Family Forestry
Future challenges and needs

Tomas Nordfjell [a] **Arto Kettunen** [b]
Birger Vennesland [c] **Kjell Suadicani** [d]

Arbetsrapport 145 2005

[a] SLU, Department of Silviculture, Umeå, Sweden
[b] TTS Institute, Department of forestry, Finland
[c] Norwegian Forest Research Institute (Skogforsk), Ås, Norway
[d] KVL, Denmark

SVERIGES LANTBRUKSUNIVERSITET
Institutionen för skoglig resurshushållning och geomatik
S-901 83 UMEÅ
Tfn: 090-786 86 34 Fax: 090-77 81 16

ISSN 1401-1204
ISRN SLU-SRG--AR--145--SE

Preface
This ”State of the art” report is the result of the work within the SNS project ”Familjeskogsbrukets framtidige utfordringar og behov”, co-ordinated by Birger Vennesland, Skogforsk, Ås, Norway. Tomas Nordfjell, SLU, Umeå has done the final editing of the report.

Umeå in June, 2005

Tomas Nordfjell

Table of contents

1 Introduction

The majority of the forest area in the Nordic countries as a whole can be categorized as non industrial private forests (NIPF), or the synonym term Family forestry. NIPF is also more and more common in the nearby Baltic republics.

The amount of forest work done on private owner basis has been decreasing considerably the last decade. Research on family forestry was quite substansible during the 1980's, but was heavily reduced during the 1990's.

Family forestry is very heterogeneous, but still an important actor in the Nordic forestry The changing structure of forest ownership, together with changes in objectives and needs of forest owners makes it challenging to describe family forestry as one group. Some of the main objectives for family forestry could be; (1) increase the income by rational silviculture and operation, and (2) increase the income for the family improving the business in a sustainable way. The former could be by engaging for example a forest owner association to use efficient harvesting technique. In this case there is no real difference in operation compared to industrial operations. However, help with decision support could be wanted, especially for those not living on their farm. This problem is also actualised by an increasing rationalisation both in the official and private sector of forestry guidance.

The latter objective could imply more self-employment. There are also possibilities to improve the activity on the NIPF by selecting business areas, e.g. combine with forest fuel handling on commercial basis, or focusing on valuable assortments to certain wood upgrading industries. In this case there seems to be quite little R&D supporting the new possibilities the present market is facing. One example in this case is a cooperative in Nord-Tröndelag, Norway specialising on alder and making that as a new business area, or farmers in Österbotten, Finland going together and supplying a school, kindergarten etc both with raw material and taking care of the heating central.

A third main objective for family forestry could be described as; (3) other main objectives than economical. Many different alternatives can be found under this headline.

One really big challenge in the problem area around family forestry is connected to the fact that the diversity of the group also creates a diversity of objectives and needs. Since it is impossible to solve every single problem, it is necessary to divide the group of family forestry into different logical categories and identify their objectives and needs. The development of information dissemination, education and extension targeted to these forest owner groups is a major challenge in all Nordic countries.

The objective of this pilot project was:
-To summarise existing knowledge about family forestry in the Nordic countries, and especially about self-employment.
-To identify NIPF research areas of interest in most of the Nordic countries

With this as a foundation, new research project applications will be aimed to solve the corresponding problems.

2 Material and methods

Most of the participating members conducted a “State of the art country report” that includes several common issues. Together, these activities form a common foundation for the development of future research proposals.

An essential part of the project has been to come together and discuss common problems related to the topic. Prior to these meetings the project participants had collected available knowledge from previous and ongoing projects within their own countries.

In the chapter “Summary and conclusions” some NIPF characteristics from the participating countries are compared, and prioritised research areas regarding self employed NIPF owners are presented.

3 Results and discussion

3.1 State of the art report from Finland

Arto Kettunen & Aki Jouhiaho, TTS Institute, Department of Forestry

3.1.1. Basic facts about family forestry in Finland

By definition, family forestry refers here to *forestry based on private, non-industrial ownership; i.e., forest holdings possessed and managed by individuals, spouses, and family members*

Non-industrial, private forest ownership is basis of Finnish forestry. Private forest holdings stand for 61 % of the forest land in Finland, and their share of the industry's annual roundwood consumption is more than 70 % (figure 1). During the last ten years, annual cuttings from private forests have increased from 29 to 49 mill.m³. At present the trend of the cutting volume seems to be still slightly increasing.

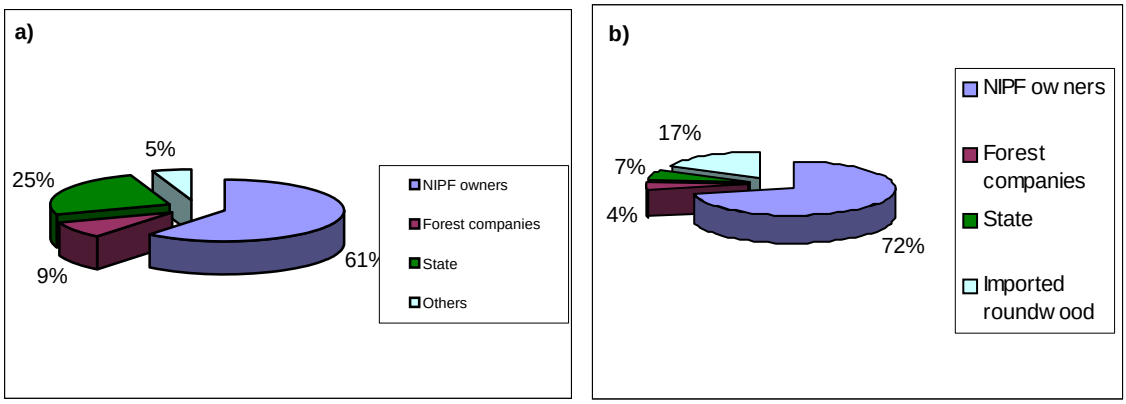

Figure. 1a). The owners of forest land in Finland. 1b). The origin of roundwood used in Finnish forest industries in 1996-2000, percentage of total roundwood consumption. (FINNISH STATISTICAL… 2003)

There are about 300 000 private forest holdings in Finland, with some 600 000 owners possessing them. The ownership structure is changing along with the changes in society: forest owners are ageing, the share of farmers among forest owners is decreasing, average size of forest holdings decreases through inheritance, and forest owners' value basis and objectives of forest ownership become more diverse. These changes lead to smaller management units in forestry, and they challenge the forestry organisations in attaining the new groups of forest owners and meeting their requirements.

The two major timber selling methods are sales of standing timber and delivery sales. The share of delivery sales of the total roundwood production from private forests has decreased steadily during the last decades, being 17 % of the 45.9 mill.m³ of roundwood in 2003 (FINNISH STATISTICAL…2004). However, the absolute amount of delivery sales timber has kept quite steady, around 10 million m³ per year. The profitability of delivery sales harvesting has decreased drastically in twenty years. Today, the average unit price paid for self-employed logging and forest haulage is ca. 10.40 € / m³ for pulpwood, and 1.30 € / m³ for logs.

3.1.2 Finnish organisations related to family forestry

In Finland the top public forest authority is the *Ministry of Agriculture and Forestry*. The Ministry of the Environment has the power over the affairs of conservation. The Ministry of Agriculture and Forestry's Department of Forestry directs and develops Finland's forest policy, promotes sustainable forest management, wood production and use of forest resources, and the protection of the forest's natural diversity. The Department of Forestry directs state-financed forest management and improvement projects, as well as forest planning and information. The department coordinates also regional Forestry Centres. (http://www.mmm.fi/)

The Forestry Development Centre Tapio provides a wide range of services and products for forest professionals for the sustainable management and utilisation of forests. FDC Tapio announces silvicultural recommendations, which make an essential tool for the guidance of silviculture in private forests. FDC Tapio offers also training for forest professionals. (http://www.tapio.net/tapionet.jsp)

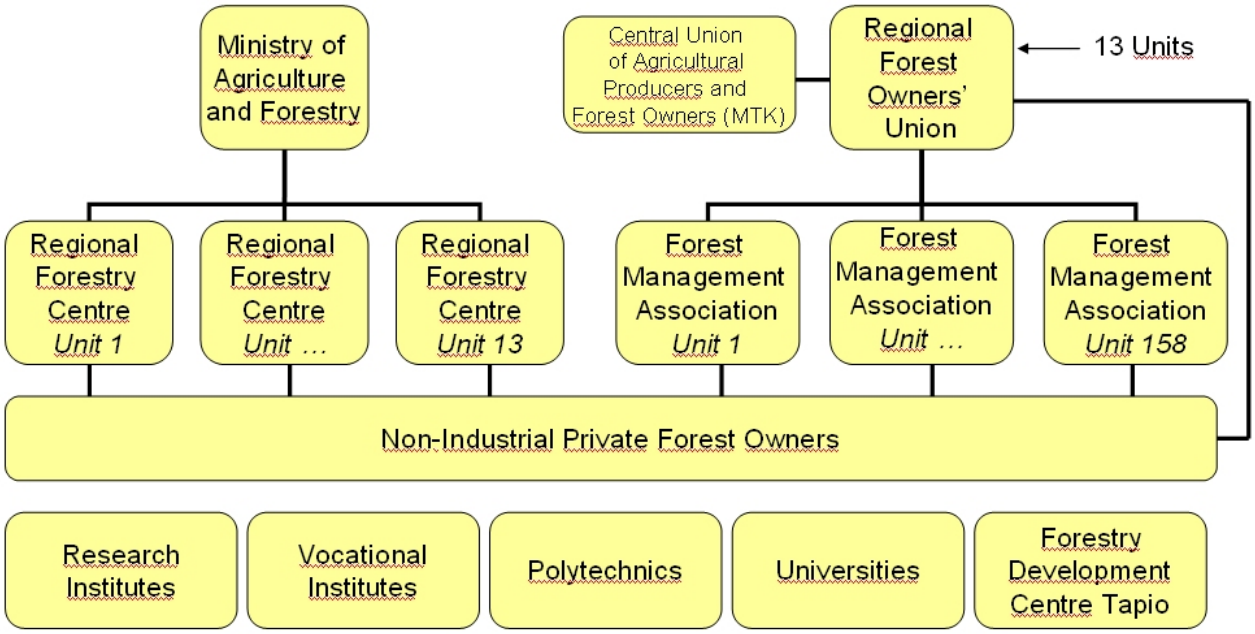

Figure 2. Finnish organisations related to family forestry.

The 13 Forestry Centres are organisations for maintaining forestry legislation and promoting forestry within their regions. A forest owner is under an obligation to inform the relevant Forestry Centre about all harvesting and regeneration work. Forestry Centres compile the forest management plans for forest holdings in their region, as well as maintain the quality and quantity of silvicultural and forest improvement work in their area of operation. (http://www.metsakeskus.fi/)

Local Forest Management Associations are working in close cooperation with forest owners in all practical matters related to forests – from planting to harvesting. Forest Management Associations are governed and financed by forest owners. The Act on Forest Management Associations enables them to collect a statutory forest management fee from forest owners, with only few forest owners relieved from the fee.

FMAs offer training and guidance, and provide professional assistance in forestry issues, thus protecting forest owners' interests and helping to achieve their objectives. The Associations take care of majority of planning and implementation of forestry measures in private forests. They also provide consulting services in timber sales planning and transactions. About 80 – 90 % of the activities related to timber production in private forests as well as approximately 70 % of preliminary planning of timber sales are carried out by FMAs. Forest owners can also grant their FMA the power of attorney concerning wood sales and deliveries. The demand for power of attorney services has grown steadily with the urbanisation of the forest owners. Currently about 40 % of timber sales from private forests are based on attorney sales. (http://www.mhy.fi/home.php)

The Regional Forest Owners' Unions are regional organs of the local Forest Management Associations. Their goal is to promote private forestry and protect private forest owners' interests as well as guide and develop the activities of the FMAs and the cooperation among forest owners. Regional Unions also provide guidance and assistance in the marketing of forest products. The Unions are financed primarily by membership fees paid by the FMAs. (http://www.liitto.mhy.fi/)

Besides the regional Forest Management Associations, Forestry Centres and FDC Tapio, several *vocational institutes and polytechnics, and two universities* provide extension and education in the field of forestry. Moreover, *research institutes*, such as Finnish Forest Research Institute (METLA), TTS Institute, Agrifood Research Finland (MTT), and Pellervo Economic Research Institute (PTT) provide plentiful information concerning family forestry in Finland.

3.1.3 Self-employment within family forestry

By definition, self-employment of a forest owner refers here to *forestry work done by the forest owner, or by the family members, on his/her forest property.*

Self-employment in timber harvesting

In 2002, ca. 12 % (5.3 mill.m³) of felling and 9 % (4.3 mill.m³) of forest haulage of the roundwood removals in NIP forests were done by forest owners. Correspondingly, the share of self-employment of the total of delivery sales timber was 52 % in logging, and 42 % in forest haulage. Self-employment has been decreasing during the 1990's, but there's evidence that this decrease has stopped by the turn of millenium (Fig. 2). (FINNISH STATISTICAL…2003, KOSKIPÄÄ 2004)

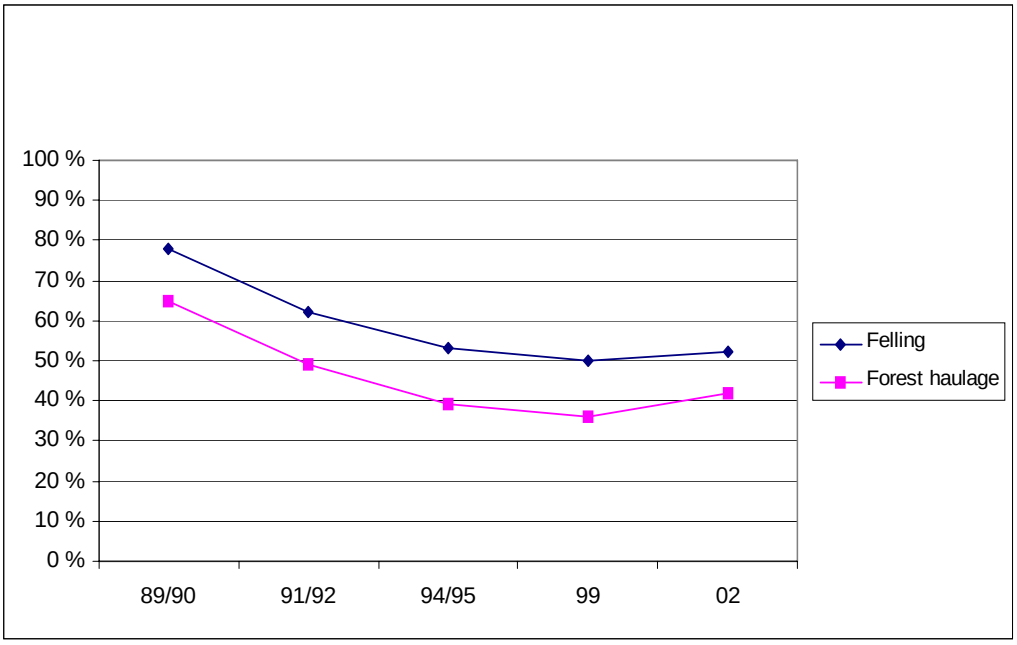

Figure 2. The proportions of self-employed felling and forest haulage of timber in the total volume of delivery-sales timber according to the studies made at TTS Institute (KOISTINEN 1991, 1994, 1996, HÄMÄLÄINEN & KETTUNEN 2001, KOSKIPÄÄ 2004).

Despite the rapid mechanisation in forest companies' timber harvesting, the harvesting methods applied in self-employed felling and forest haulage have remained relatively tradional. In 2002, as much as 94 % of self-employed felling was done manually with chain saw while only 2 % were felled with a single-grip harvester. In forest haulage, agricultural tractor equipped with forestry trailer and hydraulic loader was major method with the share of 73 %. Other methods based on agricultural tractor (e.g. winch with mechanical loader and skidding grabble) represented 17 % of self-employed forest haulage. The remaining 10 % were hauled with a forwarder (8 %) and other methods (2 %).

Along with the decreasing profitability of self-employed timber harvesting, the non-economical factors dominate as motives for self-employment. In 2002, self-employed forest owners mentioned "possibility to influence the quality of harvesting work" and "physical excercise and recreation value of work" as two main reasons to engage self-employment in harvesting. A typical self-employed forest owner in harvesting work is a 53-54 year old man, full-time farmer, living permanently on farm with forest holding of ca. 50 ha. Self-employed forest owners had made smaller delivery sales transactions than those who contracted the harvesting work to outsiders (e.g. in felling, average of 135 m³ for self-employed, and 339 m³ for those who contracted the felling work). (KOSKIPÄÄ 2004)

Self-employment in silvicultural operations

Traditionally, the self-employment rate in silvicultural work has been high in Finland (Fig. 4). The regeneration of logging sites, improvement and tending of young stands, among other silvicultural operations have been in the responsibility of family forest owners. Despite the attempts to mechanise the silvicultural operations, they are still done almost entirely manually. There's a national concern about the achievement of the annual goals of silvicultural work. This concern is mainly caused by the increase of ageing and urban forest owners, and the lack of professional forest workers. Thus, the maintenance of vigorous rural

areas and self-employed forest owners that are capable and willing to do forest work, is of primal importance in the Finnish forest sector.

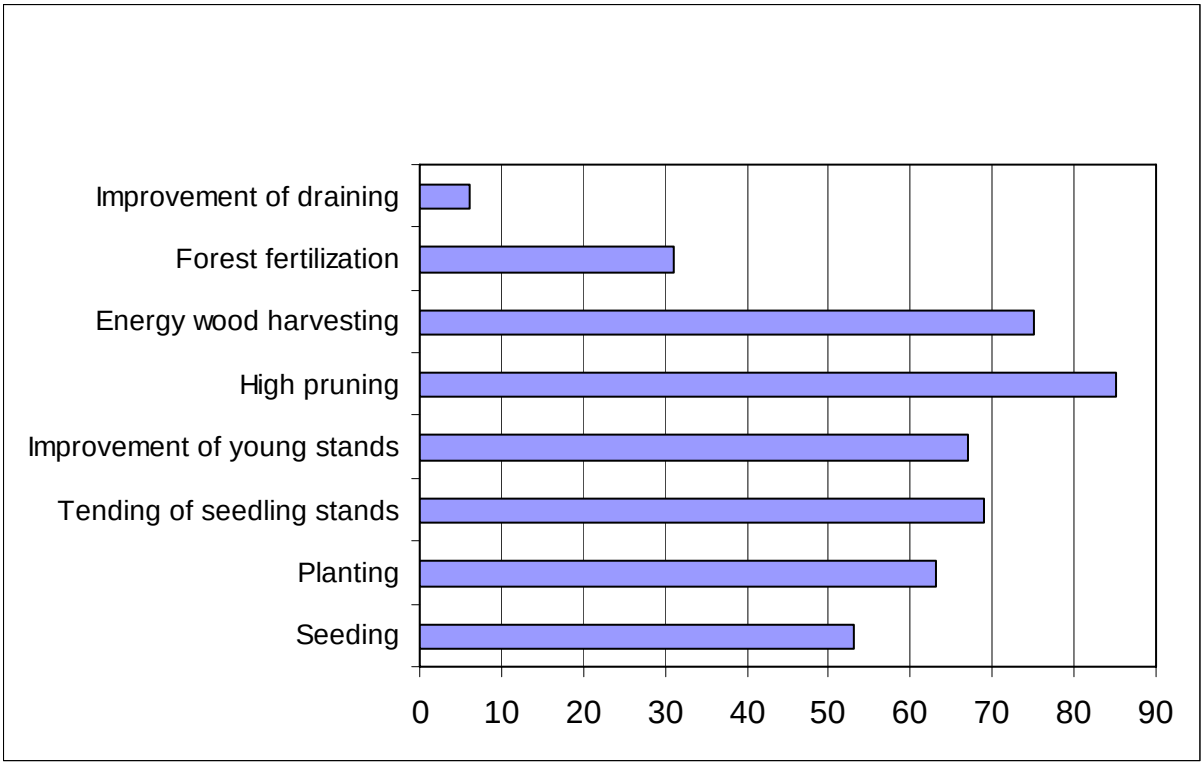

Figure 4. The proportion of self-employment in silvicultural work during 1994-1998 (KOHO ET AL. 2004).

KOHO ET AL. (2004) compared the characteristics of self-employed forest owners to those that contracted the forestry work to outsiders (with all notable forestry operations included). In the model explaining self-employment, the factors that increased self-employment were a) forestry education, b) middle-sized income (25 000 - 67 000 €/a), c) either small or big forest holding, and d) entrepreneurship in forestry, agriculture or other branch of business. Correspondingly, the factors that decreased self-employment were a) ageing of forest owner, b) increasing distance between forest owner's residence and his forest holding, and c) increasing field area in farming. The results refer that entrepreneurship and forestry know-how indicate self employment in forest work, and that ageing of forest owner and full -time farming lead to decrease in self-employment.

3.1.4 Research activities at the TTS Institute concerning family forestry

The TTS Institute is the research, development and training institute for agriculture, forestry, home economics and related fields. The Department of Forestry is one of the three research and development departments at the TTS Institute.

The Department of Forestry has specialised in developing technology for use both in private forestry and by small-scale entrepreneurs in the forest sector and woodworking industry. The department has also been involved in developing the use of bioenergy. Moreover, the behaviour of private forest owners, forest work, enterprise economics and the harvesting and utilisation of biofuels are studied. The department develops economical and safe working tools and methods and provides project coordination for businesses. Finally, the department

produces information for forest policy decision-makers, organisations of private forestry, small-scale forest enterprises, private forest owners, and one-family house owners.

Ongoing and planned projects with connection to family forestry

Productivity and quality of forest owners' silvicultural work
Duration: 2005-2007
Contact person: Jari Valkonen

The objective of the project is to find out the factors that affect to the differences in productivity and quality of work between forest owners. The data of productivity will be collected by follow-up studies on three Forestry Centres and it will be accomplished by expert views. The quality study will mainly be based on the standard control data collected by Forestry Centres. The project is to be started if funding will be granted to it.

Development of forest owners' skills and knowledge
Duration: 2001-2004
Contact person: Arto Kettunen

The aim of the project is to activate the supply of training and advisory services for private forest owners by developing the practices, which will help the training organisations in finding their customers better and more precisely. In the project, a customer database is being developed, and marketing methods were tested in forestry services marketing. Project terminates by the end of 2004.

References: PESONEN 2003, KETTUNEN ET AL. 2004.

Development of the compilation of statistics on delivery logging
Duration: 2003-2005
Contact person: Arto Kettunen

In the project, a new method will be developed to gather information on delivery sales timber harvesting, and on silvicultural work performed by NIPF owners in Finland. Two methods for collecting this data will be tested: one relying on direct contact to forest owners by mail enquiry, and the other focusing on indirect information by interviewing the regional private forestry professionals. The reliability of the two methods, and their ability to produce usable data based on areas of operation of the 13 Forestry Centres in Finland, will be analysed. In the data retrieval, project focuses on three Forestry Centres situated in Southern Finland. Project terminates by June 2005.

References: KETTUNEN 2004

Managing and developing the chopped firewood production processes
Duration: 2002-2004
Contact person: Aki Jouhiaho

The aim of the project is to improve the competitiveness of chopped firewood by producing information that can help to reduce the firewood production and delivery costs while at the same time increase the quality of chopped firewood. In addition, the methods and volume of

commercial chopped firewood production and the chopped firewood trade are studied in Finland, Sweden, Norway, Denmark, Germany and Spain.

Chopped firewood trade is typically conducted by private forest owners. 67 % of the all firewood merchants have agriculture and forestry as their main sources of livelihood. In addition, 41 % of the raw material comes from the merchants' own forests and 46 % is purchased from other private forest owners.

References: JOUHIAHO 2004, JOUHIAHO & KÄRHÄ 2003, KÄRHÄ & JOUHIAHO 2003, KÄRHÄ & SEPPÄNEN 2003

Artificial drying and quality controlling of chopped firewood
Duration: 2004-2005
Contact person: Jyrki Kouki

The aim of the project is to study the effects of raw material and dried chopped firewood storage on the quality of chopped firewood and the functionality of the developed theoretical drying programme under field conditions.

A saw-knife for high pruning
Duration: 2003-2004
Contact person: Arto Mutikainen

The aim of the project is to study a new saw-knife tool suitable for high pruning, with application of a comparative time study. In the study the productivity and costs of a saw-knife and ordinary pruning saw are studied.

High pruning is a typical example of self-employed silvicultural operation in Finland. 85 % of all high pruning is done by private forest owners.

Reference: MUTIKAINEN & JOUHIAHO 2004

3.1.5 Unsolved questions and development needs of self-employed forest work

In the following, a list of yet unsolved questions, development needs, and potential research subjects concerning self-employment in forest work, is given. The list is based on the above description of self-employment among Finnish non-industrial forest owners, stressing the potential Scandinavian cooperation in potential future research projects.

a. Productivity and quality of self-employed silvicultural work

b. Information needs concerning working methods, ergonomics and work safety in self-employed forest work

c. Profile of self-employed forest owner

References

Finnish Statistical Yearbook of Forestry. 2003. Finnish Forest Research Institute. SVT 2003:45.

Hämäläinen, Aki & Kettunen, Arto. 2001. Self-employment and working methods in delivery sales of timber by Finnish non-industrial private forest owners. Työtehoseuran julkaisuja 378. [In English]

Jouhiaho, Aki (edit.). 2004. Pilkkeen kaupallinen tuotanto. Summary: Commercial production of chopped firewood. Työtehoseuran julkaisuja 392. [In Finnish with English summary]

Jouhiaho, Aki. & Kärhä, Kalle. 2003. The chopped firewood trade in Western Europe. In: Bioenergy 2003 Conference 2.-5.9.2003 Book of Proceedings. Finbio – The Bioenergy Association of Finland: 250-252

Kettunen, Arto. 2004. Delivery sales harvesting sets the base for self-employment in forestry. English summary. Teho 1 / 2004.

Kettunen, Arto & Kärki, Pirjo. 2004. Metsänhoidon työnopastuspalvelut metsänomistajille. A silvicultural work instruction service for forest owners. Työtehoseuran metsätiedote 678. [In Finnish with English summary]

Kettunen, Arto; Palin-Ristimäki, Annika; Viik Kirsi; Rauhala, Outi & Soininen, Kirsi-Marja. 2004. Metsänomistajien neuvontapalveluiden markkinointi. Summary: Marketing forestry extension services for private forest owners. Työtehoseuran metsätiedote 674. [In Finnish with English summary]

Koho, Reino; Hänninen, Harri; Karppinen, Heimo & Ovaskainen, Ville. 2004. Omatoimisuus metsätaloudessa. Finnish Forest Research Institute. Bulletin 912. [In Finnish]

Koistinen, Arto. 1996. Metsänomistajien omatoimisuus korjuukaudella 1994/95. Summary: Finnish forest owners` self-reliance in forest work during the 1994/95 timber harvesting season. Työtehoseuran julkaisuja 347. [In Finnish with English summary]

Koistinen, Arto. 1994. Tilan ulkopuolisen osa-aikatyön yleisyys ja määrä yksityismetsissä. Summary: The frequency and extend of part-time work done outside the farm in privately owned forests in Finland. Työtehoseuran julkaisuja 332. [In Finnish with English summary]

Koistinen, Arto. 1991. Yksityismetsänomistajien tekemän metsätyön kehitys. Summary: On the development of forestry work carried out by private woodlot owners in Finland. Työtehoseuran julkaisuja 325. [In Finnish with English summary]

Koskipää, Tuomas. 2004. The structure and performers of delivery sales harvesting. Master's thesis. Unpublished manuscript. [In Finnish]

Kärhä, Kalle. & Jouhiaho, Aki. 2003. The productivity of sawing chopped firewood machines. In: Bioenergy 2003 Conference 2.-5.9.2003 Book of Proceedings. Finbio – The Bioenergy Association of Finland: 224-246.

Kärhä, Kalle. & Seppänen, Anne. 2003. The production of chopped firewood in Finland. Julkaisussa: Bioenergy 2003 Conference 2.-5.9.2003 Book of Proceedings. Finbio – The Bioenergy Association of Finland: 247-249.

Mutikainen, Arto & Jouhiaho, Aki. 2004. Sahaveitsi pystykarsintaan. Summary: A saw-knife for high pruning. Työtehoseuran metsätiedote 676. [In Finnish with English summary]

Pesonen, Juha-Matti. 2003. Metsänomistajien neuvontapalveluiden tehostaminen. Summary: Strenghtening advisory services for private forest owners. Työtehoseuran metsätiedote 661. [In Finnish with English summary]

Størdal, Ståle & Vennesland, Birger. 2004. Family forestry – future research needs. State-of-the-art report from Norway. Unpublished manuscript.

Homepages of Finnish organisations in connection to family forestry (most of them include some information in English or Swedish):

http://www.tapio.net/tapionet.jsp
http://www.mhy.fi/home.php
http://www.metsakeskus.fi/
http://www.liitto.mhy.fi/
http://www.mmm.fi/
http://www.metla.fi/
http://www.mtt.fi/
http://www.ptt.fi/
http://www.tts.fi/

3.2 State of the art report from Sweden

Tomas Nordfjell, Gun Lidestav, Christina Berlin & Ola Lindroos, SLU, Faculty of Forestry, Department of Silviculture, Umeå, Sweden

3.2.1 Basic facts about family forestry

The total land cover in Sweden is 41 million ha and according to the Swedish definition (increment of at least 1 m^3 per ha and year). About 55% of that area (22.5 million ha) are productive forest land, (Anon 2003). According to international definitions 67% the Swedish land cover are forest (Anon 2001). 51% of the productive forest land (11.5 million ha) is owned by non-industrial private forest owners (NIPFO), and as much as 58% of both total standing volume and the total forest growth is on their land. The total population in Sweden is 8.9 million persons, and 4% of them are NIPFO. This means that NIPFO are the most important forest owners in Sweden and that they are a significant part of the Swedish population.

The structure among NIPFO have changed much during the last 50 years (Törnqvist 1995). The trend has gone from an almost total majority of male NIPFO with only one owner at each forest holding, also being a farmer and living permanent on the estate (cf. Lönnstedt 1993). In the year of 2000 only 20% of the non-industrial private forests holdings (NIPFH) were managed in combination with agriculture (Anon 2003). That development shows many similarities with the situation in most of the industrialized countries (Eriksson 1990). The total number of NIPFO has increased rapidly, from 248 000 in 1976 (70% being the only owner of the forest holding) to 343 000 in 1992 (43% being the only owner of the forest holding). In the year of 2000 the total number of NIPFO were 354 000 (cf. Anon 1979; Anon 1994; Anon 2003). 34% of the NIPFH were owned by persons not living permanent on their estate (definition: living in an another community, the average size of a community is 1419 km^2) and 38% of the NIPFH were owned by women in the year of 2000 (Anon 2003) (cf. Lidestav 1998). Basic data on NIPFO and NIPFH (above 5 ha) are presented in table 1.

Table 1. Basic data on Swedish non industrial forest owners, and their holdings, 1997. (after Lidestav & Nordfjell, 2002; 2003)

	Owner category (area and number of forest owners)						
Forestland size category	Mean Area (ha)	One male owner	One female owner	Two or more male owners	Two or more female owners	Two or more owners of both sexes	Total number of forest owners
Small 5-49 ha	22	58 787	20 694	20 434	8 938	95 975	204 828
Medium 50-399 ha	112	25 721	6 233	13 448	4 659	62 909	112 970
Large 400 ha -	651	688	144	585	134	2 891	4 442
Total	55	85 196	27 071	34 469	13 731	161 775	322 239

3.2.2 Organisational structure of family forestry

In the 1920´s and 1930´s the non-industrial private forest owners (NIPFO) organised themselves into associations. The primary reason was to accomplish a stable market situation for the members' timber deliveries and besides that to enable further development of methods for silviculture.

Today, approximately 47% of the NIPF owners are associated to one of the five major forest owner associations in Sweden. These associations offer their members information, guidance

and education in different aspects of forest management. Apart from the service that is offered, the associations also run nineteen sawmills and three pulp industries, which give the organisations a significant market position. In other words they are key actors when prices are negotiated and the Federation of Forest Owner Associations (LRF Skogsägarna) have an impact on the national economic policy in forestry issues (cf. Andersson et al. 1980; Berlin et al. 2003).

The Swedish trade of timber products has developed from a principally national market to a market with a substantial import from the Baltic region and Russia. At the same time, parts of the inland of Northern Sweden are suffering from unprofitability in timber harvesting. In addition to these changes of supply and demand, the ownership structure is changing. Joint ownership of forest farms has become more and more common. In many cases, the income from the holding is no longer of decisive importance to the owner as they usually have an employment outside the forest farm and it has also become more common that the owners live outside the property. Previous studies have pointed out that the NIPF owners have become more and more heterogeneous and consequently it is relevant to divide the owners into subgroups. One criteria of division can be members and non-members in forest owner associations.

In the following data on the following groups of forest owners are presented:
Male owners (MO), 63% of the population; Female owners (FO), 37% of the population; Resident owners (RO), 49% of the population; Non-resident owners (NRO), 51% of the population; Members in the forest owner association (MFOA), 47% of the population; Owners not members in a forest owner association (NMFOA), 48% of the population (5% did not give any answer concerning membership); Owners to holdings between 5 and 50 ha (SMALL), 63.5% of the population; Owners of holdings between 50 and 400 ha (MEDIUM), 35% of the population; Owners of holdings above 400 ha (LARGE), 1.5% of the population.

Male owners (MO), resident owners (RO) and members of the forest owner association (MFOA) have in average larger forest holdings (58-66 ha) than female owners (FO), non-resident owners (NRO) and owners not members in the forest owner association (NMFOA) (47-53 ha) (Table 2). MO and RO are in average older (53.2-58.4 year) than FO and NRO (52.6-52.9 years), and owners of 5-49 ha holdings (SMALL) are in average older (53.7 year) than owners of 50-399 ha holdings (MEDIUM) (51.7 year). 80-87% of all forest owners are married, or have a partnership, and have children. The only difference found here is that FO have children in a higher extent than MO.

MO, MFOA, SMALL and MEDIUM have in higher extent a permanent living on the holding (49-58%) than FO, NMFOA and owners of holdings larger than 400 ha (LARGE) (40-44%). MO, RO, MFOA and MEDIUM owners have in a higher extent (55-58%) than FO, NRO, NMFOA, SMALL and LARGE owners (43-52%) been brought up on the holding they own.

MO, RO and SMALL owners are in a higher extent (30-34%) than FO, NRO, MEDIUM and LARGE owners (20-28%) a single owner of the holding. However, for all groups the majority (66-80%) owns the property together with someone else. FO, RO and SMALL owners do that together with their spouse in a higher extent (36-52%) than MO, NRO, MEDIUM and LARGE owners (12-30%). FO, NRO and LARGE owners do it together with relatives in a higher extent (36-58%) than MO, RO and SMALL owners (14-32%).

MO, RO and MFOA, including their families, do farming themselves in a higher extent (33-53%) than what FO, NRO and NMFOA do (12-22%). MO, RO, MFOA, MEDIUM and LARGE owners considering themselves as forest farmers in a higher extent (32-39%) than what FO, NRO, NMFOA and SMALL owners do (8-20%). The same tendencies can be found concerning if the forest owners consider themselves as agricultural farmers.

Table 2. Profile for Swedish NIPF owners

	Male	Female	Resident	Non-resident	Member	Non-member	Small	Medium	Large
Mean size of the forest holding, ha	58.2a	49.4b	58.4a	52.9b	52.7a	54.0a	21.5a	112.3b	650.6c
Mean age, years	53.2a	52.6b	58.4a	52.9b	65.7a	46.6b	53.7a	51.7b	52.7ab
Proportion of married/partner-ship, %	81.2a	83.0a	80.8a	81.5a	80.1a	82.4a	80.5	82.8	83.6
Proportion of children (bröstarvingar), %	81.1a	87.3b	83.4a	83.4a	82.2a	85.0a	83.6a	83.2a	84.5a
Proportion with permanent living on the farm, %	52.1a	44.2b	100a	0b	57.8a	42.2b	49.1a	49.7a	39.7a
Proportion brought up on the farm they own , %	57.4a	45.9b	56.7a	52.1a	58.0a	43.2b	47.9a	54.6b	44.1ab
Proportion that are single owners, %	33.6a	20.2b	31.6a	26.1b	30.5a	28.2a	31.1a	24.5b	20.9b
Proportion that owns together with spouse,%	30.5a	38.7b	51.9a	15.6b	33.9a	34.9a	36.0a	30.0b	12.0c
Proportion that owns with relatives%	31.9a	36.3a	14.0a	52.3b	30.1a	33.1a	29.6a	39.8b	58.2c
Proportion that have attained the property from their parents, %	67.0	59.2	66.9	69.7	69.2	56.2	61.3	69.1	63.7
Proportion that have attained the property from their spouse's parents, %	6.4	16.0	13.5	6.3	9.7	11.1	10.7	8.6	7.7
Proportion that whish one child/relative to take over the property, %	38.9	28.9	42.9	27.7	40.6	32.0	32.7	39.9	31.2
Proportion that whish > child/relative to take over the property, %	27.2	31.6	20.6	36.7	27.6	29.5	27.6	30.8	37.7
Proportion that do farming themselves (incl family), %	32.8a	21.2b	53.2a	12.1b	42.1a	22.4b	25.6a	24.1a	17.4a
Proportion of owners considering themselves as Forest farmers, %	37.6a	7.7b	37.8a	15.5b	38.8a	15.4b	20.4a	37.2b	32.2b
Proportion of owners considering themselves as Agri.farmers farmers, %	29.7a	9.2b	38.6a	6.5b	33.4a	12.6b	18.3a	29.0b	22.2b

[abc] Within a row, and within sex, residence, membership and size of the holding: Values followed by different letters are significant different at $p<0.05$ level.

3.2.3 Forestry activity

The bigger forest holding, the more frequent are forest activities like harvesting and silviculture operations performed during a single year (Table 3). In general, the activities are higher on forest holdings with MO, RO and MFOA than with FO, NRO and NMFOA.

Table 3. Proportion (%) of forest farms where harvesting and silviculture have been performed during the year of 1996

Task	Male owners	Female owners	Resident owners	Non-resident owners	Members	Non-members	Small	Medium	Large
Clear cut	25.7a	15.8b	23.6a	18.2b	30.6a	16.4b	16.0a	35.9b	48.2c
Thinning	44.6a	41.0a	52.9a	33.9b	50.4a	38.9b	39.8a	51.3b	44.4ab
Cleaning	45.9a	38.2b	51.2a	37.6b	45.4a	44.3a	39.1a	59.5b	58.8b
Other cuttings	20.3a	18.6a	23.7a	16.8b	25.3a	16.6b	17.2a	25.0b	32.7b
Mechanised soil preparation	14.6a	13.1a	15.4a	12.7b	18.6a	9.6b	8.3a	26.0b	44.8c
Planting	27.5a	21.0b	26.8a	22.5b	31.0a	22.2b	20.1a	36.3b	45.8c
Other task	7.3a	5.8a	5.8a	4.9b	5,7a	5.3b	6.4a	7.6a	10.3a
No operation done	15.0a	27.4b	20.2a	28.0b	16.8a	24.7b	26.9a	14.0b	15.6b

3.2.4 Self employment within family forestry

Historically, mechanisation of logging has led to a decreased participation in this activity among NIPF owners (Törnqvist 1995). Today logging is mainly carried out by entrepreneurs equipped with harvesters and forwarders. However, there are still a great number of operationally active NIPF owners (OPANO). Annually they cut, extract and deliver 6.1 million m³ to wood industries. The volume corresponds to 15% of the total cut in NIPF (Anon. 2003). In addition, a considerable amount of firewood, mainly cut by OPANO, is produced. In 1999, firewood consumption in private houses was 5.2 million m³. Furthermore, some 31 500 ha are planted and 114 500 ha are cleaned by OPANO, corresponding to 55% respectively 69% of the total treatment on NIPF. Half of the total number of working hours in Swedish forestry, or 12 million hours, is conducted by OPANO (Anon. 2003).

Until the 1950's, the same technique was used in forest operations, whether conducted on NIPF or industrial forest (Törnqvist 1995). Mechanisation and rationalisation in industrial forest operations led to usage of advance, highly productive and expensive machinery. Contemporaneously, a technique adapted to the operationally active NIPF-owners developed (Törnqvist 1995). Most often this user group demand low investment levels over high productivity when compromising is necessary. Possibilities to multiple usage is preferable for the normally only part time active NIPF-owner. Technological development evolves new equipments, proposing NIPF-owners different ways of conducting forestry (cf. Ager 1995).

3.2.5 Current knowledge of self-employment

The chain saw is the mainly used felling equipment among OPANO. Advance felling and processing equipment adapted to farm tractor exists, but is not as common. In 1984/1985, Swedish NIPF-owners possessed 246 200 chain saws, with great variations in age and condition (Sennblad 1988). The brush saw is the OPANO' mechanised aid for spacing young stands. Alternatives, i.e. manually sharp edged tools, are scarcely used. In 1984/1985, Swedish NIPF-owners possessed 83 600 brush saws (Sennblad 1988).

Modern farm tractors equipped with a trailer and a hydraulic grapple loader offers an attractive alternative of extracting timber for the NIPF owner. Especially forest owning farmers employ this equipment, using their tractor for agriculture purposes in the summer

time and in the forest in the winter time. The grapple loader is mounted on the trailer and its hydraulic system is driven by the tractor's power take off. In 1984/1985, Swedish NIPF-owners possessed 91 700 farm tractors (Sennblad 1988). The first snow mobiles were imported to Sweden 1955. It is a track driven snow vehicle which is mainly used for personal transportation. Snow mobiles are also used for extraction of timber, even though the number of machines used for this purpose is low (Geijer 1983). Sennblad (1988) showed that 7 700 forest holdings extracted timber by snow mobile 1984. The timber load is hauled on a sleigh. In 1981 80 000 snowmobiles were registered for active use (Geijer 1983). An ATV is a terrain vehicle with four or more wheels, all driven. The ATV carries the operator and the terrain vehicle's mass does not exceed 400 kg. The ATV was introduced to the Swedish market 1985 (Frisk & Kjellstrand 1988) and it is in forestry used to transport people, equipment, plants and to extract timber. The timber load is hauled on a trailer. A small forwarder is a terrain vehicle where with a mass between 1 – 3.5 tonnes. It is used to haul timber and the vehicle carries the operator as well as a small hydraulic grapple loader. The smaller terrain vehicles in the category resemble the ATVs, while the larger ones resemble conventional forwarders.

In Sweden 2002, at least 46 800 petrol chain saws were sold (Table 4), and 59% of them had a displacement exceeding 40 cm³. The total value for the sold chain saws was 154.4 millions SEK. 72% of the value was distributed on saws with a displacement exceeding 40 cm³. At least 17 500 petrol brush saws with an engine displacement exceeding 30 cm³ were sold. The total value for the sold brush saws was 88 million SEK. 3 776 farm tractors were sold in Sweden whereof 97% had an engine power exceeding 50 kW and 20% exceeding 100 kW. 98.5% of the tractors were equipped with four wheel drive. At least 1 213 grapple loader trailers were sold to a value of 101.3 million SEK on the Swedish market during 2002. During the period July 2000 through June 2001, 8 422 snowmobiles were sold on the Swedish market. There were totally 170 757 snow mobiles in Sweden the 31 of December 2001. Out of these, 57% were registered for active use that specific day. 3 211 ATVs were sold in Sweden 2002. Totally, there were approximately 20 000 ATVs on the Swedish market by the end of year 2002. On the Swedish market 2002, 73 small forwarders to a value of 23.3 million SEK were sold.

Table 4. Numbers and value of sales 2002 for equipment typically used by NIPFO (after Lindroos 2003)

	Equipment category						
	Chain saws	Brush saws	Farm tractors	Grapple loader trailers	Snow mobiles	ATVs	Small forwarders
Numbers	46 800	17 500	3 776	1 213	8 422 [a]	3 211	73
Total value, million (SEK)	155	88	-	101	-	-	23
Value (SEK / unit)	3 301	5 029	-	83 512	-	-	319 178

[a] numbers for the period July 2000 through June 2001.

Compared to earlier sales statistics, the number of chain and brush saws are rather constant, the number of small forwarders have decreased and the number of grapple loader trailers have increased (cf. Drakenberg et al. 1978; Herlitz 1993).

3.2.6 Current research in the field of family forestry

With this background, The Forest Faculty at SLU, The National Institute for Working Life and The Federation of Forest Owners Association have initiated a 5-year action and research program (2002-2007) called The FÖR-program - Working condition and more efficient technology for self-employed forest owners. Associated to the program, headed by SLU, Division of Forest Technology, is also a network of researchers from Swedish Work Environment Authority, Swedish Machinery Testing Institute and College of Dalarna, as well as manufacturers of forestry equipment.

The aim of the FOR-program is to help to diminish the accidents and work related injuries among self-employed forest owners by a) initiating the development of more efficient and better individually adopted equipment and working techniques b) increase of knowledge about risks among operators and producers of forestry equipment and c) development of strategies for information and extension focusing on different risk categories.

The research and development should include the most frequent operations in self-employment such as cutting of firewood, silviculture and harvesting and transportation in seed tree and windthrow harvesting and thinning. A number of activities will be linked together to a firm program with family life quality as one important theme. Different individuals have different risk behaviour. Risk behaviour is influenced by both biological factors and social and cultural factors and it is obvious that there exist gender differences as well. Furthermore it is obvious that work equipment are generally not adapted to women's size. Suggested measures and dissemination of information must be adapted to different categories and take into consideration that private forestry is mainly a family matter.

The research part of the program will generate 3 doctoral theses and 6 master theses, i.e. the largest work environment investment on NIPF since 1980's in Sweden. The action part of the program will increase knowledge on risk among self-employed forest owners and hopefully reduce the rate of accidents to 50%. The structure and planned activities are presented below:

- One PhD project on risk behaviour.
- One PhD project on technology for forest owners
- One PhD project on gender perspective on working condition and use of technology with special focus on learning and safety/risk behaviour.
- 1-2 Master theses per year on client basis.
- External contribution in assisting, testing and evaluating technology
- Presentation of "state of knowledge" each year by a workshop financed by the participants.

3.2.7 Unsolved questions and development needs in self-employment

For the nearest future (3 years) it is enough to point out the subjects mentioned under chapter 3.2.5 (Current research in the field of family forestry).

References

Ager, B. 1995. Om självverksamhet, rationalitet och teknikval i småskogsbruket. Garpenberg: Sveriges lantbruksuniversitet, institutionen för skogsteknik. Uppsatser och Resultat nr 282.

Andersson, B, Häckner, J & Lönnstedt, L (1980). Skogsägareförenigarna i ett historiskt perspektiv. Sveriges Skogsägareföreningarnas Riksförbund SSR, Borås: AB J F Björsells

Anon. 1979. Ägarförhållandena inom skogsbruket. Statistiska centralbyrån, Stockholm, Statistiska meddelanden J 1979:14.

Anon. 1994. Ägarförhållandena i skogsbruket. Specialstudie i samband med 1992 åra lantbruksräkning. Statistiska centralbyrån, Stockholm, Statistiska meddelanden J 1994:13.

Anon. 2001. Forest Conditions in Europe 2001, Executive Report, UN/ECE and European Commission. ISSN 1020-3729.

Anon. 2003 Statistical Yearbook of Forestry 2003. National Board of Forestry, Jönköping, Sweden. www.svo.se

Berlin, C., Lidestav, G. & Nordfjell, T. 2003. Swedish non-industrial private forest (NIPF) owners in co-operation. Paper presented on Joint FAO/ECE/ILO committee on forest technology, management and training workshop on forest operation improvements in farm forestry. Logarska Dolina, Slovenia, 9-14 September 2003. (Also printed in: SLU, Department of Silviculture, Umeå, Reports no 56).

Drakenberg, K., Lidén, E. & Sennblad, G. 1978. Skogsvårdsundersökning inom privatskogsbruket. Sveriges lantbruksuniversitet, Institutionen för skogsteknik. Garpenberg. Rapporter & Uppsatser nr 122.

Eriksson, M 1990. Ägarstrukturens förändring inom privatskogsbruket, ett framtidsperspektiv, Institutionen för skog-industri-marknad, Sveriges Lantbruksuniversitet, Rapport nr. 13, Uppsala.

Frisk, T. & Kjellstrand, M. 1988. Terränghjulingar. Användning inom skogsbruket [ATVs. Utilisation in forestry]. Småskog, Intern stencil 116:1988. Department of Operational Efficiency, Swedish University of Agricultural Sciences. Garpenberg. 22 pp. (In Swedish with English Abstract)

Geijer, S. 1983. Timber transport with snowmobile. Report No 151. Department of Operational Efficiency, Swedish University of Agricultural Sciences. Garpenberg. 99 pp. (In Swedish with English Summary)

Herlitz, A. 1993. The sales of small-scale forestry equipment 1980-92. Research Notes No. 242. Department of Operational Efficiency, Swedish University of Agricultural Sciences. Garpenberg. 37 pp. (In Swedish with English Summary)

Lidestav, G .1998. Women as Non-industrial Private Forest Landowners in Sweden. Scand. J. For. Res. 13:66-73.

Lidestav, G. & Nordfjell, T. 2002. Med skogsägaren i fokus. LRF Skogsägarna. 56 pp. (In Swedish).

Lidestav, G. & Nordfjell, T. 2003. Swedish non-industrial private forestry in transformation. Paper presented on Joint FAO/ECE/ILO committee on forest technology, management and training workshop on forest operation improvements in farm forestry. Logarska Dolina, Slovenia, 9-14 September 2003. (Also printed in: SLU, Department of Silviculture, Umeå, Reports no 56).

Lindroos, O. 2003. Changes in equipment utilisation among operationally active Swedish NIPF owners. Paper presented on Joint FAO/ECE/ILO committee on forest technology, management and training workshop on forest operation improvements in farm forestry. Logarska Dolina, Slovenia, 9-14 September 2003. (Also printed in: SLU, Department of Silviculture, Umeå, Reports no 56).

LRF Skogsägarna, Forestry branch of the national farmers' association, www.skogsagarna.se

Lönnstedt, L 1993. Vem är den enskilde skogsägaren? Skog och Forskning 1993:2, pp 4-9. Sveriges skogsvårdsförbund. (In Swedish).

Sennblad, G. 1988. Survey of logging and silviculture in non-industrial private forestry in Sweden 1984. Part 1. Logging and silviculture and who performed the forest work. Report No 175. Department of Operational Efficiency, Swedish University of Agricultural Sciences. Garpenberg. 210 pp. (In Swedish with English Summary)

Törnqvist, T. 1995. Inheritors of the Woodlands. A sociological Study of Private, Non Industrial Forest Ownership. Report No 41. Department of Forest-Industry-Market Studies, Swedish University of Agricultural Sciences. Uppsala. 460 pp. (In Swedish with English Summary)

3.3 State of the art report from Norway

Ståle Størdal [a] & Birger Vennesland [b], Skogforsk:
[a)]Eastern Norway Research Institute, Lillehammer. Norway. [b)]Norwegian Forest Research Institute, Ås. Norway

3.3.1 Basic statistical facts about family forestry

Small-scale forestry, as well as the forest sector, in Norway undergoes a significant transition that demands a high degree of capability of adjustment to the new conditions. The structure with many small and fragmented properties puts challenges both to the forest policy, to practical forestry as well as to research priorities. The real price of timber today is only half of what was the case in the 1950's. The last decade generally has seen a low activity in forestry, and investments in roads, replanting and silvicultural activities have declined. The state of forest ownership has shown to be in transition: Fewer owners combine forestry and agricultural production, the larger forest properties tend to harvest more often than smaller ones, and an increasing share of the forest owners work and live outside their properties. A milestone was reached in 1996 when wages (from work outside the farm) became more important than net income from the agricultural property at the average farm. In sum these developments puts new demands on small-scale forestry practices in Norway.

There are in order of 120,000 forest properties in Norway that are potential suppliers of timber. Most of them are small, non-industrial farm woodlots. The average size of the productive forest area in the forest properties is 57 hectares. However, more than half the properties hold less than 25 hectares of productive forestland, and altogether they own just over a tenth of the total productive forest area. Only one per cent of the forest owners owned more than 500 hectares of productive forest, while all of these areas made up almost a third of the productive forest area in Norway. 44 per cent of forest owners also farmed in 1999, and they owned 43 per cent of the productive forest area in Norway. The number of combined farmer-forest owners has dropped in the last 20 years, while the overall number of forest owners has remained fairly constant.

Table 1. Number of forest properties and the share of farm-forests (Statistics Norway, 2001).

	1979	1989	1999
Forest properties (>2,5ha), total	120,930	125,522	120,471
Forest properties with agricultural area in use. Per cent	62	53	44

Non-industrial private forest owners (NIPFs), including farm forests, hold 97% of the forest properties while they own 78% of the forest area. The size and structure of the NIPF holdings have been stable the last decades and forestry in combination with agriculture has traditionally been important for the economy in farms.

Table 2. Number and size of forest properties divided in ownership groups, 1989 (Statistics Norway, 2004).

	Properties		Forest area	
	Number	Share of total	Hectares	Share of total
Private non-industrial owners	122236	97.4%	5,502	78.5%
Company owned	1393	1.1%	424	6.0%
Governmental	1162	0.9%	831	11.8%
Others	731	0.6%	256	3.6%
Total	125522	100%	7,012	100%

Table 3. Distribution of forest properties after size class, 1967-1989 (Statistics Norway, 2004)

	Total	2.5-24.9 ha	25-99.9 ha	100-499.9 ha	5000 ha >
1967	128,337	81,488	36,025	9,638	1,186
1979	120,930	71,757	37,125	10,856	1,192
1989	125,522	72,485	40,004	11,817	1,216

Forest owners who also farm have an average of 4.4 fewer hectares of productive forest area than pure forest owners, but with major differences among the counties. On the other hand, in half the counties, combined farmer-forest owners have more productive forest than pure forest owners. There is a correlation between the size of the forest area and farming area in production among combined farmer-forest owners, so that forest owners who farmed lots of land owned a considerable amount of forest and vice versa. Combined farmer-forest owners logged more often than forest owners who did not farm. On a national basis, combined farmer-forest owners accounted for half the quantity cut for sale. Large forest properties were logged more often than small ones (Statistics Norway, 2001).

Forestry in Norway faces huge challenges; its share of the gross domestic product has declined significantly over the last decades and now accounts for only 0.2% to the national economy. Approximately 5000 persons are employed in forestry, but since the share of farm-forests is so high there is also much self-employment in the sector.

Data of self-employment in Norway: 9.000 persons are involved in pre-commercial thinning and 5.000 people are involved in planting. This gives 150.000 working hours in planting and 200.000 working ours in pre-commercial thinning every year. 740.000 working hours are used in felling and thinning of 1.3 million m3 of timber. 510.000 working hours are used in off-road transportation of 1.4 million m3 of logs. Counting 1850 hours pr. man-year tells us that self-employment in Norwegian forestry gives 850 man-year.

Contrary to the experience in neighbouring countries, the total industrial fellings (fuelwood and home consumption at the farms excluded) in Norway have declined with 30 per cent the last decade and it reached about 7.5 million cubic metres in 2002 (Statistics Norway, 2003a). The distribution of species is 77% Norway spruce, 22% Scots pine and 1% non-coniferous species. Contrary to the developments in domestic cut and exports, imports of timber have increased from 1 million cubic metres to 3 million cubic metres during the same period. The total domestic consumption of timber has consequently been much more stable.

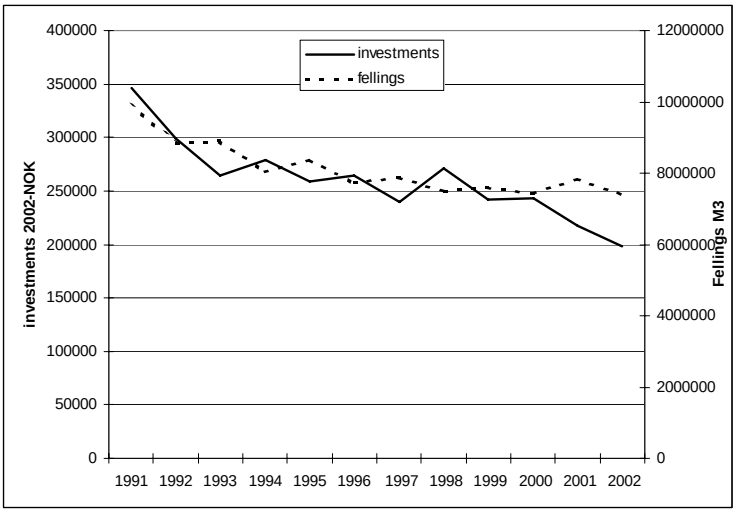

Figure 1. Developments in total fellings and investments 1991-2002 (Statistics Norway, 2004).

3.3.2 Organisational structure of family forestry

Impacts of the far larger and powerful forest industry firms were the reasons of the foundations of regional forest owners' associations (FOAs) in Norway the first part of the 1900's. During the first decades the FOAs amalgamated into 19 independent associations. Their main task was to conduct price negotiations with the purchasers, but they also had a significant role in exploiting economics of scale in brokering timber from the small wood lots held by their members. Most forest owners are members of one of the remaining 8 regional associations under the Norwegian Forest Owner Federation. These associations conduct timber sales, consulting activities and forest planning for their members. The significance of the forest owners' cooperative in Norway is illustrated by the fact that tree-quarters of the industrial roundwood in Norway today are brokered by the 8 regional FOAs (Størdal, 2004a). There also exist some direct sales to the industry, as well as a few independent brokers. Among the latter group is Norskog, which actually also is a FOA that traditionally has organized the larger, industrial forest owners, and is thus, not a part of the Norwegian agricultural cooperative system. The forest owner sells most timber cut-in-length. The chronology in the FOA/forest industry price negotiations is that prices are set for different seasons each year (e.g., winter, summer and fall). The FOA informs their members of the outcome, which for sawlogs depends on a price matrix consisting of stem diameter and log length for various grades. A forest owner notifies the FOA of his planned harvesting schedules, which in turn plans transportation and distribution of timber to the mills. The FOA pays the forest owner according to the price matrix, and according to various bonus arrangements.

Passive forest owners have made the FOAs searching for new methods for securing stable timber supply, and they are offering a range of different contracts and bonus arrangements (cf. Størdal, 2004b). As an example the regional FOA Mjøsen Skogeierforening (Mjøsen regional FOA) is offering forest owners a "management contract" where the FOA offer to do parts of or all the necessary work at the property. This kind of agreements is an adoption to the fact that forestry has become increasingly less important for the economy in the households.

3.3.3 Policy framework and production conditions

In Norway there are basically three different policy levels:
The national level (Ministry of Agriculture)
The regional level (County governor)
The local level (Municipality forester).

The Ministry of Agriculture is responsible for the general forest policy, regulations and the forestry act. In addition the Ministry of Environment is responsible for certain conservation acts that influence forestry activities.

The County governor has an agricultural division, which has a special responsibility to ensure a sustainable long-term management of the forest as a resource for profitable industries; an infrastructure that allows for effective harvesting; and environmental considerations. The Governor shall co-operate with forest owners and others to encourage small-scale, wood based industries. The Governor helps municipalities in areas like forest road planning, silviculture and environmental questions. Coordinating forestry planning in the county, managing the forest taxation, state grants and supervision. However, the regional policy level is facing reduction in importance.

The Municipality forester is responsible for implementing the state policy at the municipality level, contacts with the forest owner. In 2004 the municipality level was given a significantly more important role in implementing the forest policy in the years to come. I.e. in distributing state grants on the basis of the municipality's own criteria and priorities.

The forest policy was last revised in 1998 in a White paper to the parliament. (Landbruksdepartementet 1998). Here the government presented the guidelines for a comprehensive forest policy for forestry and the forest industry. The government emphasised both the forestry's role as an income generator and that forests also play an important role in the conservation of biodiversity, for recreation purposes and thus contribute positively to human health and well-being.

State subsidies and the Forest Trust Fund give the main policy incentives. Traditionally, priority has been given to support silviculture, road construction and forest management schemes. The state subsidies has been reduced the last years and in 2003 the forestry received about NOK 286 million in public subsidies, corresponding to approximately 12 percent of the gross timber value (Rogstad, 2003). A dedicated programme aiming at supporting value creation from timber utilization and processing were launched in 2000. This programme was given NOK 36 million in 2003 from State grants. Silvicultural activities were allocated NOK 14 million in 2003. These subsidies are now being phased out and replaced with more favourable rules for the usage of the Forest Trust Fund. The forest owners are obliged to set aside between 4 and 40 per cent of the income from timber sales. If the withdrawn funds are used for silvicultural measures, up to 60 per cent of the sum remains free of tax.

Sales of agricultural and forest properties are strongly regulated in Norway. The authorities must approve prices and new owners of properties larger than 10 hectares (until 2004: 2,5 hectares). In addition there are regulations that favour transactions within the family and also certain regulations prohibit selling out parts of the property. The regulations for property transaction have been heavily criticised for cementing the structure of the properties and giving no incentives for innovation.

3.3.4 Self-employment within family forestry

An increasing share of the forest area is no longer subject to an active forest management. Just about half of the forest area is now managed with economic profits from harvesting as the objective. The other half is forest that neither for biological nor for economic reasons is suitable for commercial forestry. To some extent declining timber prices can be outweighed by more efficient harvesting, i.e. an increasing share of the harvests is conducted fully mechanized by others than the owner herself. While earlier was the forest owner conducted felling in the NIPF holdings, an increasing share of the fellings today are outsourced and conducted mechanically. The 1999 farm census (Statistics Norway, 2001), showed that the forest owners accounted for only 16 per cent of fellings and 18 per cent of hauling. 78 per cent of the timber sold was cut and hauled by forest contractors. Use of harvesters are more common on larger than on smaller properties. Commonly the fellings are clear-cuts with an average size of approximately 1.5 ha. Lately there has been an increased interest in closed-form fellings. Regeneration and silvicultural activities are conducted manually either by the owner or outsourced to others.

3.3.5 Current research in the field of family forestry

There are a number of organizations that study aspects in relation to small-scale forestry, but three merit mention: *The Agricultural University of Norway, Department of Natural Resource Management* provides research related to all aspects of forestry. *Skogforsk (Norwegian Forest Research Institute)* aims to strengthen the scientific basis for the management of forest resources, the creation of wealth from forests and countermeasures against environmental problems in forests. *The Norwegian Insitute of Land Inventory (NIJOS)* is Norway's major supplier of data on soil, forest, outfield and landscape resources. The information supplied by NIJOS is vital for agriculture, forestry and other land-based enterprises, as well as for land-use and environmental management. NIJOS provides basic, unbiased biological and environmental data, which is required in order to ensure the sustainable utilization of our natural resources.

The main publications are the journals *Norsk Skogbruk* (published by the Norwegian Forest Society) and *Skogeieren* (published by the Norwegian Forest Owners' Federation). In addition there are a number of websites where information on Norwegian forestry can be obtained (E.g., www.skogsnorge.no, www.skoginfo.no, www.skog.no)

Resarch in the participating organisations

Research in forestry is provided by a range of institutions. Besides providing research, the Department of Natural Resource Management at the Agricultural University of Norway is the only institution providing teaching at Masters and Doctoral level. In addition, bachelor level education is provided by Hedmark College and Nord-Trøndelag College. The leading research institute in areas related to forest are Skogforsk (Norwegian Forest Research Institute), which is an autonomus institute under the Ministry of Agriculture. In addition research is provided by the The Norwegian Institute of Land Inventory (Norsk institutt for jord- og skogkartlegging, NIJOS), which is an independent, public institute under the Norwegian Ministry of Agriculture, and a number of regional research institutions (Østlandsforsking/Eastern Norway Research Institute, Bygdeforsk/Centre for Rural Research and Møreforsking Volda/Møre Research are relevant examples). The Norwegian forestry extension institute provides extension services and training related to forestry. In general the role of national state forest services in providing extension services, training education and research is generally good.

Description of studies and their potential connection to joint Scandinavian themes.

The Norwegian Agricultural Economics Research Institute's annual account statistics for agriculture (Rogstad 2003) shows that for the farms included in the separate forestry statistics (About 200 properties out of 1000 participating farms), forest income represented 18 per cent of the total net farm income from both forestry and agriculture in 2001. However, the forestry's share of the average household income is only 2 per cent. Even in Eastern Norway, where forestry is relatively important, forestry accounts for only 4 per cent of the total household income at the average property. This means that income from outside the property has become increasingly more important.

Since an increasing share of the forest area is becoming marginal for economic forestry, goods other than wood and fiber have received attention. Some of these goods might be exploited by single owners or by an association of owners. For many of the owners, game- and fish resources have become a significant source of income, often combined with offering accommodation and other kinds of arrangements. In many districts the combination of management of deer-game and forest management has not been optimal, especially if one

takes grazing damages on young forest stands into account. Moreover, a significant part of the goods related to forests are collective goods like landscape or eco-systems values. Wood for bioenergy purposes will probably be more important in the years to come as well as production of Christmas trees has turned out to be profitable for an increasing number of forest owners.

An interesting study is carried out by the member organization of those who produce chopped firewood in Norway (Norsk Ved). A survey was conducted among 3500 members in 2004. 75% of all traders among chopped firewood are running an active farm whereas they produce most of their chopped firewood from their own forests (80%). Investments in these businesses are limited. 28% has made investments the last year with an annual cost of 54.000 NOK.

In Norway the firewood consumption is about 50 % of the total bioenergyconsumption, approximately 7 TWh annually (3.8 mill m^3 solid) and about 800 farms have chip-heating plants. The firewood consumption has increased with 35 % the last 4 years. The firewood production means a lot for the producer. The firewood is often sold for 1000 NOK/m3 solid. The timber costs is about 300 NOK/m3. This means there is a potential of value increase in the production for about 2660 mill NOK. The price for firewood is often competitive with electricity and oil, even in Norway. It has been done very little research in small-scale bio energy operations in Norway the last 20 years. We need more knowledge about economy, production and quality of firewood production and small-scale chip heating operations.

3.3.6 Unsolved questions and development needs in self-employment

There is a huge potential for self-employment and increased value added in the production of chopped firewood. For example the total value of firewood is probably higher than the total value of the timber at an increasing number of properties. There is a need for research on what the potential for sales of chopped firewood is and what economic contribution this gives at forest holdings and local communities, and to self-employment at the property.

There is a research need regarding the contribution of self-employment of forestry to the total household economy within a farm. However, in light of that nearly all of the entrepreneurs, which trade-off is between self-employment in forestry and employment outside the property, conduct all of the harvesting and commercial thinning, this topic can be analysed in different aspects.

References:

Landbruksdepartementet 1998. Verdiskaping og miljø – muligheter I skogsektoren. St.mld. nr. 17. (1998-99). In Norwegian.

Rogstad, B (eds). 2003. Norwegian Agricuture. Status and Trends 2003. Norwegian Agricultural Economics Research Institute, Oslo. 142 pp.

Statistics Norway 2001. 1999 Census of Agriculture, final figures. http://www.ssb.no/english/subjects/10/04/10/jt1999_en/

Statistics Norway, 2003a. Commercial roundwood removals. Preliminary figures, 2002. http://www.ssb.no/english/subjects/10/04/20/skogav_en/

Statistics Norway, 2003b. Silviculture, 2002. http://www.ssb.no/english/subjects/10/04/20/skogkultur_en/

Statistics Norway, 2004. Forestry Statistics. http://www.ssb.no/english/subjects/10/04/20/

Størdal, S. 2004a. Impacts of the European Economic Area Agreement on the structure and concentration of roundwood sales in Norway. Forest Policy and Economics 6: 49-62.

Størdal, S. 2004b. Efficient timber pricing and purchasing behaviour in forest owners' associations. Journal of Forest Economics 10: 135-147.

3.4 Summary and Conclusions

In the Nordic countries there are at least 1.07 million NIPF owners and the total NIPF area is close to 30 million ha, or 59% of the total forest cover (Table 1).

Table 1. Comparison of family forestry related characteristics in Sweden, Norway, Denmark and Finland.

General data:	Sweden	Finland	Norway	Denmark
Total forest area (million ha)	22.5***	20.3	7.0	0.5
NIPF area (million ha), part of the total forest area (%)	11.5 / 51%	12.3 / 61%	5.5/ 79%	0.2/46%
NIPF holdings (1000 units)	191 (>5 ha)	318	122	25
NIPF owners (1000 persons, % male, % female)	322 (18-80 years old) 63 % m, 37% f	600 76% m 40% f*	123	26 86% m 14% f
Average NIPF holding (ha)	55	37	57	9
Average NIPF owner age (year)	53	57		53
Self employment:				
Volumes harvested, ****** (million m^3 / % = percentage of roundwood removals from NIP forests)	6.1 / 15%	5.3 /12%	1.3	
Volumes transported ****** (million m^3, % = see above)	6.7 / 17%	4.3 / 9 %	1.4	
Working time in planting (1000 hours)	1893 in silviculture total	270	150	
Working time in pre-commercial thinning (1000 hours)	Se above	755	200	
Working time in harvesting (1000 hours)	8325 in harvesting and extraction	3 300	740	
Working time in extraction of logs (1000 hours)	Se above	860	510	
Numbers involved in planting (1000 persons)	80*****	71	5	
Numbers involved in pre-commercial thinning (1000 persons)	106	101	9	
Numbers involved in harvesting (1000 persons)	90	66		
Numbers involved in extraction (1000 persons)	65	44		
Place of residence of the forest owner	49% on the forest estate, 32% not on the forest estate and 19% has a free time living on the estate.	63% in rural areas, 37% in urban areas		80% close to the forest estate
Occupational status of the forest owner	Forest ***** farmer 27%, agric. farmer 22%, employee 50%, retired 24%, contractor 11%, others 6%	Farmer 22%, employee 30%, contractor 6%, retired 37%, others 5%		

*) Among the persons who make decisions in forest holdings the share of women is 24 %.

**) Solid volume with bark

***) According to international definitions 27.5 million ha.

****) The Swedish data concerning number of persons in self employment referee to the forest owners themselves, not including family members

*****) A person can have more than one occupation

The average age of a NIPF owner is in the scope of 53-57 years, and the percentage of female owners in the scope of 14-40% (Table 1). In total, at least 17 million working hours are conducted as self employment by NIPF owners. As much as 81% of that time concern harvesting and extraction, and the remaining 19% concern silvicultural treatments. At least 216 000 NIPF owners do self employed forestry work in pre-commercial thinning. The corresponding values for tree planting, harvesting and extraction are 156 000, 156 000 and 109 000 NIPF owners, respectively.

A ranking of the importance of different research activities concerning NIPF owners and self employment for the future was made. The result clearly indicates that research regarding processing and measurements of fire wood is of high interest for all Nordic countries (Table 2). It was also concluded that beside fire wood, all research areas mentioned in Table 2 are of an interest high enough to be included in future proposed research project.

Table 2. Prioritised subjects for a cooperative research between Sweden, Finland, Norway and Denmark in the area of self-employed NIPFO. (Ranking 1-5)

Research area	Country				Average ranking (low number means high ranking)
	Sw	Fi	No	De	
Fire-wood processing and safety, including standardised fire-wood measuring methods	1	1	1	2	1.25
Economy in self-employment, for the individual and the society	4	3	2	3	3.0
Silviculture, productivity and economy	3	2	3	5	3.25
Profile of self-employed forest owners	2	4	4	4	3.5
Christmas tree production	5	5	5	1	4.0

Serien Arbetsrapporter utges i första hand för institutionens eget behov av viss dokumentation. Rapporterna är indelade i följande grupper: Riksskogstaxeringen, Planering och inventering, Biometri, Fjärranalys, Kompendier och undervisningsmaterial, Examensarbeten, Internationellt samt NILS. Författarna svarar själva för rapporternas vetenskapliga innehåll.

Riksskogstaxeringen:

1995	1	Kempe, G.	Hjälpmedel för bestämning av slutenhet i plant- och ungskog. ISRN SLU-SRG-AR--1--SE
	2	Nilsson, P.	Riksskogstaxeringen och Ståndortskarteringen vid regional miljöövervakning. - Metoder för att förbättra upplösningen vid inventering i skogliga avrinningsområden. ISRN SLU-SRG-AR--2--SE
1997	23	Lundström, A., Nilsson, P. & Ståhl, G.	Certifieringens konsekvenser för möjliga uttag av industri- och energived. - En pilotstudie. ISRN SLU-SRG-AR--23--SE
	24	Fridman, J. & Walheim, M.	Död ved i Sverige. - Statistik från Riksskogstaxeringen. ISRN SLU-SRG-AR--24--SE
1998	30	Fridman, J., Kihlblom, D. & Söderberg, U.	Förslag till miljöindexsystem för naturtypen skog. ISRN SLU-SRG-AR--30--SE
	34	Löfgren, P.	Skogsmark, samt träd- och buskmark inom fjällområdet. En skattning av arealer enligt internationella ägoslagsdefinitioner. ISRN SLU-SRG-AR--34--SE
	37	Odell, P. & Ståhl, G.	Vegetationsförändringar i svensk skogsmark mellan 1980- och 90-talet. - En studie grundad på Ståndortskarteringen. ISRN SLU-SRG-AR--37--SE
	38	Lind, T.	Quantifying the area of edges zones in Swedish forest to assess the impact of nature conservation on timber yields. ISRN SLU-SRG-AR--38--SE
1999	50	Ståhl, G., Walheim, M. & Löfgren, P.	Fjällinventering. - En utredning av innehåll och design. ISRN SLU-SRG-AR--50--SE

	52	Fridman, J. & Ståhl, G. (Redaktörer)	Utredningar avseende innehåll och omfattning i en framtida Riksskogstaxering. ISRN SLU-SRG-AR--52--SE
	54	Fridman, J., Holmström, H., Nyström, K., Petersson, H., Ståhl, G. & Wulff, S.	Sveriges skogsmarksarealer enligt internationella ägoslagsdefinitioner. ISRN SLU-SRG-AR--54--SE
	56	Nilsson, P. & Gustafsson, K.	Skogsskötseln vid 90-talets mitt - läge och trender. ISRN SLU-SRG-AR--56--SE
	57	Nilsson, P. & Söderberg, U.	Trender i svensk skogsskötsel - en intervjuundersökning. ISRN SLU-SRG-AR--57--SE
2000	65	Bååth, H., Gällerspång, A., Hallsby, G., Lundström, A., Löfgren, P., Nilsson, M. & Ståhl, G.	Metodik för skattning av lokala skogsbränsleresurser. ISRN SLU-SRG-AR--65--SE
	75	von Segebaden, G.	Komplement till "RIKSTAXEN 75 ÅR". ISRN SLU-SRG-AR--75--SE
2001	86	Lind, T.	Kolinnehåll i skog och mark i Sverige - Baserat på Riksskogstaxeringens data. ISRN SLU-SRG-AR--86--SE
2003	110	Berg Lejon, S.	Studie av mätmetoder vid Riksskogstaxeringens årsringsmätning. ISRN SLU-SRG--AR--110--SE
	116	Ståhl, G.	Critical length sampling for estimating the volume of coarse woody debris. ISRN SLU-SRG-AR--116--SE
	117	Ståhl, G. Blomquist, G. Eriksson, A.	Mögelproblem i samband med risrensning inom Riksskogstaxeringen. ISRN SLU-SRG-AR--117--SE

	118	Ståhl, G. Boström, B. Lindkvist, H. Lindroth, A. Nilsson, J. Olsson, M.	Methodological options for quantifying changes in carbon pools in Swedish forests. ISRN SLU-SRG-AR--118--SE
2004	129	Bååth, H., Eriksson, B., Lundström, A., Lämås, T., Johansson, T., Persson, J A. & Sundquist, S.	Internationellt utbyte och samarbete inom forskning och undervisning i skoglig mätteknik och inventering. -Möjligheter mellan en region i södra USA och SLU. ISRN SLU-SRG-AR--129--SE

Planering och inventering:

1995	3	Homgren, P. & Thuresson, T.	Skoglig planering på amerikanska västkusten - intryck från en studieresa till Oregon, Washington och British Colombia 1-14 augusti 1995. ISRN SLU-SRG-AR--3--SE
	4	Ståhl, G.	The Transect Relascope - An Instrument for the Quantification of Coarse Woody Debris. ISRN SLU-SRG-AR--4--SE
1996	15	van Kerkvoorde, M.	An Sequential approach in mathemtical programming to include spatial aspects of biodiversity in long range forest management planning. ISRN SLU-SRG-AR--15--SE
1997	18	Christoffersson, P. & Jonsson, P.	Avdelningsfri inventering - tillvägagångssätt och tidsåtgång. ISRN SLU-SRG-AR--18--SE
	19	Ståhl, G., Ringvall, A. & Lämås, T.	Guided transect sampling - An outline of the principle. ISRN SLU-SRG-AR--19--SE
	25	Lämås, T. & Ståhl, G.	Skattning av tillstånd och förändringar genom inventeringssimulering - En handledning till programpaketet. ISRN SLU-SRG-AR--25--SE
	26	Lämås, T. & Ståhl, G.	Om detektering av förändringar av populationer i begränsade områden. ISRN SLU-SRG-AR--26--SE
1999	59	Petersson, H.	Biomassafunktioner för trädfraktioner av tall, gran och björk i Sverige. ISRN SLU-SRG-AR--59--SE

	63	Fridman, J., Löfstrand, R. & Roos, S.	Stickprovsvis landskapsövervakning - En förstudie. ISRN SLU-SRG-AR--63--SE
2000	68	Nyström, K.	Funktioner för att skatta höjdtillväxten i ungskog. ISRN SLU-SRG-AR--68--SE
	70	Walheim, M.	Metodutveckling för vegetationsövervakning i fjällen. ISRN SLU-SRG-AR--70--SE
	73	Holm, S. & Lundström, A.	Åtgärdsprioriteter. ISRN SLU-SRG-AR--73--SE
	76	Fridman, J. & Ståhl, G.	Funktioner för naturlig avgång i svensk skog. ISRN SLU-SRG-AR--76--SE
2001	82	Holmström, H.	Averaging Absolute GPS Positionings Made Underneath Different Forest Canopies - A Splendid Example of Bad Timing in Research. ISRN SLU-SRG-AR--82--SE
2002	91	Wilhelmsson, E.	Forest use and it's economic value for inhabitants of Skröven and Hakkas in Norrbotten. ISRN SLU-SRG-AR--91--SE
	93	Lind, T.	Strategier för Östads säteri: Redovisning av planer framtagna under kursen Skoglig planering ur ett företagsperspektiv ht 2001, SLU Umeå. ISRN SLU-SRG-AR--93--SE
	94	Eriksson, O. et. al.	Wood supply from Swedish forests managed according to the FSC-standard. ISRN SLU-SRG-AR--94--SE
2003	108	Paz von Friesen, C.	Inverkan på provytans storlek på regionala skattningar av skogstyper. En studie av konsekvenser för uppföljning av miljömålen. SLU-SRG-AR--108--SE
2005	145	Nordfjell, T., Kettunen, A., Vennesland, B. & Suadicani, K.	Family Forestry Future challenges and needs ISRN SLU-SRG-AR--145--SE

Biometri:

1997	22	Ali, A. A.	Describing Tree Size Diversity. ISRN SLU-SRG--AR--22--SE
1999	64	Berhe, L.	Spatial continuity in tree diameter distribution. ISRN SLU-SRG--AR--64--SE

2001	88	Ekström, M.	Nonparametric Estimation of the Variance of Sample Means Based on Nonstationary Spatial Data. ISRN SLU-SRG-AR--88--SE
	89	Ekström, M. & Belyaev, Y.	On the Estimation of the Distribution of Sample Means Based on Non-Stationary Spatial Data. ISRN SLU-SRG-AR--89--SE
	90	Ekström, M. & Sjöstedt-de Luna, S.	Estimation of the Variance of Sample Means Based on Nonstationary Spatial Data with Varying Expected Values. ISRN SLU-SRG-AR--90--SE
2002	96	Norström, F.	Forest inventory estimation using remotely sensed data as a stratification tool - a simulation study. ISRN SLU-SRG-AR--96--SE

Fjärranalys:

1997	28	Hagner, O.	Satellitfjärranalys för skogsföretag. ISRN SLU-SRG-AR--28--SE
	29	Hagner, O.	Textur i flygbilder för skattningar av beståndsegenskaper. ISRN SLU-SRG-AR--29--SE
1998	32	Dahlberg, U., Bergstedt, J. & Pettersson, A.	Fältinstruktion för och erfarenheter från vegetationsinventering i Abisko, sommaren 1997. ISRN SLU-SRG-AR--32--SE
	43	Wallerman, J.	Brattåkerinventeringen. ISRN SLU-SRG-AR--43--SE
1999	51	Holmgren, J., Wallerman, J. & Olsson, H.	Plot-level Stem Volume Estimation and Tree Species Discrimination with Casi Remote Sensing. ISRN SLU-SRG-AR--51--SE
	53	Reese, H. & Nilsson, M.	Using Landsat TM and NFI data to estimate wood volume, tree biomass and stand age in Dalarna. ISRN SLU-SRG-AR--53--SE
2000	66	Löfstrand, R., Reese, H. & Olsson, H.	Remote sensing aided Monitoring of Nontimber Forest Resources - A literature survey. ISRN SLU-SRG-AR--66--SE
	69	Tingelöf, U. & Nilsson, M.	Kartering av hyggeskanter i pankromatiska SPOT-bilder. ISRN SLU-SRG-AR--69--SE

	79	Reese, H. & Nilsson, M.	Wood volume estimations for Älvsbyn Kommun using SPOT satellite data and NFI plots. ISRN SLU-SRG-AR--79--SE
2003	106	Olofsson, K.	TreeD version 0.8. An Image Processing Application for Single Tree Detection. ISRN SLU-SRG-AR--106-SE
2003	112	Olsson, H. Granqvist Pahlen, T. Reese, H. Hyyppä, J. Naesset, E.	Proceedings of the ScandLaser Scientific Workshop on Airborne Laser Scanning of Forests. September 3 & 4, 2003. Umeå, Sweden. ISRN SLU-SRG-AR--112--SE
	114	Manterola Matxain, I.	Computer Visualization of forest development scenarios in Bäcksjön estate. ISRN SLU-SRG-AR--114--SE
2004	122	Dettki, H. & Wallerman, J.	Skoglig GIS- och fjärranalysundervisning inom Jägmästar- och Skogsvetarprogrammet på SLU. - En behovsanalys. ISRN SLU-SRG-AR--122--SE
2005	136	Bohlin, J.	Visualisering av skog och skogslandskap -erfarenheter från användning av Visual Nature Studio 2 och OnyxTree. ISRN SLU-SRG-AR--136--SE

Kompendier och undervisningsmaterial:

1996	14	Holm, S. & Thuresson, T. samt jägm. studenter kurs 92/96	En analys av skogstillståndet samt några alternativa avverkningsberäkningar för en del av Östads säteri. ISRN SLU-SRG-AR--14--SE
1997	21	Holm, S. & Thuresson, T. samt jägm.studenter kurs 93/97.	En analys av skogstillsåndet samt några alternativa avverkningsberäkningar för en stor del av Östads säteri. ISRN SLU-SRG-AR--21--SE
1998	42	Holm, S. & Lämås, T. samt jägm.studenter kurs 94/98.	An analysis of the state of the forest and of some management alternatives for the Östad estate. ISRN SLU-SRG-AR--42--SE

1999	58	Holm, S. & Lämås, T. samt studenter vid Sveriges lantbruksuniversitet.	En analys av skogstillsåndet samt några alternativa avverkningsberäkningar för Östads säteri. ISRN SLU-SRG-AR--58--SE
2001	87	Eriksson, O. (Ed.)	Strategier för Östads säteri: Redovisning av planer framtagna under kursen Skoglig planering ur ett företagsperspektiv HT2000, SLU Umeå. ISRN SLU-SRG-AR--87--SE
2003	115	Lindh, T.	Strategier för Östads Säteri: Redovisning av planer framtagna under kursen Skoglig Planering ur ett företagsperspektiv HT 2002, SLU Umeå. SLU-SRG--AR--115--SE

Examensarbeten:

1995	5	Törnquist, K.	Ekologisk landskapsplanering i svenskt skogsbruk - hur började det? ISRN SLU-SRG-AR--5--SE
1996	6	Persson, S. & Segner, U.	Aspekter kring datakvaliténs betydelse för den kortsiktiga planeringen. ISRN SLU-SRG--AR--6--SE
	7	Henriksson, L.	The thinning quotient - a relevant description of a thinning? Gallringskvot - en tillförlitlig beskrivning av en gallring? ISRN SLU-SRG-AR--7--SE
	8	Ranvald, C.	Sortimentsinriktad avverkning. ISRN SLU-SRG-AR--8--SE
	9	Olofsson, C.	Mångbruk i ett landskapsperspektiv - En fallstudie på MoDo Skog AB, Örnsköldsviks förvaltning. ISRN SLU-SRG-AR--9--SE
	10	Andersson, H.	Taper curve functions and quality estimation for Common Oak (Quercus Robur L.) in Sweden. ISRN SLU-SRG-AR--10--SE
	11	Djurberg, H.	Den skogliga informationens roll i ett kundanpassat virkesflöde. - En bakgrundsstudie samt simulering av inventeringsmetoders inverkan på noggrannhet i leveransprognoser till sågverk. ISRN SLU-SRG-AR--11--SE
	12	Bredberg, J.	Skattning av ålder och andra beståndsvariabler - en fallstudie baserad på MoDo:s indelningsrutiner. ISRN SLU-SRG-AR--12--SE

	13	Gunnarsson, F.	On the potential of Kriging for forest management planning. ISRN SLU-SRG-AR--13--SE
	16	Tormalm, K.	Implementering av FSC-certifiering av mindre enskilda markägares skogsbruk. ISRN SLU-SRG-AR--16--SE
1997	17	Engberg, M.	Naturvärden i skog lämnad vid slutavverkning. - En inventering av upp till 35 år gamla föryngringsytor på Sundsvalls arbetsområde, SCA. ISRN SLU-SRG-AR--17--SE
	20	Cedervind, J.	GPS under krontak i skog. ISRN SLU-SRG-AR--20--SE
	27	Karlsson, A.	En studie av tre inventeringsmetoder i slutavverkningsbestånd. ISRN SLU-SRG-AR--27--SE
1998	31	Bendz, J.	SÖDRAs gröna skogsbruksplaner. En uppföljning relaterad till SÖDRAs miljömål, FSC's kriterier och svensk skogspolitik. ISRN SLU-SRG-AR--31--SE
	33	Jonsson, Ö.	Trädskikt och ståndortsförhållanden i strandskog. - En studie av tre bäckar i Västerbotten. ISRN SLU-SRG-AR--33--SE
	35	Claesson, S.	Thinning response functions for single trees of Common oak (Quercus Robur L.). ISRN SLU-SRG-AR--35--SE
	36	Lindskog, M.	New legal minimum ages for final felling. Consequenses and forest owner attitudes in the county of Västerbotten. ISRN SLU-SRG-AR--36--SE
	40	Persson, M.	Skogsmarkindelningen i gröna och blå kartan - en utvärdering med hjälp av Riksskogstaxeringens provytor. ISRN SLU-SRG-AR--40--SE
	41	Eriksson, M.	Markbaserade sensorer för insamling av skogliga data - en förstudie. ISRN SLU-SRG-AR--41--SE
	45	Gessler, C.	Impedimentens potentiella betydelse för biologisk mångfald. - En studie av myr- och bergimpediment i ett skogslandskap i Västerbotten. ISRN SLU-SRG-AR--45--SE
	46	Gustafsson, K.	Långsiktsplanering med geografiska hänsyn - en studie på Bräcke arbetsområde, SCA Forest and Timber. ISRN SLU-SRG-AR--46--SE

	47	Holmgren, J.	Estimating Wood Volume and Basal Area in Forest Compartments by Combining Satellite Image Field Data. ISRN SLU-SRG-AR--47--SE
	49	Härdelin, S.	Framtida förekomst och rumslig fördelning av gammal skog. - En fallstudie på ett landskap i Bräcke arbetsområde. ISRN SLU-SRG-AR--49--SE
1999	55	Imamovic, D.	Simuleringsstudie av produktionskonekvenser med olika miljömål. ISRN SLU-SRG-AR--55--SE
	62	Fridh, L.	Utbytesprognoser av rotstående skog. ISRN SLU-SRG-AR--62--SE
2000	67	Jonsson, T.	Differentiell GPS-mätning av punkter i skog. Point-accuracy for differential GPS under a forest canaopy. ISRN SLU-SRG-AR--67--SE
	71	Lundberg, N.	Kalibrering av den multivariata variabeln trädslagsfördelning. ISRN SLU-SRG-AR--71--SE
	72	Skoog, E.	Leveransprecision och ledtid - två nyckeltal för styrning av virkesflödet. ISRN SLU-SRG-AR--72--SE
	74	Johansson, L.	Rotröta i Sverige enligt Riksskogstaxeringen. - En beskrivning och modellering av rötförekomst hos gran, tall och björk. ISRN SLU-SRG-AR--74--SE
	77	Nordh, M.	Modellstudie av potentialen för renbete anpassat till kommande slutavverkningar. ISRN SLU-SRG-AR--77--SE
	78	Eriksson, D.	Spatial Modeling of Nature Conservation Variables useful in Forestry Planning. ISRN SLU-SRG-AR--78--SE
	81	Fredberg, K.	Landskapsanalys med GIS och ett skogligt planeringssystem. ISRN SLU-SRG-AR--81--SE
2001	83	Lindroos, O.	Underlag för skogligt länsprogram Gotland. ISRN SLU-SRG-AR--83-SE

	84	Dahl, M.	Satellitbildsbaserade skattningar av skogsområden med röjningsbehov (Satellite image based estimations of forest areas with cleaning requirements). ISRN SLU-SRG-AR--84--SE
	85	Staland, J.	Styrning av kundanpassade timmerflöden - Inverkan av traktbankens storlek och utbytesprognosens tillförlitlighet. ISRN SLU-SRG-AR--85--SE
2002	92	Bodenhem, J.	Tillämpning av olika fjärranalysmetoder för urvalsförfarandet av ungskogsbestånd inom den enkla älgbetesinventeringen (ÄBIN). ISRN SLU-SRG-AR--92--SE
	95	Sundquist, S.	Utveckling av ett mått på produktionsslutenhet för Riksskogstaxeringen. ISRN SLU-SRG-AR--95--SE
	98	Söderholm, J.	De svenska skogsbolagens system för skoglig planering. ISRN SLU-SRG-AR--98--SE
	99	Nordin, D.	Fastighetsgränser. Del 1. Fallstudie av fastighetsgränsers lägesnoggrannhet på fastighetskartan. ISRN SLU-SRG-AR--99--SE
	100	Nordin, D.	Fastighetsgränser. Del 2. Instruktion för gränsvård. ISRN SLU-SRG-AR--100--SE
	101	Nordbrandt, A.	Analyser med Indelningspaketet av privata skogsfastigheter inom Norra Skogsägarnas verksamhetsområde. ISRN SLU-SRG-AR--101--SE
2003	102	Wallin, M.	Satellitbildsanalys av gremmeniellaskador med skogsvårdsorganisationens system. ISRN SLU-SRG-AR--102--SE
	103	Hamilton, A.	Effektivare samråd mellan rennäring och skogsbruk - förbättrad dialog via ett utvecklat samrådsförfarande. ISRN SLU-SRG-AR--103--SE
	104	Hajek, F.	Mapping of Intact Forest Landscapes in Sweden according to Global Forest Watch methdology. ISRN SLU-SRG-AR--104--SE
	105	Anerud, E.	Kalibrering av ståndortsindex i beståndsregister - en studie åt Holmen Skog AB. ISRN SLU-SRG-AR--105--SE

	107	Pettersson, L.	Skördarnavigering kring skyddsvärda objekt med GPS-stöd. SLU-SRG-AR--107--SE
	109	Östberg, P-A.	Försök med subjektiva metoder för datainsamling och analys av hur fel i data påverkar åtgärdsförslagen. SLU-SRG-AR--109--SE
	111	Hansson, J.	Vad tycker bilister om vägnära skogar - två enkätstudier. SLU-SRG-AR--111--SE
	113	Eriksson, P.	Renskötseln i Skandinavien. Förutsättningar för sambruk och konflikthantering. SLU-SRG-AR--113--SE
	119	Björklund, E.	Medlemmarnas syn på Skogsägarna Norrskog. ISRN SLU-SRG--AR--119--SE
2004	120	Fogdestam, Niklas	Skogsägarna Norrskog:s slutavverkningar och PEFC-kraven - fältinventering och intervjuer. ISRN SLU-SRG--AR--120--SE
	121	Petersson, T	Egenskaper som påverkar hänsynsarealer och drivningsförhållanden på föryngringsavverkningstrakter -En studie över framtida förändringar inom Sveaskog. ISRN SLU-SRG--AR--121--SE
	123	Mattsson, M	Markägare i Stockholms län och deras inställning till biodiversitet och skydd av mark. ISRN SLU-SRG--AR--123--SE
	125	Eriksson, M.	Skoglig planering och ajourhållning med SkogsGIS - En utvärdering av SCA:s nya GIS-verktyg med avseende på dess introduktion, användning och utvecklingspotential. ISRN SLU-SRG--AR--125--SE
	130	Olmårs, P.	Metrias vegetationsdatabas i skogsbruket - En GIS-studie. ISRN SLU-SRG--AR--130--SE
	131	Nilsson, M.	Skogsmarksutnyttjande på Älvdalens kronopark före 1870. En kulturhistorisk beskrivning och analys. ISRN SLU-SRG--AR--131--SE
2005	133	Bjerner, J.	Betydelsen av felaktig information i traktbanken -Inverkan på virkesleveranser samt tidsåtgång och kostnad vid avverkningar. ISRN SLU-SRG--AR--133--SE

138	Kempainen, E.	Ett kalkylstöd för ekonomiska analyser av avverkningsåtgärder på beståndsnivå. A calculation support program for economic analysis of cutting actions on stand level. ISRN SLU-SRG--AR--138--SE
140	González, J.D.D.	A time study and description of the work methods for the field work in the National Inventory of Landscapes in Sweden. ISRN SLU-SRG--AR--140--SE
141	Jacobsson, L.	Förbättringspotential i avverkningsplanering -En fallstudie av ett års avverkningar på två distrikt inom SCA skog, Jämtlands förvaltning. ISRN SLU-SRG--AR--141--SE
142	Gallegos, Å.	Design and evaluation of a computer aided calibration program for visual estimation of vegetation cover. ISRN SLU-SRG--AR--142--SE
143	Gålnander, H.	Bevarande av naturvärdesträd i enlighet med FSC och Holmen Skogs naturvårdspolicy. ISRN SLU-SRG--AR--143--SE
144	Lövdahl, H.	Automatisk beståndsavgränsning i satellitbilder - En jämförelse av gränser från två segmenteringsmetoder och Grön Plan. ISRN SLU-SRG--AR--144--SE

Internationellt:

1998	39	Sandewall, M., Ohlsson, B. & Sandewall, R.K.	People's options of forest land use - a research study of land use dynamics and socio-economic conditions in a historical perspective in the Upper Nam Water Catchment Area, Lao PDR. ISRN SLU-SRG-AR--39--SE
1998	44	Sandewall, M., Ohlsson, B., Sandewall, R.K., Vo Chi Chung, Tran Thi Binh & Pham Quoc Hung.	People's options on forest land use. Government plans and farmers intentions - a strategic dilemma. ISRN SLU-SRG-AR--44--SE
1998	48	Sengthong, B.	Estimating Growing Stock and Allowable Cut in Lao PDR using Data from Land Use Maps and the National Forest Inventory. ISRN SLU-SRG-AR--48--SE

1999	60	Sandewall, M. (Edit.).	Inter-active and dynamic approaches on forest and land-use planning - proceedings from a training workshop in Vietnam and Lao PDR, April 12-30, 1999. ISRN SLU-SRG-AR--60--SE
2000	80	Sawathwong, S.	Forest Land Use Planning in Nam Pui National Biodiversity Conservation Area, Lao P.D.R. ISRN SLU-SRG-AR--80--SE
2002	97	Sandewall, M.	Inter-active and dynamic approaches on forest and land-use planning in Southern Africa. Proceedings from a training workshop in Botswana, December 3-17, 2001. ISRN SLU-SRG-AR--97--SE

NILS:

2004	124	Esseen, P-A., Löfgren, P.	Vegetationskartan över fjällen och Nationell Inventering av Landskapet i Sverige (NILS) som underlag för Natura 2000. ISRN SLU-SRG-AR--124--SE
	126	Allard, A., Löfgren, P. & Sundquist, S.	Skador på mark och vegetation i de svenska fjällen till följd av barmarkskörning. ISRN SLU-SRG-AR--126--SE
	127	Esseen, P-A., Glimskär, A. & Ståhl, G.	Linjära landskapselement i Sverige: skattningar från 2003 års NILS-data. ISRN SLU-SRG-AR--127--SE
	128	Ringvall, A., Ståhl, G., Löfgren, P. & Fridman, J.	Skattningar och precisionsberäkning i NILS - Underlag för diskussion om lämplig dimensionering. ISRN SLU-SRG-AR--128--SE
	132	Esseen, P-A., Glimskär, A., Moen, J., Söderström, B. & Weibull, A.	Analys av informationsbehov för Nationell Inventering av Landskapet i Sverige (NILS). ISRN SLU-SRG--AR--132--SE
2005	134	Glimskär, A., Allard, A. & Högström, M.	Småbiotoper vid åkermark – indikatorer och flygbildsbaserad uppföljning i NILS. ISRN SLU-SRG--AR--134--SE
	135	Hylander, K. & Esseen, P-A.	Lavkompendium för Nationell Inventering av Landskapet i Sverige (NILS) ISRN SLU-SRG--AR--135--SE
	137	Ericsson, S.	Arthandbok Fältskiktsarter för Nationell Inventering av Landskapet i Sverige NILS. ISRN SLU-SRG-AR--137--SE

139 Weibull, H. Mosskompendium för Nationell Inventering av Landskapet i Sverige (NILS) 2004. ISRN SLU-SRG-AR--139--SE