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DEVELOPING THE SCOTS PINE RESOURCE

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Markets for Scots Pine Roundwood







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Contents

Photos are by the editor, when no other source is given.
The English text was revised by Elspeth Macdonald and Ben Davis.

SUMMARY

The Highlands of Scotland has seen great plantations the last decades to increase wood production on former pasture land. A main part, one quarter of the plantations, have been Scots pine, the traditional and domestic species. The wood is used for panels (chipboards), fencing and other solid wood products. Roundwood pricing and trade are hardly standardised, but follow several diverging procedures: Standing sale – either tender and auction or negotiation, roadside sale, and delivered. Prices are settled either by weight or volume, either average prices for the lot or differentiated by category. Prices, being influenced by imported timber, have shown a general downward trend since the late 80s. Main market opportunities are suggested in value added and local processing. Annual per capita consumption of sawn wood is inferior to that found in the Nordic region, indicating a market potential for wood products.

Excluding some of the most important forested areas of Norway, pine wood products were always important to the North-Mid-West (NPP) regions All over the country roundwood is typically traded from generally small private properties via regional forest owner associations to the forest industries. Pulp and energy wood are sold either by volume or weight. Sawlogs are sold in a well established procedure according to the log's length, diameter under bark and species/quality, with prices specified in so called L-D price matrices agreed by seller and buyer. Generally, the most versatile qualities and dimensions obtain the highest prices. Both round and sawn timber always being to a large degree traded across national borders, prices usually are at the same level as neighbour countries.

The Northern part of Sweden demonstrates huge forest resources organised in quite large forest estate companies, and the forest industries are of considerable commercial significance. Major pulp and sawn timber factories are found along the eastern coastline; these are mainly large, export oriented mills. Like in Norway, log scaling is taken care of by independent, non-profit organisations set up by the sellers' and buyers' associations. But while Norway has a strictly standardised algorithm for calculating log volume, various notations that might diverge as much as 50% are used in Sweden. Examples for grading rules and sawlog prices are given. Modern bio- energy heating and power plants have been built throughout the country, and the importance is expected to increase.

Finland is a widely forested country. Like in the rest of the Nordic countries, native pine and spruce are the most important species. Annual harvest is less than the increment, and consequently the growing stock is accumulating year by year, and mostly for pine. Compared to domestic consumption, the country has a surplus of wood supply and a long tradition for industrial wood production and export. Approximately 40% of Finland's commercial forestry is located in the northern NPP regions. Roundwood is traded both as standing stands (80%) and as harvested lots (delivery sale, 20%). Volume is given over bark, and scaling usually done in the computerised harvester head (standing sales) or at the buyer's mill. Prices are agreed according to dimension, quality and species, and largely influenced by international prices. Former national regulations in the timber trade have been abandoned, following EU requirements. Even if efficient, at present during the international crisis, substantial structural changes take place in the pulp and sawmill industry.

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PREFACE

This report is an output from the Northern Periphery Programme project "Developing the Scots Pine Resource". The overall aim of this project is to stimulate the development and optimal utilisation of the Scots Pine resource as a basis for sustainable, competitive, small- and micro-scale rural industries. Describing and analysing existing markets is part of this task, and the objective of this report. The report covers the Scots pine roundwood trade in the northern parts of Scotland, Norway, Sweden and Finland, the area covered by the InterReg Northern Periphery Programme (NPP, www.northernperiphery.eu). It consists of four papers, one for each country, which have been prepared by the relevant project partners. Together they give a thorough overview of the Scots pine timber trade in north-west Europe.

In the Scots pine timber industry, as in the rest of forest products value chain, each of the commercial participants must operate profitably: forestry, primary breakdown, secondary manufacturing, etc. It is equally important to have well-organised markets for the efficient trade of logs and semi-manufactured wood products between sellers and buyers. In this report the current situation in each country is described, including the evolution from traditional to modern wood utilisation, the annual growth and harvest of pine timber and the roundwood processing industry (either for local consumption, countrywide use or export). The grading and scaling rules are also described: there is a marked variation in the rules between countries, reflecting widely differing market situations. Finland and Sweden produce a large surplus of sawn timber, which is exported. Norway, on the other hand, has a good balance between national production and consumption, while Scotland is a net importer.
More information on the project can be found at **www.pineinfo.eu**.

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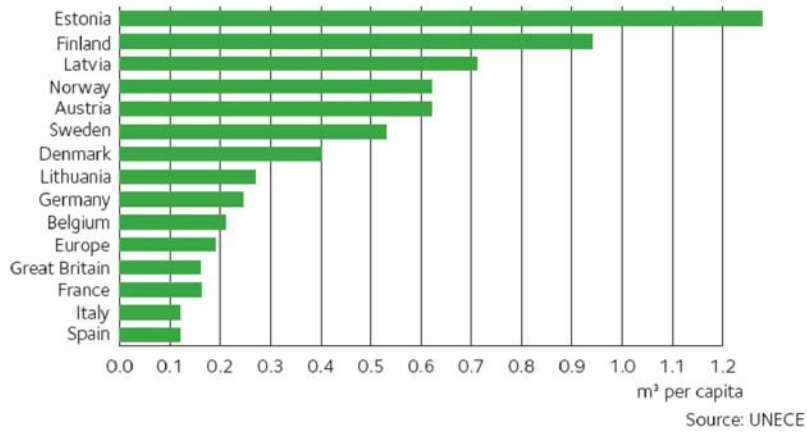

Consumption per capita of sawn softwood.
Source: www.skogsindustrierna.org

1. SCOTS PINE IN THE HIGHLANDS OF SCOTLAND

Ben Davies, Highland Birchwoods and Elspeth Macdonald, Forest Research[1]

Scots Pine Utilisation

Traditional uses of Scots pine

Commercial exploitation of Scots pine began in the Highlands around the 17th century. Prior to this period there had only been small scale fellings of timber for local use. Initially, the timber cut was mostly used for ship building and, to a lesser extent, to produce charcoal used for iron smelting. Later, with the expansion of the railway network in the 1850's and 1860's, Scots pine timber was widely used for sleepers, fencing, and railway construction.

Current uses of Scots pine

Apart from the industrial roundwood markets of particle board and orientated strand board for small dimension timber, there is a steady demand for timber for livestock and deer fencing. Presently, lower quality logs are used for fencing, pallet making and packaging. Until the 1970's much of this material was used for pit props but with the decline of deep coal mining, this outlet has disappeared.

Sawlogs of various specifications are produced from larger dimension trees. Roundwood of sufficiently high quality receives a premium as transmission poles. Some sawn timber is used in house framing, but the potential for using Scots pine timber in higher value joinery markets has not been developed in any quantity because of the lack of secondary processing facilities and timber quality limitations.

In a survey of Scots pine timber utilisation carried out in 2006 (Macdonald & Gardiner, 2008), wood processors reported that they processed a total of 325600 m3 of Scots pine timber during 2005.

The total volume of sawn timber and timber products produced was 187700 m^3. Just over 50% of this volume was panel board products, produced from chipwood. Nearly all of the sawn timber, produced from pallet logs and sawlogs, went to fencing markets (Figure 1) while decking and sleepers, which are perceived as higher-value products, comprised only 2% and 1% respectively of the Scots pine sawn timber volume. The majority of processed timber (approx 60%) was sold through timber merchants, builders' merchants, and DIY outlets.

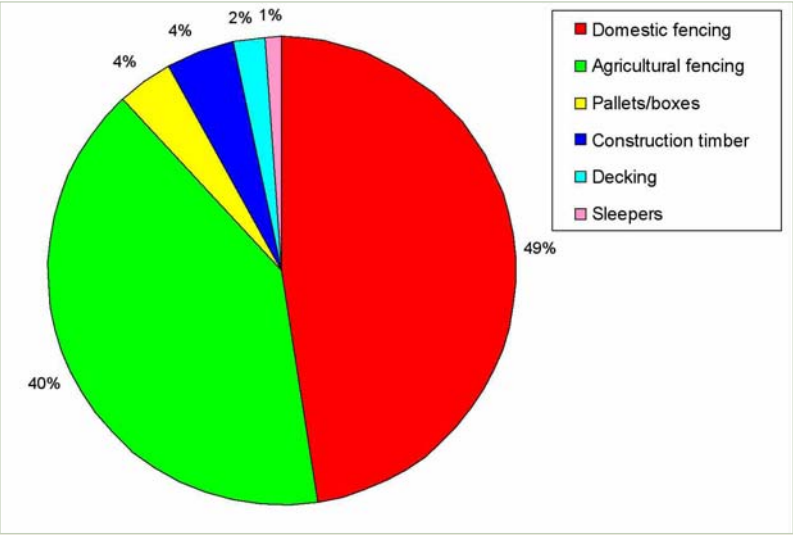

Figure 1: Breakdown of sawn timber produced from Scots pine roundwood into product categories (Macdonald & Gardiner, 2008).

Area of Scots Pine in the Highlands

There are approximately 250,052 ha of conifer high forest in the Highland Region, of which Scots pine comprises 66, 910 ha (26.8 %). It ranks third after Sitka spruce (83703 ha: 33.5%) and lodgepole pine (75837 ha: 30.3%) (Figure 2). 64 % of the Scots pine area is owned by the private forestry sector and the remainder by the Forestry Commission.

In recent years there has been an expansion in the area of Scots pine - in 1995 there was 66,910 ha of high forest Scots pine compared to 55,080 ha in 1980 (Forestry Commission, 2001).

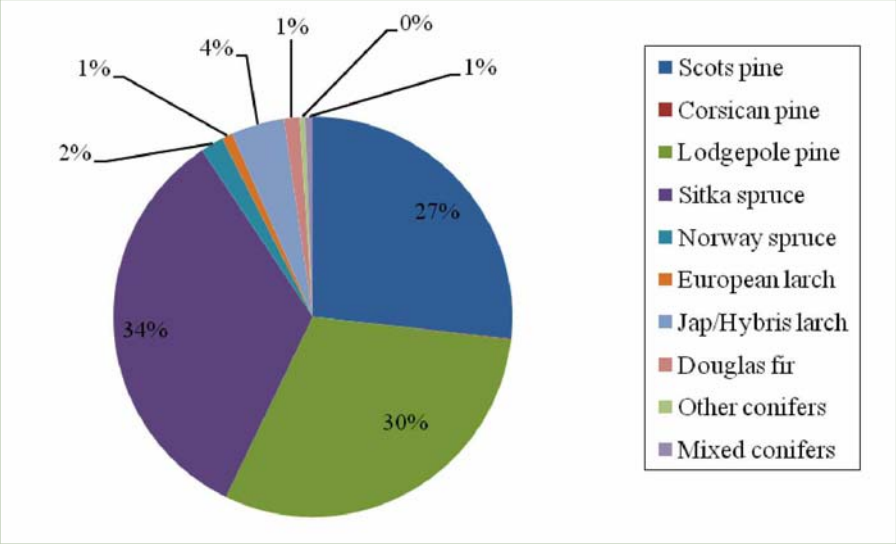

Figure 2: Distribution of planted species in the Highlands (Forestry Commission, 2001)

Scots Pine Timber Production

A forecast of softwood availability from Forestry Commission and privately owned forests in the Grampian & Highland areas of northern Scotland was produced using the methodology developed by Halsall et al. (2006). Results showed that Scots pine timber production is expected to continue increasing gradually over the next 20 years (Figure 3). The contribution of Scots pine to the overall softwood timber production is shown in Figure 4.

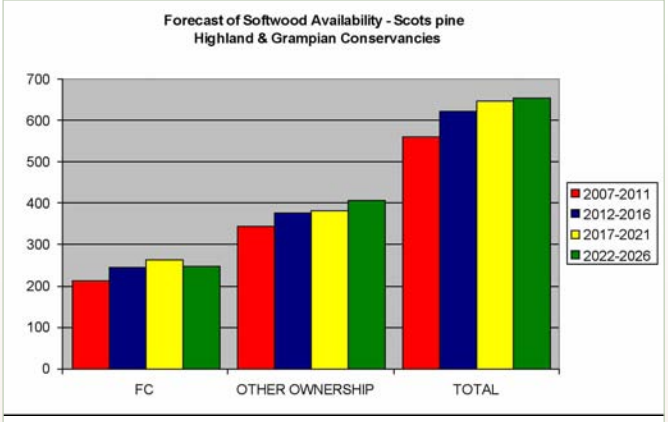

Figure 3: Forecast of Scots pine timber availability for Highland and Grampian conservancies (after Halsall et al., 2006)

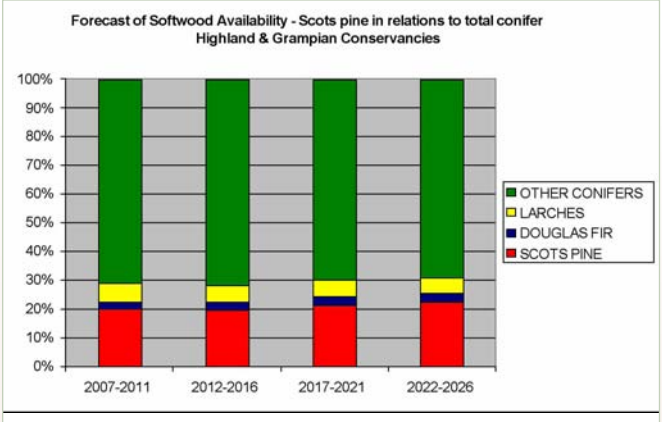

Figure 4: Forecast of softwood availability for Highland and Grampian conservancies - Scots pine in relation to total conifer production (after Halsall et al., 2006)

Forest Resource Assessment Techniques

Pre-Harvest Volume Assessment

The normal convention for estimating the volume of standing trees in Great Britain involves the use of tariff tables (Matthews and Mackie 2006). This is based on a linear relationship between tree volume and basal area. This relationship has been used to construct tariff tables that give estimations of volume, from diameter at breast height and a tariff number. There are two main types of standing sale tariffing procedure, full tariffs, and abbreviated tariffs. In a full tariff the total number of trees in the stand to be harvested is counted by marking each individually, with a sub-sample of trees being measured for diameter, and a sub-sample of diameter sample trees being felled and the volume assessed. This is an expensive and time consuming procedure which is not in common use. In most cases some form of abbreviated tariff procedure is used, based on estimating the number of trees together with diameter and height distributions from measurements made in randomly located sample plots. Full details of these procedures are described by Matthews and Mackie (2006).

Pre-Harvest Quality Assessment

As part of pre-harvest volume assessment it is normal for an estimate of the breakdown of round timber into different top diameter categories to be made (e.g. sawlogs with a top diameter > 16cm, pallet logs with a top diameter >14 cm or small roundwood with a top diameter > 7cm). This is generally based purely on diameter and height information, using assumptions about average stem taper, and does not make allowances for any stem defects such as sweep, crook or excessive knottiness. Forest Research has developed a method for stem straightness assessment for Sitka spruce, which is being adapted to other species including Scots pine (Macdonald et al. 2001, 2009). The use of this assessment method as an integral part of pre-harvest assessment is currently being trialled by Forestry Commission Scotland.

Sawlog quality assessment

The sale of sawlogs in Scotland is largely based on the a system of grading set out in the booklet "Classification and Presentation of Softwood Sawlogs" (Forestry Commission, 1993). This publication sets out the specification for two broad categories of sawlog - the higher quality "green" logs and the lower quality "red" logs, together with a specification for log poles (long logs if minimum 5.2 m length, extracted for cross-cutting in the sawmill). The log characteristics assessed for allocation to these categories include top diameter, length, straightness, knots, scars, decay, insect damage and blue stain in pine. In addition to this system sawmills or other wood processors may develop their own specification for particular roundwood categories which are notified to the seller and form part of the contract for purchase of roundwood.

Points of Sale

In the UK timber is either sold standing, as roundwood at the forest roadside or as roundwood delivered to the processing facility. The majority of Scots pine timber, in the Highland and Grampian regions of Scotland, is sold by standing sales (69%) (Table 1) (Macdonald and Gardiner 2007).

METHOD OF SALE		TRANSPORT DISTANCE TO PROCESSING FACILITY		TYPE OF PROCESSING FACILITY	
Standing Sale	69%	<50 miles	88.8%	Large Sawmill	49.1%
Roadside Sale	15%	50-100 miles	10.6%	Medium Sawmill	8.3%
Delivered In	16%	>100 miles	0.6%	Small Sawmill	0.1%
				Panel Board Mill	42.5%
Sum	100%	Sum	100%	Sum	100%

Table 1: Scots pine timber utilisation survey: results relating to method of sale, transport distance and type of processing facility (Macdonald and Gardiner 2007)

Standing sales

The sale of trees standing to a timber merchant involves the least outlay, work and commercial risk for the grower. It also provides, before felling, an estimate of the financial return that can be expected. The trees to be sold are either individually marked or the boundaries of the area to be felled within that area are indicated by some means. Recording the number of trees by breast height diameter classes, and calculating the total volume for each class is helpful to both sides when deciding on a sale price. The conditions under which the timber is to be sold should be clearly defined, so that the grower's interests are safeguarded and changes in circumstances or disruptions to the sale are planned for. Timber sold standing is generally sold on a price per tonne, or cubic metre basis, either with a single price for all products or with price differentiated between different roundwood categories (i.e., logs/small roundwood etc). This method is easy to operate using the weight tickets of the delivery lorries as a control. The sale contract will also specify the date of entry by the purchaser, completion date for the whole contract, and the dates for removal of produce.

Sale of converted produce

Where timber is to be converted by the grower and sold as separate products, e.g. sawlogs, telegraph poles, pulpwood, etc., it is normal practice to find a purchaser for the produce before a tree is felled. Sales of converted produce are most commonly made through, or to, a timber merchant, who will often be willing to organise collection and transportation. In negotiating prices it needs to be made clear whether prices are at 'roadside' or 'delivered'.

Felled trees in the length

Some growers may not wish to sell all their produce standing, for various reasons. For example the purchaser may wish to select the trees himself - this is often the case with individuals buying sawlogs for log home construction, trees for sale may be too scattered to attract a timber merchant, or may have to be felled with care to avoid damage.

Methods of sale of standing timber

Tender and auction

Sales by tender and auction are competitive and can generally be expected to give a true reflection of market prices. Tenders/bids can be invited from selected merchants or by advertising in the trade press. The precise terms of sale must be determined before advertising, and copies sent to interested potential buyers. This is necessary because acceptance of a tender automatically concludes a contract on the conditions. In Great Britain a system of electronic tender and auction sales is in operation and is widely used in addition to more conventional methods (see www.beaconauctions.co.uk).

Negotiation

The prices and other conditions are agreed between the buyer and the seller, and a suitable contract drawn up between them. Negotiated sales depend on the grower having a good knowledge of timber value.

Conifer Standing Sale and Sawlog Price Trends

There has been a general downward trend in both coniferous standing sale, and sawlog prices, in real terms, since the late 80s. The latest figures for the Sawlog Price Index for Great Britain are shown below (Figures 5). The price index measures the average price received per cubic metre from Forestry Commission sales, expressed in real terms (1996 prices).

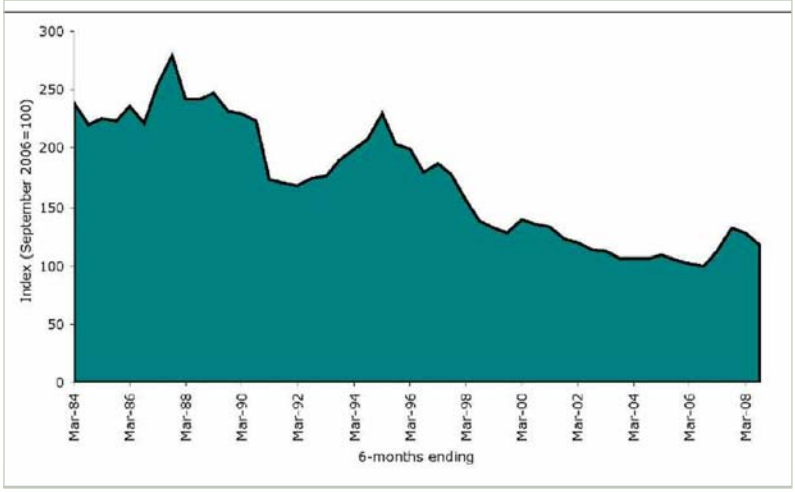

Figure 5: Softwood sawlog price index for GB

Factors Influencing UK Timber Prices

Because home produced timber accounts for only a small fraction of the country's timber usage (Figure 6), the prices of imported timber and wood based products have a strong influence on the general level of home grown prices.

Large timber users, such as panel board producers, negotiate prices with suppliers, reflecting the price of the imported finished product, haulage distance to mill, etc. Timber quality affects price to a varying degree, according to locality and markets. For example, high quality Scots pine may command a good price if local millers can process the material, but may fetch only average prices if local users are interested in only general purpose timber. The factors that also affect price are tree size, species, ease of harvesting etc. These together with local demand will have an important bearing on timber prices.

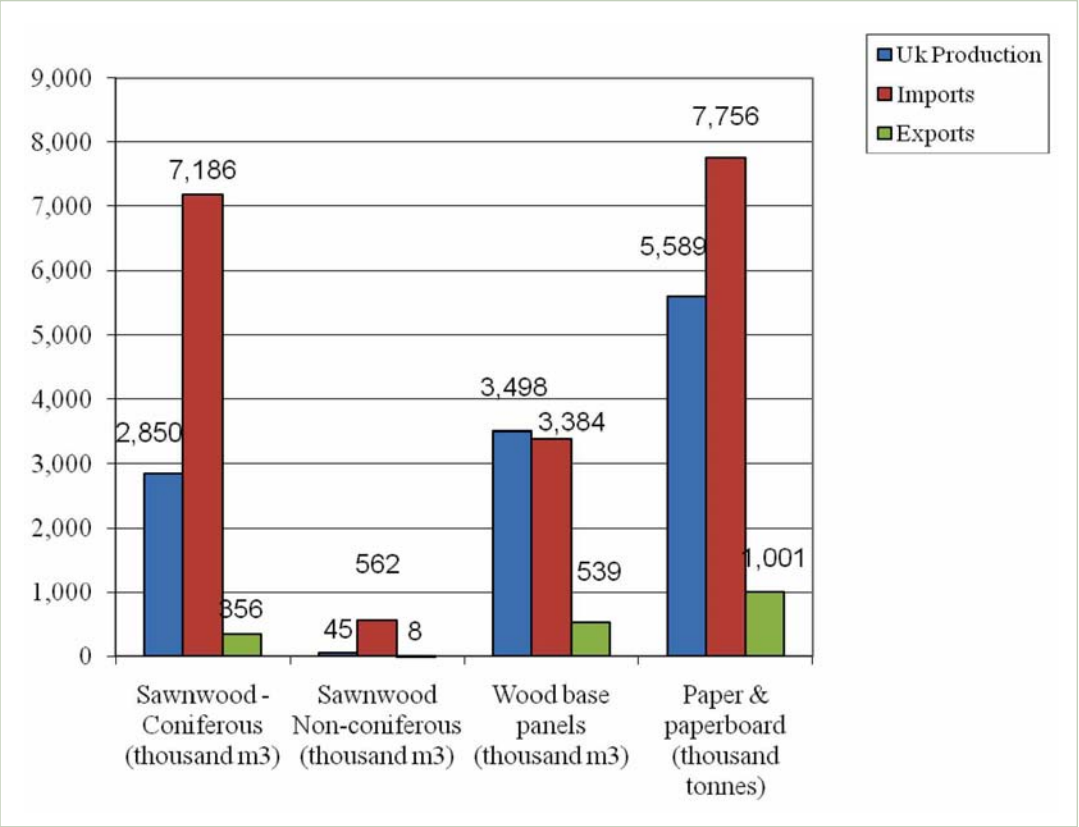

Figure 6: UK Timber Imports and Exports, 200

Market Opportunities for Scots Pine

In 2007 Napier University's Centre for Timber Engineering conducted a market development study to evaluate market opportunities for Scots pine timber grown in north Scotland (Macdonald et al., 2008). The study focused on value added and local processing. From the analysis undertaken the best prospects were garden and landscaping products (with a focus on thermal and chemical wood modification techniques), stress-laminated timber bridges, massive wood construction, external cladding, and playground equipment. Other products such as post and beam construction were felt to have potential if blue stain and dead knots are controlled.

A survey conducted in North of Scotland in 2005, to determine the extent of European larch, Douglas fir, Scots pine and hardwood trees capable of sustaining the quality and size requirements of higher value end-use markets, indicated that approximately 63,500m^3 of suitable material will be marketed in the next five years, of which Scots pine comprises 38, 665m^3 (about 60%) (Figure 7) (Forestry Commission, 2007).

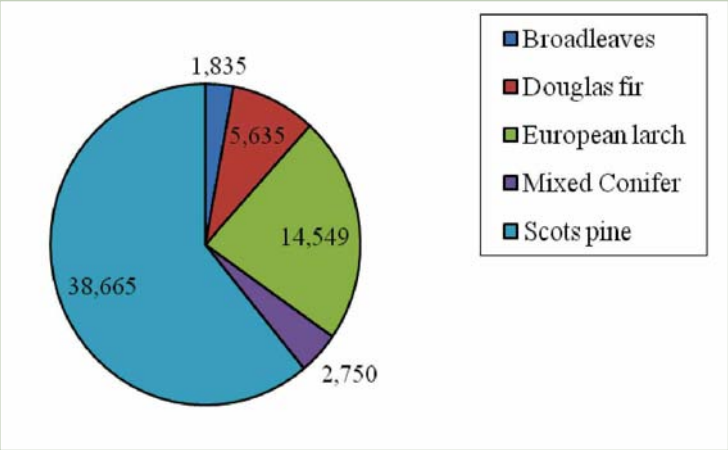

Figure 7: Projected volumes (m3) of higher value timber, by species, to be marketed over the next 5 years in northern Scotland

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2. NORWEGIAN FORESTRY AND THE PINE TIMBER TRADE

Peder Gjerdrum, Norwegian Forest and Landscape Institute[2]

History and background

In rural Norway, people have traditionally lived in farms and villages, mainly located in the lowland and valleys, where cultivated land was surrounded by forested hills. Thus, wood was always close at hand for the benefit of the population. In general, the domestic consumption of forest products is well balanced with the production of sawn, solid timber and fuelwood. In most rural districts there is a tradition of using all available wood resources for building houses, ships and boats, fences, tools and artefacts, as well as for energy: (household cooking and heating, and huge amounts for mining and glass factories).

The main native species of commercial significance are Norway spruce (Picea abies), Scots pine (Pinus silvestris) and a dozen broadleaved trees, of which the birches (Betula pubescens, B. verrucosa) are most important. Softwood is mainly used for solid wood products (the better qualities), newsprint/pulp, and energy (the poorer quality). Hardwood is mostly used for energy, either local consumption in the rural districts or - to an increasing degree - in industrial heat plants. The better hardwood qualities are increasingly popular for a range of uses.

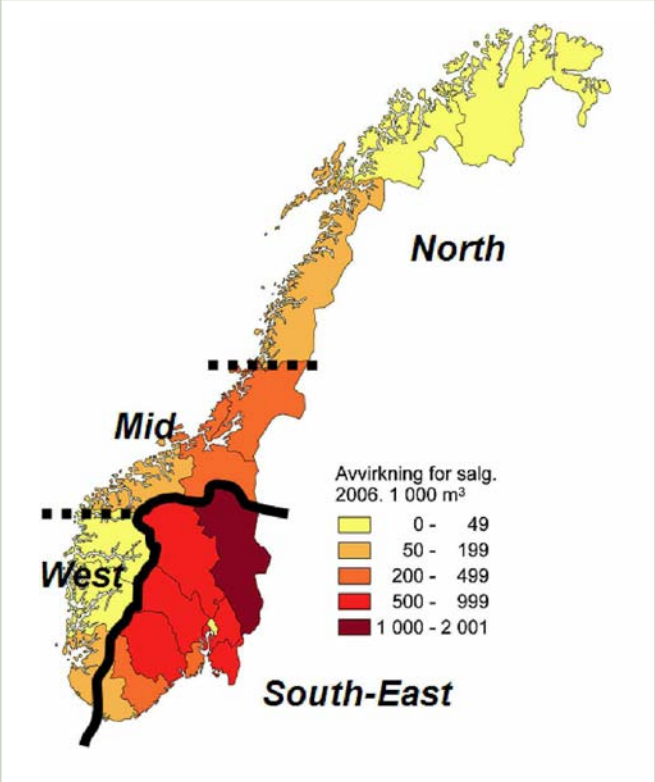

Figure 1: Harvest for commercial purposes, i.e. mainly softwood, by 'fylke' (district) 2006, in 1000 m³. National NPP areas are the regions to the west and north of the black line; as can be seen, the main commercial forestry area is not part of the NPP.

Spruce and pine are, and have been, largely used interchangeably or for similar purposes depending on local availability. However, there is some deviation from this general rule. Pine is preferred for more durable products, either preservative treated or naturally durable heartwood. In addition, pine is sought for clear, knot-free wood (found in the outer, basal part of large pines). Pine is also often preferred for appearance panels due to the vivid visual impression and the high surface quality of planed boards. The demand for appearance products fluctuates, according to market fashion. The increasing restrictions in wood preservation treatment might reduce the usefulness of pine timber, especially the lower timber grades. Traditionally, pine has been preferred for craft pulp. On the other hand, spruce is preferred for products to be glued (e.g. laminated beams) or painted, as spruce has a lower resin content and, therefore less resin leaching. Also, only spruce is used for ground pulp (mainly TMP) for newsprint paper.

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Solid wood consumption

A brief overview of the national harvest and production in the forest industries related to the domestic population is given in Table 1; the figures should be considered as an approximate average for the last decade.

Table 1: Annual harvest a), production and consumption of solid wood[3]

Annual harvest		10	mill. m³/a
Of this, local consumption		2	- " -
Rest = industrial harvest, 76% spruce, 23% pine, 1% hardwood		8	- " -
pulpwood (directly from forest)	3.5		
Sawlogs	4.5		
Sawn timber produced (50% of sawlog consumption)		2.25	mill. m³/a
of this, exported	- 0.50		
+ imported	+ 0.50		
Mean annual solid wood consumption		2.25	mill. m³/a
No. of inhabitants 4.5	mill.		
Annual per capita consumption		0.5	m³

a) Most public statistics include only the harvest for industrial purposes; only rough figures are known for local consumption.

Figure 2: Pine is an important raw material for sawmills (left), in turn supplying secondary wood manufacturing and wooden furniture production (right).

The NPP Area in Norway[4]

Most of the forested area, and consequently, most industry, is found in the central-south-eastern regions of Norway, which is outside the NPP area (Figure 1). Only the North-Mid-West (NMW) regions of Norway are covered by the NPP area and these will be the main concern of this report.

Forestry in the NMW regions has generally been of minor commercial importance. Large areas consist of steep slopes or high mountains in the west or have a harsh, arctic climate in the north. Only about 14% of the national commercial harvest originates from this wide region (Table 2), and pine volume is lower (8% of harvest) than in the country as a total (23%). Of particular concern for nature preservation is the

[3] All statistical information, when not otherwise stated, is based mainly on information from Statistics Norway, www.ssb.no/skog; accessed in January 2009

[4] Only the North-Mid-West region of Norway is included in the Northern Periphery Programme eligible area, Figure. 1. In this report, the following regions by 'fylke' (administrative district) are applied. North: Finnmark, Troms, Nordland; Mid: Nord-Trøndelag, Sør-Trøndelag, Møre og Romsdal; West: Sogn og Fjordane, Hordaland, Rogaland; South-East: all the rest

Table 2: Commercial pine harvest by region, 2007

	FOREST, % of land area	PINE, INDUSTRIAL HARVEST 1000m³	% of total	TOTAL HARVEST 1000m³
NPP, North	16%	5	2%	135
Mid	24%	62	7%	829
West	16%	20	12%	171
Total NPP	18%	87	8%	1135
South-East (non-NPP)	40%	1818	26%	7077
Sum Norway	27%	1905	23%	8212

extremely slow-growing pine forest in protected locations in the far north-east, in the valleys of Finnmark and along the borders to Finland and Russia.

In NMW, the most important commercial forestry can be found in the mid region, in Trøndelag and Møre. A major newsprint pulpmill in Trøndelag, based on spruce, has been a most successful forestry enterprise for decades.

Nevertheless, native pine forest can be found in many locations, which has provided a log supply to an important sawmill industry and furniture factories, such as in Møre. Boats and barrels for storing herring were always of wood, and dwelling houses are always built in wood in NMW as in the rest of the country.

A large part of the NMW area has the potential for increased forest production, and has for almost a century had a programme for afforestation. Along with native species, a number of imported trees have been trialled. The most successful species were found in the north-west coastal regions of North America. Among them, Sitka spruce (Picea sitkensis) was most widely planted, and is now increasingly being harvested on a commercial scale. Other cultivated species are Lutzi spruce, Siberian larch, and fir species.

Nevertheless, a lack of tradition and knowledge of forest cultivation and operations, missing infrastructure and industry, and modest local timber consumption is of major concern in the Northern Periphery area of Norway. However, timber consumption need not be limited to local markets[5]. Norway, and in particular the coastal regions found in NMW, has always been open to long distance trade by ships.

Forestry

The forested area is around 1/4 of the total land area in Norway, and a little less than 1/5 of the NMW land area (Table 2). The natural treeline extends up to about 1000 m elevation in the southern central part of the country, declining westwards approaching the coastline and northwards approaching arctic regions. Thus, in various regions there is a limitation on forested land due to the harsh environment of the mountains, the Polar Regions and the marine influence.

[5] A rather curious example is a large amount of stems and logs escaping the huge rivers of Siberia and drifting all the way to our northern coasts, where they would be used like any other timber.

Not all of the forested area is classified for commercial and profitable timber production. Approximately 1/4 of Norwegian forest land is classified as 'not profitable'. In the NMW, 57% of the forest is considered profitable, compared to 83% in the rest of the country (i.e. the south-east part).

Figure 3: Cutting – both thinning and clear-cutting – is highly mechanised and computerised to optimise bucking (left); forest owners deliver their logs at roadside, separated in assortments e.g. pine sawlogs (right).

Cultivated land is predominantly comprised of small private properties, usually a mix of farm land, pastures and forest. The small size, on average some 50 ha, originates from property splitting to accommodate an increasing rural population a couple of centuries ago.

The drawback of small properties in modern times has been counteracted by widespread, albeit voluntary, cooperation in regional Forest Owner Associations[6]. Key issues for the cooperation are silviculture, harvesting, hauling and transport, roundwood trade, training in various topics of practical tasks and forest management, and providing information to the public and authorities. Similar cooperation is found for the construction and maintenance of forest roads, hunting and angling. In this way, the forest sector has been able to benefit from modern and most efficient technology, thus keeping the cost of forest operations at a low level. At present, 80% of all harvest in NMW is done by harvester (overall in Norway the figure is 91%).

In summary, the NMW region of Norway which falls within the NPP area, is less forested and has a lower proportion of profitable forest compared to the rest of the country.

Forest legislation and management regulation[7]

Norwegian policies dealing with the conservation and sustainable utilisation of forest resources are based on fundamental principles of maintaining the long-term stability and resilience of the resource base. The goal of Norwegian forest management policies is to meet social, economic, ecological and cultural needs for present and future generations. Norway has ratified the Rio convention on biological diversity and the climate and signed resolutions on sustainable management of Europe's forests. The principles expressed in these documents are also incorporated into Norwegian forest policy. Within these frameworks, the forest owner is free to manage the forest in relation to his own objectives ("freedom with responsibility").

[6] http://www.nordicforestry.org or www.skog.no
[7] This paragraph is cited from www.nordicforestry.org/facts/Norway.asp

The public forest administration in Norway is divided into three levels:

- *Nationally the Ministry of Agriculture and Food has authority over forestry*
- *At county level the authority over forest matters is delegated to the county governor*
- *At municipal level each municipality serves as the authority on forest matters*

The forestry authorities' tasks include:

- *Seeing that the Forest Act and other relevant acts are complied with*
- *Administering the public subsidy arrangements*
- *Guidance for the forest owners*
- *Participating in the planning process, particularly as regards land management*
- *Administering the forestry preservation duty arrangements Forest legislation*

Forest industries

It is customary to separate industrial from small-scale sawmills. Industrial mills are operated continuously and sawn timber production is typically the main purpose of the mill. Small-scale mills are usually operated part-time and integrated with other activities such as forest farming or wood manufacturing and trade. The main roundwood consumers are:

- *Around 100 moderate- to medium-sized industrial sawmills consuming 50 - 300 000 m³ sawlogs annually, either specialised for one species (pine or spruce) or mixed softwood. It can be estimated that 10-15% of these sawmills are located in NMW, i.e. proportional to total industrial harvest.*
- *Around 1 600 small-scale sawmills producing on average 300 m³ sawn timber annually for local consumption. Annual consumption in the region of 1.0 to 1.5 mill. m³ sawlogs. About 60% of these mills are found in the NMW area[8].*
- *Specialised factories for preservation treatment of poles and garden products from pine, and various hardwood products*
- *A few large mills for sulphate pulp from pine and refinery/grindwood pulp from spruce*
- *An emerging number of industrial heat plants based on biofuel, and a vast number of commercial or non-commercial producers of fuelwood.*

The NMW regions have four times more small-scale sawmills than pro rata of the industrial harvest. It can be assumed that a part of their log supply is non-industrial, i.e. logs harvested for local consumption (cp. Table 1).

Round timber scaling

Round timber scaling, including quality assessment and grading, is performed by an independent organisation, Norsk Virkesmåling (Tømmermålingen)[9]. Tømmermålingen is organised as a national, non-profit body by the agreement of the private organisations representing the seller (forest owner associations) and buyer (sawlog and pulpwood, respectively), and supported by the Government.

[8] Apneseth T, Kleppe L and Aalstad, OH 1999: Small-scale sawmills in Norway. Report 43, Norwegian Institute of Wood Technology (Norwegian, English summary)
[9] http://www.tommermaling.no

Quality assessment

Tømmermålingen has set up a system of regulations for grading and scaling which includes general rules for all categories of roundwood, and specific rules for sawlogs and pulpwood respectively. A translated version of these regulations[10] can be found on the web-page under the tab "Reglement | English". A set of definitions follows the regulations. In general, the regulations for domestic use are far more specific than the corresponding EuroNorms.

The quality requirement is described partially in general terms ("The individual log is to be fit for sawing"), partially by explicit tolerances for each quality class. Until a couple of decades ago, the tolerance table had to be approved by the Ministry of Agriculture, and the same rules were applied nationwide. At present, the tolerances are agreed by the selling and buying partners, and there are two regional tolerance tables, one for south and west and another east and north. Further, the partners might agree on specific tolerances for their trade, usually a company specific tolerance table adapted to the market situation for the sawmill in question.

Figure 4: Sawlog scaling in log scanner at industrial sawmill (left); quality grading is done by visual assessment while logs are moved by a conveyor

The most important traits or defects are:

- *Dimensions: upper and lower limit for small-end diameter (typically min. 12 cm under bark) and for length (34 to 58 dm), and maximum diameter anywhere on the log (max. 60 cm);*
- *Knots: separate rules for sound knots, dead or bark-ringed knots, rotten knots, knot burrs, and spike knots;*
- *Crook: specification for long crook, sharp crook, angled crook, butt end crook, double crook, spiral crook;*
- *Annual ring width (for the higher grades);*
- *Compression wood and resinous wood, bark pockets, double pith, butt end deformations;*
- *Checks: specified for ring shakes, seasoning checks, felling damage;*
- *Decay: specified for forest decay (rot), storage decay, aniline coloured wood, log stain, insect damage.*

For further details, the reader is referred directly to the regulations.

[10] Definitions http://www.m3n.no/tm-eng-malereg-definisj.asp
General specifications for all roundwood http://www.m3n.no/tm-eng-malereg-gener.asp
Regulations for sawlogs http://www.m3n.no/tm-eng-malereg-sag.asp

Nominal volume

In principle, sawlogs are scaled and traded individually, based on the log's length L, small end diameter DT and quality Q (Figure 3). Nevertheless, a nominal volume VN is calculated, mainly for statistical purposes or to give key figures for sawlog prices. The algorithm for calculating VN shall be briefly described. It is important for understanding the Norwegian timber trade, for the procedure of bucking a stem into logs, for roundwood allocation to different industries and for realising the relative values between logs of varying taper and dimension.

Most often, sawlogs are traded in random length and diameter. The diameter is measured in a random direction. Length is rounded down to the nearest decimetre. DT is given as the centre of 1 cm-classes (e.g. all logs observed to 20.0 ... 20.9 cm is set to 20.5 cm; this is for historic reasons to ease manual calculation at the time; beyond 30 cm top diameter, 2 cm-classes are applied). If observed before debarking, a bark deduction is calculated. A nominal taper of 1 mm/dm from top to mid-way log length is added to DT to give a nominal mid-diameter DM (e.g. 2.5 cm will be added for a 50 dm long log). DM is converted to decimetre, and nominal volume VN in cubic decimetre is calculated by Huber's formula:

$$VN[dm^3] = \pi/4 \cdot DM^2 \cdot L$$

Example. The log is observed to 23.2 cm on bark and length 467 cm. Bark deduction is 1.1 cm (by formula), so log diameter under bark is 22.1 cm. Then DT = 22.5 cm, and L = 46 dm. Nominal taper to mid yields 2.3 cm, so DM = 24.8 cm or 2.48 dm. Finally, VN = 222 dm3.

The importance of this formula:

- *logs with low taper (< 0.1 cm/dm) are allocated a higher nominal than actual volume, and vice versa;*
- *logs with low taper generally have fewer knots and are of higher quality, and such logs obtain a higher price per actual volume;*
- *in primary breakdown, low sawn timber volume recovery results from high log taper (in particular for the main yield), and this is lower the longer the log;*
- *during cross-cutting of the stem, high taper yields short sawlogs, in accordance with the sawmill's wishes;*
- *thus, this algorithm for nominal volume demonstrates coinciding economic incentives for the forest owner as well as for the sawmill.*

Modification of the dimensions

The log dimensions are usually measured by shadow scanners (traditionally by ruler and calliper) at reception at the sawmill, before debarking. First, a deduction for bark is made. Each pine log is assigned to one of three bark classes: thick (found near the tree's base), intermediate, and thin (upper part of the stem). Representative, mean values for double bark thickness, proportional to the diameter, are applied.

For logs of inferior quality, that exceed the thresholds for tolerated defects, length or diameter adjustments might be applied.

Roundwood price and value

Average selling prices for pine roundwood from forestry are illustrated in Figure 5. The price ratio is approximately 1 : 2 : 3 for pulpwood : sawlogs : special quality logs. At present (early 2009) the prices demonstrate a declining tendency.

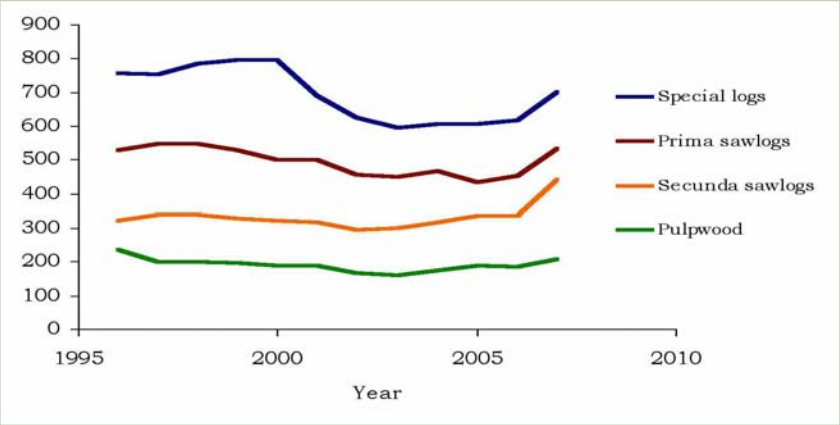


Figure 5: Average selling prices for the major pine sortiments, NOK per m3 for delivery cut-to-length and transported to forest roadside. Exchange rate to Euro has varied in the range 1 EUR ~ 8-9 NOK. Source: www.ssb.no

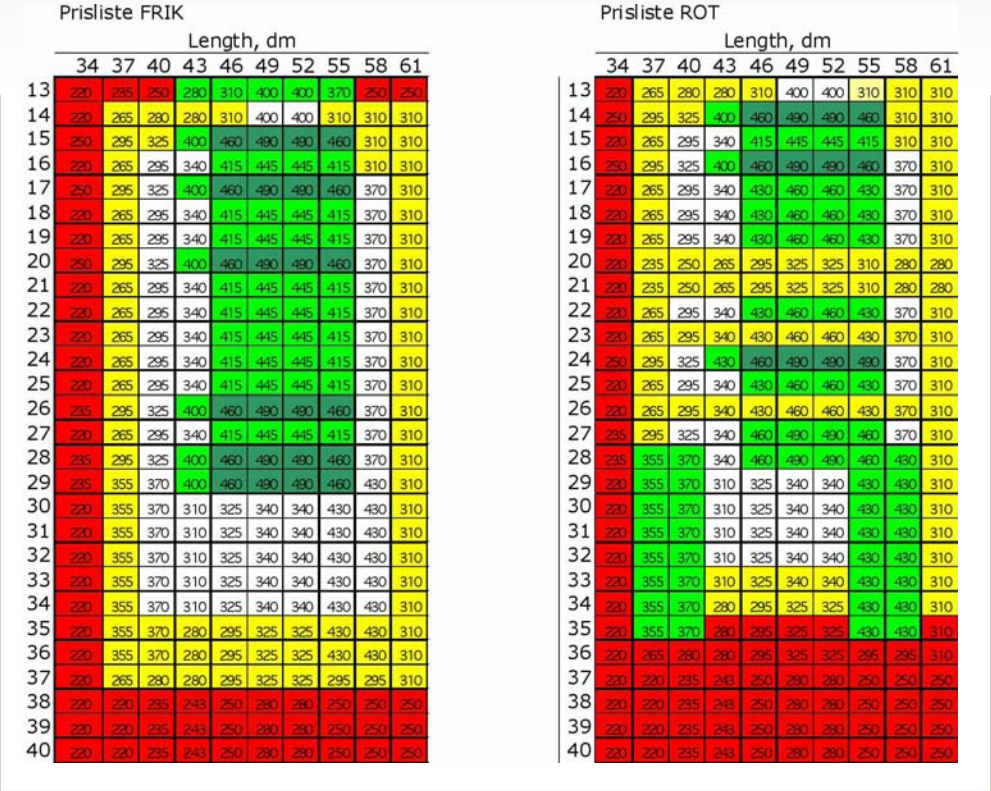
Prices are negotiated and agreed between seller and buyer, or their organisations. For pulp- and energy wood, prices are specified per cubic meter under bark. The following description will deal with logs for sawn and other solid wood products.

Sawlog value is basically decided for each log according to top-end diameter, length and quality. However, for ease of use, the value is calculated as the product of price per cubic metre and nominal volume. Prices are listed in a DT by L table or matrix. In the standard version, prices increases as DT and L get higher, up to given dimension boundaries where prices level off or diminish.

However, many buyers find this standard matrix is not flexible enough. For reasons such as customer preference or technical equipment, some logs might be more valuable - and others less valuable - as raw material. Consequently, it is a well established practice to agree on specific price matrices (Figure. 6)[11]. Certain combinations of length - diameter - quality, which are more deriable to the processor, are given a higher price to stimulate bucking/cross-cutting. For other combinations, the price is lowered to indicate they are less attractive.

This procedure works well in computerised harvesters. However, there are some restrictions in the efficiency: One is that the shape and taper of the trunk is always more important than the price matrix. E.g. from a trunk one can make either a short and thick log, or a long and thin. Another is that the scaling performed to assist the bucking is not perfectly accurate. Therefore, a D-L range is usually preferred to very precise and narrow combinations.

[11] MSc Forestry Carlos Myrebø gave invaluable contribution to this description.



Prisliste FRIK

	Length, dm									
	34	37	40	43	46	49	52	55	58	61
13	220	235	250	280	310	400	400	370	250	250
14	220	265	280	280	310	400	400	310	310	310
15	250	295	325	400	460	490	490	460	310	310
16	220	265	295	340	415	445	445	415	310	310
17	250	295	325	400	460	490	490	460	370	310
18	220	265	295	340	415	445	445	415	370	310
19	220	265	295	340	415	445	445	415	370	310
20	250	295	325	400	460	490	490	460	370	310
21	220	265	295	340	415	445	445	415	370	310
22	220	265	295	340	415	445	445	415	370	310
23	220	265	295	340	415	445	445	415	370	310
24	220	265	295	340	415	445	445	415	370	310
25	220	265	295	340	415	445	445	415	370	310
26	235	295	325	400	460	490	490	460	370	310
27	220	265	295	340	415	445	445	415	370	310
28	235	295	325	400	460	490	490	460	370	310
29	235	355	370	400	460	490	490	460	430	310
30	220	355	370	310	325	340	340	430	430	310
31	220	355	370	310	325	340	340	430	430	310
32	220	355	370	310	325	340	340	430	430	310
33	220	355	370	310	325	340	340	430	430	310
34	220	355	370	310	325	340	340	430	430	310
35	220	355	370	280	295	325	325	430	430	310
36	220	355	370	280	295	325	325	430	430	310
37	220	265	280	280	295	325	325	295	295	310
38	220	220	235	243	250	280	280	250	250	250
39	220	220	235	243	250	280	280	250	250	250
40	220	220	235	243	250	280	280	250	250	250

Prisliste ROT

	Length, dm									
	34	37	40	43	46	49	52	55	58	61
13	220	265	280	280	310	400	400	310	310	310
14	250	295	325	400	460	490	490	460	310	310
15	220	265	295	340	415	445	445	415	310	310
16	250	295	325	400	460	490	490	460	370	310
17	220	265	295	340	430	460	460	430	370	310
18	220	265	295	340	430	460	460	430	370	310
19	220	265	295	340	430	460	460	430	370	310
20	220	235	250	265	295	325	325	310	280	280
21	220	235	250	265	295	325	325	310	280	280
22	220	265	295	340	430	460	460	430	370	310
23	220	265	295	340	430	460	460	430	370	310
24	250	295	325	430	460	490	490	490	370	310
25	220	265	295	340	430	460	460	430	370	310
26	220	265	295	340	430	460	460	430	370	310
27	235	295	325	340	460	490	490	460	370	310
28	235	355	370	340	460	490	490	460	430	310
29	220	355	370	310	325	340	340	430	430	310
30	220	355	370	310	325	340	340	430	430	310
31	220	355	370	310	325	340	340	430	430	310
32	220	355	370	310	325	340	340	430	430	310
33	220	355	370	310	325	340	340	430	430	310
34	220	355	370	280	295	325	325	430	430	310
35	220	355	370	280	295	325	325	430	430	310
36	220	265	280	280	295	325	325	295	295	310
37	220	220	235	243	250	280	280	250	250	250
38	220	220	235	243	250	280	280	250	250	250
39	220	220	235	243	250	280	280	250	250	250
40	220	220	235	243	250	280	280	250	250	250

Figure 6: Price matrices, examples for two different quality assortments; FRIK (green knots) logs are found in the upper parts of a trunk, while ROT is the butt log. Green colour indicate that the price is raised, yellow and red that the price is lowered.

Consignment lots

The identity unit in roundwood trade is the lot consigned between buyer and seller (albeit this is not fully unambiguous when a third party like the forest owner association is involved). All data related to a consignment lot is transferred electronically for further processing and issue of documents. All system and programme development for the calculations is done by the IT company Skog-Data AS[12]. Over a number of years, a large number of integrated sub-systems have been developed to provide a modern and versatile range of solutions, covering software for consignment contracts, scaling, value calculation and transport for the forest sector as well as accounting and logistics for sawmills, and a number of other solutions.

SKOG-DATA AS

Primary breakdown

For most Nordic softwood, the main yield, or centre yield, is by far the most valuable part. Sideboards are _ the price of the main yield, while residue is sold at very low prices. In such cases, a stepwise optimisation starting with the most valuable products, the main yield, will usually be quite efficient. For a certain main yield, i.e. a certain combination of centre boards, the log of suitable quality and with the smallest possible top end diameter is chosen.

Butt logs of old pine stems might be the exception, with clear, knot-free and highly valuable side boards being sawn from the outer part of the logs. For such logs, the optimisation should proceed outside inwards, as opposed to starting with the main yield.

12 www.skogdata.no

Prospects for pine products

Here only a few aspects will be discussed. The objective is more to illustrate that the demand for pine products is continuously and dynamically changing, so that a successful industry will need to consider the future of their markets rather than history.

International finance crisis

Solid wood consumption is influenced by general trends in economic development, in fashion, etc. The slowdown in the regional and global economy is expected to reduce the demand for costly dwellings, such as high-priced pine log-houses. On the other hand, people will probably start asking for traditional, well-known products, which would benefit rustic pine furniture and appearance wood products.

Environmental issues

The forestry sector has a long tradition of claiming wood as an environmentally friendly material. However, this statement will be accepted only as long as we are able to convince - not ourselves - but the general public, that it is true. For the wood preservation industry, it appears as if the argument has already been lost. Preservation treatment by mineral biocides is strictly regulated and greatly reduced, leaving only much more expensive treatment methods available, resulting in a reduced volume of timber being treated. The performance of these products if often inferior, and now there are problems selling this timber. This battle is lost, more because of the general eco-trend than factual arguments. We should be aware that other wood products might be met with similar arguments, e.g. emission of volatile resinous compounds.

Figure 7: Preservation of timber for outdoor use or soil contact. The consumer market for impregnated timber is substantial, and fabrication well suited for SMEs.

Bioenergy

The political interest in using trees and wood for energy purposes might add to the demand for pine, as well as for other species of timber.

3. PINE TIMBER TRADE IN SWEDEN

Lisa Classon, Swedish Forest Agency[13], and Peder Gjerdrum, NFLI

History - background - legislation

Geographically Sweden is characterized by its long coastline, large forests and numerous lakes. Some two-thirds of Sweden's land area is covered with forests. Despite its moderate population of nine million inhabitants and large, predominantly rural, area, Sweden has always been a technologically advanced country with well organised infrastructure and efficient transport and communication. The country is divided into 24 'län' (counties) and 290 'kommuner' (municipalities).

The Swedish Forest Agency, SFA, is organised under the Ministry of Agriculture. SFA is responsible for implementation of forest policy, to be applied for all forest land and each of the three dimensions of the sustainability concept: economy, ecology and social factors. The operative work is carried out by 43 forest districts. State forests, outside national parks, are managed by the fully state owned, commercial company, Sveaskog, which is entirely separated from SFA. National parks are managed by the environmental authorities.

Figure 1: Natural regeneration of Scots pine: High quality trees are left to produce seeds; scarification or mounding improves the germination.

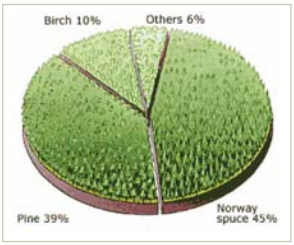
Since 1903 Sweden has had a dedicated Forestry Act. The present act, most recently revised in 1994, assigns equal importance to production and conservation goals. The forest owners are given great responsibility for achieving these goals.

The forest sector has always been an integrated and important part of Swedish society and the economy. Nearly 2/3 of the land area[14], 27.4 million ha, is forested, of which 21.7 million ha is commercial forest. Non-productive land (swamp, rock surface or sub-alpine woodlands) covers 5.7 million ha. The annual harvest amounts to 80-100 million m3. The major roundwood consuming businesses are the pulp, paper, energy and sawn timber industries. The forestry sector employs some 180 000 persons and generates abundant export sales, about 50% of Sweden's net annual export value. Forestry (and related activities such as transport) is the single most important industry in innumerable rural communities; this industry is locally based with little dependence on external resources.

[13] Skogsstyrelsen, Region mitt, E: Lisa.Classon@skogsstyrelsen.se

[14] The main source for all statistical information is SFA, www.skogsstyrelsen.se/episerver4/default.aspx?id=37802

Softwood species, Norway spruce and Scots pine, are commercially most significant. Of the broadleaves, birch is most important. The traditional uses of wood are:



- *Firewood for domestic heating, cooking etc*
- *Building materials for houses, boats*
- *Materials for tools and equipment*
- *Energy for mining and glass factories*
- *Production of coal and tar*
- *Fertiliser (the ashes) in the slash-and-burn cultivation*
- *Sawn timber, since the emergence of the sawmill industry in the 15th century*

Bio energy is becoming a significant wood use. Forests play an important role as a domestic source of renewable energy, creating employment and commercial activities in mainly rural areas. Almost 50 % of the total harvest is used for generating energy in some way or other. Of this, large quantities come from the by-products of the forest industry.

The use of wood fuel is increasing for direct heating in remote areas and heating plants as well as for electricity production. District heating plants based on chipped logging residues have expanded rapidly. The technology for making briquettes, pellets and sawdust developed considerably throughout the nineties. These products are primarily made from industry by-products such as plane shavings and sawdust. The forest industries use more than 50 % of Sweden's bio fuels for producing hot water, steam and/or electricity.

Solid wood consumption

For 2007 roundwood consumption was 95.5 million m_ with bark. Removals amounted to 77.6 million m_ under bark (Table 1).

Table 1: Annual harvest, production and consumption of solid wood

Annual harvest under bark			80 mill. m_/a
Of this	Sawlogs	40	
	Pulpwood	30	
	Fuelwood	6	
	Other roundwood	0.5	
Sawn timber produced (50 % of sawlog consumption)			20 mill. m_/a
	Of this exported	- 11.3	
	+ imported	+ 0.4	
Mean annual solid wood consumption			9 mill. m_/a
No. of inhabitants			9 mill.
Annual per capita consumption, ca			1.0 m^3

Forest ownership

In 2007, the number of forest owners amounted to 335 805. By tradition, the ownership is classified in four categories: private persons, state forests, other public forest and company owned land.

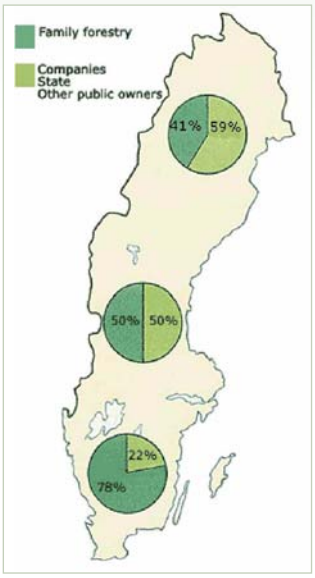


Figure 2: More company and state owned forest in the NPP area in the north.

Half of the commercial forest land is owned by private persons. These properties vary from a few hectares up to several thousand hectares, with an average of 45 ha. 38% of the properties are owned by women. Joint ownership with agriculture is still common, but pure forest estates are gradually becoming more widespread. While most private owners traditionally were self-employed on their own property, most owners now live in towns and hire personnel for the forest operations. In 2007, the forest owners association had 106.000 members with a total forest area of 6.3 million ha.

State forest accounts for 19% of the forest area, of which Sveaskog AB is the most important; other state forests are used for railroad and road purposes, research and teaching, fortification or commercial purposes other than forestry. A further 5% of public forest is owned by local communities, the church and other joint ownership areas.

Private companies own 25% of the forest. Some of these companies were established principally for the purpose of commercial forest management, while others acquired forest land as part other industries, e.g. mining. Major forest companies are Sveaskog AB (3.5 mill. ha), SCA Skog AB (2.0 mill. ha), Bergvik Skog AB (1.9 mill. ha) and Holmen Skog AB (1.0 mill. ha).

The national NPP area[15]

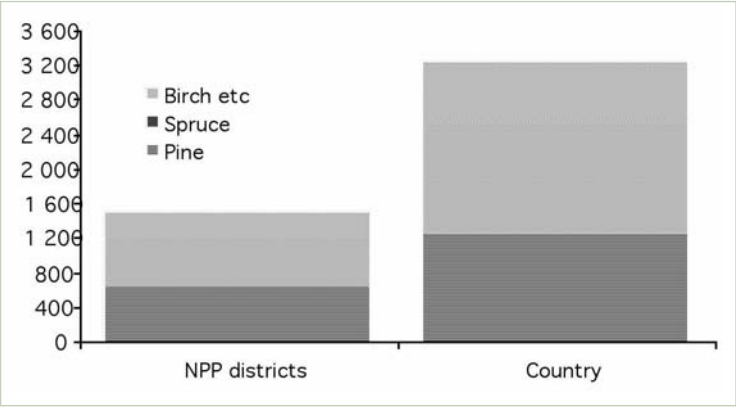


Figure 3: Growing stock (standing volume) in million m3

The NPP area is the sparsely populated landscape in the north dominated by conifer forests. Most of the forest industry is located close to the east coast, where there are also a few larger cities. The interior consists of wide forested areas where people live in small communities and villages. In parallel with the sparse population, a smaller proportion of the forest land is owned by private individuals, and a larger part by companies and the state.

Approximately 46 % of Sweden's total growing stock, all species, is found in the NPP area, of which 630 million m3 is pine. The NPP Scots pine growing stock is 19% of all growing stock in Sweden, and 51% of total NPP stock. However, due to the slower growth rate in the north and to extensive areas set aside for national parks, the NPP annual harvest is rather low, 24 million m3 or 25% of the total harvest.

[15] The NPP area consists of the following 'län' (~counties): Norrbotten, Västerbotten, Jämtland and Västernannland. This area does not completely coincide with the generally used Swedish regions Norra and Södra Norrland, which even includes Gävleborgs län. For this reason, some of the statistical information is approximate.

Forest Owners Associations

The regional forest owners associations are economic associations that work for their members. Their task is to give the private forest owners a stronger position in the timber market and in society in general. The associations offer marketing and sales services, and also logging and advisory services. In addition to this they often represent the interests of family-enterprise forestry in consultation with the Swedish Forest Agency and other authorities. There are four forest owners associations in Sweden today: Södra Skogsägarna, Mellanskog, Skogsägarna Norrskog and Norra Skogsägarna. The associations active in the NPP area are Mellanskog[16], Skogsägarna Norrskog[17] and Norra Skogsägarna[18]. Some of the Forest Owners Associations owns wood processing plants: pulp mills, sawmills and energy plants. The total number of members in the NPP area is approximately 50 000, and the forest area connected to the forest owners association is almost 4 million hectares.

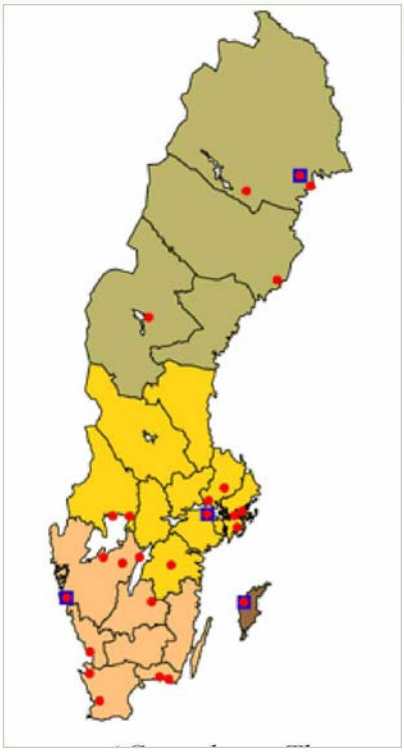


Figure 4: Sweden: The main regions and cities. The NPP area is the northern region. Source: www.sna.se

Forest and related industry in general and in the NPP area

The Swedish forest industry is based traditionally on a variety of saw-, pulp- and papermills and remanufacturing industry for boards, packaging, joinery, etc. Larger factories are located with direct access to harbours. The forest industry is strongly export oriented. Sweden is the third largest exporting country of sawn wood products and fourth for pulp and paper. In the NPP area the forest industry is extremely important.

At a national level production during 2007 resulted in:

- *18.6 mill. m³ sawn wood, of this 18.3 mill. m³ was softwood.*
- *1.355 mill. m³ preservation treated (impregnated) sawn timber[19], of which 0.912 mill. m³ pine timber*
- *12.4 mill. tonnes wood pulp (sum of sulphate, mechanical, sulphite, and semi-chemical pulp), of this 4.1 million tonnes market pulp and the rest for paper production.*
- *11.9 million tonnes paper and paperboard.*

Industry in the NPP area

- *In the NPP area there are 52 sawmills producing less than 100 000 m³ and 15 sawmills that produce over 100 000 m³ sawn timber annually. Production in the 52 small to medium size sawmills (producing less than 25 000 m³) added up to 155 000 m³ per year. The larger sawmills produced 4 266 000 m³.[20]*

16 www.mellanskog.se
17 www.norrskog.se
18 www.norraskogsagarna.se
19 Source: Swedish Wood Preserving Institute.
20 Source: The 2000 Sawmill Inventory.

- *All pulp and paper factories are located on the east coast and produce for export. In fact, this is the major Swedish area for this industry. Wood supply is acquired from the interior landscapes and hauled to the coast. The products are exported by ship.*
- *Particle boards*

Figure 5: Sawn timber, pulp and paper have always been Sweden's most important export products

Non-wood forest products

- *Berries - picked in part for commercial and industrialised manufacturing, in part for local and private consumption. Main species are lingon berries (Vaccinium vitis-idaea), blueberries (V. myrtillus) and cloudberries (Rubus chamaemorus)*
- *Fungi - either naturally occurring and collected directly in the forest, or farmed in old caves. Various species, e.g. chanterelles. The fungi are sold fresh in the season or dried, canned or otherwise semi-processed off season.*
- *Lichen - collected and packed for marketing for decoration purposes.*

Scots pine timber trade

Scots pine forest grows and is harvested over most of the NPP area, except for the most interior and northern parts. Part of the harvested volume is consumed locally, e.g. timber sawn in small-scale mills for local purposes, and energy wood for power plants and firewood. However, most of the volume is transported to the major factories on the east coast for processing. Pine pulpwood is predominantly used for craft (sulphate) pulp. Several sawmills are species specific, i.e. processes only pine or only spruce timber.

Roundwood scaling

Roundwood measuring - scaling and quality assessment - is mainly preformed by the three regional wood measurement societies VMF (Virkesmätningsföreningar). These organisations are independent, and both sellers and buyers are represented in the board. The Swedish Timber Measurement Council VMR[21] is responsible for coordinating activities in the measuring field, and strives towards uniform and standardised measurement practice throughout the country. Almost all scaling takes place on arrival in the industrial plant, harbour or any other roundwood terminal. After scaling, a protocol stating the lot's volume, quality and value is sent to both seller and buyer. This protocol is often used as the basis for payment of log transport. For the NPP area, the main operator is VMF Nord[22].

Figure 5: Sawn timber, pulp and paper have always been Sweden's most important export products

[21] www.virkesmatning.se
[22] VMF Nord is located in Umeå, www.vmfnord.se

A separate non-profit IT company for the Swedish forestry sector, SDC[23], has been established jointly by forest owners and forest industry to take care of software and data processing related to roundwood procurement.

Measuring rules for pine and spruce saw logs

There are general 'Regulations for measuring of roundwood' as well as specific rules like 'Measuring rules for pine and spruce sawlogs', both available on the internet in English translation[24]. The rules are based on SFA's regulation and VMR's instructions. Important parts of the rules are compulsory for the entire roundwood trade in Sweden, while others are in the form of recommendations; however, even the recommendations will generally be applied.

Scaling and volume

In principle, sawlogs are measured individually, log by log. The scaling of volume can be based on top measurement, top and butt end measurement or by measurement of sections. Sampling methods are allowed. Most scaling is done by log scanners, and the data collected is transferred electronically for processing by SCD (see above). If a log has scars or flutes that affect the scaling cylinder, the diameter is deducted by 1 cm unless these defects are within 20 cm of one log end (tolerance).

A number of volume calculation methods are applied, and shall briefly be described[25]:

- *Forest felling with bark given in M3SK (volume forest cubic)*
- *Industry consumed solid volume with bark M3FPB (solid volume over bark)*
- *Industry consumed solid volume without bark M3FUB (solid volume under bark)*
- *Sawmill consumed top-end-cylinder volume without bark M3TO*

Sawlogs volumes are generally given in M3TO. However, all these volumes are in daily use in forest operations and roundwood trade, so it is useful to have some 'conversion rules'. First, the following relations always apply:

M3SK > M3FPB > M3FUB > M3TO

The difference from M3SK to M3FPB is losses during transport and storing, e.g. part of the bark gradually being worn away. The difference between M3FPB and M3FUB is just the bark. Solid volume (the F is derived from the Swedish word 'fast' meaning fix or solid) is typically calculated from measurement of log sections. By contrast, M3TO is the calculated volume of a cylinder with diameter equal to the top, or small, end of the log under bark, disregarding any volume from the log taper.Although the conversion from M3TO to M3FPB must be calculated for each combination of log length and diameter, the following conversion factors may be used as rules of thumb[26]:

M3SK = 1.19 * M3FUB
M3FPB = 1.15 * M3FUB
M3TO = 0.81 * M3FUB

[23] www.sdc.se
[24] http://www.virkesmatning.se/default.asp?id=1220
[25] Majuscule and minuscule letters are used interchangeably
[26] Source: Grundbok för skogsbrukare, Skogsstyrelsens (SFA's) förlag 2005, ISBN 91-88462-64-4

Grading

A log's grade is based on its properties on the whole cylinder surface and on both end surfaces. If the log's position on the ground or on the conveyor can be regarded as random, it is sufficient to take account of only the exposed part when grading. According to agreements between buyer and seller, grades may be merged or excluded. The following grades apply for Scots pine:

Grade 1 High quality for joinery purposes
Grade 2 Sound knots for joinery, furniture and interior solid wood panels
Grade 3 Building materials like staircases and window frames
Grade 4 Other building materials for non-structural use
Grade 5 Low-grade sawn timber, e.g. for packaging

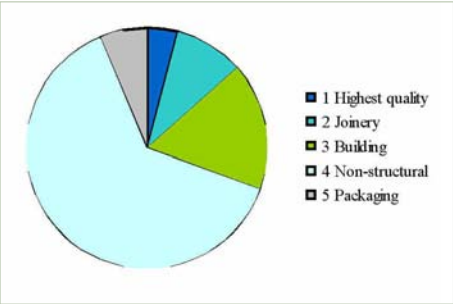


Figure 7: Outcome of pine sawlog grading in the northern region, average 1998-2007; volume fractions

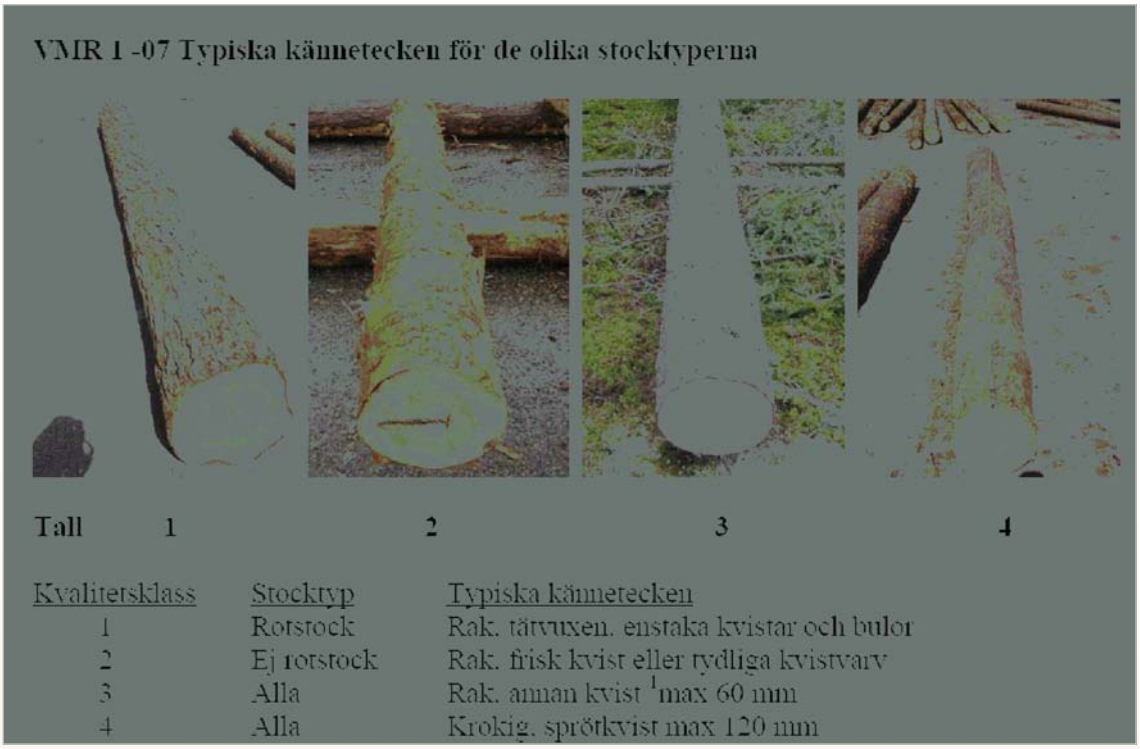


Figure 8: Examples for pine sawlogs grade 1 - 4.

Pine grades

	Grade			
	1	2	3	4
Log type	Butt log	Not butt log	All log types	All log types
Knots, whole mantle surface	Max 20 mm, all knot types. Max 5 knots	Sound knots max 120 mm. Other knots max 60 mm.	Sound knots max 120 mm. Other knots max 60 mm	Spike knot max 120 mm. Other knots unlimited.
Knot within 15 dm from butt end		A minimum of two distinct whorls or one sound knot		
Knot swelling	Max 5			
Growth rings 2-8 cm from pith	Minimum 20		Minimum 12	
Straightness	Max. 20 cm loss of saw yield			Max. 120 cm loss of saw yield
Indication of top rupture	Not allowed			Allowed
Blue stain	Not allowed			Allowed
Forest rot	Not allowed			Max 5 % of end surface

Figure 9: Tolerances for pine sawlogs

General requirements for sawlogs:

- *have been cut from a live stem section, delimbed, and crosscut with a saw*
- *fulfil the length and diameter requirement set by the trading parties*
- *be straight enough*
- *be within the tolerances for knot size, number and type*
- *be free from insect damages and storage decay (applies to the wood)*
- *be free from coal, soot, stones, metal and plastics (applies to wood and bark)*
- *a maximum of 5% forest rot on the end surface is allowed*
- *not have buttresses higher than or equal to 15 cm*
- *not have open scars, indents caused by feed rolls, splits from felling or crosscutting, splits originating from the growing tree, or other stem damages*

Once accepted, a sawlog is assessed according to the specified tolerances for various traits (e.g. Figure 9).

Selling prices

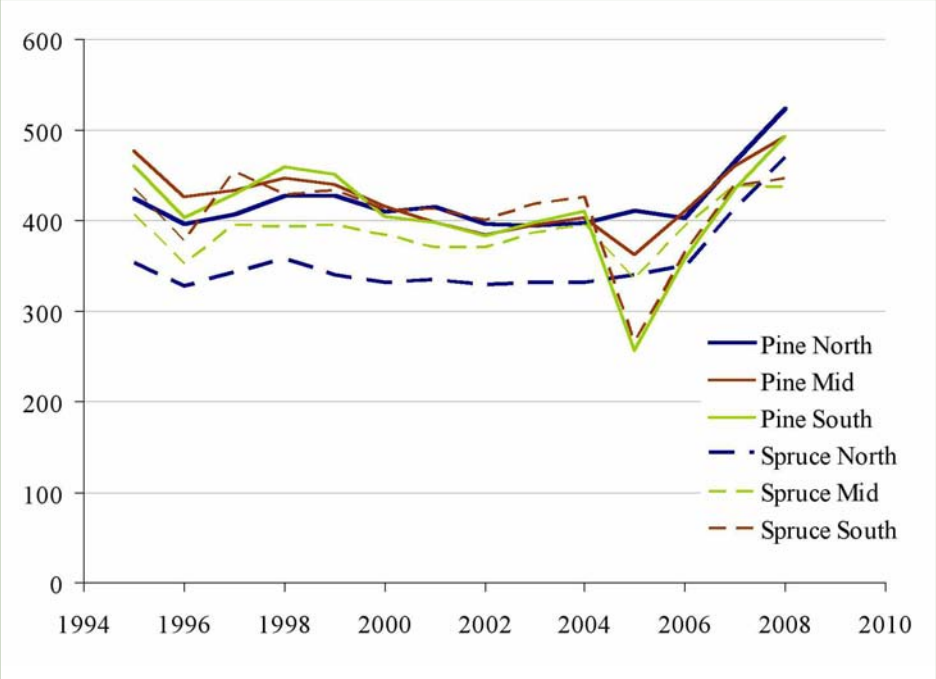


Figure 10: Average selling prices in the three major regions for pine and spruce sawlogs delivered at forest roadside, SEK per M3FUB; 1 EUR ~ 10-11 SEK

Selling prices were quite stable from the mid nineties, at around 400 SEK/m³. In the north, pine sawlogs are considered to be of generally good quality and obtain a price premium compared to spruce. In the last two years, during the timber boom, all prices increased steeply. At present, this situation is reversed and the prices are drastically reduced, even if this is not yet obvious in the graph. The noticeable price reduction in the south in 2005 was due to severe storm felling.

Prislista timmer

Virkesprislista - talltimmer m³fub

2006-08-01. Samtliga priser gäller exklusive lagstadgade skatter.

Toppdiameter under bark i cm*

Centimeter	14	15	16	17	18	19	20	22	24	24	28	30++
Kvalitet 1	515	555	605	639	670	690	741	777	820	840	861	872
Kvalitet 2	440	465	480	515	552	557	561					
Kvalitet 3	450	475	490	520	578	599	625	641	671	680	685	690
Kvalitet 4	370	379	400	435	468	500	528	548	575	588	597	604
Kvalitet 5	315	320	330	335	350	392	400	418	440	445	450	455

Figure 11: Typical selling prices for pine sawlogs in SEK/M3FUB for the quality grades 1 - 5 and varying top end diameter; example from Lundbergs Trä 2006 www.lundbergstra.se/index.php?pid=prislista

4. FINNISH FORESTS AND PINE TIMBER TRADE

Lea Pesonen, North Karelia University of Applied Sciences[27]

General figures of Finnish forests and silviculture[28]

In Finland about 26.3 million hectares (86 %) of the land area is forestry land, of which 20.1 million hectares is classified[29] as forest land, 2.7 million ha scrub land and 3.2 million ha waste land. The volume of growing stock on scrub land is marginal; therefore most of wood production and forestry activities take place on forest land. Figure 1 shows the growing stock volumes on forest land on average and illustrates clearly that of all growing stock volume the most grows in the southern parts of the country while the Northern and Middle boreal areas (the project target areas) have lower growing stock volumes. The most important commercial tree species growing in Finland are pine (Pinus sylvestris), spruce (Picea abies) and birch (Betula pendula, Betula pubescens).

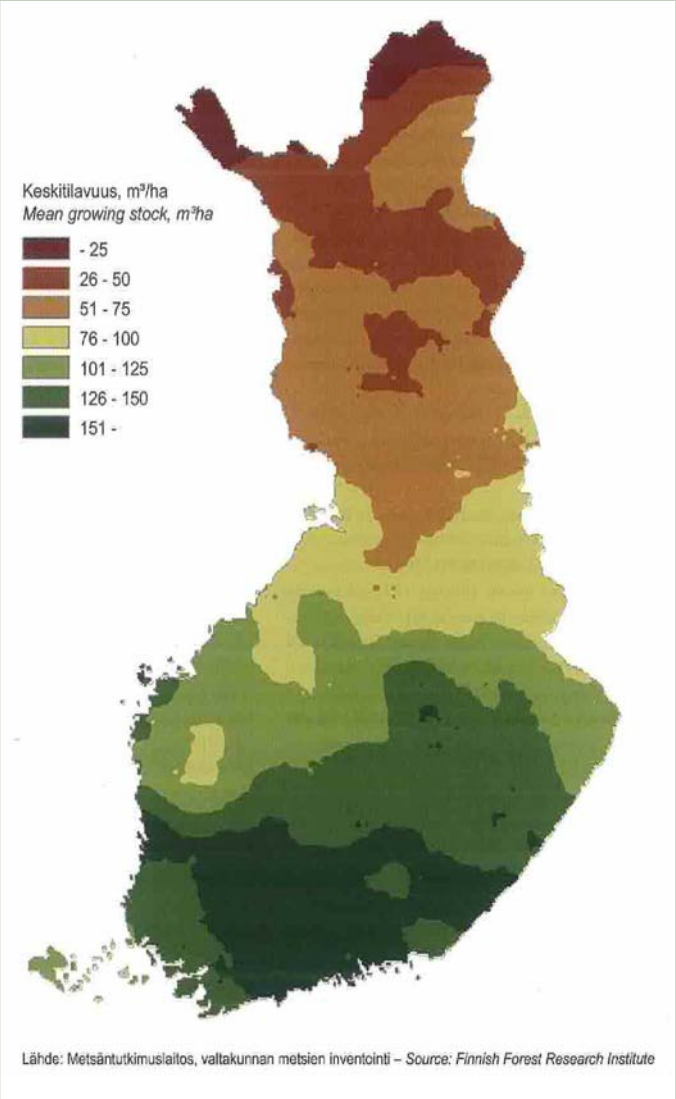


Figure 1: Mean growing stock volumes on forest land.

Of forest land 4.5 % is strictly protected and not available for forestry activities. This means that 19 million hectares of forest land is available for wood production. The percentage of protected forest land in the project focus area is much higher, since the percentage of protected forest land is 12.1 % in Lapland, 3.3 % in North Ostrobothnia, 4.2 % in Kainuu, 2.2 % in North Karelia and 0,9 % in North Savonia. The typical percentage of protected forest land in southern Finland is under 2 %.

The growing stock volume on land available for wood supply is 2068 million m3 and has almost doubled during the last four decades, mainly due to forest policies aimed at effective silviculture and peatland drainage. Half of the growing stock volume in Finland consists of Scots pine, 30 % of spruce and 20 % of broadleaves (mainly birch). Lately the proportion of pine has been increasing as the proportion of spruce has decreased. The total volume of Scots pine stock on land available for wood supply is 1027 million m^3 of which about 547 million m3 (53 %) is growing in the project target area. The following chart illustrates the tree-species dominance on forest land in the project target area.

[27] Joensuu, Pohjois Karjala, Ita Suomi, E: Lea.Pesonen@pkamk.fi

[28] All statistical information of this report is based on the Statistical Yearbooks of Forestry.

[29] The capability is Forest land > 1.0 m3/ha/year Scrub land 0.1 - 1.0 m3/ha/year Waste land < 0.1 m3/ha/year

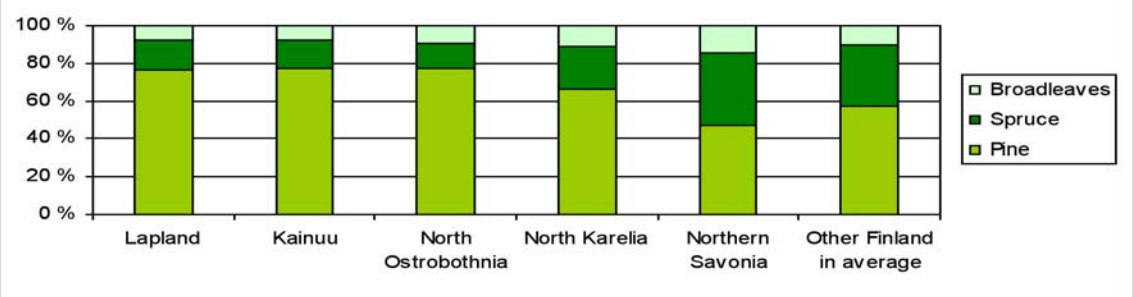


Chart 1: Tree-species dominance on forest land in project target area and in other areas of Finland.

The annual gross increment of the growing stock on the land available for wood supply is 96.3 million m^3 being 72 % higher than in 1960s. About 48 % of the annual increment consists of pine and results mostly from the growth of the young Scots pine stands which are in a rapid growth phase at the moment. The total increment of Scots pine stock was 45.8 million m^3 and 24.8 million m^3 in the project target area in 2007. In 2007 the total drain was 72.9 million m^3 of which the proportion of pine was 42 %, spruce 38 % and broadleaves 20 %. The total drain of Scots pine was 30.7 million m^3 and 14.6 million m^3 in the project target area.

Due to effective silviculture and peatland drainage in the middle of the 20th century and also due to delayed first thinning the amount of potential thinning wood has been increasing. At the same time the proportion of pine stands with high quality saw logs are predicted to decline at least temporarily especially in northern parts of the country. The following chart shows the proportions of pine roundwood assortment in the project target area and on average in other parts of southern Finland.

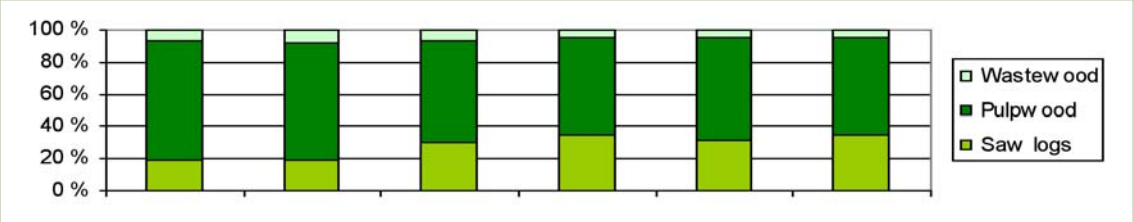


Chart 2: Proportions of pine sawlogs, pulpwood and wastewood on forest and scrub land.

Traditional use of pine[30]

Wood consumption in Finland was already very high in the 17th century. Pine (especially immature pine trees) was used as a raw material in tar burning by peasants in the 17th and 18th centuries. In addition to domestic use, tar was the first strategic export product. In coastal areas and by the side of the rivers, boards, planks and beams were hewn of pine. From the beginning of 18th century planks and beams sawn in water-driven saws were exported to the fast growing cities of Western Europe. A lot of wood was also burned in the mining industries. Large forested areas, including pine forest especially in eastern part of the country, were used for slash-and-burn cultivation. Household and agricultural use of wood as a firewood, fencing and for house building was also significant. Tar burning, wood burning in the mining industry, fire cultivation and primitive construction timber production caused significant alteration of forested areas in the 17th and 18th centuries because these actions needed extensive forest areas and large amount of wood.

[30] For example Markku Kuisma: Metsäteollisuuden maa. Suomi, metsät ja kansainvälinen järjestelmä 1620-1920.

In the middle of 19th century the sawmill industry made a breakthrough. In the beginning of 20th century sawmilling and paper industries were significant for the economy and brought general well-being to Finnish society. The growing sawmilling industry needed more and more logs which led to an increasing selection felling. This caused concern of weakening structure and genetics of forest and to the development of periodic silvicultural methods which were aimed at sustainable wood production. The first forest act which prohibited deforestation was also enacted at the end of the 19th century. After the Second World War, as Finland had to settle the war indemnities with Russia, Finnish saw milling and paper industries start to flourish. This was also the starting point for a forest cluster[31] which is now - in the 21st century - facing new challenges in the globalising world.

Pine roundwood use in Finnish forest industries[32]

Roundwood consumption in Finland

In 2007 81.4 million m^3 of roundwood was consumed in Finland which is the highest wood consumption ever recorded. Over 90 % or 75.4 million m^3 was used in forest industries and the remaining 6 million m^3 was used as fuelwood in energy generation. The consumption of roundwood in forest industries divides into wood-products industries and pulp industries. The consumption of wood in wood-products industries was 32.5 million m^3 (43 %) and in pulp industries 42.9 million m^3 (57 %). The chemical pulp industry consumed the highest amount of wood with 31.9 million m^3 consumption. Sawmilling consumed 27.9 million m3 being the second largest timber user in Finland. Of the total wood consumption in forest industries 30.5 million m^3 (40 %) consisted of pine of which 13.8 million m^3 were logs and 16.7 million m^3 pulpwood. The amount of pine consumption has been growing quite steadily from the 1960s and has been at its height in recent years.

Domestic commercial roundwood removal in 2007 amounted total of 58 million m^3. Of this, commercial pine removals amounted to 12 million m^3 of sawlogs and almost 14 million m^3 of pulpwood. About 25 % of the wood used in forest industries was imported (mainly from Russia), but most of the pine used in Finland

Area	Domestic logs	Imported logs	Domestic logs, %	Domestic pulpwood	Imported pulpwood	Domestic pulpwood, %
Lapland	906	-	7 %	2988	193	20 %
North Ostrobothnia	1388	49	11 %	1760	105	12 %
Kainuu	671	50	5 %	181	10	1 %
North Karelia	1414	341	11 %	738	130	5 %
Northern Savonia	402	0	0 %	397	-	3 %-
NPP target area, total	4781	440	37 %	6064	438	41 %
Other Finland, not NPP	8113	450	63 %	8831	1391	59 %
Whole country	12894	890	100 %	14895	1829	100 %

Table 1: The domestic and imported pine roundwood consumption (1000 m3) and the percentage of imported roundwood use in the project target area and in Finland in general.

[31] Forest cluster in Finland is based on the timber processing industries. Pulp, paper, cardboard and sawmilling industries has created for example industries upgrading the forest products, engineering industries producing machines and devices for forestry needs, chemical industries and a lot of other supportive industries.

[32] Following numbers of pine consumption of this chapter covers the whole Finland if it is not separately mentioned to stand for the project target area.

is domestic. The import of pine has been decreasing[33]: about 0.9 million m3 (- 37 % from 2005) of pine logs and about 1.8 million m³ (-18 % from 2005) of pine pulpwood used in forest industries was imported.

Domestic roundwood export has been quite insignificant in recent decades. About 1 million m3 of roundwood has been exported annually, the amount consisting mainly of (pine) poles and roughly edged timber.

Approximately 5.2 million m³ of pine logs (37 %) and 6.5 million m³ of pine pulwood (44%) were consumed in the programme target area. Table 1 shows that imported pine roundwood has quite vital importance in North Karelia at the moment as in Northern Finland it has lower significance.

Pulp industries

Chemical pulp industry consumed 31.9 million m³ of wood in 2007. The raw material used consists mostly of pine or birch pulpwood or logs not suitable for the wood products industry. The total amount of pine roundwood consumed was 15.4 million m³ of which only 134 000 m³ were logs. In addition to roundwood the pulp industry also uses sawdust and chips as raw material originating mainly in the sawmilling industry.

Mechanical pulp industry uses mainly fresh spruce pulpwood as a raw material. The total wood consumption in 2007 was 10.1 million m³. The amount of pine pulpwood consumed was only 61000 m³ and was quite insignificant compared to the use of spruce pulpwood. Semi-chemical forest industry in Finland uses small amount of spruce and birch pulpwood. Pine is not used in the semi-chemical forest industry.

Wood-products industries

Sawmills consumed 28.0 million m³ of roundwood in 2007. Of the total consumption the share of pine was 52 % as the amount of pine used was 14.6 million m³. According to statistics 1.4 million m3 was small-sized pine logs. In 2007 6.6 million m³ of pine sawnwood was produced of which 3.6 million m³ was exported. The calculated domestic use of pine sawnwood in 2007 was approximately 3 million m³.

The sawdust and chips generated as by-products of sawmilling are sold to the particle board (about 6 % of by-products) and chemical pulp industries (about 60 % of by-products). The bark is used in energy generation (about 30 % of by-products). If 40 % of all pine roundwood used in sawmilling is converted in the sawmilling process as sawdust and chips, this means about 6 million m³ of pine sawdust and chips for further uses.

In Finland the veneer industry uses birch or spruce logs mainly as raw material. The amount of roundwood consumed in the veneer industry in 2007 was 3.9 million m³. The amount of pine logs used in plywood and veneer industries is not significant; only 22 000 m³ of pine logs were used in 2007. Pine can be used for example in a surface of softwood veneer if the purpose is to produce knotless plywood.

Wood chips and sawdust are used in panel industries to produce particle boards and fibreboards. The raw material originates mainly in sawmilling or is imported. The total output of wood based panels is

[33] The imported roundwood originate mainly in Russia, the share of roundwood imported from Russia being about 80 % (over 15 million m3, over bark) of all wood imported into Finland. The amount of wood imported from Russia has been decreasing during 2000s and is predicted to cease because of the custom tariffs of wood export. Russia was intending to raise the custom tariffs in the beginning of 2009 but the economical downswing probably delayed the timing of the raise. According to an unofficial source the delayed raise is supposed to put into action in the beginning of 2010 (Kauppalehti 29.12.2008). If the raise takes place the custom tariffs of roundwood exported are going to be 80 % of the custom value or at least 50 EUR/m3 concerning roundwood which top diameter is over 15 cm. Because it is difficult to assort the timber in different classes of diameter before haulage, the raise of custom tariffs means in practice that the minimum 50 EUR/m3 custom tariffs have to be paid on all roundwood imported from Russia.

about 500 000 m^3 which means that wood chips and sawdust originating in sawmilling are mainly used in the pulp industry. It is estimated that about 6 % (roughly 360 000 m^3) of sawdust and chips originating in sawmilling is used in panel industries. Roundwood is not consumed in wood-based panel industries.

Other wood-products industries consist primarily of production of wooden poles and log buildings. Pine is an excellent material for log houses and majority of the logs are made of Scots pine in Finland. The amount of pine logs used in this category was 422 000 m^3.

Energy generation

In 2007 the amount of wood used in energy generation was 5.9 million m^3. Birch is the most popular tree species as domestic firewood and the proportion of birch is over one third of 5.1 million m^3 of domestic firewood (roundwood). Pine is of course suitable for firewood use also and about 1 million m^3 of pine roundwood is used as domestic firewood. The fuel wood used in energy generation in heating and power plants are mainly forest industry by-products or other wooden residues. Only 0.8 million m^3 of the total amount of 13 million m^3 is roundwood. If the share of pine of fuel wood is the same than the share of pine used in forest industries (40 %), estimation can be made that about 5 million m^3 of pine chips, sawdust and other energy wood is used in energy generation.

Processed wood products: examples of the most important uses of Scots pine

Pine sawn-timber is much used along with spruce for prefabricated houses, timber framed private dwellings and small apartment houses. In 2002 85 % of all one-family houses, 57 % of semi-detached/row houses were wood-framed in Finland. Of small apartment houses (not over 4 storey houses are allowed to build of wood) just 1-2 % has been built with wooden framings in recent years. Almost all of the recreational dwellings are instead wood-framed and with wooden façade also. There are about 20 companies manufacturing wooden elements and 200 companies manufacturing industrial log houses in Finland. Construction, log house building and other building component production uses roughly 1-1.5 million m^3 of pine annually.

Planing is the largest single segment using pine with the consumption about 1.5 million m^3 annually. Planed pine is excellent for interior coverings for example. Pine is not used for parquets, but some amount of planed wood is used for wooden plank floors. Building joinery industries including window, door, stairs and joinery uses roughly 1 million m^3 of pine yearly. About 0.8 million m^3 of pine is also used in furniture industry. About 0.15 million m^3 of pine is impregnated and heat treatment is also used to improve the suitability for outdoor uses. Pine is not typically used as raw material of EWP. Some amount of pine is used to produce edge glued boards for furniture industry.

The technical organization of roundwood trade

Partners in the roundwood trade

The partners of roundwood trade are the landowner/holder of logging right and the timber buyer which usually is one of the biggest forest companies. In Finland of the total forestry land area 52 % is owned by private owners, 26 % by state, 9 % by forest companies and 6 % by other owners including municipalities, parishes and communities. But if the growing stock or total increment is considered, the share of private owners and companies gains more importance. The state owned forests are located in general in Northern Finland and in less productive areas. The following chart shows the shares of forest owners in Finland.

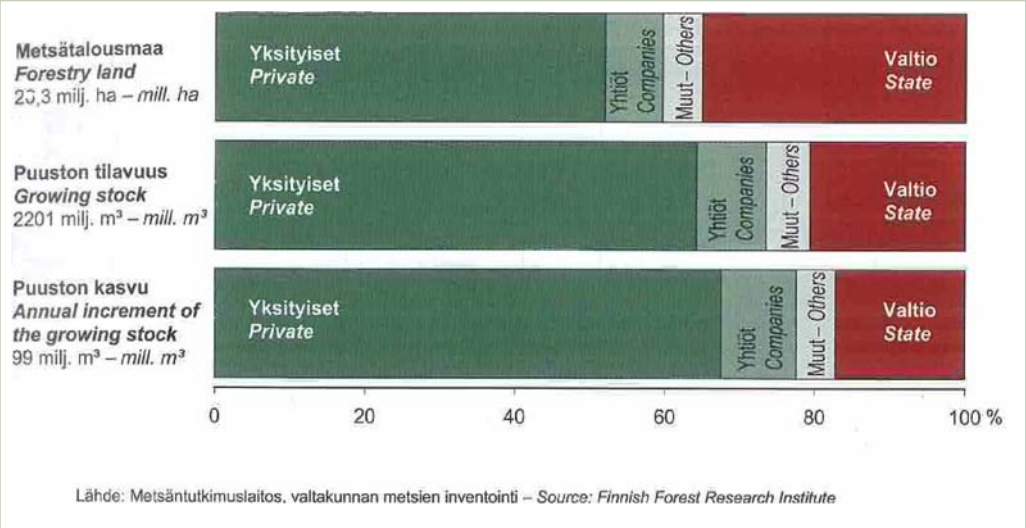


Figure 2: Forestry land, growing stock and annual increment of growing stock by forest ownership category.

The number of timber buyers has decreased during the past twenty years because of merging, corporate acquisitions and other actions. There are four major buyers for sawlogs and three major buyers for pulp wood at the moment. Major buyers purchase 80-90 % of all industrial sawlogs and almost all of the pulp wood. There has been a concern that the reducing number of wood buyers generates an imbalance in the market, but until now the high demand for timber has kept the markets quite balanced between the buyers and sellers. Since wood purchase is concentrated on a few major buyers, it reduces SMEs' ability to purchase roundwood for their needs. The fragmentation of private forest ownership as a result of inheritance is creating a concern that the timber trade will become more complicated in the future and that there will be a reduction in volumes of timber traded. The total number of private forest holdings is almost 450 000 and the mean area of single holding is about 24 hectares.

Calculation of roundwood volume

Timber sellers and buyers agree on the timber calculation method in the trade agreement before harvesting the timber. The trade agreement contains an estimation of the amount of wood in the stand marketed for cutting, but measurement on delivery is the basis for the sale price paid to the seller. The measurement on delivery has to be performed according to the timber calculation act (364/1991). With the authority of preceding acts the Ministry of Agriculture and Forestry has confirmed the methods which can be used in timber measurement and also the instructions to perform the measurements. The unit of measurement is solid cubic meter (m3) over bark.

In Finland logging is usually performed using the cut to length method, which means that the logged timber is limbed and bucked in the felling site. Harvester calculation methods are the most common method of timber calculation in private forest felling. Other general methods used are measurement in the mill[34] and the measurement of piled wood at the roadside. The wood trade can be made as a standing sale (80 % of all felling) or as a delivery sale (20 % of all felling). When a standing sale is at issue the measurement is usually done with harvester or in the mill. When the trade is done as a delivery sale the most common means is the calculation in the mill or on the roadside.

[34] There are several methods, which can be used. Scanning the load with laser is one of the modern techniques.

Timber assortments and qualities

The general timber assortments are special grades (for joinery, poles), logs (sawlogs, veneer logs and beams) and pulpwood. Energy wood can probably be added to this list also.

If there are not special grades a pine trunk is usually cut into three categories of sawlogs which are knotless quality butt log, intermediate/middle log with dead knots and top log with sound knots. Small-sized logs with sound knots are also a further possible assortment for most timber buyers. Dividing the pine trunk into these products is done visually by the harvester operator. The rest of the trunk which does not fulfil the requirements of logs or special grades is bucked as pulpwood. In addition the logging residues can be used as energy wood.

The timber seller and buyer agree the measuring and quality requirements in the trade agreement. These requirements differ between timber buyers and even the same buyer may have several types of requirements depending on the end-uses of the timber. Timber buyers increasingly try to take into account their customers' needs. But at the same time the seller wants to enhance the revenue of the timber sale, which means maximizing the yield of logs. In general for the end-user/manufacturer the value yield is higher as log length and diameter increase, which requires different bucking compared to that which is aimed at maximizing the total yield of logs.

In general the value of a sawlog is determined by the log quality, size and tree species; the sawn timber grading rules form the basis for log quality. The quality of the log depends on defects. The most important defects are knots, especially dead and rotten knots. The size of the knots is decisive. Other defects include sweep, crooks, cracks and rots. The size of the log is another important factor that affects the value. The measuring requirements are length and diameter of the logs. Usually the log length varies between 3.1 and 6.1 meters in 30 cm increments. Minimum diameter is usually 17-19 cm for stout logs and 12-14 cm for small-sized logs.

Sawn-timber is sorted in quality grades in compliance with certain sawn-timber standards (for example Nordic timber grading rules). The main grades of sawn-timber are A1-A4, B, C, and D. Sawn-timber for construction can also be strength graded visually or by machine. The amount of knots and type of knots is the most significant factor affecting to the grading of sawn-timber. The sawn-timber can also be sorted using a specific system defined by the customer.

Timber market prices in general and prices in a single timber bargain

Until 1990-91 the timber trade in Finland was governed by the national contract system of timber price-recommendations in which the guiding prices of timber were agreed in negotiations between the central organizations of wood buyers and sellers. The purpose of this system was to ensure the wood supply for forest industries and the operational preconditions of forestry. The national contract system ended when Finland joined the EU. Nowadays timber prices are mainly determined by international price development. The world market prices of end-products and the utility value of timber which is based on the world market prices, theoretically determine the market prices of roundwood. General economic trends have a strong influence on stumpage prices. Domestic supply and demand, and the import of roundwood also affect stumpage prices. For example the import of pine pulpwood from Russia supplemented the domestic supply and has lowered the stumpage prizes of pine pulpwood.

The following chart shows the trends of timber prices for the main commercial tree species in Finland. The actual stumpage price has remained at the same level, but economic fluctuations have been strong in different years.

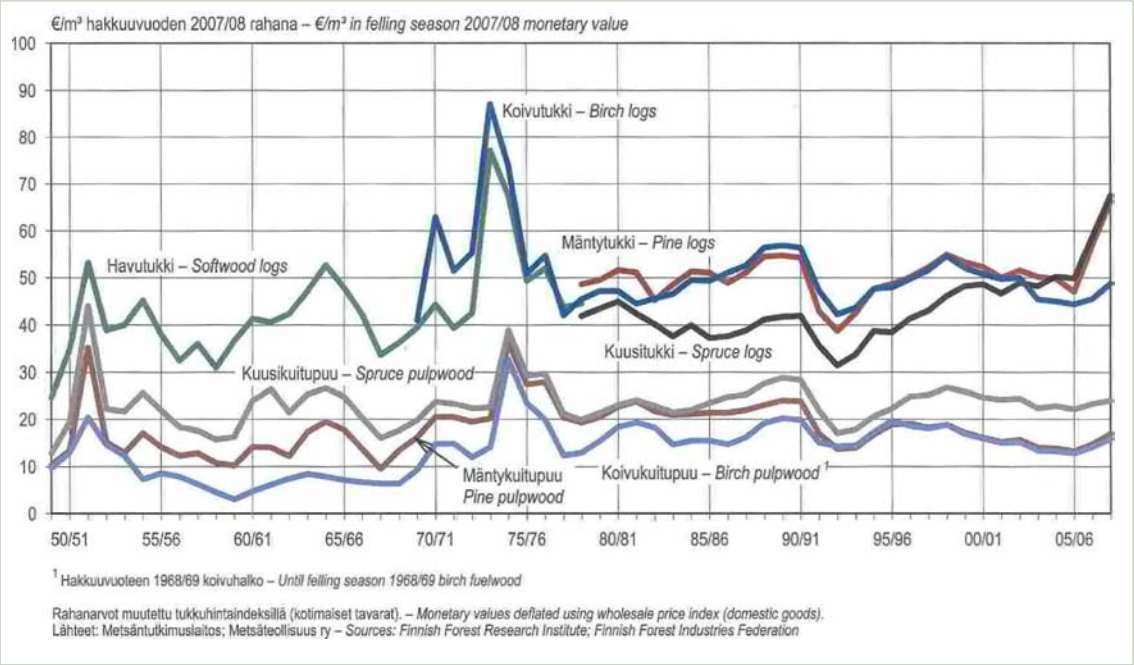


Figure 3: Average stumpage prices in non-industrial, private forests by felling season, 1949/50-2007/08.

Forest policies and legislation in general

The basis of the roundwood trade is that the forest owner is free to sell the trees. There are no rules which oblige the forest owner to sell. The legislation gives broad boundaries to the timber trade: one can sell the stand if the trees are sufficiently mature for regeneration felling or thinning and providing nature conservation/forest protection legislation is not breached.

Although the timber trade is free of regulation compelling the forest owner to sell timber, the government does try to influence the timber trade by legislation and taxes. Government interaction can be divided into three categories of control methods: regulatory, economic and information control methods. Regulation defines the limits to the timber trade. With the economic control methods government tries to influence the timber trade by accelerating or slowing down the markets depending on the market situation. For example, the Finnish government has recently reduced the sales tax for the timber trade to boost markets. There are also economic support systems, which aim to promote forestry, for example a silvicultural subsidy for management of young stands. The information control mechanism is based on forest research and guidance, and its function is to produce information for forestry, silviculture, timber markets etc. Finland has several organisations which function is to support forest owners in decision making for silvicultural and wood-trade related activities.

In recent decades forest policy in Finland has focused on maximizing the growth of forests and strengthening production for the needs of the pulp and paper industries. But in the future the aim of forest policy is likely to change towards supporting diversified production structures and new businesses in forest industries. The sustainable and versatile management of Finland's extensive forests resource is a key factor in the country's economic and general well-being.

Some future prospects of forest industries and pine use in Finland

The future of Finnish forest industries in Finland

Several scenario modelling exercises regarding the future of Finnish forest industries over the next ten years have been conducted. The general conclusion of these studies is that the forest industry will not maintain its profitability and competitiveness if new products and businesses are not created or existing structures are not developed.[35] Most of the scenarios assume that the paper manufacturing industry, which has long dominated the Finnish forest sector, will continue to diminish, following significant cutbacks made in the past few years.[36] The Finnish paper industry, which has concentrated on magazine printing papers, is not sufficiently profitable enough at present. According to the scenario modelling this situation is unlikely to improve, as a result of reducing markets in Europe and competition from developing countries which have a fast-growing resource and emergent pulp and paper industries. The saw-milling industry is also facing serious problems at the moment due to the poor economic situation in Europe.

The forest sector in Finland is at a turning point. One option for future development is wood-based energy production. The European Union has strengthened its climate and energy policies towards in favour of wood as an energy and heat-producing resource. Technological development may also expand the biochemical uses of wood in future. Wood could be used, for example, to produce liquid fuel for transportation and as a substitute for oil as a raw material in the manufacture of plastics.[37] Construction in Europe is also seen as a potential market: developing wooden architecture and a predominance of detached houses in Europe in the future is likely to increase the use of wood, which has an increasing profile as a sustainable and renewable raw material.Recreational activities and forest tourism offer additional possibilities for exploiting Finnish forests.

Some views of the future of Scots pine

In the coming 10-15 years the supply of larger diameter pine timber is probably going to decrease or remain stable, depending on the geographical area. This is partly due to nature conservation and other restrictions on forest use, but mostly due to the change in age class distribution in forests, as the proportion of younger forest increases (Figure 4).

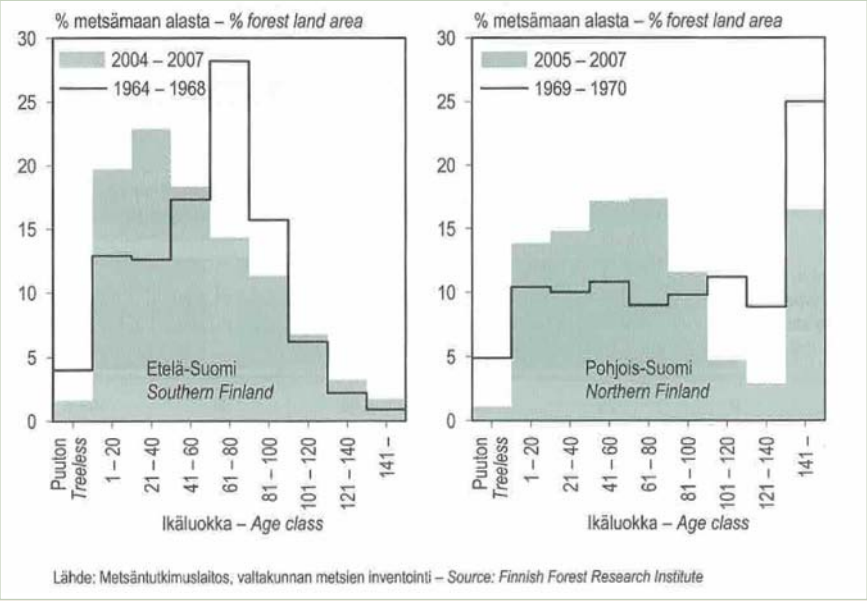


Figure 4: Age structure of Finnish forests in the 1960s and 2000s.

[35] Niskanen, Anssi et al. Metsän uusi aika. Kohti monipuolisempaa metsäalan elinkeinorakennetta. 2008
[36] Several paper ans pulp producing factors for example in Kemijärvi, Kajaani, Hamina, Kuusankoski and Tervakoski have been shut down.
[37] Niskanen, Anssi et al. Metsän uusi aika. Kohti monipuolisempaa metsäalan elinkeinorakennetta. 2008

One challenge is to improve utilisation of Scots pine timber from the first commercial thinning. In particular the increasing quantity of pine pulpwood growing in drained peatlands is creating challenges for efficient timber use. The biggest problem relates to the purchase of raw material (for example wood quality issues and a low yield of sawlogs combined with high logging costs) and to the efficiency of sawing (current machines are not necessarily suitable for sawing small-sized stems).[38] The quantity of small sized-logs used in the wood-products industries could be increased in coming years and this could be one possible solution also for the Northern areas which might be lacking larger diameter timber. Small-sized pine timber would be a suitable raw-material for some engineered wood products, but new investments for production plants of engineered wood products are unlikely in the near future.[39]

It is possible that current building regulations concerning energy-efficiency and heat insulation are going to be tightened further in the near future, due to European Union energy efficiency orders. If the regulations are tightened, it will cause some problems for massive log house construction in Finland. Declining quantities of sawlogs also affect the log house market: an increasing number of log houses are likely to be made from glued logs in the future, as the availability of larger material for log construction decreases.

The reduction in roundwood imports from Russia due to custom tariffs, or their eventual cessation, could cause problems for industries using birch pulpwood or logs, because the domestic harvesting potential is not sufficient. Problems may also occur in the mills near the Russian border in which the production has been highly dependent on imported timber. The increase in custom tariffs planned for the beginning of 2009 was delayed by Russia, and at the moment th eincrease is expected to come into force at the beginning of September 2009.

According to the national forest inventories, domestic felling could be increased by the amount of the annual volume of imported wood (about 16 million m3). This means that the cessation of roundwood imports from Russia will not necessarily mean a cutback in production in Finland. The maximum sustainable removal of timber for 2006-2015 is estimated to be 72 million m3, but the statistics show that the annual average removal in 2002-2006 has been only 56 million m3. The volume of Scots pine stock in Finland is increasing, which enables more felling in coming years. At present the problem is not that there is an insufficient amount of Scots pine growing in Finnish forests, but that there are difficulties in timber purchase from the forests of private owners. One reason of the unwillingness of private owners to sell timber is the low price for standing pulpwood.

The poor economic situation at the moment is of course creating severe threats and challenges to forest industries and the forest sector in general.

[38] Among others: Boren, Hannu: Pienpuun käytön lisääminen mekaanisessa puunjalostusteollisuudessa. 2000; Heräjärvi et.al, Mänty- ja koivupinepuun käyttömahdollisuudet rakennepuutuotteissa (EWP). 2003.; Wall et. al, Harvennusmännyn hankinnan ja sahauksen kehittäminen. 2005.

[39] Heräjärvi et.al,: Mänty- ja koivupienpuun käyttömahdollisuudet rakennepuutuotteissa (EWP).