Forest Nurseries in Finland

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Poteri M. 2003. Forest nurseries in Finland. In: Riley L.E., Dumroese R.K., Landis T.D., technical coordinators. National Proceedings: Forest and Conservation Nursery Associations—2002. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station. Proceedings RMRS-P-28: 59–63. Available at: http://www.fcnanet.org/proceedings/2002/poteri.pdf.

Abstract

In Finland, forest tree seedling production has shifted between 144 to 207 million seedlings during the last decade. Currently 7 enterprises own 24 nurseries which produce about 85% to 90% of the total number of seedlings. The main tree species in Finland are Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies*) and European silver birch (*Betula pendula*). About 90% of the seedlings are grown in containers. Hard plastic containers like Plantek® (Lannen) and Blockplanta® (BCC) have nowadays almost replaced the former widely used Ecopot® (Lannen). Container Scots pine and silver birch seedlings are usually 1 year old and spruce seedlings 1 and 2 years old when shipped. During winter, seedlings are stored either in the nurseries outdoors under natural or artificially made snowcover, or seedlings are packed into plastic-laminated cardboard boxes and placed in freezer storage. A minority of the seedling production is bareroot, and that is mainly Norway spruce. It is likely that seedling production will become more centralized, meaning that the amount of seedlings produced per nursery will increase while the number of nurseries will decrease. Other new challenges to seedling production are the extension of the outplanting season to cover the whole growing season from May to September, and the development of seedling types suitable for increasing machine planting.

Key Words

Silvicultural operations, seedling culture, forest regeneration, seed orchard

Abbrevations: FFCS = The Finnish Forest Certification Scheme, EMAS = The EU Eco-Management and Audit Scheme, ISO = International Organisation for Standardization

Introduction

Forestry and the forest industry in Finland have important roles in the national economy, as the products of forest industry constitute almost one third of the total exports of goods. To date, 90% of roundwood consumed in the forest industry has come from domestic resources, although roundwood import has slightly increased during the last decade.

Forest land area in Finland is about 49 million acres (20 million hectares). Peculiar to Finnish forest ownership is a high proportion of private forest owners. At this moment, 62% of forest land area is owned by private families, with the state controlling 25%, and forest industries owning 9%. The mean forest area owned by private (families) is about 62 acres (25 hectares), and there are some 400,000 private forest owners. It is clear that all logging and silvicultural operations are challanged by these relatively scattered forest areas and many associates.

Cutting and forest regeneration methods follow national standards and regulations that are roughly the same between different forest owners. To regularly evaluate the state of the forest managements, different quality and environmental certification systems are nowadays applied among the various groups (EMAS and ISO for forest industry and state owned forests, and FFCS for private forests).

Although Finland is located between 60° and 70° latitudes, the climate is mild (fig. 1). The reason for this is the Gulf stream that carries heat from the Indian Ocean to the North Atlantic Sea, and has an effect on the climate in the whole of North Europe and Scandinavia.

The duration of the growing season in south Finland is about 180 days, but only 120 days in the north; the annual temperature sums of degree days are about 1350 and 750, respectively. The annual precipitation is 16-28 inches (400 to 700 mm) and snow cover occurs

Figure 1. Finland is located in the northeastern corner of Europe between 60° and 70° latitudes.

in the whole country; even the southern and western coasts have snow for some weeks every year.

Finland belongs to the Eurasian boreal forest zone where forests are dominated by conifers. The tree species having silvicultural importance are Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies*) and, of the broad-leaf trees, European silver birch (*Betula pendula*). Other less cultivated species are larch (*Larix sibirica*), aspen (*Populus tremula*), hybrid aspen (*Populus tremula* x *P. tremuloides*), black spruce (*Picea mariana*), alder (*Alnus glutinosa*) and downy birch (*B. pubescens*).

The regeneration methods have shifted during the past decades. Natural regeneration has replaced artificial regeneration, especially planting. At this moment, however, almost 50% of the regenerated forest area is planted. During the last 10 years, the annual planting area, including private, forest industry, and state owned forests, has shifted between 193000 to 252000 acres (78,000 to 102,000 hectares). Depending on the regeneration site and tree species, 650 to 800 seedlings are planted per acre (1600 to 2000 seedlings per hectare).

In 2001, the forest tree seedling production was 154 million seedlings and, in addition, some 10 million seedlings were imported from Sweden. Seedling

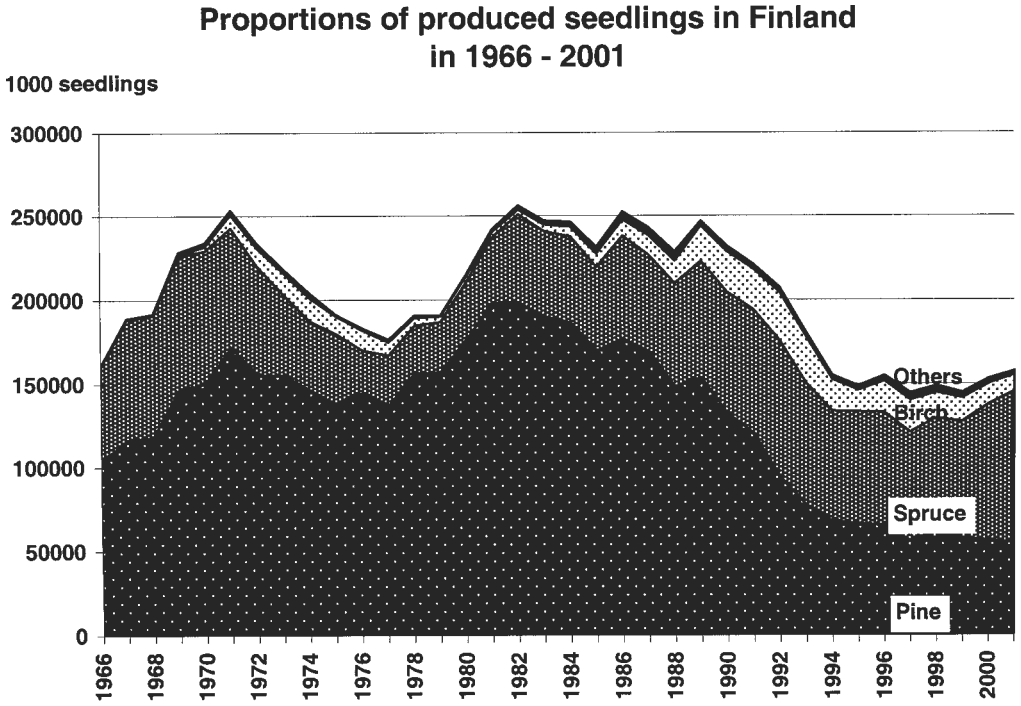

Figure 2. Forest tree seedling production in Finland from 1966 to 2001 (Ministry of Agriculture and Forestry).

production has decreased from its peaks, which were in the end of 1960s and in the 1980s when the annual production was 250 million seedlings. The main reason for the decrease is that natural regeneration has replaced the planting of pine (fig. 2).

Nurseries Owned by Enterprises

Until the beginning of 1990, most forest nurseries belonged to state owned provincial forest organisations. A privatisation of forest nurseries occurred and, as a consequence, the number of nurseries decreased. At this moment, there are 7 nursery companies who own a total of 24 nurseries.

The seedling production of these enterprises covers about 85% to 90% of the total number of seedlings delivered for planting. The remaining 10% of the total planting stock is grown in small, family-owned nurseries, comprising a total of around 60 to 70 nurseries. The average amount of seedlings produced/nursery is between 5 to 10 million, but some of the biggest nurseries produce 15 to 20 million seedlings (fig. 3).

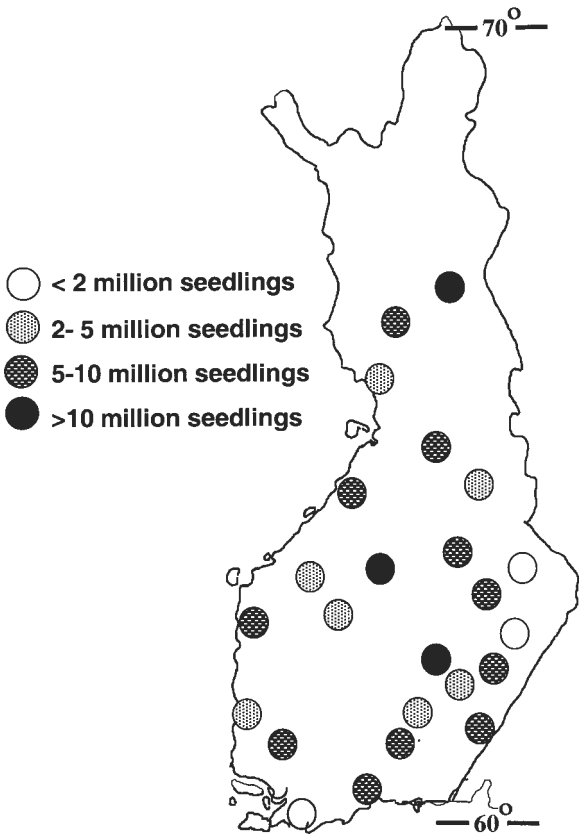

Figure 3. Map of Finnish enterprise owned nurseries and their annual seedling production.

When extensive seedling production for forest regeneration started in the beginning of the 1960s, the main product was bareroot pine. Many of the forest nurseries were established on forest land, and only a minor part was located on former agricultural farm land. Most of the nurseries are still "in the forest".

The change from bareroot to container production has been very fast. Nowadays, about 90% of the seedlings are produced in containers (fig. 4). Bareroot production is mainly spruce, which is grown for 2 years in nursery beds or for one year in containers and transplanted. Bareroot spruce seedlings are grown especially for areas with rich vegetation cover and are usually 4 years old when shipped.

Hard Plastic Containers

The most common container type at this moment is a hard plastic container like Plantek® (Lannen) and Blockplanta® (BCC). To some extent, Ecopot® (Lannen) containers are still in use, where seedlings are separated by paper strips which are removed before lifting. Other less used systems are Jiffy® and a Finnish Vapo-plug system.

As a growth substrate, sphagnum peat is used. Normally no additional compounds like sawdust, vermiculite, or perlite are used. Commercial peat is adjusted to fit suitable pH and nutrient content for forest tree seedlings. Finland has rich peat resources, so national peat manufacturers can supply custom mixtures and taylor-made products.

Over 60% of nursery seeds come from seed orchards (fig. 5). North Finland has a lack of seed orchards; therefore seed collecting from known stands or

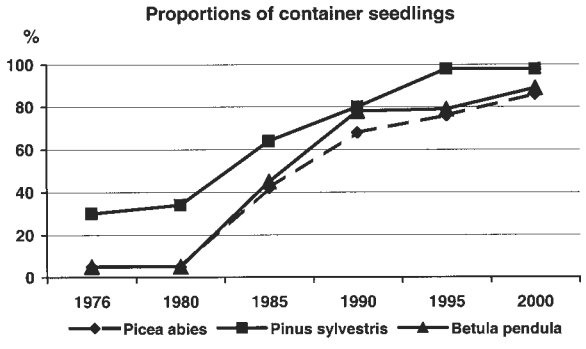

Figure 4. Proportion of container seedlings of the planting stock in Finland from 1976 to 2000 (Ministry of Agriculture and Forestry).

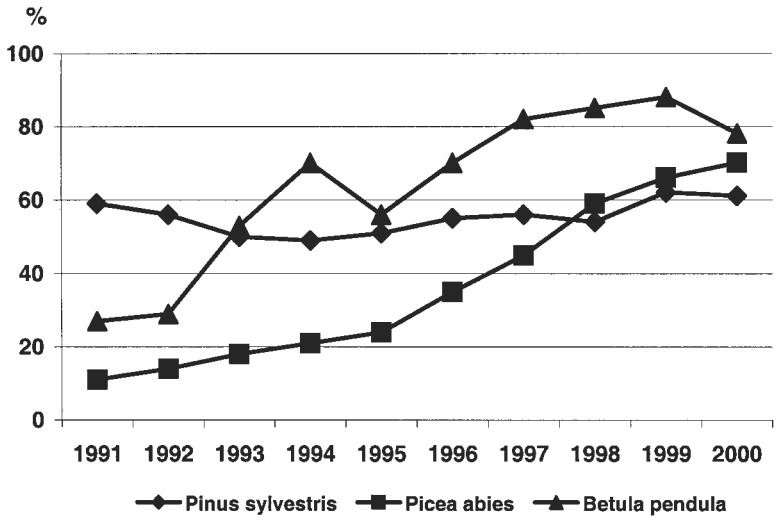

Figure 5. Use of seed orchard seeds in Finnish nurseries from 1991 to 2000 (Ministry of Agriculture and Forestry).

regions is more common there. Nursery sowing lines (machines Lannen® and BCC®) use mainly double or single seed sowings. After sowing, containers are covered with sand or vermiculite.

Seeded containers are placed on metal frames or pallets which are transported with jack lifts to plastic houses. In the greenhouses (and outdoor growing areas as well) pallets are raised some 8 to 10 inches (20 to 25 cm) from ground level to improve root pruning and air ventilation.

Growing Procedures

Early sowings start in March to April and usually heating is needed at that time. Also, additional light is used to prevent bud formation in the most early sowings. Seedlings are grown in plastic greenhouses from 6 weeks to 5 months, depending on the species and seedling type. Bigger nurseries commonly grow 2 crops in a greenhouse. The latest sowing times (usually spruce) are in the beginning of July.

In container production, irrigation is done with moving booms both in the greenhouse and in the outdoor growing areas. Sprinklers are used in bareroot production. Most fertilizers are applied with irrigation water.

In growing pine, fungicide sprayings against Scleroderris canker and snow molds are needed, especially in the northern part of the country. Grey mold can be a problem in storage and usually has to be controlled by sprayings. Insecticides are used mainly against aphids. To protect the planted seedlings against *Hylobius* weevil attack at the planting site, container conifer seedlings are sprayed in the nursery before packing or shipping.

Herbicides are used in bareroot production to treat the field area before transplanting. Selective products are used in the transplant beds usually after the seedling growth has stopped. To control liverworts in containers, it is possible to use quinoclamin (product Mogeton® WG).

For winter, seedlings are stored either in freezer storage or left outdoors. Pallets or large container frames which will remain outdoors under natural or artificially made snowcover are set on the ground in fall to prevent frost injury to roots. After winter storage, either outdoors under the snowcover or in freezer storage, many nurseries do routine root growth potential (RGP) tests to check the condition of the root system before shipping.

Short-day treatments are used to control the growth of seedlings and to harden them. One-year-old spruce seedlings are the main species requiring black-out. The treatments are used to especially protect fall planted spruce seedlings from the damages caused by night frosts. Nurseries can also gain more time for packing in the fall if the work can be started earlier with hardened, short-day treated seedlings.

Container spruce seedlings are 1 to 2 years old when shipped; pine and birch seedlings are usually 1 year old. Plastic laminated paperboard boxes are used to

store and ship seedlings. Normally, seedlings are not graded individually at packing; but the evaluation of seedling stock is based on the lot samples taken before hand and checked for their size and quality requirements.

For contracts, seedling lot specifications are set by the producer and customer. The key role of national authorities in size specifications of seedling stock has ended, although the annual evaluations of seedling stock are still performed regularly by authorities. In Finland, the national seedling requirements are in accordance with the directive of forest reproductive material described by the Council of European Union.

Future Trends

It is obvious that the centralisation trend will continue, that is, more seedlings are produced per nursery. It also seems that the proportion of container seedlings will remain or even increase further.

The role of terminal freezer storage will become more essential in the shipping of seedlings from nurseries to planting areas. It is likely that more seedlings will be packed and transported into terminals in fall. In spring, the seedlings are delivered from freezer storage to local planting areas.

The extension of the planting season to cover the entire growing season from May to September/ October will demand more hot-lifted seedlings during June to August. The wider planting window is connected to the increased interest on machine planting (Bräcke®, EcoPlanter®). Although there are many issues to be solved before machine planting can become routine, the lack of labour for manual planting is one force driving current regeneration research. New research topics include finding more optimal site preparation methods, and developing container seedlings more suitable for machine planting.

Reference

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