e.g. Hämäläinen 1973 and Enk 1988). A bookkeeping system including a balance sheet can, however, be motivated by risk minimization considerations (Carpenter 1987).

The balance sheet shows a consolidated statement of the assets and liabilities of the enterprise at the end of the financial year and constitutes a focal point for the start of the next (Theophilus 1982). Table 3 shows a proposed balance sheet format for forestry according to the amended Accounting Act and Accounting Decree (Teränne 1993). The figures are taken from the balanced strategy of the cases in Section 3.

Assets are displayed first and then liabilities in

Table 3. Proposed balance sheet for a financial year (USD/hectare).

	31 Dec, 1991
ASSETS	
FIXED ASSETS AND OTHER NON-CURRENT INVESTMENTS	
Tangible assets	
Closing valuation of forest	1833.1
Machinery and equipment	264.8
Forest roads	
Financial assets	
Forestry account	103.9
CURRENT ASSETS	
Stocks	
Receivables	
Cash in hand and at banks	71.7
	2273.5
LIABILITIES	
CAPITAL AND RESERVES	
Subscribed capital	
Equity capital	1716.4
Retained earnings/surplus	
Untaxed reserve	103.9
Calculated profit (loss) of the property	265.5
CREDITORS	
Non-current	
Silvicultural liabilities	122.7
Current	
Loans from credit institutions	65.0
	2273.5

accordance with balance sheet theory. In Sweden, NIPF owners are legally allowed to deposit a certain proportion of the sales value in the forestry account. This provision means that they do not have to show the whole profit for the year. When enterprises do not have any sales or have only a small profit for the year, they can augment disposable income for that year by withdrawing money from the forestry account. Tax is not paid unless money is withdrawn from the account. However, a recent change in Swedish taxation policy requires that a certain portion of the interest earned on the deposited amount be paid as tax.

Fixed assets such as machines, forest roads, etc. have their depreciated values included under assets. The depreciation rule typically applied is the straight-line method, and the depreciation time varies from, say, five years in the case of machines (cf. Valkonen 1990) to up to forty years for roads (see Josten and Püllen 1983). Fixed assets are not sold, except for machines and similar assets, and even then, usually only after several years' use. If some of the fixed assets belonging to the forest holding are sold, the enterprise's normal activity is affected. The closing value of the forest is the most significant item in the assets and is calculated at the end of the financial year. Different methods of calculating it have been presented; see for example Hannelius (1986), Sagl (1988), Airaksinen (1989) and Hämäläinen (1989), among others. The forest closing value is included under fixed assets in the spirit of both the inventory evaluation concerning the standing timber and the fixed asset evaluation concerning the soil price evaluation. All in all, the evaluation is performed using the best local knowhow and applying five-year moving averages for each fiscal year (Hyder and Lönnstedt 1993). Recall, however, that the change in forest value in the calculated profit appearing in the profit and loss statement contains only that in the growing stock.

The grouping of liabilities and equity follows the same pattern as for the assets. Short-term liabilities are those payable within one year. Long-term liabilities in forestry include mainly bank loans, as well as silvicultural liabilities, which are a reserve. They arise as a consequence of final cuttings. These silvicultural treatments are partly compulsory in Sweden and Finland but, as noted, these activities are not often carried out during the year of final cutting. However, the costs of these treatments are duly charged in the profit and loss account for the financial year to show a justified profit. The amount of the

cost is a liability of the forest enterprise, since the cost is not paid until the silvicultural treatment is carried out. This liability will disappear with the payment of the cost, and the profit and loss account is then adjusted by the difference between the actual cost and the reserve.

2.5 Profitability

The proposed accounting system we have developed above for profit and loss accounting by NIPF owners is based on general business economic theory. The goals of forestry contain several items, both economic and non-economic (see e.g. Speidel 1984). Accounting generally measures the performance of an enterprise with respect to *economic results* (Ijiri 1975). Here it is assumed that the key goal of most NIPF owners is profitability. *Profitability* is shown to be the *best overall indicator* of company performance by the National Research Council (Brozik 1984). It can be defined as net income related to shareholders' average equity (return on equity, ROE) or the net income related to total assets (return on assets, ROA) (Foster 1986). Some studies use, however, operating assets in the definition of the ROA.

Here calculated profit is related to the total property of the forest enterprise, as a proxy for the investment, and this ratio is used as the measure of profitability and is also called the *return on investment* (ROI). Note that the calculated profit is used here as a proxy for 'earnings before interest and taxes' (EBIT), which is the most common profit used in ROI calculations (Westerlund 1984).

Recall the theoretical background of the business economics ROI, ROA and ROE concepts as introduced in the interest theory developed by Fisher (1930). The ROI, ROA or ROE for forestry can be analyzed applying the du Pont approach and the calculated profit (see e.g. Jöbstl 1990b and Penttinen 1992). The du Pont system was introduced as early as the 1920s as a tool for analyzing profitability (see e.g. Polimeni et al. 1991, p. 1016). Note that the net profit is the final result of accounting and that the terms of the modified Finnish Accounting Decree (Teränne 1993) are used. The calculated profit measures the performance of the forestry property, including also non-accounting measures (see e.g. Drury 1992, p. 743) such as changes in the growing stock. However, the estimation of the value

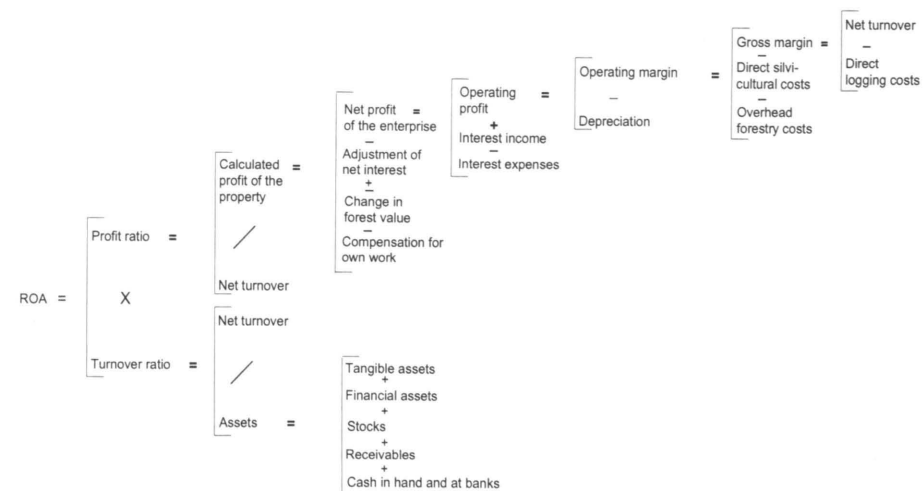

Fig. 1. Formation of return on assets (ROA) in forestry.

of the property gives rise to problems even when using market and felling values (see Speidel 1984, p. 120). Recall that the alternative approach, the classic theory, has a long tradition, including also conflicts between the forest rent and soil rent schools (see e.g. Dickson 1956 and Speidel 1984, p. 83). The business economics approach and the classic approach have been discussed by Hämäläinen (1982), among others.

The profitability of forestry under different management strategies and of alternative investments is analyzed in the following section using the return on assets (ROA) in Fig. 1 as the relevant measure.

3 Cost Accounting for Three Different Forest Management Strategies

In this section we illustrate the cost accounting principles outlined above by considering a medium-size NIPF enterprise in Sweden and applying three forest management strategies, i.e. *extensive*, *balanced* and *intensive* strategies. The extensive strategy refers to a forest owner who is cautious about final cutting and maintains the level of cutting below a sustainable level. A private owner is said to apply the balanced strategy if he follows the guidelines of the sustainable yield principle concerning silvicultural and final cutting. The intensive strategy is just the opposite to the first strategy and refers to a level of cutting which is higher than the sustainable cut in the long run.

The forestry firm studied has a forest area of about 76 hectares and is located in the province of Uppland, near the Stockholm region (for a more detailed description of the case and its background, see Hyder and Lönnstedt 1993). Site productivity is 6.3 m^3/ha while the volume, calculated at the end of 1991, approaches 129 m^3/ha if the forest management plan is followed, which is slightly lower than the provincial average. As concerns the state of the forest, more than one-third of the area is covered by older forest and is therefore suitable for final cutting. About 17 % of the forest is suitable for thinning while the remainder comprises young stands. The forest area is dominated by pine (about 60 %). One-third of the total area consists of spruce.

The result of the calculation is illustrated by means of two types of comparison: the first by comparing the result for different years when the same strategy is applied; the second by comparing the result when different strategies are applied. As part of the first comparison, a profit and loss account and balance sheet for the extensive strategy is presented. This comparison is made for the period 1987–1991. A similar type of calculation can also be made for the other two strategies. The second type of comparison is comprehensive and includes data on the three different profit and loss accounts and balance sheets, as well as some financial ratios. In our example, all the forestry work is carried out by contractors. This simplification is made because the principle applied in calculating compensation for self-activity can vary widely internationally.

3.1 Comparison between Different Years

Profit and Loss Account

The forest firm's profit and loss account for the period 1987–1991 when the extensive strategy is applied is shown in Table 4.

Gross margin, the difference between forestry revenues and direct logging costs, is positive for three years. The firm's forestry revenues for 1987 are generated through final cutting. The direct logging cost for that year is relatively low compared with the years 1989 and 1990, when only thinning was carried out. There were no revenues or gross margin in 1988 or 1991, since the forest owner refrained from cutting or thinning.

The operating margin is, as expected, highest for the year 1987. Because of the absence of revenues for 1988 and 1991, the net profit for these years ends up being negative. Overhead forestry costs and expenses, which consist mainly of fixed costs, make up 17 percent of the total costs in 1987. Direct logging and silvicultural costs are variable costs and account for 46 and 37 per cent, respectively.

Depreciation is attributable to certain common forestry equipment and forest roads. The calculation is based on the replacement cost, which is a combination of procurement cost and the inflation rate. Depreciation for machinery used during the final cutting is included in the direct logging cost. This procedure is applied because of the difficulty of obtaining precise information on depreciation from the contractor. Net interest expenses decrease throughout the period. Net profit is negative for the years 1988, 1989 and 1991. In 1989, revenues did not quite suffice to meet expenses.

According to the definition used, the change in the value of the forest is included in the balance sheet. For the valuation of the forest enterprise the real estate method, developed by the Land Survey, is applied (see Hyder and Lönnstedt 1993). This method takes the change in the state of the forest, including volume and site productivity, into consideration. It is used to calculate the market value of the forest. Since the market value can change dramatically, the average market value for the last five years is calculated. This approach emphasizes the fact that the forest is a long-term investment and dampens abnor-

Table 4. Profit and loss account for the period 1987–1991 applying the extensive strategy (1000 USD).

	1987	1988	1989	1990	1991
Net turnover	23.4	0	5.0	8.7	0
Variable costs					
Direct logging costs (–)	6.2	0	2.1	3.1	0
Gross margin	17.2	0	2.9	5.6	0
Direct silvicultural costs (–)	4.9	0	0	0	0
Margin after variable costs (forestry margin)	12.3	0	2.9	5.6	0
Fixed costs					
Overhead forestry costs and expenses (–)	2.3	2.1	2.2	2.2	2.3
Operating margin	10.0	–2.1	0.7	3.4	–2.3
Depreciation (–)	0.5	0.5	0.5	0.5	0.6
Operating profit (loss)	9.5	–2.6	0.2	2.9	–2.9
Financial income and expenses					
Interest income (+)	0.4	0.9	0.9	1.0	1.0
Interest expenses (–)	1.5	1.3	1.2	1.0	0.9
Net profit (loss) of the enterprise	8.4	–3.0	–0.1	2.9	–2.8
Adjustment of net interest (±)	1.1	0.4	0.2	0.1	–0.1
Change in forest value (±)	0.6	16.2	13.5	20.1	23.1
Compensation for own work (–)	0	0	0	0	0
Calculated profit (loss) of the property	10.1	13.6	13.6	23.1	20.2

Table 5. Balance sheet for the period 1987–1991 applying the extensive strategy (1000 USD).

Balance sheet	1987	1988	1989	1990	1991
ASSETS					
FIXED ASSETS AND OTHER NON-CURRENT INVESTMENTS					
Tangible assets					
Closing valuation of forest	66.4	82.6	96.1	116.2	139.3
Machinery and equipment	16.9	17.3	17.9	19.1	20.1
Forest roads					
Financial assets					
Forestry account	5.8	6.3	6.8	7.4	7.9
CURRENT ASSETS					
Stocks					
Receivables					
Cash in hand and at banks	5.0	5.4	5.8	6.3	5.5
	94.1	111.6	126.6	149.0	172.8
LIABILITIES					
CAPITAL AND RESERVES					
Subscribed capital					
Equity capital	64.2	72.9	88.4	103.4	130.5
Retained earnings/surplus					
Untaxed reserve	0.0	6.3	6.9	7.4	7.9
Calculated profit (loss) of the property	10.1	13.6	13.6	23.1	20.2
CREDITORS					
Non-current					
Silvicultural liabilities	16.0	14.8	13.5	10.5	9.3
Current					
Loans from credit institutions	3.8	4.0	4.2	4.6	4.9
	94.1	111.6	126.6	149.0	172.8

mal fluctuations in market prices.

Note that the changes in the value of the forest were positive for all five years and were more than enough to offset the negative net profit recorded for three years. In 1991, the forest value increased mainly because of the growth in the volume and a higher average wood price. The realized income constitutes a very small portion of the calculated profit with the exception of the year 1987, when heavy final cuttings were made.

Balance Sheet

The balance sheet, which summarizes the firm's position at the end of the financial year, is shown for the period 1987–1991 in Table 5.

The table shows that the short-term liabilities increased throughout the period while the long-term liabilities, including the liabilities for silvicultural costs, decreased. The untaxed reserve equals the deposits in the forestry account as no other reserves are available. The change in the market-based value of the forest, 20 % per year, contributes significantly to the increase in equity capital for all five years.

Equity capital comprises the outstanding equity capital at the end of the financial year plus the untaxed reserve and calculated profit after tax (50 %). To avoid the problem of tax (tax regulations differ widely in different countries) and complexity in computing calculated profit, it is assumed that the forest owner has not withdrawn any net profit in the period 1987–1991. The major part of the profit has been invested in the forestry account while the remainder has been reinvested in the forestry firm. This holds for all the strategies applied in the study. In reality, a forest owner actually requires forestry income for consumption and to meet other expenses. To deal with this problem, the forest owner is assumed in all the strategies to withdraw USD 1250 from his bank account in 1991. Equity capital and the value of the forest gradually improve over the period. There is little difference between the values for 1988 since the forest value increased by nearly 25 % in that year compared with 16–20 % in the other years.

3.2 Comparison between the Strategies

Our calculations show that the result is not satisfactory when the extensive and balanced strategies are applied (Fig. 2). The reason for this is the level of cutting, which is either low or nil in

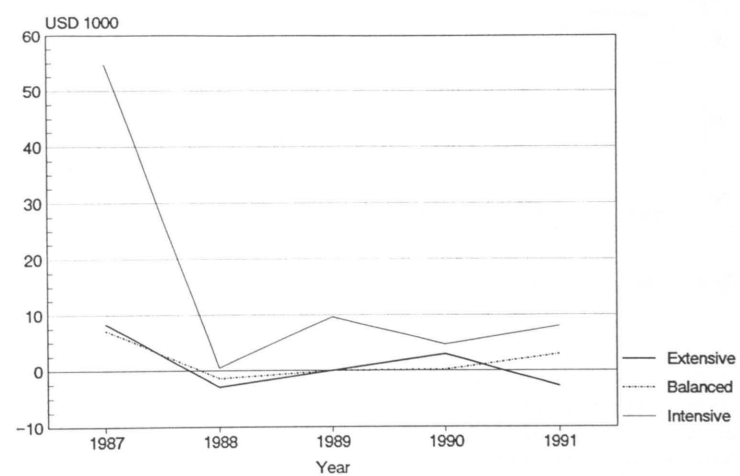

Fig. 2. Net profit for the three different strategies (USD).

Fig. 3. Calculated profit for the three different strategies (USD).

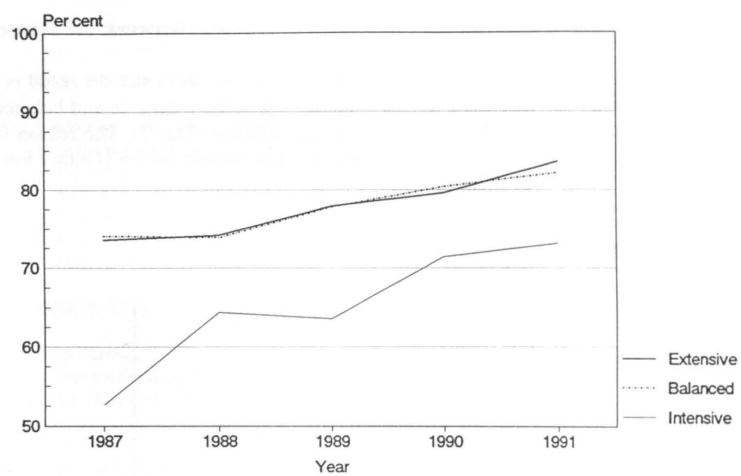

Fig. 4. Equity to total capital ratio for the three different strategies.

these cases. Thus it is difficult for the firm to cover the running costs. In the case of the extensive strategy, there was no sale of wood in 1988 and 1991, which means that the firm had to find extra resources to pay the expenses incurred during these years. Costs consist of forestry costs and expenses, depreciation and negative net interest. Depreciation does not really require any payment but other costs must be paid. If the firm cannot generate funds from the sale of wood these costs are covered out of reserves or other earnings of the forest owner.

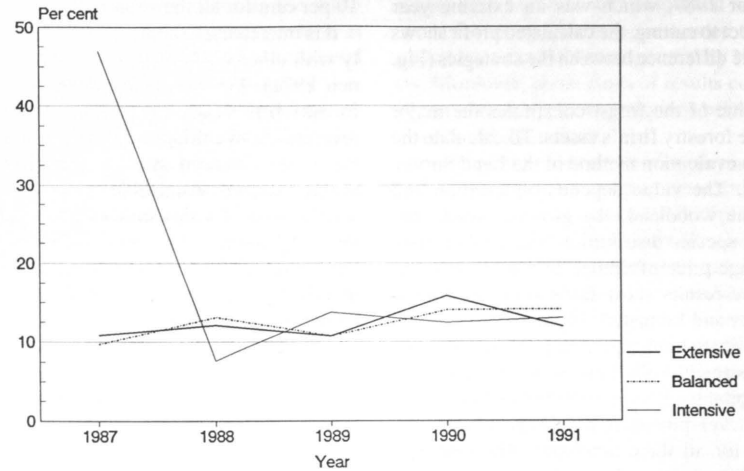

Fig. 5. Calculated return on assets (ROA) for the three different strategies.

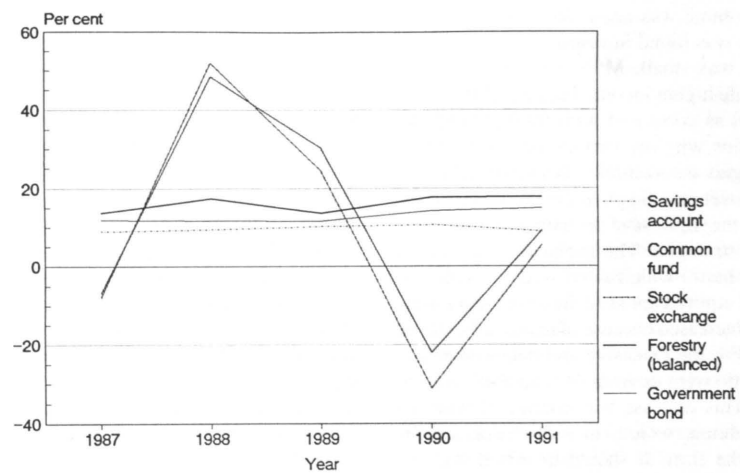

Fig. 6. Return on assets (ROA) of forest property compared with other investment alternatives.

We have described the calculated profit as being the most important element in the calculation of the profit and loss account for a forestry firm. To obtain the calculated profit, the change in the value of forest is added to the net profit. As is evident (from application of the intensive strategy), a high net profit for one year can be balanced by a negative change in the forest value (compare Fig. 2 with Fig. 3). If the forest owner wishes to ensure comfortable growth in the forest all the years, he must be careful about the volume of cutting which generates net profit.

Except for 1987, which was an extreme year with respect to cutting, the calculated profit shows a moderate difference between the strategies (Fig. 3).

The value of the forest constitutes the major part of the forestry firm's assets. To calculate the value, the evaluation method of the Land Survey was used. The value depends on location and size of the woodland, the growing stock, age class and species distribution, site quality class and average price of timber during the last five years. The results show fairly uniform growth (see Hyder and Lönnstedt 1993).

The equity to total capital ratio depicts a firm's financial strength called solvency, i.e., change in equity capital in relation to the firm's assets. Fig. 4 shows developments in the equity to total capital ratio for all three strategies. The ratio has more or less improved for all strategies. Note that sales of timber in 1987–1991 were almost the same for the extensive and balanced strategies. In both cases, the only cutting was in 1987 and the volume was about the same. The only difference was found in respect to thinning, and even that was small. Moreover, thinning does not generate higher income because of the lower price level as compared with final cutting. All this explains why the various curves for these two strategies are so similar. However, when the intensive strategy is applied the ratio falls drastically for the first year as compared with the other two strategies. The explanation lies in the cutting volume, which decreased the value of forest and equity capital while at the same time liabilities increased because of increased untaxed reserves. For the extensive and balanced strategies the ratio went up from 74 % in 1987 to 83 % in 1991. This increase was connected with the rise in volume, which, in turn, increased the value of the firm. It should be noted that the value of the forest is included in the value of the total assets and an increase in this value increases equity capital.

We also compared the calculated return on assets for the three different strategies (Fig. 5). The intensive strategy shows the highest and lowest return in 1987 and 1988, respectively. In fact, the high return for 1987 causes the low result in the following year. Apart from these two years, the return on the assets has been over 10 per cent for all the strategies.

It is interesting to compare forestry profitability with other kinds of investment (cf. Hämäläinen 1971). For this comparison, we used the forestry firm's calculated return, which includes revenues from cuttings and unrealized revenues. Since the balanced strategy reflects the commonly adopted sustainable yield principle, we use the return for this strategy as a yardstick for the comparisons. The alternative investment vehicles that might be of interest for a comparison mainly consist of government bonds, stocks and bank savings. It is clear from Fig. 6 that government bonds yield a stable and high return in the financial markets. During the period studied stocks yielded the most uncertain return. The figure shows that forestry actually offers the best return for the five years. This result is in conformity with the findings of Kula (1988), who found forestry investment superior to bank savings in northern Ireland. However, it is important to remember that the data presented are based on only one case and a certain time period.

4 Conclusions

An accounting system like the one presented above is a major aid to NIPF owners in estimating the results of their property and work ex post and as a model for decision-making and management ex ante. The importance of information on profit and cost structures has been highlighted in recent years as a consequence of the profitability crisis in forestry. The forestry accounting and profitability results provided in this study offer a potential solution to the present crisis and a way out of the deadlock.

The financial performance of a forest enterprise depends strongly on how the revenues, costs and expenses are calculated. The net profit of a private enterprise (Personenunternehmen, see Schneider 1970) includes both the contribution of the property and the work of the entrepreneur. The calculated profit of the property, which can be compared with other forest holdings and investments, includes also non-realized items such as the growth in the value of the standing timber. Both the net and calculated profit have important but different functions as far as the NIPF owner is concerned. The net profit, which is mainly dependent on cutting and silvicultural treatments, depicts activity in the financial year and the actual result. It provides the forest owner with a good understanding of the financial transactions and the financial result. However, the picture of the net profit is incomplete and in some situations even misleading. One large final cutting, which yields a high net profit, might decrease future profits. Moreover, the net profit cannot be used for comparing the result with other activities and businesses. The calculated profit is computed for this purpose. However, as is shown in this study even a positive calculated profit can conceal a real financial problem. The forestry enterprise may lack realized revenues and consequently liquidity. Therefore, these two measures of profits have to be treated separately in order to avoid complications and misunderstandings. The net and calculated profit, and their relationship allow the forest owner to assess the relative attraction of cuttings and developing the volume and value of the firm to strike a balance between short-term and long-term financial objectives.

Forestry costs can be divided into five cost types – labour, material, capital, external services and other costs (Sekot 1987a) – or into three major groups – labour, machines and material – as is done by Openshaw (1980) and Enk (1988). However, we did apply cost centre groupings: direct logging, direct silvicultural costs and overhead costs. We allocated overhead costs as proposed e.g. by Rideout and Hof (1987). A true picture of the forestry firm's economic situation also requires accurate estimation of machine and labour costs, the implementation of which is tested in this study. On the other hand, cost accounting has a price and requires effort. It turned out that working hour accounting is the most laborious and critical information source to produce. Thus this cost has to be balanced against the benefits, how much an owner can afford or what is feasible.

Future research requires a network of nationwide bookkeeping forest holdings in order to generate comprehensive basic data not only for financial accounting but above all for management purposes and e.g. for ratio analysis. Profitability data together with improved accounting and software applications are needed to provide a basis for successful management by NIPF owners. Moreover, these kinds of results constitute a cornerstone for price negotiations between NIPF owners and the industry.

Our recommendations for forestry accounting are: (i) the gap in accounting between an industrial enterprise and a forestry enterprise should be avoided; (ii) the up-to-date European Union and International Accounting Standards norms should be recognized; (iii) an industry-specific framework, such as RP plan in Scandinavia, is also needed for forestry; and, (iv) all developments require feasibility testing and criticism by NIPF owners, which have limited capacity and interest in postings. An accounting system like the one presented above tackles the problems mentioned. It serves as a major aid to NIPF owners in estimating the results of their property and work ex post and also as an effective information source for decision-making and management ex ante.

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Total of 95 references