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The profitability of forestry in Finland and Russia

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Joensuu Research Unit / 7506 Comparing Finnish and Russian calculation methods for the profitability of forestry; 3545 Russia as an operational environment for forest sector and as a market competitor for forest industries

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Abstract
The purpose of this report is to study the profitability of forestry in Finland and in Russia by describing the methods used for profitability assessment and following up in both countries by using specific examples to calculate the profitability of forestry. Also, the availability of profitability assessment results is studied on a state-level. Finally, the methods and results are compared.

These example calculations are based on multiple data sources. Finnish analyses concentrate on non-industrial private forest owners and the data consists of financial statements from Finnish jointly-owned forests and the follow-up data from Finnish bookkeeping farms. Russian analyses concentrate on the profitability of forestry in the national economy and are generally based on publicly available state and regional level budget information.

Differences were found in both the methods used and the availability of profitability assessment results. While in Finland forestry is strongly regarded as a business, Russian methods mainly describe the cash-flow between federal authorities and the regions. The results indicate significant differences in profitability between Finland and Russia. Whereas in Finland, non-industrial private forest owners have on average benefitted from forestry, in Russia state-level forestry has been heavily unprofitable. Massive regional differences were discovered in Russia. The reasons for these regional differences have remained a mystery.

Keywords
non-industrial private forestry, profitability, Russian forestry, operating profit, follow-up, jointly-owned forests

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Contents

Preface

I would like to express my gratitude to all who have contributed to this study, which has been funded by the Ministry of Agriculture and Forestry. The topic proved to be extremely broad and the writing process was slow and difficult. Therefore I am grateful for all the help I received. In particular I would like to thank Mrs. Sari Karvinen and Mr. Yuri Gerasimov from the Finnish Forest Research Institute METLA for their invaluable help in constructing the Russian analyses and background information. I am also thankful to Mr. Anssi Ahtikoski for his contribution in clarifying the economic aspects of profitability. Thanks also go to Ms. Mirja Rantala for providing me with information regarding the METSO programme and to Mr. Mikko Nivala for producing maps for this work.

I also wish to thank Mr. Arto Latukka and Mr. Olli Rantala from MTT Agrifood Research Finland for providing data for this study. As for the Russian materials, I wish to express my gratitude to Mr. Anatoly Petrov and the other ARICEF experts for their help and I would especially like to thank Mr. Vasily Koryakin from VNIILM for the materials and comments he provided. A collective commendation goes to the Finnish Forest Research Institute METLA for offering me first-class working conditions and excellent colleagues to work with.

1 Introduction

1.1 Background information

Despite forestry's major role in today's Finnish national economy, only a few efforts have been made by private non-industrial forest owners to investigate the financial profitability of forestry operations (Hyder et al. 1999). The reasons for this could include the lengthy time frame between forestry operations and the reluctance of local people to practice bookkeeping. The existence of relatively small private forest estates which are of limited economic importance can be seen as a cause for inactivity. According to Penttinen et al. (2001) historical factors have also affected private forest owners' concerns. In the past, the state actively promoted the forestry industry's operational preconditions without paying much attention to the profitability of wood production. Most of the attention has been focused on silvicultural operations and felling volumes rather than on economic sustainability.

Although the environment in Russia is completely different, the situation with regard to profitability is not very different. Since the Soviet Union collapsed at the beginning of the 1990s, forestry in Russia has been in a somewhat turbulent state. A once blooming industry has turned into a fight for survival with the introduction of ever-changing forest legislation and rapid development in the wake of the transition from a planned to a market economy; a process which has still not been completed. The unique way forestry has been organised, the lack of markets and the low level of infrastructure has put forestry workers and organisations to the test.

1.2 Objectives

Since 2011, the profitability of forestry has been under discussion by the Finnish-Russian Working Group on Forestry, led in Finland by the Ministry of Agriculture and Forestry and in Russia by the Federal Forestry Agency. The Working Group has proposed closer cooperation between the two countries regarding profitability assessment. The purpose of this study is to examine and analyse more closely the methods of assessment and factors behind the profitability of forestry and to conduct a comparison between Finland and Russia by utilising the existing methods of profitability assessment from Finland and Russia, where possible.

The means of conducting this analysis consist of a brief review of the traditional methods used for profitability analyses in both countries, describing the tools for defining the profitability of forestry, and presenting some example calculations of profitability from Finnish and Russian data sources. Sample calculations will be based on data from multiple data sources, including state and region level data, but data from different research and authoritative institutes will also be used. The study concentrates on the profitability of forestry as a part of the national economy.

Data from Finland are provided by MTT Agrifood Research Finland and selected from -owned forests. As for the Russian data, a publicly available budget data on state and regional level is referred to here. Data from the Federal Forestry Agency is also used. Attention is paid to covering the way in which different multiple-uses of forestry achieve profitability, while the main emphasis is placed on the profitability of forestry as a whole. Finally, the differences in profitability between Finland and Russia are reviewed and the reasons for the differences are discussed.

2 Cost accounting and profitability in general

Cost accounting is a process of gathering information about costs and incomes for the purpose of internal or external reporting (Drury 1992). The purpose of cost accounting is to find the unit cost for each produced product not only for cost monitoring, but also for decision making, price level adjustment and adaptation of production (Vehmanen & Koskinen 1997). Cost accounting can be seen as a part of management accounting whose functions are, among others, observing the profitability and fulfillment of the monetary goals of the company. Therefore, cost accounting is an essential tool in determining the profitability of business operations (Neilimo & Uusi-Rauva 2007).

2.1 Profitability

Profitability, productivity, liquidity and capital structure are the most important key indicators of business for the financial management of a company (Neilimo & Uusi-Rauva, 2007). Profitability is an economic term that comprises the valuation of monetary results from the point of view of short-term or long-term observation. Profitability can be defined as the potential of a production unit to make profits by consuming expenses during a defined time period (Vehmanen & Koskinen 1997).

There are two main types of profitability: absolute profitability and relative profitability. **Absolute profitability** simply measures monetary flows during one accounting period, i.e. costs and income, and can be calculated by subtracting costs from income during this period. In this way it is possible to define the balance which is available for allowances and savings. Absolute profitability is not the perfect method for measuring the profitability of strongly cyclical branches such as forestry, because forestry income occurs in unstable cycles and in many cases after long periods of time, whereas costs occur regularly every year (Uotila 2009). Absolute profitability, however, gives an overview of the business in short-term analysis (Neilimo & Uusi-Rauva, 2007).

Neilimo & Uusi-Rauva (2007) have presented some key indicators for analysing the short-term profitability of a business enterprise:

A gross margin indicates what is left of sales profits after deducting adjustments for items of sales and variable purchases corresponding to sales. A gross margin can be absolute or relative. A gross margin ratio is derived from the relative percentages of gross margin and turnover.

An operating margin is a major indicator of short-term profitability. It indicates what is left of sales revenues after the adjustment items of sales and variables and fixed operating costs have been deducted. The monetary operating margin is what remains of turnover for profit distribution, creating portions to be financed from investments and partial payments of loans. An operating margin ratio can be defined in terms of the relationship between the percentage of the monetary operating margin and the turnover of the business enterprise.

An operating profit describes the profitability of a business after both the variable and fixed costs and the depreciation have been deducted from the turnover. Using this method, depreciation needs to be taken into account as an annual expense item. In order to keep a business profitable, the profits also have to cover the costs of the depreciation of the equipment which has been invested in.

Relative profitability compares income with invested capital or assets and is more common in long-term profitability analyses of business (Neilimo & Uusi-Rauva, 2007). Fisher (1930) has defined relative profit (r) as follows (Equation 1):

$$r = \frac{d + p_1 - p_0}{p_0} \quad (1)$$

Where d = the income from capital during the accounting period, p_0 = the value of capital at the beginning of accounting period, and p_1 = the value of capital at the end of accounting period.

In a forestry context, the value of capital is usually equivalent to the stumpage value. Since in forestry income is often distributed unevenly across the rotation time and not all timber is logged every time, the logging left-over (or out-of-realisation profit, $p_1 - p_0$) is required as part of the equation (Kuuluvainen & Valsta 2009).

Return on Investment (ROI) is one of the most widely used methods across the world for calculating the short-term profitability of businesses (Neilimo & Uusi-Rauva, 2007). ROI is an application of the equation presented by Fisher (Eq. 1) in which the annual net profit is considered in proportion to the invested assets. If, on the other hand, capital is considered as being equivalent to assets, Return on Assets (ROA) indicates how profitable a business operation has been in relation to its assets. Investment is profitable if the ROI (or the ROA) is higher than the interest rate.

The basic principles of utilisation of ROI in the forestry context are illustrated in Table 1. The net income from forestry includes all the costs and income for one rotation, which is 75 years in this case (see Table 2 for the formation of the net result). The value of the standing stock can be the capital invested in a forest (the price paid for the forest plot) plus the value of standing stock as an expectation value, or just the latter. Return on investments is the proportion of annual net income and the invested capital. In the example, the ROI (2,72 per cent) is lower than the 3 per cent interest rate used as the benchmark to compare investments.

It has to be emphasised that there is a fundamental difference between calculating a) the profitability of stand management and b) assessing the profitability of forestry. Traditionally, the profitability of forestry has been defined by a cash flow analysis of an area of interest. Also, analysis of the data from follow-up farms can be used to measure the profitability of forestry in general. The profitability of stand management, on the other hand, is a much narrower concept that is usually limited to a single compartment level (i.e. a stand) where the bare land value or financial profitability of a single forestry operation or of a management schedule/regime is being examined. In this study, profitability is examined on a forestry level (b), but some notice of profitability of stand management (a) and its affect on forestry may be required.

Table 1. An example of ROI calculation in forestry (modified after Kuuluvainen & Valsta 2009).

Net income of forestry over one rotation (logging income – regeneration costs)	15,050 EUR/ha
Annual costs	10 EUR/ha
Annual net income per hectare ((15,050 EUR / 75) – 10)	190.7 EUR/year
The value of standing stock as an expectation value (3 per cent interest rate)	7,000 EUR
ROI (190.7 EUR / 7,000 EUR)	2.72%

2.2 Deflating monetary values and currency conversions

Due to inflation, i.e. a general rise in prices, monetary values are deflated to correspond with real changes in prices, costs and benefits. Nominal monetary values are converted to real ones by the following equation (Eq. 2, Official Statistics of Finland 2012c, e.g. p. 21):

$$P_{treal} = \frac{D_{pp}}{D_{pt}} \times P_{tnom} \qquad (2)$$

Where:
P_{treal} = Real monetary value at moment t,
D_{pp} = Deflator index value at chosen base year and month,
D_{pt} = Deflator index value at moment t, and
P_{tnom} = Nominal monetary value at moment t.

Monetary values are made commensurate with the last year's values of the data series. In this study, the cost of living index (1951:10=100) and the wholesale price index (1949=100) are used to deflate Finnish monetary values (Official Statistics of Finland 2012a/2012b). Russian monetary values are deflated by using a modification of the Russian producer price index (Rosstat 2012a) in which the monthly change in prices is transformed into point figures that correspond to the Finnish system of indexes. The base year for this index is 2002 (2002:01=100).

In order to better serve readers on both sides of the Finnish-Russian border, most of the graphs describing monetary values are shown in two currencies (RUB and EUR). The exchange rate used for the conversion between Euros and Rubles is the annual average exchange rate of 2011 (1 EUR = 40.878 RUB) (Bank of Finland 2012). The monetary values in the left-hand side axis are the primary values against which they are also deflated. The secondary axis (right) represents the scale for the second currency which is valid for the year 2011 only. For other years it should be regarded as an approximation.

3 Forestry in Finland

3.1 Forestry and the forest sector in Finland

The statistics in this section (3.1) are based on the Finnish Statistical Yearbook of Forestry, (2011) unless otherwise stated.

Roughly 60 per cent of the forest land in Finland is owned by non-industrial private forest owners. For most of them, forests have an economic importance comparable to an investment that can be looked at from an economic point of view. Hänninen et al. (2011) studied the ownership structure of Finnish private forest owners and the trends of their goals for forests from the late 1990s onwards. They found that the number of private forest owners who consider their forest as an investment that provides economic safety is increasing. Considering that the majority of the wood supply from the forest industry in Finland comes from private forests, the national economic importance of non-industrial private forest owners is indisputable.

The stand management (i.e. wood production at stand level) cycle is illustrated in Figure 1. In this example the rotation period is 100 years and thinnings are carried out on three occasions prior to final felling. From economic point of view, the stand management cycle is divided into the management phase and the profit phase. The management phase involves calculating the costs for regeneration, the tending of a sapling stand and the first thinning; which usually does not yield a profit for the forest owner. After the first thinning, assuming that all the management procedures are conducted properly, the profit phase follows. Benefits from commercial thinnings are in most cases greater than costs – thus, executing these procedures is profitable. In the final felling, the standing stock is fully harvested and the stand management cycle starts again.

For Finnish non-industrial private forest owners there are two common ways to execute wood sales:

Standing sale. This is the most common method for logging operations in non-industrial private forests. In this form of wood sales, the timber buyer is responsible for logging the timber. Also, forest transport can be carried out by the buyer or a contractor for the buyer.

Delivery sale. Delivery sales constituted roughly 15 percent of all commercial roundwood removals in 2010. In delivery sales, the seller of timber takes care of the logging site preparations, the loggings and the transport to the roadside landing. In some cases the seller may also deliver the timber to the end-user.

The price for logs in standing sales is slightly less or equal to the prices of timber in delivery sales. Pulpwood prices in 2010 were approximately 43 per cent higher for delivery sales than for standing sales. Commercial roundwood removals from non-industrial private forests constituted 40.7 mill. m^3, of which 34.5 mill. m^3 was from standing sales and 6.2 mill. m^3 from delivery sales. Commercial roundwood removals from the forest industry's and the state's forests made 11,3 mill. m^3 in 2010. Commercial roundwood removals in non-industrial private forests in 2001–2011, including standing sales and delivery sales, are illustrated in Figure 2.

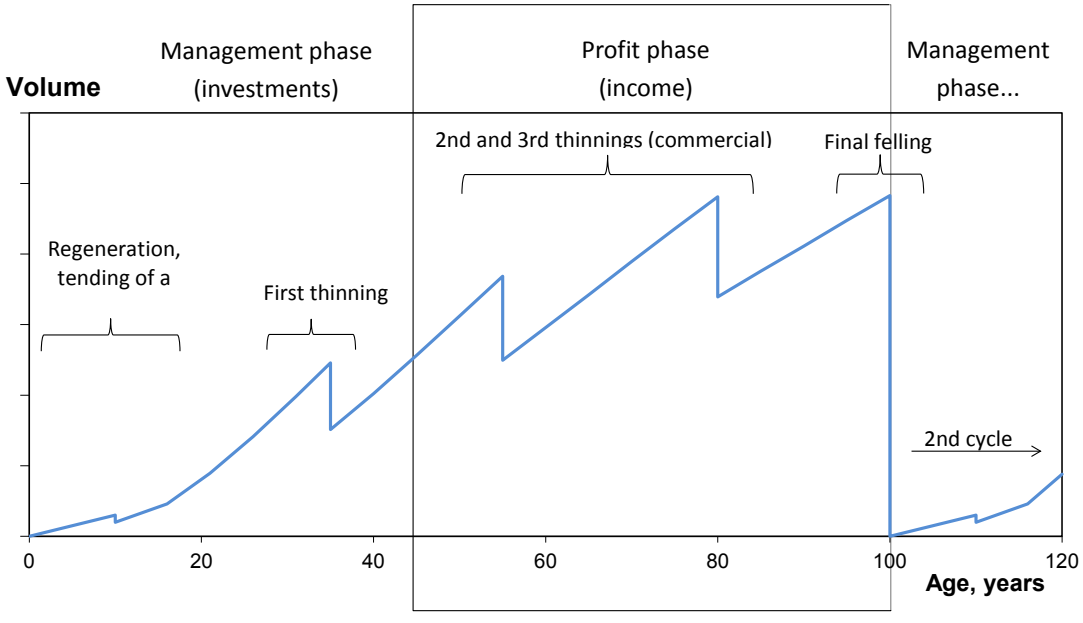

Figure 1. Illustration of different management activities and growing stock in different phases of the wood production cycle in Finland. After Ahtikoski (2011).

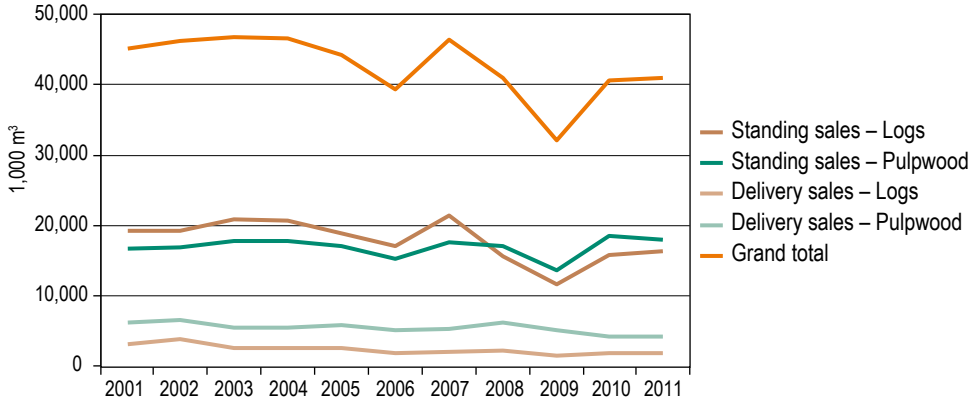

Figure 2. Commercial roundwood removals in non-industrial private forests in 2001–2011.

In Finland, the state supports wood production in non-industrial private forests to ensure the quality and quantity of material flow to the forest industry. The principles of the law were established in the Act on the Financing of Sustainable Forestry (1094/1996) and its successor (544/2007). These so-called KEMERA (Finnish abbreviation for Act on the Financing of Sustainable Forestry) subsidies are available, among others, for planting and sowing, young stand improvement, fertilisation, ditching, the prevention of root rot in buildings, the maintenance of forest roads and the procurement of energy wood and chippings. In 2010, the state supported private wood production, including procurement of energy wood and chipping, by 80 million EUR. The share of self-financing in non-industrial private forestry was 144 million EUR. The total financing costs of non-industrial private forestry between 1980–2010 are illustrated in Figure 3 and the composition of state subsidies between 2001 and 2010 is presented in Figure 4.

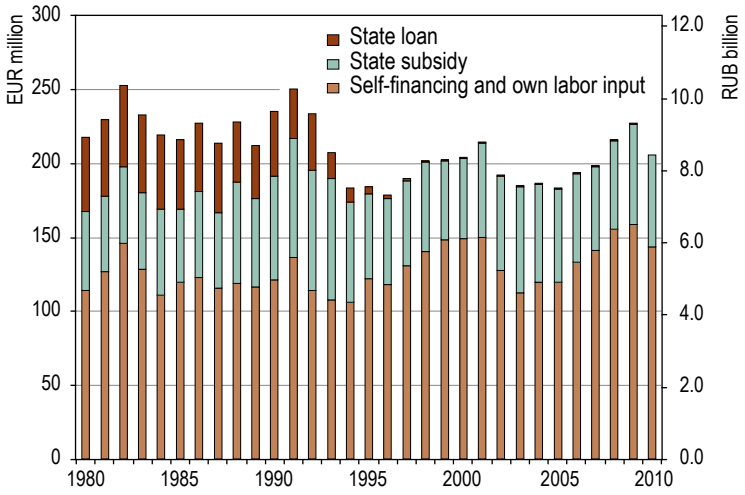

Figure 3. Total financing costs of silvicultural and forest improvement work in 1980–2010 for non-industrial forest owners. Monetary values are deflated to 2010 values using cost-of-living index (1951=100). Support for harvesting and chipping of energy wood is not included in the subsidies of wood production.

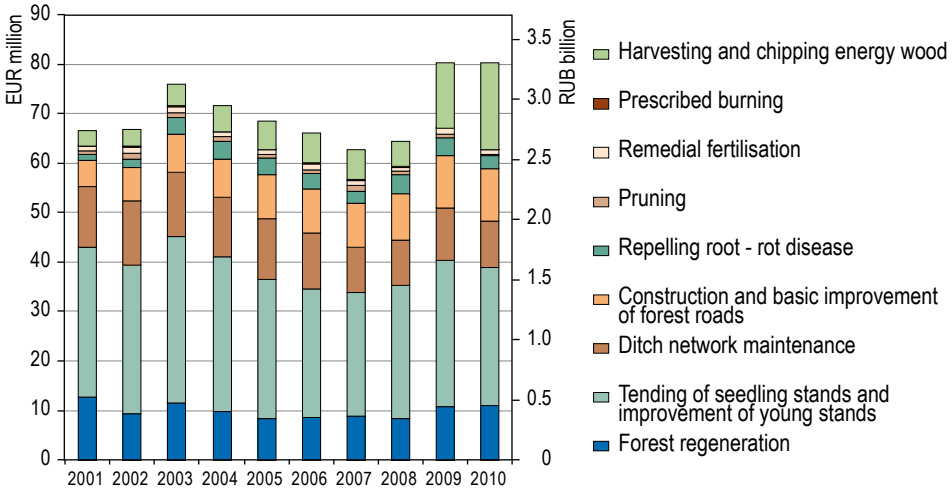

Figure 4. State subsidy and loans used for securing wood production and energy wood harvesting in non-industrial, private forests, 2001–2010 (Statistical yearbook... 2011). Deflated to 2010 values using cost-of-living index (1951=100).

3.2 Profitability of forestry in a national economy

Cost accounting in forestry has been the subject of active research and development in Finland since the 1930's by. Keltikangas (1934, 1970) and Piha (1941). Penttinen (1992) has summarised the development of domestic and international cost accounting in forestry. A recent article by Hyytiäinen & Penttinen (2008) tackles the issue of forestry returns in relation to alternative investment objects such as apartments, bank deposits, bonds and stocks. Studies concentrating on the profitability of non-industrial private forestry (e.g. Penttinen et al 1995, Hyttinen 1995) have been conducted in Finland since the early 1990's in the wake of the joint research project 'Profitability of Forestry' (Metla 1995) which was financed by the Ministry of Agriculture and Forestry.

The idea for 'Profitability of Forestry' was first advanced in the late 1980's when it was discovered that there was not any actual data on the profitability of private forestry in Finland. The aim of the project was to create an extensive network of bookkeeping farms for the continuous follow-up of profitability of private forestry and wood production in particular. A follow-up project means that the data consists of both aggregated and real costs and income information that has been published for several decades. A pilot study was conducted between 1992 and 1995 in which the basis for a profitability follow-up was created. However, the original plan of having an extensive network of follow-up farms was rejected as being too complicated and expensive. Instead, it was decided that the actual data for the analysis would be the same as that collected during the pilot study. The profitability follow-up of private forestry began in 1997 in the Finnish Forest Research Institute (Metla) (Uotila 1997).

It was decided that the purpose of the first phase was to find out the profitability of wood production. This meant the costs of logging and multiple use forestry had to be separated from the monetary flows of wood production. The completed follow-up project was based on the findings Metla had started to publish with regard to the annual profitability statistics of Finnish non-industrial private forestry. These statistics can be found on the Internet as part of Metla's Metinfo statistical service (Metinfo 2012a).

The Finnish Forest Research Institute (Metla) has a long tradition of collecting statistics on Finnish forests and forestry. National Forest Inventory (NFI) data has been collected since the beginning of 1920s, wood price information since 1949, commercial logging volumes since 1955 and the costs of silvicultural and forest improvement procedures since 1963. Gross stumpage earnings statistics by forest owner groups have existed since the late 1950s. Although there are some uncertainties in the compilation of this information (e.g. the calculation method of gross stumpage earnings and valuating the forest owner's own work contribution), this information creates a solid base for national and regional scale profitability assessment of private forestry in Finland. The profitability follow-up produces information on gross stumpage earnings, operating profit and investment return on assets (ROA). (Uotila 2010). In the following examples, all statistical data is from the Metinfo statistical service unless otherwise stated.

3.2.1 Gross stumpage earnings

Gross stumpage earnings describe the monetary income from the timber sales of private forest owners, companies and the state. Stumpage earnings information is available at Metla's Metinfo statistical service (http://www.metla.fi/metinfo/tilasto/kannattavuus/) from the year 2002 onwards, when the responsibility for its calculation was transferred from the Central Statistical Office to Metla. These statistics also include state owned forests and company forests. Gross stumpage earnings are an estimated value from information that is based on annual regional commercial cuttings and average stumpage prices by wood assortment. The share of private forests also includes an estimation of the value of household wood. Statistics can be sorted by roundwood assortments, forestry centre regions and ownership categories. Gross stumpage earnings statistics are available reasonably quickly after the turn of the year which, despite its deficiencies, makes them a useful tool in policy making.

In this context the term *private forests* includes the forests of private persons, the estates of deceased persons, collective forests, municipalities, parishes, foundations and similar communities. *Forest companies* includes industrial forestry companies that own forest areas. Finsilva Oyj and Tornator Oy[1] are included in this category as they own and manage forests of large forest industrial companies. *Finnish Forest and Park Service* represents state owned forests. Wood assortments include logs and pulpwood of the most common tree species. Among these, fuel wood from stemwood is also counted.

Since 2002, the average gross stumpage earnings in Finland, including all forest owner grou ps (Figure 5), have been around EUR 2 billions and the biggest share (of roughly two-thirds) has been from the standing sales of non-industrial private forest owners (Uotila 2010). Gross stumpage earnings, like most other economic indicators of forestry in Finland, reflect the Finnish forest industry's sensitivity to economic fluctuations. This can be seen in the record-high gross stumpage earnings of 2007 and the recession that followed in 2009. In the annual statistical bulletins the shares of different wood assortments in the total gross stumpage earnings are presented. Figure 6 shows the development of stumpage prices in Finland between 1983 and 2010.

1 Tornator Oy and Finsilva Oyj are incorporated forest owners that own and manage large forest holdings in Finland. Tornator Oy has forests also in Estonia and Romania. (Tornator Oy 2012, Finsilva Oyj 2012)

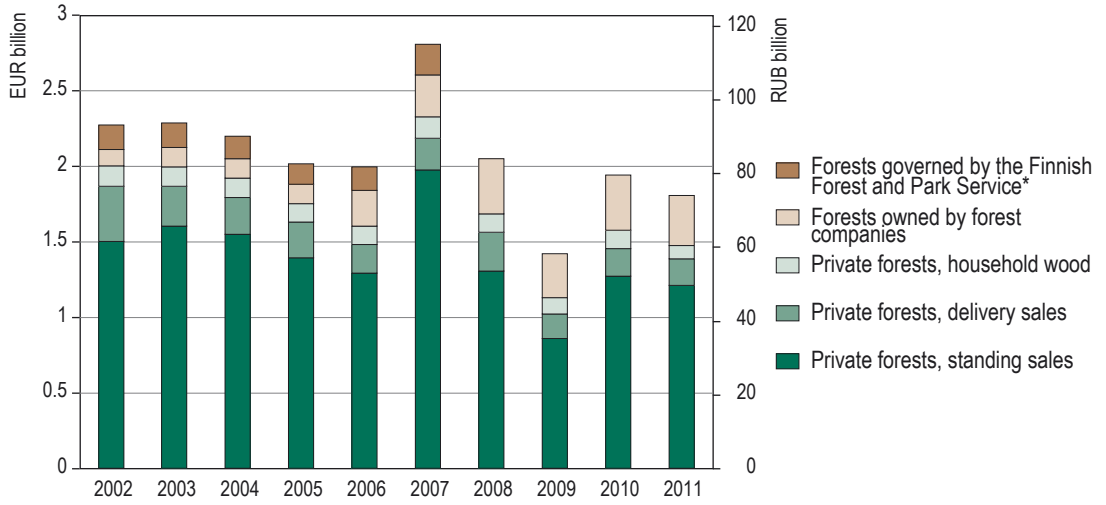

Figure 5. Gross stumpage earnings in 2002–2011 by forest owner categories in EUR billions (Metinfo 2012a). Deflated to 2011 values using wholesale price index (1949=100). *From 2008 onwards, forests governed by the Finnish Forest and Park Service (Metsähallitus) are combined with company forests.

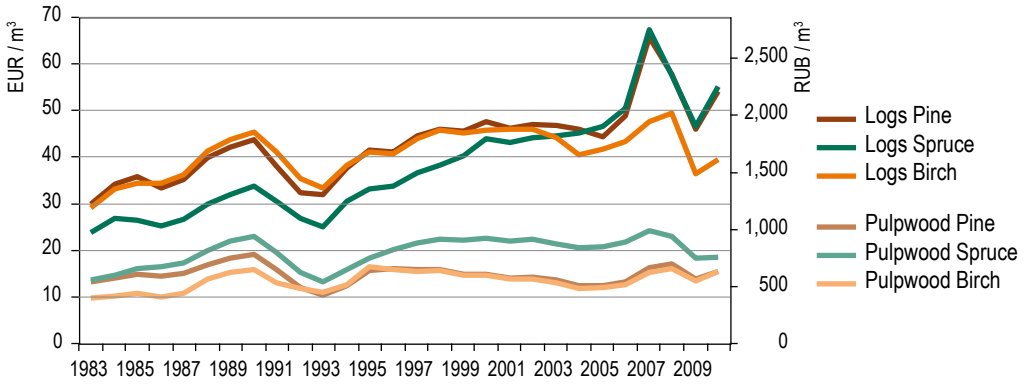

Figure 6. Development of log and pulpwood stumpage prices in non-industrial private forests in Finland between 1983 and 2010 (Metinfo 2012a).

Uotila (2010) points out that there are some uncertainties in the results that need to be taken into account when using the statistics. One of these is that the price information is based not on contracts or volumes but on actual cuttings. When there are strong fluctuations in roundwood prices, the cuttings are usually carried out some time (even two years) after the contract has been done, therefore possibly giving slightly erroneous results. Another point is that delivery sales' gross stumpage earnings are calculated from stumpage prices, not from delivery prices. This is because there is not accurate enough data available about the real costs of delivery sales. Uotila (2010) estimates that this causes an overestimation of about 1–2 per cents in the gross stumpage earnings of private forest owners.

3.2.2 Operating profit

Operating profit is based on margin calculation and it is one example of an indicator of absolute profitability. Metla's Metinfo service provides annual operating profit figures on a national and regional level from the year 1990.

Operating profit is formed by subtracting the costs of forestry and administration from gross stumpage earnings and the state subsidies granted for forestry. Operating profit (Equation 3) can be calculated by using the following equation:

$$OP = (GSE + S) - C \quad (3)$$

where OP = operating profit, GSE = gross stumpage earning, S = subsidies, and C = total costs for forestry. Subsidies do not include subsidies for energy wood harvesting or chipping. In practice, gross stumpage earnings also include an estimation of the value of wood for household use. Costs are derived from Metla's Metinfo statistical database (http://www.metla.fi/metinfo/) and include investment costs for silvicultural activities, forest improvement and administrative costs. Uotila (2010) has divided the costs into four categories or cost centres:

- Forest regeneration costs (preparation of regeneration sites and regeneration)
- Costs for the tending of seedling stands and improvement of young forests
- Forest improvement costs (pruning, fertilising, ditching, forest road construction and basic improvements)
- Administrative costs

Administrative costs include *inter alia:*

- Travel costs (excluding travel costs of self-directed forest management)
- Forest road maintenance costs
- Other costs, e.g.
  - Forest insurance costs
  - Educational expenses
  - Costs for acquisition of professional literature and magazines
  - Labour market organisation fees
  - General administrative costs (telephone, meeting and mailing costs).

Gross costs extracted from gross stumpage earnings result in gross profit. When state subsidies are included in gross profit, the result is net profit (EUR per hectare) before debt interests and taxes. What is left after interests and taxes is the profit for the forest owner. Relative profitability is derived from the relationship between annual gross profit and capital bound up in the forest in accordance with Equation 1.

Operating profit can be represented nationwide or regionally in absolute terms (Figure 7) or in relation to area (e.g. EUR /ha). Figure 8 presents the operating profit of forestry in relation to the forest area in Finland.

Operating profits do not include taxes or the costs of external capital. Regional statistics give an overview of how costs and income develop over time. Operating profit has been used, for example, in the National Forest Programme to indicate how the programme has succeeded and how the principles of sustainable forestry been sustained. Although operating profit is an important tool, it does not indicate how efficiently the forest resources are being utilised or how the value of standing stock changes (Uotila 2010).

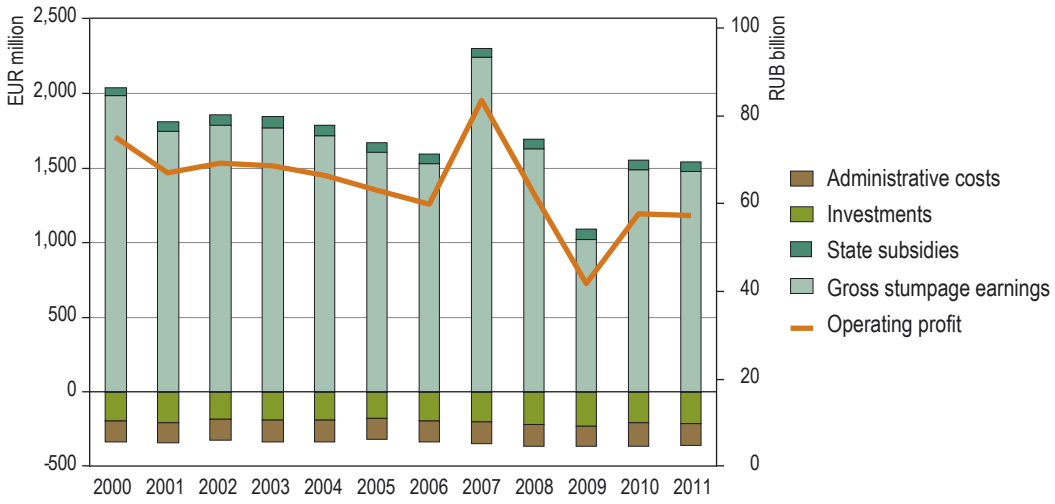

Figure 7. Operating profits of Finnish private forestry between 2000 and 2011 in the whole country. Deflated using cost-of-living index (1951=100).

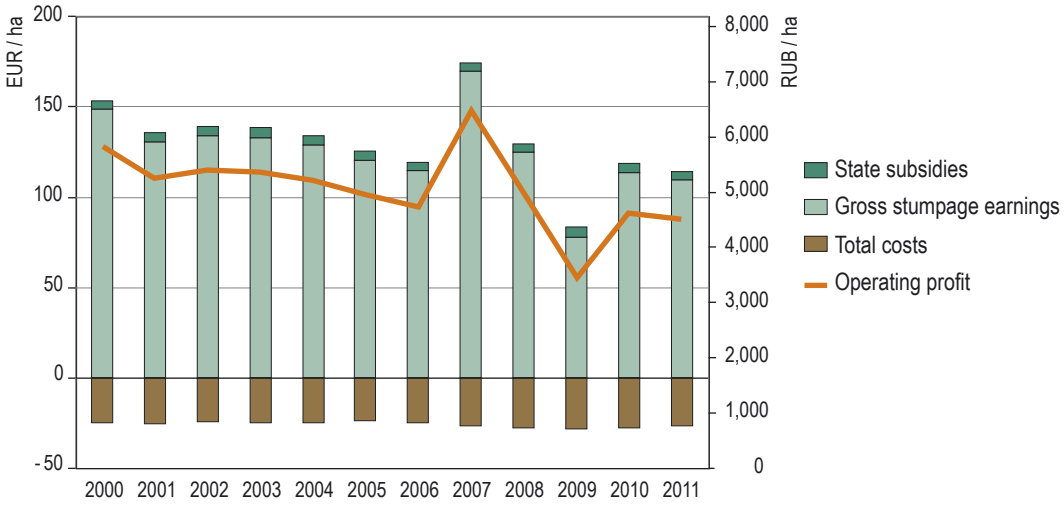

Figure 8. Operating profits of Finnish private forestry between 2000 and 2011, EUR/ha. Monetary values are deflated using cost-of-living index (1951:10=100).

Over the past ten years the real operating profit per hectare has been around 110 EUR/ha which is slightly less than the target of 120 EUR/ha for operating profit in private forests in the National Forest Programme 2015 (Finland's National Forest… 2008). In recent years the real operating profit per hectare has decreased slightly along with fluctuations in the forest industry's market situation, which has a direct impact on wood sales income. Also the inflation rate has grown faster than income from forests, which has brought operating profits down in many areas of Finland.

3.2.3 Investment return in forestry

Lausti & Penttinen (1998) developed a method for calculating the risk and investment return on assets of private forestry (forestry return) in the mid-1990's. In this method, the investment return on forestry is disaggregated to its components and the return is then calculated for each component

as a proportion of the investment component profit and assets bound up in forests. Assets include an approximation of the logging value of a forest. The logging value is calculated from regional forest inventory data by wood assortments and stumpage prices in the respective area.

Metla's Metinfo service provides annual statistics on forestry returns for non-industrial private forest owners' wood production. Furthermore, forest statistical bulletins give an overview of forestry return on wood production in comparison with other investment types, such as public listed shares, forest industry shares, residential real-estate investments or government bonds. Penttinen & Lausti (2004) have described the method for calculating forestry return for different investment types.

Metla's forestry return statistics for non-industrial private forestry consist of the following components:

- Timber sales revenues (stumpage earnings): The effect of timber sales and household wood on returns. Statistics are calculated from December prices. Positive effect.
- Costs of wood production: The effects of silvicultural and administrative costs on returns. Negative effect.
- State subsidies: How the state support affects on return. Positive effect.
- Change in balance sheet value of standing stock: How changes in stock quantities affect the value of the forest. Either negative or positive effect on returns.
- Change in stumpage prices: Describes how stumpage price fluctuations affect the value of the standing stock and thus of return. Change is calculated as the difference from previous year. The effect is either negative or positive.

Interpolation is used to derive the volume of standing stock between NFI's. In case of unavailable stock inventory data, extrapolation is implemented. Returns are calculated as a proportion of each component by a conversion of the natural logarithm for the ability to straight derive mean returns over different time spans and defining standard deviation which describes the risk of investment. This method also takes into account the effect of exceeding or going under allowable cut in return. Moreover, fluctuations in stumpage prices can either be taken into account or left out of the results. The real return on non-industrial private forestry is calculated primarily by cost-of-living index (1951=100). (Metinfo 2012b)

The real return on wood production has seen many fluctuations over the years since the beginning of 1990's. The stumpage price forms the biggest share of profit in non-industrial private forestry and also strongly affects real returns. This is because the change in stumpage price has a strong influence on the value of standing stock which, on the other hand, exceeds the value of loggings and net growth of forests by 30 times (Uotila 2009). It can be seen in Figure 9 that the real forestry return follows the trends of gross stumpage ea rnings (Figure 5) quite well. For example, the year 2007 was a record-breaking year in Finland for gross stumpage income in private forestry. This was followed by a deep recession in the forest industry and stumpage earnings plummeted in 2009. After the recession. stumpage income started to rise again and also real returns on forestry climbed to positive values.

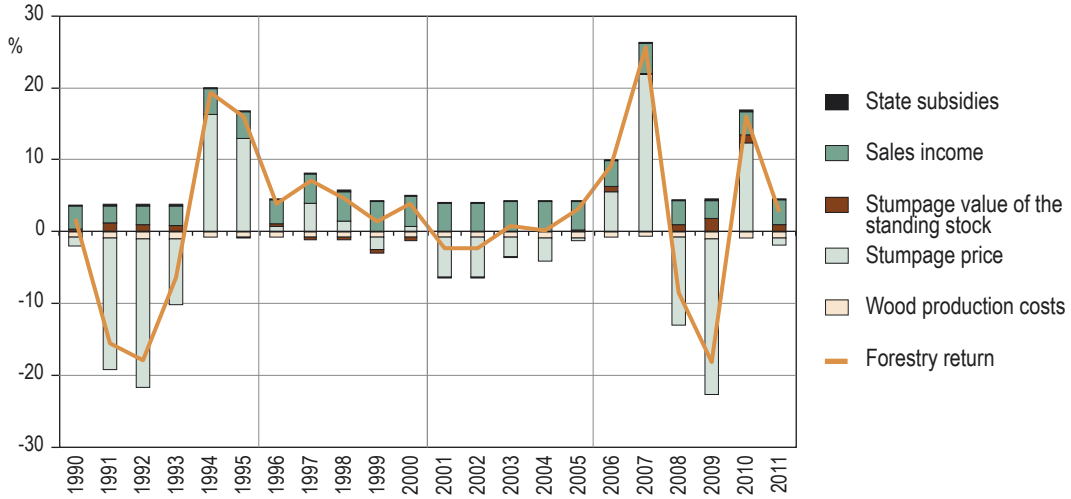

Figure 9. Real forestry return in wood production in private forests in 1990–2011 when changes in stumpage prices are taken into account.

3.3 Net present value

When there is a need to investigate the profitability of a single future silvicultural measure (such as ditching) or stand management for either a single stand or group of stands, net present value (NPV) is commonly used. Net present value is used to define the real monetary value of an investment and also indicates whether the investment is profitable and feasible. The purpose of this method is to discount future costs and incomes to the present moment using a suitable interest rate. This makes it possible to compare future costs and benefits and also to compare forestry with other optional investment objects. The sum of present values of income and costs should yield a positive cash flow in terms of present value in order to produce any profit for the investor (usually the forest owner).

Hepburn and Koundouri (2007) have studied discounting interest rates. They recognise that choosing the right interest rate is one of the most influential and also controversial aspects of forestry. Interest rates can be established according to the options the forest owner has to invest his or her money. The idea behind an interest rate is that the same amount of money will be worth less in the future than now (i.e. the time value of money), since it can be invested more profitably the sooner it is received (Kuuluvainen & Valsta 2009, p. 53). Thus, the interest rate is needed to compensate for this depreciation. If the forest owner has the possibility of investing his or her funds into another investment object, the interest rate in forestry should be at least the profit rate of this alternative investment object. Also the level of risk has a crucial role in choosing the interest rate. The more risky the investment is, the higher the expected yield should be; i.e. the interest rate. Choosing the right interest rate for forestry should be based on an investment with a similar risk level. According to Kuuluvainen & Valsta (2009), the common real rate of interest in forestry in Finland has risen from 3 to 5 per cent.

Inflation strongly affects the results of long-term investments and their funding (Penttinen et al. 2001). Inflation, i.e. a rise in the general level of prices of goods and services and a decrease in purchasing power, means that the forest estate, for example, is losing its real value at a given

inflation rate every year. Inflation needs to be taken into account when choosing A suitable interest rate for investments because real profit is formed from profits that exceed inflation rate.

Mathematically, net present value (Equation 4, Kuuluvainen & Valsta 2009 p. 56) can be expressed as:

$$NPV = \sum_{t=0}^{T} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{C_t}{(1+r)^t} \quad (4)$$

Where
B_t = benefits or income at the given year,
C_t = costs at the given year,
T = time frame, years,
t = years to the cost or income in the future, and
r = interest rate.

Table 2 presents a concrete example of an NPV calculation for forestry. The annual costs and benefits are presented both in absolute and discounted terms for each forestry operation. In this case the initial investment is the regeneration which, for simplicity reasons, has been summed up as one single investment on the zero moment (i.e. the time of stand establishment, t_o). All costs and benefits are discounted to the zero moment using a three per cent interest rate and then summed. Equation 4 is used for the discounting of costs and benefits.

Future rotations to infinity are an important component in forestry NPV calculations because traditional forestry is a continuous but cyclical process in which the main part of the benefits occur in the latter part of the rotation while the majority of the costs take place at the beginning of each rotation. The costs and benefits within one rotation cycle are prolonged to the time of final felling and then discounted from infinity to the present using the following equation (Eq. 5):

$$V_0 = \frac{V_t}{(1+r)^t - 1} \quad (5)$$

Where V_0 indicates the recurrent benefit that occurs indefinitely, r is the annual interest rate and t is the moment. In other words, V_t includes all costs and benefits of one rotation cycle prolonged to the time of final felling.

Table 2. Example of net present value calculation. The value of future rotations (to infinity) is prolonged to the final felling moment (first column) and after that the net present value is derived by Equation 5 (second column).

Operation	Age	Cost or benefit, EUR/ha	Discounted cost or benefit, EUR/ha
Regeneration	0	-1,500.0	-1,500.0
1st thinning	25	250.0	119.4
2nd thinning	40	1,400.0	429.2
3rd thinning	55	3,200.0	629.7
Final felling	75	11,700.0	1,274.7
TOTAL		15,050.0	952.9
Future rotations (to infinity)		10,469.1	1,139.6

The profitability of different management procedures can be compared by simulations which predict stand development according to growth models incorporated into specific computer software (e.g. Hynynen & Ahtikoski 2005). In these growth models the development of trees is expressed in mathematical functions that are usually based on vast empirical data covering relevant site types and tree species. The growth models are designed to predict the future growth of the trees as realistically as possible. Simulation results can be used to determine NPV from different management scenarios which are useful for the forest owner in decision making situation. One practical example of implementing NPV analysis is the study by Ahtikoski et al. (2008) where they applied ROI (see section 2.1) and NPV to estimate the financial efficiency of ditch network maintenance on two medium-quality site-types in northern Finland.

The investor can also compare different investment alternatives by conducting a *benefit-cost (B/C) ratio* analysis, which indicates the efficiency of the investment. If the discounted benefits are greater than the discounted costs, i.e. if the ratio of discounted benefits and costs is equal to or greater than 1, investment is feasible. Different investment alternatives can be compared further by finding the alternative with the best B/C ratio. Although investments can be sequenced according to their economic efficiency, the best alternative may not necessarily produce the highest net present value (Kuuluvainen & Valsta 2009).

There are some assumptions involved in using the NPV method. First of all, it is assumed that the investor is able to borrow money at a desired interest rate and that funds that have become vacant from a previous investment which can be further invested at the desired interest rate. Furthermore, it can be assumed that the costs and benefits of the investment are known and there is no risk involved. Also, if a comparison is made, the compared investments will be equal in size and duration. If the sizes are not equal, the benefit-cost ratio can be utilised instead.

3.4 Valuating forest owner's own work contribution

In Finland non-industrial private forests, owners work actively in order to increase the cash flow from their forests or to gain other (non-monetary) benefits. These may include the need to keep fit or sentimental values that are related to forest owner's family background or personal life history. Also, recreational aspects are increasingly popular (Karppinen 2000). Although forest owners' own work covered up to 20 per cent of all loggings in the early 1980's, mechanization of logging has brought the number down to approximately 10 per cent (Koho et al. 2004). Also the emphasis on forest owners' own contributions has shifted from commercial fellings to tending of sapling stands, improvement of young stands, procurement of energy wood and regeneration. Karppinen et al. (2002) point out that in many cases these measures are on forest owners' responsibility because professionals are not necessarily always available to do them. Koho et al. (2004) found that during their study period in 1999, active forest owners contributed approximately 4,650 person-years that were worth EUR 90 million.

3.5 Other forest uses

Shifting the goals of forest owners and tightening policy to reduce greenhouse gas emissions creates new ways of making profit out of forests. In Finland, alternative ways of utilising forests include, for example, the trading of forest estates suitable for cottages, nature value trading, other

non-wood forest products and in the near future possibly also carbon and emissions trading. By seeking alternative ways to utilise forests one can increase income and improve the profitability of businesses.

Trading in natural values is one of the most common alternative ways to utilise forests in Finland. For non-industrial private and company forest owners, there is a designated METSO programme for increasing biodiversity in Finnish forests. The METSO programme is coordinated by the Ministry of the Environment and the Ministry of Agriculture and Forestry. According to the METSO situation report (Etelä-Suomen metsien monimuotoisuuden… 2011), by the year 2011 a total of 13,700 hectares of private and state conservation areas have been established. In 2011, EUR 24,4 million was paid in METSO compensation. 2,862 hectares of state-owned conservation areas were established and 2,956 hectares of private conservation areas. METSO compensation is based on the condition and volume of the growing stock and it is a viable option for the usual logging alternative, especially in remote areas with high biological values where it is very expensive to arrange wood harvesting for normal wood sales.

Viitala (2010) has speculated that renewable energy, mainly wind energy, could be a very useful alternative source of income, especially for large forest companies and private forest owners in the future. He notes that in Sweden, for example, there has been a lot of activity regarding building wind turbines on forest companies' lands. In Finland the adoption of the green energy climate policy has been encouraging. As a result, the proportion of wind energy produced should increase from the current level of approximately 0.3 TWh (Stenberg & Holttinen 2011) to 20 TWh by the year 2050 (Valtioneuvoston tulevaisuusselonteko... 2009) which may prove to be a significant source of income for the large upland forests of Northern Finland and the coastal forests. Viitala (2010) notes that the current energy policy will probably increase the share of alternative forest uses in the forests of large forest owners, but so far the future for these land use options is unclear.

4 Forestry in Russia

4.1 Utilisation of forest resources

Russia (The Russian Federation) possesses the world's largest forest resources with 809 million hectares of forests (49 per cent of the total land area in Russia) and 80 billion cubic metres of growing stock (FAO 2010). Private ownership of forests is, however, strongly restricted in Russia as the majority of forest lands are state-owned. However, there are two ways of getting access to forest resources. Forest resources are available for private persons and companies through lease contracts or short-term sale/purchase contracts.

Lease contracts are long-term rent contracts that may be arranged for periods of 10 to 49 years. Contracts are made by the regional forest authority with leases for the purpose of wood-harvesting, recreational activities, collection of non-wood forest resources etc. The lease charge is defined according to the annual allowable cut in the case of wood harvesting or leased area in other forms of forest use. Leasing happens in all cases through auction procedures except when specific priority is given to investment projects in which securing the wood supply is essential for industrial enterprises.

The starting price of an auction is determined by the federal minimum charge. For wood harvesting it is based on different local components such as the conditions of forest management, stand properties and transportation distance. An attempt has been made to include the economic situation and the market situation of forestry products in formulating a minimum fee. In the auction, the highest bid wins and the amount exceeding the set minimum charge goes to the regional budget, while the minimum charge goes to the federal budget. In the case of a lease contract, the leaser may also be obligated to cover the costs of possible intermediate fellings, forest regeneration, forest planning, forest road construction and forest fire prevention in the contractual area.

Sale/purchase contracts can be made on some occasions to give temporary right to use forests for less than a year. Rights to conclude wood sales contracts are sold by auction by the local forest authorities to fulfill the needs of state and municipal organisations or for forest protection purposes. Private citizens can also conclude sale/purchase contracts to obtain wood for their own use. In that case, the right is admitted without auction and payment is set according to the minimum charge, which is determined by the growing stock of the forest area under interest, as in lease contracts. (Lesnoy Kodeks Rossiyskoy…2009)

In general, the minimum and average charges for harvested wood in Russia are extremely low (minimum charge on average 35 RUB/m³ and average charge 50 RUB/m^3 in Russia in 2010) compared to stumpage prices in Scandinavia (Karvinen et al. 2011). According to Buldakov (2011), the average charge has been declining slightly since 2008 but the federal set minimum charge has remained substantially constant.

4.2 Administrative levels of forestry

The Russian Federation is divided into eight federal districts which are formed from 83 federal subjects. The federal districts in Russia act as a formal body between the central administration of the Russian Federation and its federal subjects (constituent entities of the Russian Federation). Administratively, the federal districts are not independent administrative bodies under the federal government like federal subjects. However, federal districts are under the administration of the federal government and their function is to supervise federal subjects so that they comply with the federal laws (Ukaz presidenta… 2000). Federal districts and their capital cities are presented geographically in Figure 10.

Figure 10. Illustration of the federal districts and their capital cities. Federal districts are presented in different colours.

As mentioned above, administratively Russian forests are divided between the federation and the regions. Federal level authorities are responsible for general policymaking, governance and regulations, whereas regional level authorities are responsible for forest management activities and practical matters of forest utilisation. On the federal level the Government of the Russian Federation and the Federal Forestry Agency (*Rosleskhoz*) are the main authorities. From 2010 to 2012 Rosleskhoz was a direct subordinate to the Government of the Russian Federation, but in 2012 it became subordinate of the Ministry of Natural Resources and Ecology. The main responsibilities of Rosleskhoz as the federal executive body include supervision of forest policy implementation, allocation of state subsidies, organising forest inventories and forest fire protection and monitoring.

Forest administration in Russia is organised in a multi-level structure that has three or four levels (Karvinen et al. 2011). The highest level is the Government of Federation Subjects, which is divided into a multitude of different regional organisations, such as ministries, departments and committees which act as the highest forest authority in the subject. If the second level organisation has a wider scope of activities, for example natural resources or environment, there is usually a third administrative level for forestry issues. The regional authorities are responsible for the implementation of the regional forest policy, the allocation of forest use rights, organising different forestry and silvicultural operations as well as supervision functions. Three functions of forest governance can be recognised in Russia: legislative, executive and judicial. The judicial function applies only at the federal level.

On a very elementary level, below regional authorities there are local units, forest districts (*lesnichestvo*) and forest parks (*lesopark*). Forest districts are further divided into forest ranges (*uchastkovoye lesnichestvo*). Forest districts are responsible for organising practical matters of forest utilisation, such as regeneration, protection and fire safety measures.

4.3 Statistical services

Sources for profitability assessment may be difficult to find, since in Russia there is no such forestry-specified statistical service like Metinfo in Finland. However, the Federal Statistics Service, 'Rosstat' (Rosstat 2012b) offers some general figures on forestry in Russia and its economy. As of 2007, a new, Unified Interdepartmental Statistical Information System (UniSIS) has been under development and it currently hosts basic statistical information on forest resources in Russia, forest regeneration, forest fires, forest protection etc. (Fedstat 2012). Furthermore, figures for forestry on federal and regional levels are presented in detail in budgets which are published annually by the Federal Treasury (Federal Treasury 2012).

Other sources of information include the Federal Forestry Agency and regional administrations which publish annual statistics on forestry and also regional forest plans. The information from these sources can sometimes be contradictory and even confirmed data may change, which makes it difficult to fully utilise these sources.

4.4 Economic aspects of forestry in Russia

Forestry has been of relatively minor importance in the Russian national economy since the collapse of the Soviet Union. Compared to the economic locomotives such as coal, gas and oil, forestry plays only a minor role. This has led to the situation where forestry is not actually considered an economic activity but a social function, providing livelihood and employment. This has caused that the costs and benefits of forestry activities not to be accounted in detail and no special attention is paid to profitability. Although regulations on cost accounting of forestry can sometimes be strict, by nature they have not been designed for calculating economic sustainability.

As mentioned earlier, budgeting of forestry is divided between the federation and regions. The structure of funding of forestry is very different from that in Scandinavia, since all forest resources are state-owned. There have been minor changes in the way forestry was funded in the past, but currently major part of forest charges are collected in the federal budget and further circulated back to the regions to fund different forestry organisations and services. The mechanism upon which the funding is divided between regions has been criticised as outdated and not objective towards the regions (e.g. Rusova 2010). In this study, the federal and regional level forest economy is taken into account. Leaseholders' standpoint, on the other hand, is left out as each leaseholder has its own methods and means for conducting profitability assessment.

4.4.1 Financial mechanisms of forestry in Russia

Forestry in Russia deviates from many other countries by the fact that state level forestry has not yet been fully transferred to the market economy (e.g. Rusova 2010, Petrov 2011). Stumpage prices and forest use charges are centrally set and most of the administrative and executive bodies operate under the state support through the subventions system. The performance of forestry organisations in market situation does not affect the price level which is set for forest use. Therefore, if considered as a business activity carried out by the federation, the operative profitability of forestry has been very low in recent years.

Financial flows of forestry in Russia are presented in Figure 11 (modified after Pankratova 2010). It can be seen how monetary flows circulate from the leaseholder to regional and federal budgets and from the federal budget back to regions in the forms of subventions. Other income besides charges for forests, such as indemnities and fines for violations of the forest code, are not presented here. Numbered lines correspond to the following descriptions:

1. Income tax of the forest user
2. Minimum charge of forest use to federal budget
3. Additional charge (exceeding minimum charge) of forest use to regional budget
4. Funding of the federal forestry authority from the federal budget
5. Allocation of funds to regions for implementing forestry-related operations and services
6. Allocation of funds in forms of federal and regional subventions to regional forest administration
7. Allocation of funds to forest districts and forest parks for forest management
8. Total costs of forest management at the forest district level
9. Costs of forest management operations based on competitive tendering
10. Forest user's own funding of forestry operations

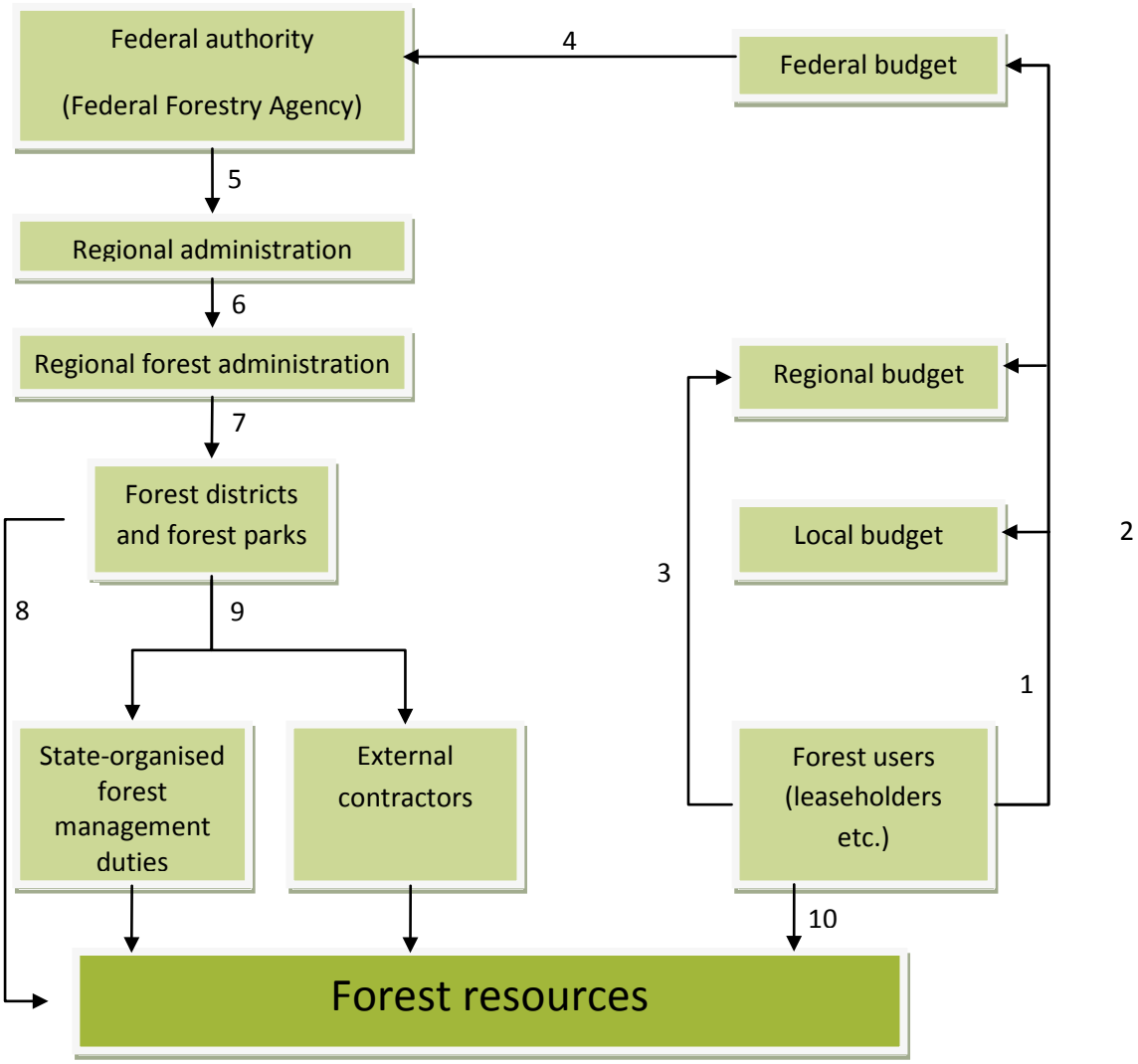

Figure 11. The financing cycle in forestry in Russia (Pankratova 2010).

Forestry-related costs are divided into several categories in the federal budget. The largest single item of expenditure consists of subventions for the subjects of the Russian Federation. The amount of subventions for each region is defined in a formula which consists of forest area and costs of implementing powers of public authority (Postanovlenie pravitelstva… 2006). Other targets for allocating funds for forestry are, for example, social costs, education, nature protection and national economy related costs. The structure of costs is further analysed in the Results section.

Regions have their own forestry budgets which work separately from the federal budget. In the regional economy forestry causes different salary and social costs but the additional part of the rental payment is directed to the regional budget in order to gain income. Theoretically, the more leaseholders there are in a specific area, and the higher the demand for wood, the more income a region earns from forestry. Other than that, state subventions are also available for the funding of forestry operations and organisations.

4.4.2 Indicators of economic efficiency

As stated earlier, finding information on the economic indicators of Russian forestry is difficult due to the lack of statistical data. However, literature on the topic exists. Rusova and Koryakin (2009) have presented some methods for measuring the economic efficiency of forestry on a federal level in their article "Economic indicators of forestry". They note that the analysis and collection of economic indicators is something of a novelty in the Russian economy, in which market economy has existed for only about two decades. According to Rusova and Koryakin, a Centre of Forest Payment Management and Price Monitoring has been established under the Russian Research Institute for Silviculture and Mechanization of Forestry (VNIILM). The purpose of this centre is to collect information on three key indicator groups of federal or regional level forest economy, which are income, costs and social indicators. In the income category of indicators (Table 3) this includes the following seven items:

Table 3. Economic indicators according to Rusova & Koryakin (2009).

Indicator	Unit
The proportion of realised and planned charges from forest use	%
The proportion of arrears of charges and realised charges of forest use	%
The share of charges collected to federal budget from forest use	%
Income from forest use	Roubles per hectare
Income from logging	Roubles per hectare
Average payment per unit of logged wood material	Roubles
Average minimum payment per unit of logged wood material	Roubles

Rusova & Koryakin (2009) found that the higher the minimum and average charges from forest use are, the lower the profitability of state-level forestry is as the share of arrears increases. They note that the share of arrears tripled when average and minimum charges went up by 10 per cent between years 2007 and 2008. This indicates that many leaseholders in Russia operate under very low marginal profits.

Also Rusova (2010) has presented some indicators in her article 'The balance of income and costs in forestry'. In the article there are listed, in addition to previously mentioned, charges collected from other uses of forests than wood production (RUB/ha), the shares of planned and realised amounts on financing of forestry from different sources and the balances of income and costs of forestry by budget systems and federal districts. According to the examples presented, in 2008 the proportion of income and costs of forestry in the federal budget was 0.65 and in the regional budgets 1.77. In other words, according to this manner of representation, on ac federal level benefits were only 65 per cent of costs. On a regional level, on the other hand, benefits exceeded total costs by 1.77 times, which meant that forestry produced more benefits than costs.

5 Data sources and study methods

5.1 Finnish data sources

5.1.1 Non-industrial private farm forestry

An extensive dataset of follow-up accounting data from Finnish farms exercising forestry was acquired from MTT Agrifood Research Finland to represent non-industrial private forestry. MTT has conducted a profitability follow-up on Finnish farms since the 1910's (MTT Agrifood Research… 2012). Besides agricultural information, information on forestry also is collected.

Data consists of cost and income accounting data from roughly a thousand farms in Finland between 2000 and 2010. Results are sorted with regard to the thirteen Forestry Centres of Finland. Material is used for calculating the operating profit of non-industrial private forestry for each area according to the method that is presented in section 3.2.2. Also the share of multiple uses of forests (primarily hunting) is analysed. The results are compared with Metla's follow-up results and the results of jointly-owned forest analysis in this study.

The material provided by MTT consists of 113 separate accounts which contain detailed accounting information on costs and income over each fiscal year. For calculating operating profits, those accounts which are obsolete for this purpose are discarded. The profitability of wood production is the main object of interest and for that reason, for example, accounts that contain information on forest land sales are ignored. From income accounts, only wood sales, income and state subsidies are taken into calculations. From costs, material and supply costs, external service costs, variable personnel costs, other variable costs and other fixed costs are included. A detailed list of all accounts used for calculations is found in Annex 1.

The cost of an entrepreneur's self-directed work is calculated using the estate-level working time statistics provided by MTT and the annual average hourly earnings in Finnish private forests (Finnish Statistical Yearbook 2011). The costs of different types of work are calculated and then summed. Then the cost per hectare is calculated and the Forestry Centre level averages for each year are derived. The results are then deducted from the Forestry Centre level's operating profits. In the calculations it is assumed that the share of motor-manual felling is 90 per cent and mechanised harvesting is 10 per cent. Fourth quarter hourly earnings statistics are used if available.

The balance of costs and benefits (operating profit per area) is calculated by subtracting costs from benefits (including subsidies) and the result is divided by the area of the forest estate to gain an operating profit per hectare for each farm. Accounting information contains an area at the beginning of fiscal year and at the end of fiscal year. An average of these areas for each year is used in the calculation. Individual farms are averaged to establish results for each year and for each region. Then, monetary values are deflated to 2010 values using the cost-of-living index (1951:10=100) to eliminate the effect of inflation and to make results comparable.

5.1.2 Jointly-owned forests

Jointly-owned forests (JOF's) were selected for this study because they are obligated to make annual financial statements for taxation purposes, which can enable large scale systematic profitability assessments and follow-ups. Also this kind of form of forest ownership is interesting from the

point of view of profitability. Therefore the basic prerequisites for profitability assessment exist in jointly-owned forests. The principles on jointly-owned forests and their reporting are set in the *Act on Jointly Owned Forests (109/2003).*

The profitability of jointly-owned forests has been studied before, although on a limited scale. Penttinen & Kinnunen (1992) studied the profitability of forestry in 33 jointly-owned forests in Northeastern Finland and Lapland at the beginning of the 1990's. Although the study was conducted during the financial crisis of the early 1990's, the results suggest that forestry in jointly-owned forests is profitable even in the harsh climatic conditions of Lapland.

In this study, the prerequisites for profitability assessment and the profitability of forestry in jointly-owned forests are examined briefly according to materials around Finland. Data requests were sent to five rather large (> 4,000 ha) jointly-owned forests for better representativeness in forestry. According to the financial statements sent by the jointly-owned forests the possibility of calculate relative profitability is assessed. Also the share of multiple-uses (mainly selling hunting and fishing licenses) is examined in relation to wood sales income and turnover.

A brief analysis of profitability is also conducted by following the example of Penttinen & Kinnunen (1992). Operating profits per hectare for wood production are presented for all studied JOF's. Operating profit is calculated using 'timber sales income' as income and the following items as cost items: 'timber procurement', 'silviculture and maintenance of forest roads', 'administration and personnel' and 'other costs'. The reporting of KEMERA subsidies was different in each JOF. Where subsidies are not reported, it is assumed that the share of subsidies is 25 to 50 per cent of 'other income' based on information in the yearbook of the respective JOF. Operating profit is calculated in accordance to Equation 3.

Also, the share of multiple-uses is presented in results. Since hunting, fishing and other related activities are not regarded as primary activities in accounting in all jointly-owned forests, these data cannot usually be derived from the financial statements. However, some jointly-owned forests publish their annual reports (yearbooks) which contain this information, and therefore it was possible to include it in this study.

5.2 Russian data sources

5.2.1 Budget data

The data from Russia is based mainly on publicly available federal and regional level budget information. Federal level budget information is collected from years between 2005 and 2011 and budgets are analysed according to the costs and income related to forestry and the Federal Forestry Agency. Regional budget information is collected from four regions. The source for the federal and regional level data is the Federal Treasury of Russia (http://www.roskazna.ru/) which is the federal executive body that is responsible for exercising control over the federal budgets and monetary transactions involved in budgeting (Federal Treasury 2012).

Budget data concerning forestry and the Federal Forestry Agency is manually selected and picked from the rest of the budgets for each year and further analysed. The cost structure for each year

is formed and it is presented in the results section. Also the economic efficiency (profitability) of forestry on federal level is examined through the dynamics of cost and revenue

The aim of the analyses is to form a balance of forestry on federal and regional levels. For this purpose, information concerning income from forest use, which consists of charges collected from forest utilisation (mainly rental payments and harvesting charges), was picked from the budget item named 'charge of forest use' (Plata za ispolzovaniye lesov) which included the above-mentioned income accounts. This does not include other income items, such as fines and penalties for violations of the forest code, which play only a minor role in annual forestry-related income. Costs were collected from the main category 'forestry' (Lesnoye khozyaistvo) which includes multiple sub-categories. Costs are subtracted from income and results are presented in the Results section. Monetary values are made comparable using a modification of the Russian producer price index (2002:01=100).

The cost sub-categories were further broken down into smaller units and then combined into five groups (research, education and international cooperation; investment in fire protection, equipment etc.; administration and authoritative tasks and subventions to regional budgets). Subventions dominate monetary transactions on both federal and regional levels. Therefore, on a federal level subventions are regarded as costs and on a regional level as income. Although budget information exists from the year 2005, due to major institutional changes that occurred in 2006, only the last five years (2007–2011) are taken into consideration in studying the cost structure for better comparability.

Also, four regions (federal subjects) of the Russian federation are taken into closer inspection and analysis (Figure 12). Information regarding the selected regions is collected and analysed in the same manner as federal level data. In addition to budget data, information on forest resources and leasing is collected. The purpose of this is to briefly demonstrate how spatial location, competing markets and activities in forest leasing affect cost-income dynamics and the profitability of forestry. The source for these data are the publicly available regional budgets of the Federal Treasury of Russia (Federal Treasury 2012).

Figure 12. The four regions that were selected for closer inspection in this study.

Information regarding the costs and income of forestry is collected from regional budgets. Information on forest resources, leasing and economic activity are gathered from multiple sources and are presented in a table. Operating profits for forestry as a whole are calculated for each region by subtracting the costs from income both with and without subventions to demonstrate the effect of subventions on profitability. Also the result per hectare is calculated by dividing the result with the total forest area (area covered by forest). If there are reserve forests in a region, i.e. areas that are excluded from forestry, their area is subtracted from the total forest area. Also the structure of funding is presented.

5.2.2 Data from the Federal Forestry Agency

In order to get some information on federal district level spatial changes in the profitability of forestry, a dataset from the Federal Forestry Agency was acquired for the years 2010 and 2011 (Federal Forestry Agency 2012a). The dataset consists of cost and income information for each federal district and also the shares of different stakeholders in funding of forestry. Different silvicultural operations, as well as other forestry-related operations, are presented in the data. Cost-benefit dynamics are analysed for the year 2010 by presenting the annual costs and benefits of forestry on a federal district level. The structure of costs and funding of forestry operations is itemised and discussed for the years 2010 and 2011.

6 Results

6.1 Finland

6.1.1 Non-industrial private farm forestry

Estate-level follow-up data by MTT Agrifood Research Finland was studied for forestry centre level profitability (operating profit per hectare).Figure 13. Operating profits (EUR / ha) according to MTT data analysis for the whole of Finland and three major regions. Monetary values are deflated to 2011 values by the cost-of-living index (1951:10=100). Figure 13 shows the results of MTT data analysis by whole country and three major regions. The region of Western Finland consists of forestry centres Rannikko (1), Lounais-Suomi (2), Häme-Uusimaa (3), Pirkanmaa (5), Etelä-Pohjanmaa (7) and Keski-Suomi (8). Eastern Finland comprises forestry centres Kaakkois-Suomi (4), Etelä-Savo (6), Pohjois-Savo (9) and Pohjois-Karjala (10). Northern Finland consists of forestry centres Kainuu (11), Pohjois-Pohjanmaa (12) and Lappi (13). Figure 14 presents the operating profits of individual forestry centres on the map.

6.1.2 Jointly-owned forests

Only three out of five jointly-owned forests (JOFs) from Central and Northern Finland were willing to provide financial statements for this study. For privacy reasons, no exact figures, names or locations are used. Financial statements included also more detailed annual reports (yearbooks) for two of the JOFs, which were also utilised in the analyses.

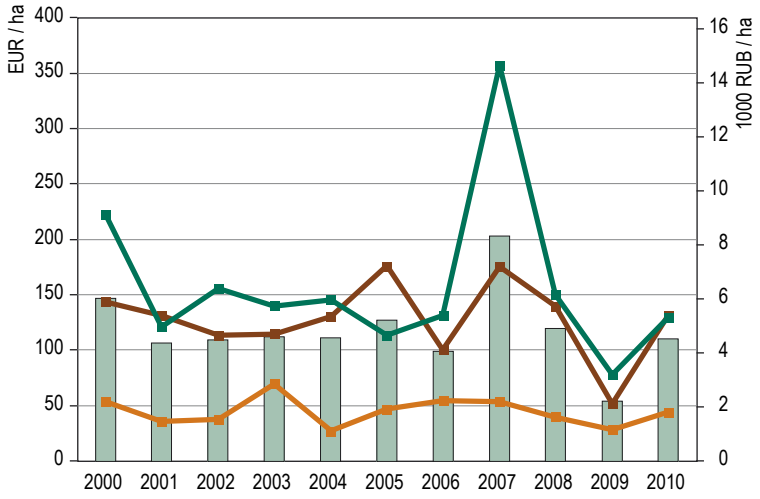

Figure 13. Operating profits (EUR / ha) according to MTT data analysis for the whole of Finland and three major regions. Monetary values are deflated to 2011 values by the cost-of-living index (1951:10=100).

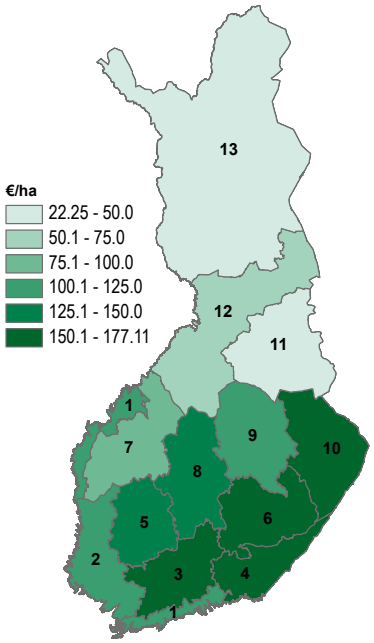

Figure 14. Operating profits (EUR / ha) on average between 2000 and 2010 presented by forestry centres.

As mentioned above, JOFs are obligated to make annual financial statements about their activities during the fiscal year. In this study the main focus of JOF analyses was to find out whether these financial statements could be utilised in assessing the relative profitability of JOF. This assessment would require information on the value of the standing stock and wood sales income. Also the possibility to derive income from the figures from each area was analysed.

The analysis of the financial statements from two JOFs revealed that valuating the standing stock is practically impossible due to insufficient information on standing stock and its change during the fiscal year. Wood sales income, on the other hand, was either published straight in the annual report or could be calculated from wood sales quantities and average stumpage price during the fiscal year. The value of standing stock could in theory be derived from the financial statements section 'tangible assets: land and water areas', but as JOFs are not required to keep records of the current value of the assets in this category, it usually only includes the value of forest plots at the time of their purchase. This may have been recorded decades ago, and therefore it is not considered to be feasible information for this analysis. This means that financial statements cannot be utilised in calculating relative profitability.

Financial statements also do not contain any information about the annual area of forestry land, which hinders the analysis of income per hectare. All three JOFs in this study, however, provided this information either in the annual report or in a separate paper. There were some inconsistencies between the JOFs, as some reported the forestry land area and some only the total coverage of the forest area with water bodies included. Income per hectare is calculated using profit per fiscal year and available area information for each year. The results are presented below.

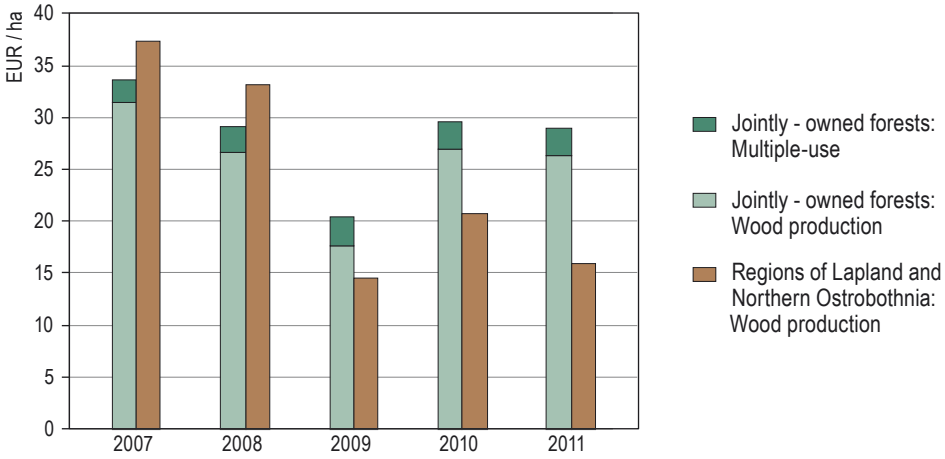

Figure 15. Comparison of regional average operating profits of wood production (EUR / ha) with operating profits of wood production and multiple-use of the three jointly-owned forests. For better comparability, the region of Lapland was weighted by two-thirds in calculating average operating profits for the regions. Monetary values are deflated to 2011 values using producer price index (1949=100).

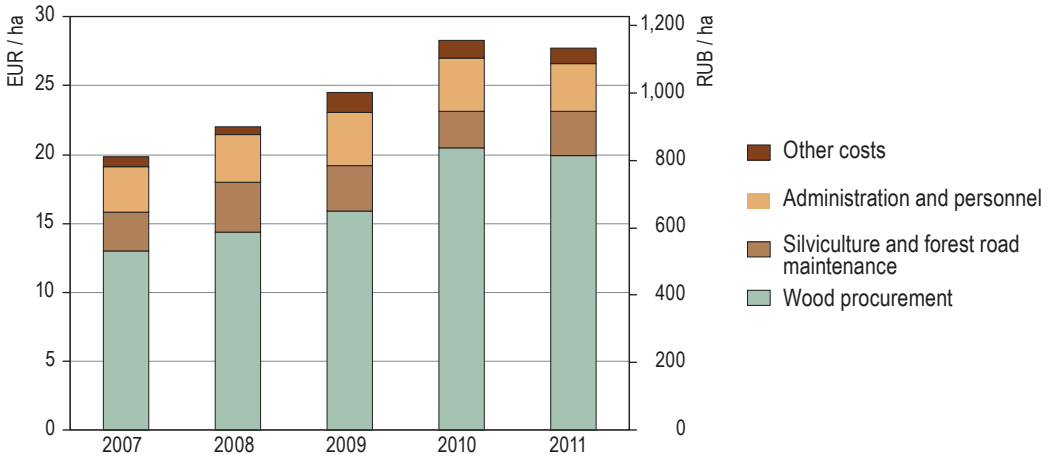

Figure 16. Cost structure of two jointly-owned forests. Monetary values are deflated to 2011 values using the producer price index (1949=100).

Operating profits per hectare for the three JOFs are compared with regional averages for the corresponding areas in Figure 15 (wood production and multiple-use are shown in the same bar). The results are also presented in Table 4 in which operating profits for wood production and multiple-use forestry, mainly hunting in this case, are presented in numeric format. The share of multiple-uses is a proportion of income of multiple-use from the net profit. Figure 16 presents the cost structure per hectare of two JOFs out of three. The cost division in the financial statement and yearbook of one JOF did not allow for uniform comparison. Therefore, one jointly-owned forest was left out of this graph. The trend, however, was clearly visible.

Table 4. Operating profits EUR/ha of wood production and the share of multiple-uses (mainly hunting licenses etc) from the net profit of the financial period. Monetary values are deflated to 2011 values using producer price index (1949=100).

	2007	2008	2009	2010	2011
Operating profit, EUR/ha	31.44	26.63	17.73	26.99	26.33
Non-wood forest products, EUR/ha	2.24	2.56	2.74	2.65	2.61
Share of multiple-uses, %	10.3	10.2	26.4	9.7	12.3

6.2 Russia

6.2.1 Federal level profitability and cost structure analysis

The profitability of forestry on a federal level between 2005 and 2011 is presented in Figure 17. The graph clearly demonstrates the current state of federal level forestry in which costs exceed income heavily. Income from forest use has been steady in the past but has increased gradually from 2005. The structure of budget costs is presented in Figure 18. The dominant cost item here is "Subventions to regional budgets" which covers up to two-thirds of the total costs of forestry.

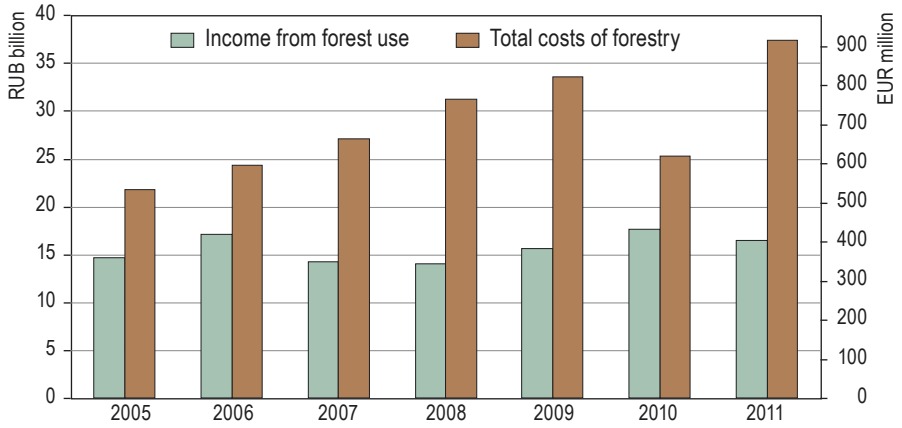

Figure 17. Income from forest use and costs of forestry in the federal budget 2005–2011. Monetary values are deflated to 2011 values using producer price index (2002:01=100). Federal Treasury (2012).

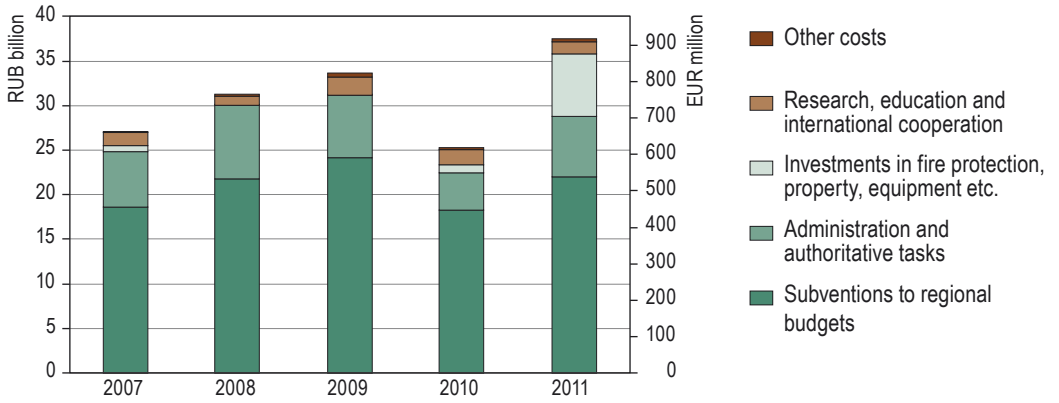

Figure 18. Shares of different cost items in federal budget in 2007–2011. Deflated to 2011 values using producer price index (2002:01=100). Federal Treasury (2012).

Due to major institutional changes in Russian forest administration in 2006, the cost analysis is presented only from 2007 onwards for better comparability. Administrative and authoritative tasks are coordinated directly by the Federation. Also, the funding of state organs implementing forest authority on a regional level is partly accounted for in this category. Other costs include federal target programmes and other minor costs not included in the above categories.

The share of research and education (inside group 'Research, Education and International Co-operation') has been increasing over the five year time span; year 2007 being the lowest with 520 million rubles and 2009 being the peak with over 1.5 billion rubles invested in research

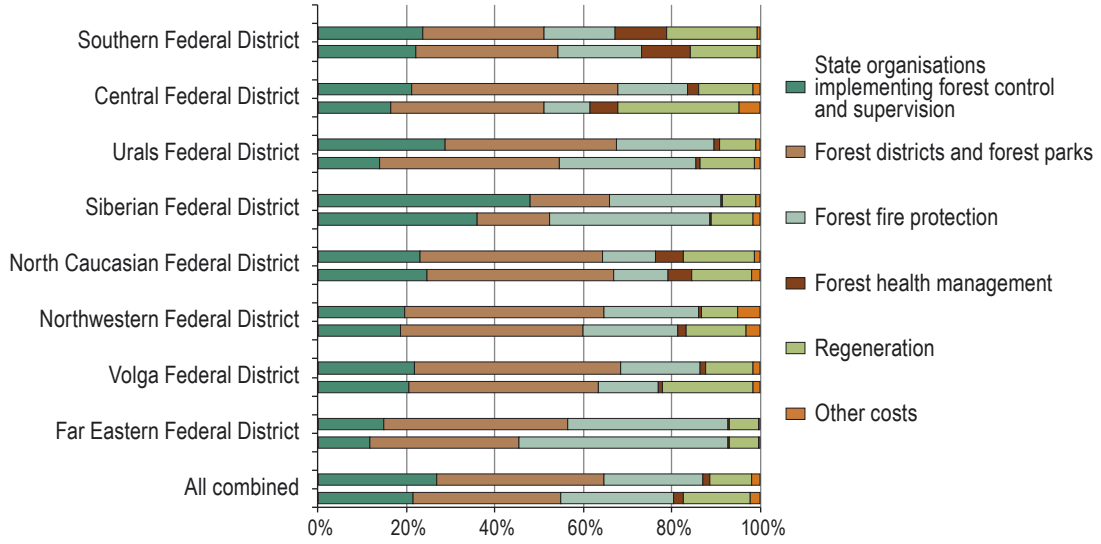

Figure 19. Funding of forestry through subventions to subjects presented by federal districts. The upper bar of the two represents 2010 and lower one 2011. Federal Forestry Agency (2012a)

and education. Since 2009 the share has been declining slightly (in 2011 1.2 billion rubles). International cooperation, on the other hand, has diminished from to zero on 2011, while its share was as high as 520 million rubles.

It can be seen that funding of different organisations takes the biggest share of subventions. While funding of state organisation implementing forest control and supervision as well as forest districts and forest parks has slightly decreased in 2011, more funds have been directed towards regeneration. It has to be noted that there was roughly RUB 4 billion difference between years 2010 and 2011 in federal funding of forestry (see Figure 18), which makes it difficult to compare the proportions in Figure 19.

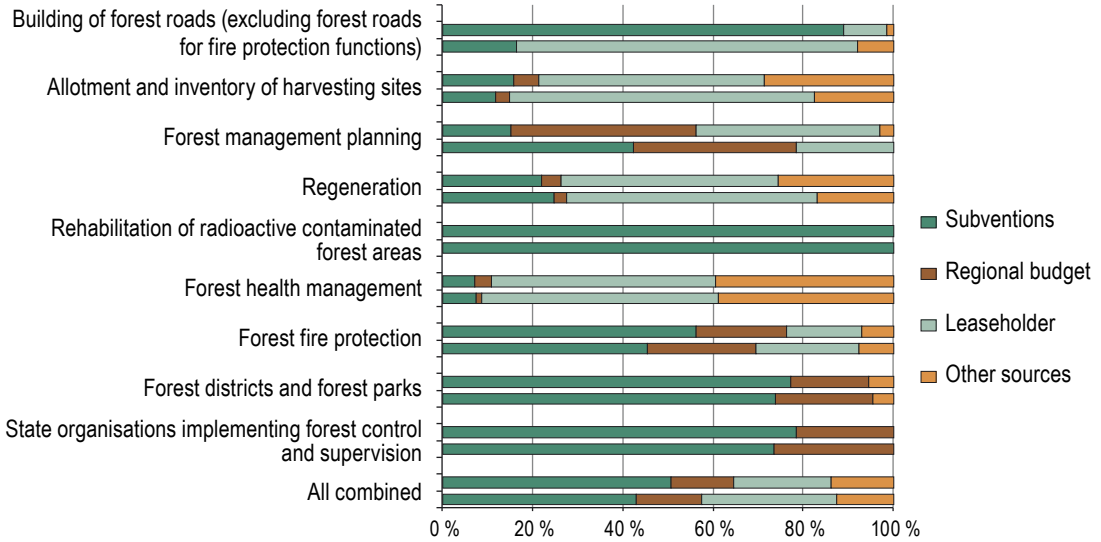

Figure 20. Sources for funding of different forestry related organisations and services. Upper bar of the two represents year 2010 and lower one year 2011. Federal Forestry Agency (2012a)

Here it can be seen that forestry-related organisations get the biggest share of funding. Also regions are visibly involved in the funding of these organisation. Leaseholders have quite a significant share in practical procedures, such as regeneration and forest health management. Rehabilitation of radioactive contaminated forest areas is carried out mainly in areas that were affected by the Chernobyl radioactive fallout in the late 1980's. This is an extremely small item of expenditure and is fully covered by state subsidies.

6.2.2 Federal district level cost distribution

Federal district level profitability was assessed using a dataset from the Federal Forestry Agency. Figure 21 gives an overview of the profitability of forestry by federal districts by showing proportional forestry-related costs and incomes. This is because it was not possible to present absolute monetary values. Negative values represent the costs of forestry and positive value incomes from forest use. The divisor value used in calculating the shares was the total costs of forestry in 2010. This was needed to make both cost and benefit sides comparable. Figure 21 also illustrates different sources of funding and the division of budget income between federal and regional budgets. The figure shows that incomes exceeded costs in only two federal districts in 2010: the Northwestern federal district and Siberian federal district. Southern areas made heavy losses in forestry, although their importance for state-level forestry was fairly small.

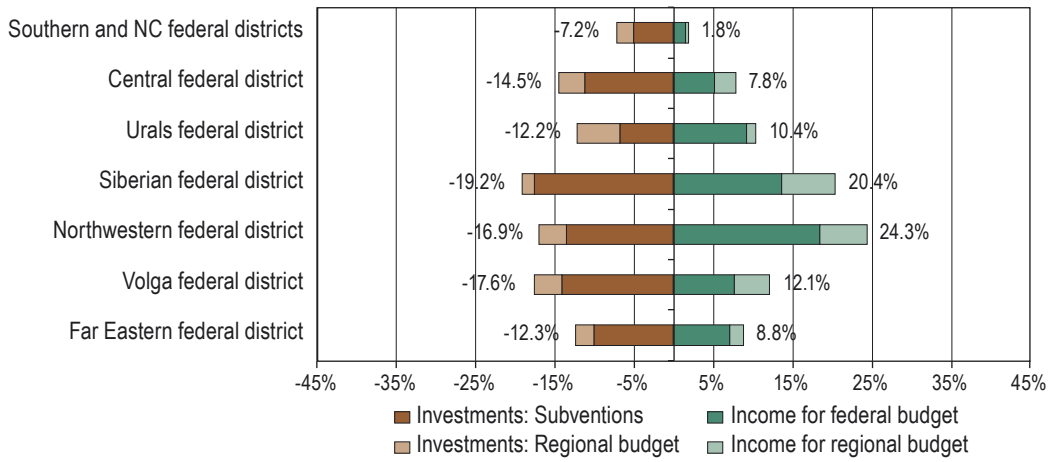

Figure 21. Costs and income of forestry related operations and services by federal districts in 2010 (relative to total costs of forestry). The North Caucasian federal district (NC federal district) was combined with the Southern federal district, due to its minor share in budget income (0.3%) and costs (2.5%). Federal Forestry Agency (2012a).

6.2.3 Regional level profitability of forestry

Four regions from Russia; the, Republic of Karelia, the Republic of Komi, Sverdlovsk Oblast and Kemerovo Oblast, were selected for further analysis in order to study the factors that affect the regional level profitability of forestry. The selection was based upon the assumption that the share of leased forests differs greatly between these regions. The hypothesis was that profitability is interlinked with the share of leasing activity. The Republic of Karelia and the Republic of Komi are located in the Northwestern federal district, whereas Sverdlovsk Oblast is situated in

the Urals federal district and Kemerovo Oblast in the Siberian federal distr ict (Figure 12). Table 5, Figure 22 and Figure 23 present a rough overview of the year 2010 forest budget including main cost categories and income from forest use. Also the balance of forestry income and cost is included for each region. The sources of income for each region are illustrated in Figure Table 5. Comparison of four regions and their forest economy in 2010.n Table 5 it can be seen that there is no connection between profitability and leasing activity. Regional differences in forest resources and efficiency of forestry in 2010 are clearly presented. Figure 22 and Figure 23 present the cost structure for the study regions as absolute cash-flow numbers and per hectare figures. Dependency on state subventions can be seen. Income structure is further elaborated on in Figure 24, which reveals quite significant differences between the regions.

Table 5. Comparison of four regions and their forest economy in 2010.

	Republic of Karelia	Republic of Komi	Sverdlovsk Oblast	Kemerovo Oblast
Total forest area, ha[1]	9,768,600	30,636,800	13,594,900	5,930,000
Forest coverage[1]	52.70%	72.50%	68.60%	60.20%
Area covered by forest, ha[1]*	9,519,000	30,288,000	13,320,900	5,723,000
Volume of logged timber, 1000 m^3 [1]	5,560.60	7,443.90	6,734.80	917.40
Area of leased forestland, ha	9,506,200[2]	6,161,248[3]	4,078,470[4]	1,063,636[5]
Share of leased forests	97.3%	20.1%	30.0%	17.9%
Costs of forestry, RUB[6]	581,086,251	495,975,992	512,241,190	204,495,546
Income from forest use, RUB[6]	253,241,483	81,081,310	101,940,960	281,609,071
Subventions from federal budget, RUB[6]	416,194,100	378,481,000	443,230,390	166,151,300
Result of forestry, RUB	-327,844,768	-414,894,681	-410,300,230	77,113,525
Result with subventions, RUB	88,349,332	-36,413,681	32,930,160	243,264,825

Sources:

[1] Fedstat (2012)

[2] Lesnoy plan Respubliki Kareliya (2010)

[3] Lesnoy plan Respubliki Komi (2010)

[4] Federal Forestry Agency 2012b (2012 data, approximate figure)

[5] Departament lesnogo kompleksa… (2012)

[6] The Federal Treasury (2012)

* Includes seedling stands with a relative density of 0.4 and above and forest stands with relative density of 0.3 and above (Federal Forestry Agency 2012c). In Kemerovo Oblast, a total of 56,000 hectares of forestland, regarded as reserve forests, was subtracted from the total area covered by forests in calculating results per hectare (Lesnoy plan Kemerovskoy… 2012, p. 48).

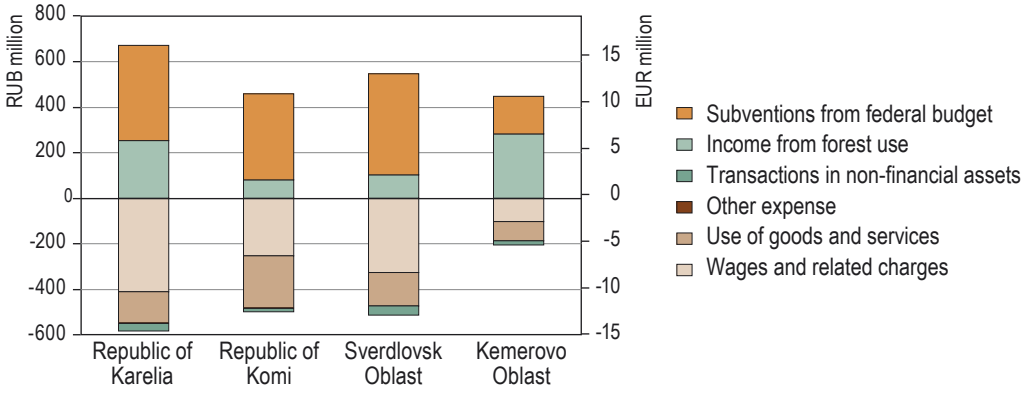

Figure 22. Income and cost of forestry in 2010 including state subventions on four regions of Russian Federation. Federal Treasury (2012).

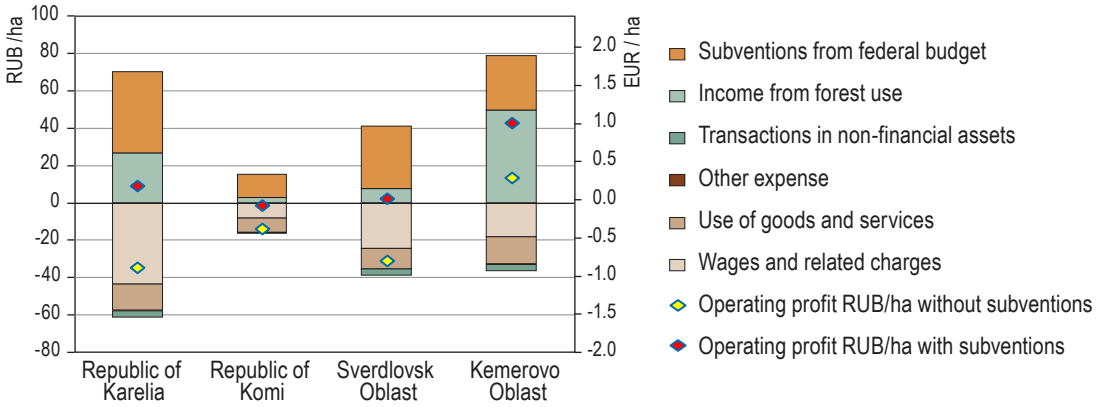

Figure 23. Income and cost of forestry in 2010 per hectare for each region. Results are calculated both with state subventions and without to emphasise the importance of state support. Federal Treasury (2012).

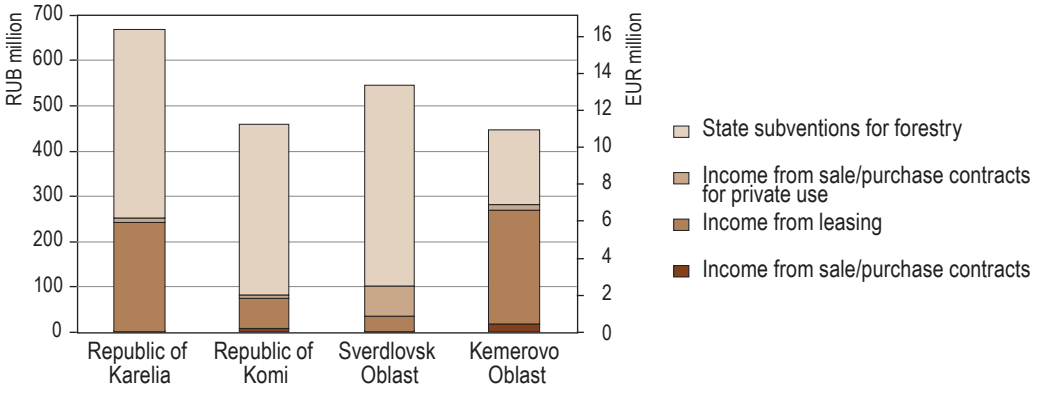

Figure 24. Sources of income for each region on 2010. Income from collected fines and penalties for violations of the forest code was left out because they were not accounted as an independent item and also because of their insignificant share in the budget. Federal Treasury (2012).

7 Discussion

7.1 Finland

The brief analysis of jointly-owned forests revealed that accounting and reporting customs vary greatly between jointly-owned forests and that uniform nationwide profitability follow-up based on financial statements would probably not be possible. Although the material base for this analysis was extremely narrow (only three jointly-owned forests), already this dataset revealed significant differences between reporting which made it difficult to make comparable results or cost structure analyses.

As for the results of operating profits, yet again it has to be emphasised that no significant conclusions can be reached based on these findings. The results were compared with Metla's regional results on operating profit of wood production and it was found that operating profit is close to regional averages (Finnish Statistical Yearbook… 2011). Shareholders' possibilities for self-directed work are usually restricted in jointly-owned forests which makes it difficult to estimate its significance. However, JOF may pay for shareholder for his/her self-directed work and this is usually included in the costs.

Also, the share of income from multiple-uses of forests, mainly consisting of hunting, was analysed briefly. Since these jointly-owned forests were rather large and were situated in the Northern parts of Finland, the significance of multiple-use primary hunting was remarkable. One thing that was noteworthy was that, when wood sales income was low (especially in 2009), the share of hunting revenues was surprisingly high. Overall it can be said that the share of multiple-uses is constantly increasing, which was even evident prior to 2007 in the yearbooks of JOF's.

Finland's National Forest Programme 2015 (2008) states that increasing the profitability of non-industrial private forestry and gradually increasing the average size of forest estates as one of the major targets for this period. As one of means for reaching this target it is mentioned that the preconditions for forming jointly-owned forests should be fortified. JOF's offer many favourable features for reaching this target. JOF's allow long-term contracts for large forest areas with harvesting companies, which brings costs down. Also, especially in larger JOF's, silvicultural decision-making is concentrated in professional hands, which eliminates decision-making based on insufficient knowledge. Thus emotional values that often affect private forest owner's decisions can be eliminated and decisions taken are therefore rational.

Besides jointly-owned forests, the profitability of forestry among MTT Agrifood Research Finland's bookkeeping farms was studied. The results indicate somewhat higher operating profit per hectare that on average by Metla's statistics (Metinfo 2012). It needs to be stated that the farm owners in the bookkeeping register are probably more experienced in forestry than the average non-industrial forest owners. Also, the average estate size was more than twice as high in this case (approx. 80 hectares) than the average size in Finland. The cost of entrepreneurs' self-directed work was estimated using estate-level working hour statistics and the annual average hourly earnings of forestry workers. Some assumptions had to be made in the formation of this cost which obviously affects the reliability of the results.

The results indicate that operating profit follows the trends of stumpage prices quite well in Eastern and Western Finland. Northern Finland, on the other hand, does not seem to be affected

by fluctuations in stumpage price. On the record-year 2007, operating profit per hectare rose up to 360 EUR/ha in Eastern Finland. This could partly be explained by the low number of farms in this region. On average the region of Eastern Finland considered only 44 bookkeeping farms per forestry centre and in North Karelia alone only 21, which obviously makes it difficult to extrapolate the results.

One purpose of this study was to analyse sources of income other than wood production. While in jointly-owned forests , hunting and other related activities accounted for a noticeable share of annual income, in non-industrial private farm forestry situations, this was quite different. Follow-up data analysis revealed that multiple-uses were not common and that in some areas there were no income or costs from multiple use at all between the years 2000 and 2010. Altogether some 25,000 EUR was invested in multiple-use forestry during the study period. Selling hunting licenses raised less than 8,000 EUR during the respective period.

Uotila (2010) has criticised the MTT forestry bookkeeping data for being slightly unsuitable for generalisation for forestry purposes as it serves primarily the purposes of agriculture. As mentioned above, the estate sizes are also larger than usually and farm owners are likely to be more accustomed to forestry work. Therefore, the possibility of comparing results with other studies concerning operating profits of non-industrial private forestry is limited.

7.2 Russia

The profitability of forestry in Russia was the other main object of interest in this study. The analysis of Russian forestry and its profitability was begun at a state level by analysing annual federal budgets in the form of cash-flow analysis. The cost-benefit dynamics presented in Figure 17 tell the crude reality of the current situation: costs exceed income in the federal budget. Judging from the chart it is easy to see the problem. Income remained steady for the whole study period of 2005–2011, while costs have gone up significantly. State level forestry is very unprofitable at the moment and the difference between cost and income seems to increase every year.

Figure 18 provides a more detailed analysis of federal budget cost items. Due to institutional changes in 2006, cost analysis was conducted only for the years between 2007 and 2011. It can be seen that subventions to regions is the single most significant cost item throughout the study period. They cover up to three quarters of annual expenses while the remaining quarter is shared between administrative costs and other costs, such as research, education and international cooperation. The share of research and education reached its peak in 2009 and since then it has been declining. Also, the share of international cooperation has declined to zero but it has also has been noted that this item may have been transferred into some other budget item in the latest budgets and therefore shows zero values.

The biggest cost element, subventions, was itemised in Figure 19. The share of state organisations and regional level organisations has declined but forest regeneration has gained more of a share in the total sum. One has to remember that the total sum of subventions increased in 2011 in relation to the previous year, which is not visible in the graph. It is clearly visible that the major part of state subventions was directed towards the funding of different forestry-related organisations such as those providing inventory and supervision services and regional level activities. Also, the share of forest fire protection was quite significant. On the other hand, the state does not carry

out silvicultural activities very actively, and less than 20 per cent in 2011 was directed to forest regeneration.

Figure 20 illustrates the sources of funding of forestry and their division in different forestry operations and services. Although there is some variation between the 2010 and 2011, the basic division is quite clear. Here it can be seen too that state organisations are mainly funded from the federal budget whereas leaseholders' responsibilities are the allotment and inventory of forestry sites, regeneration and forest health management. Regions are mostly involved in the forest management planning. Also the share of other sources, which covers for example grants and donations for leaseholders, is remarkable, especially in terms of forest conservation.

One of the interests regarding Russian data was to identify spatial differences in the efficiency of forestry. Figure 21 illustrates this division between the eight federal districts of the Russian Federation. Although studying only one year does not reveal the true situation, is shows that the chart is heavy on the costs side. This means that most of the federal districts are heavily unprofitable in forestry. The only federal districts that were able to exceed their costs by benefits were Northwestern federal district and Siberian federal district. They are also the biggest by volume. As discussed later on, the effect of available markets is visible in the chart.

It seems that those areas where forests and forestry do not play as significant role as in Northwest or Siberia, forestry is not able to balance between costs and benefits. This is especially true in the Southern, North Caucasian and Central federal districts. One reason for this might lie in the share of costs of forest fire protection and extinguishing which were exceptionally high in 2010. Figure 21 also illustrates the share of federal budget funding and regional budget funding as well as forest charges collected to federal and regional budgets. This shows yet again how forestry is strongly supported from the federal budget.

The third level of profitability assessment in Russia was the regional level. Four regions were chosen for closer examination based on the assumption that profitability is linked to leasing activity. The regions were the Republic of Karelia, the Republic of Komi, Sverdlovsk Oblast and Kemerovo Oblast. The general statistics for each region are presentTable 5. Comparison of four regions and their forest economy in 2010.able 5. It must be said that no connection between leasing activity and profitability was found. It has also be noted that also the data in this case is very limiting, analysing longer time series could reveal hidden trends among these regions.

The results show the same dependency on state support as the previous charts. In Figure 22 and Figure 23 the balance between costs and benefits is presented for each region for the budget year 2010. Variation among these regions is huge: The Republic of Komi could not achieve positive results even with state support, whereas forestry in Kemerovo Oblast was profitable even without state support. The remaining regions made heavy losses but with state support their profit per hectare rose to positive figures. Further examination and a broader material base would be needed to explain these differences.

In Figure 24 the main income sources are illustrated. As for Kemerovo Oblast, it seems that their organisation of leasing is very efficient as the share of absolute collected charges from leasing is the highest, although the share of leased forestland was the lowest among the regions. This points out that the profitability of forestry on regional level is not dependent on leasing activity. Also the share of state subventions was low which indicates that Kemerovo Oblast is able to carry

out forestry independently. This trend would be welcome also in other regions if the state level profitability is to rise. As previously noted, materials were extremely limited and no in-depth conclusions should be made based on these findings.

The Russian Federation is not the only country in the world where majority of forestry revenue is collected as part of the state budget and where forestry is strongly supported by state. In the Global Forest Resource Assessment 2010 (FAO 2010) the low level of public revenue collections and expenditure on forestry indicates how the low level of efficiency of forestry in a country. In terms of global comparison the Russian Federation had among the lowest results regarding public revenue collection and expenditure per hectare, which obviously is influenced by the size of the vast forest area of Russian Federation.

7.3 Comparison of methods and results

One of the goals of this study was to conduct a comparison of a) methods for profitability assessment and b) profitability itself utilising methods of profitability assessment from both countries. Unfortunately, due to largely different forest ownership structure of forests, a lack of available materials and differences in profitability assessment methods, a concrete side-by-side comparison was not possible. However, the methods and results can be compared on a general level.

Differences were found both in the availability of profitability assessment results and methods. In Finland, which is one of leading countries for availability of forest resource information, the results of continuous follow-up and the methods are relatively easy to identify. Follow-up has been carried out for many years, in some cases decades. This means that financing mechanisms are relatively transparent and that forming a solid view of the development of profitability of forestry over the past years is easy. In Russia, however, such information is not easily available as it is published alongside scientific papers concerning the issues of profitability in Russia. This has also been a limiting factor in this study.

With regard to the methods themselves, differences can also be found here. Whereas in both countries attention is paid to describing the balance of costs and the income from forestry for the forest owner groups concerned, in Finland a strong business economic approach has been taken in describing the results of forestry in the major owner group, non-industrial private forest owners. A good example of this is the forestry return method (see section 3.2.3) which clearly considers forestry as business economic activity and describes how different components affect the result and the yield of forest investment in relation to other available investment objects.

What characterises the Russian methods is that while sources and levels of income and price levels for different products and services are listed very carefully, the cost structure of forestry cannot be ascertained from the results. As forestry in Russia is strongly budget-orientated, it should not be very difficult to implement. Also, the concept of a market economy is missing in Russian forestry, as it has been mentioned before. This can be seen in the lack of indicators describing the efficiency of forestry in terms of any kind of return on investments or assets on a federal level. This can be seen as a potential area of development in the future.

A comparison of results is somewhat difficult due to the fact that the Finnish results describe the profitability of non-industrial private forestry, but the Russian results show the profitability of

forestry for Russian Federation as the only forest owner. In Finland many private forest owners consider their forests as an investment and seek to maximise their profits. Also, the highly-developed forest industry has created favourable conditions for a highly profitable forestry in Finland. Markets work very efficiently in Finland by the laws of supply and demand and forestry in general is profitable.

In Russia the mechanism is totally different. On a federal level the forest economy, market economy function is largely missing as the main part of federal costs consists of subventions and the benefits are formed from centrally set forest charges. This situation could be compared with the Finnish KEMERA support system, but this is not the goal of this study. A very inefficient organisation of forestry, underdeveloped investment climate and consequent lack of markets can be regarded as some reasons for low profitability of forestry. One major problem is also the leasing system which does not motivate leaseholders to manage their leased forestlands in a sustainable manner. It is a known fact in Finland that carrying out silvicultural measures in time and in a proper way is crucial for future profitability of forestry.

7.4 Affecting the profitability of forestry

It is difficult to further improve profitability in a well-managed forest in Finland. However, profitability can be maximised by carefully following recommendations for successful silviculture. This obviously, requires that the forest owner is well aware of the state of his forests. Critical phases in forestry include regeneration, tending of seedling stands and the timing of final felling. For example, delaying the regeneration and tending of a seedling stand in Southern Finland so that the final felling is delayed by ten years decreases the return on investment by three quarters (Uotila 2009). Since forestry and wood production are time-consuming and slow branches, it is essential to have a forestry plan and follow it up.

The same advice also applies to the Russian forests. Although the operational environment is different in Russia, the basis for profitable forestry is in the very elementary level forest management. The purpose of this paper was not to find solutions for improving profitability of forestry in Russia. However, it can be recognised that problems in Russian forestry are very deep in the whole organisation of forestry, starting from road infrastructure and ending with the market situation and leasing. Noticeable changes need to happen before the current course can be changed.

8 Conclusion

Finland and Russia are two completely different countries in almost all ways. What characterises both is, however, the abundance of forest resources. In Finland, forests are not as strongly shadowed by other natural resources as in Russia, where oil, coal and gas have been given the attention they deserve as the economic locomotives. This has given the Finnish forest industry a good chance to develop to become a leading industry in Finland and a successful player in the global market. A successful forest industry needs to be backed-up by a strong knowledge of forestry.

The role of profitability in forestry will most probably become more and more important in both countries in the future. Therefore more study is needed and practical measures need to be taken to implement theory in practice. The differences between Finland and Russia may bring challenges to future cross-border research on this topic. Forestry as a long-term activity is especially difficult to study, as profitability assessments usually require many years of follow-up study and careful planning. Nevertheless, both countries can most probably learn from each other and benefit from this kind of cooperation.

This study should be considered as a preliminary report to prepare for future cooperation regarding the profitability of forestry, as it leaves a lot of room for future development. Although this broad study can only scratch the surface, it has been established that there are fundamental differences between the two countries and that there is a need for closer, in-depth analysis of the factors behind the profitability of forestry; especially in Russia. A lot of changes need to happen in Russian forestry before the balance between cost and revenues sees an upturn. Time will tell when Russia is ready for the forestry revolution.

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Appendix 1

The following accounts were used in forming the operating profit for the non-industrial private farm forestry. First two account groups (340*** and 378***) represent income accounts and the remaining cost accounts.

FORESTRY INCOME	340***
Standing sales income	3410
Delivery sales income	3420
Other timber sales income	3430
FORESTRY SUBSIDIES	378***
Subsidy for forestry	3781
Other subsidies for forestry	3789
MATERIAL AND SUPPLY COSTS OF FORESTRY	460***
Forest cultivation materials	4610
Fuel and lubrication costs	4620
Fertilizers	4630
Other materials and supplies for forestry	4680
OUTSIDE SERVICES OF FORESTRY	486***
Outsourcing service costs for timber procurement	4861
Outsourcing service costs for timber sales	4862
Outsourcing service costs for silviculture	4863
Outsourcing service costs for maintenance of forestry	4864
Outsourcing service costs for multiple-use forestry	4865
Outsourcing service costs for fertilization on forestry	4866
Outsourcing service costs for other fertilization on forestry	4867
Outsourcing service costs for pruning	4868
Other outsourcing service costs for forestry	4878
VARIABLE PERSONNEL COSTS OF FORESTRY	52****
Variable net salaries	5210
Income tax of forestry salaries	5220
Other tax withholdings of forestry salaries	5230
Social security contributions of forestry salaries	5240
Old-age pension insurance premiums of forestry workers	5250
Variable personnel costs of forestry	5260
Transfer of forestry personnel costs from other sectors	5280
Transfer of forestry personnel costs to other sectors	5290
Transfer of forestry personnel costs to investments	5295

OTHER VARIABLE COSTS OF FORESTRY	56****
Travel expenses of forestry workers	5610
Rental costs of forestry machinery	5620
Credit losses	5630
Other variable costs of forestry	5690
OTHER FIXED COSTS OF FORESTRY	651***
Travel costs for forestry	6510
Maintenance of forestry equipment and machinery	6520
Acquisition of small-scale forestry equipment and machinery	6530
Maintenance of forestry buildings, roads and ditches	6540
Forestry insurance costs	6550
Forestry marketing costs	6560
Real estate tax of forestry	6571
Motor vehicle taxes for forestry vehicles	6572
Inspection costs of forestry motor vehicles	6573
Forestry fee costs	6575
Other public costs of forestry	6579
Telephone charges of forestry	6581
Forestry education costs	6582
Counselling costs of forestry	6583
Forestry magazine and literature costs	6584
Membership fees of forestry	6585
Accounting, IT and other office costs of forestry	6586
Road tolls of forestry	6591
Other fixed costs of forestry	6599