

## Iceland

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## Summary

For historical reasons there has been little utilisation of forest resources in Iceland. Therefore in order to utilise the forest resources resulting from current afforestation activities research and development of potential markets for all forest products is necessary. Presently the major limiting factor is the absence of raw materials for manufacturing purposes. During the interim, efforts are being made to locate future markets and manufacturing methods suitable for predicted timber harvests.

## 1. Consumption

### 1.1. State of the art and historical development

Fossil evidence indicates that Iceland was forested to a considerable extent during the mid to late Tertiary, with tree genera including *Metasequoia*, *Magnolia*, *Sassafras* and many others, indicating that the climate was warm-temperate. By the late Pliocene, shortly before the onset of Pleistocene glaciations, coniferous forests predominated including *Pinus*, *Picea*, *Abies*, *Larix*, *Betula* and *Alnus*, indicative of a boreal climate.

With succeeding glaciations, the Icelandic flora has become ever more depauperate. *Pinus* survived (or was able to return after) the first few glacial periods up to about 1.1 million years ago and fossil evidence of *Alnus* is found during interglacials to about 500,000 years ago. The only forest forming tree species to survive/return to the present interglacial is *Betula pubescens*. Other native tree species found in Icelandic forests are *Sorbus aucuparia*, which is uncommon, and the extremely rare *Populus tremula* (found in only 7 locations) along with *Salix phylicifolia*, which sometimes reaches tree size but is usually a shrub.

At the time of human settlement over 1100 years ago, birch forest and woodland probably covered 25-40% of Iceland's land area (Figure 1). The relatively tall (to 15 m) birch forests of sheltered valleys graded to birch and willow scrub toward the coast, on exposed sites and wetland areas and to willow tundra at high elevations.

As in agrarian societies everywhere, the settlers began by cutting down the forests and burning scrubland to create fields and grazing land. Sheep were important as a source

of wool from the outset, but by 1300 they had become a staple source of food for Icelanders as well. Sheep grazing prevented regeneration of the birchwoods after cutting and/or burning and the area of woodland declined rapidly.

The birchwoods were nevertheless economically essential, especially as a source of charcoal, needed to smelt bog iron and make iron tools, of which the most important were scythes. Utilising birch directly as fodder for sheep and birch charcoal for making scythes necessary for hay-making probably kept the Icelanders from going the same way as the Nordic Greenland settlement, which died out about the time Columbus “discovered” America. Birch was used as a source of charcoal up to 1870, when steel scythes were first imported from Scotland. Woodlands continued to be important as a source of fuel and winter fodder for sheep until the 1930’s, after which these economic functions were replaced by geothermal heat, imported oil and cultivated hayfields. The extent of Icelandic birchwoods probably reached a post-glacial minimum, or about 1% cover based on total land area, during the early 20<sup>th</sup> century and even though improvements in agriculture alleviated the need to utilise birch for fodder, increases in sheep numbers and high levels of summer grazing continue to prevent natural extension of woodlands outside of protected areas.

Today, birchwoods are not of commercial importance, although birch forests within national forests and national parks are popular recreational areas. A small amount of birch is felled each year within two national forests and sold for firewood and small scale handicrafts. (Eysteinnsson 2002).

#### History of forestry and recent trends

Organised forestry is considered to have started in Iceland in 1899 with the planting of the “Pine Stand” at Thingvellir. Forestry efforts focused on protecting birch forest remnants during the first half of the 20<sup>th</sup> century, with several forest areas being acquired by the Iceland Forest Service (IFS) for that purpose. They, along with more recently acquired afforestation areas and experimental forests comprise the National Forest system today. During the past 50 years however, the emphasis has been on afforestation through planting trees. Native birch has always been a component of trees planted but its popularity has varied as have the reasons for planting it.

From the time the Icelandic Forestry Association was established in 1930 until 1951, native birch was the most planted species in Iceland, with planting ranging from a few thousand to over 150,000 seedlings per year. Until the late 1940’s, native birch along with native rowan (*Sorbus aucuparia* L.) and native *Salix phylicifolia* (L.) were practically the only species available from the country’s four small tree nurseries at the time.

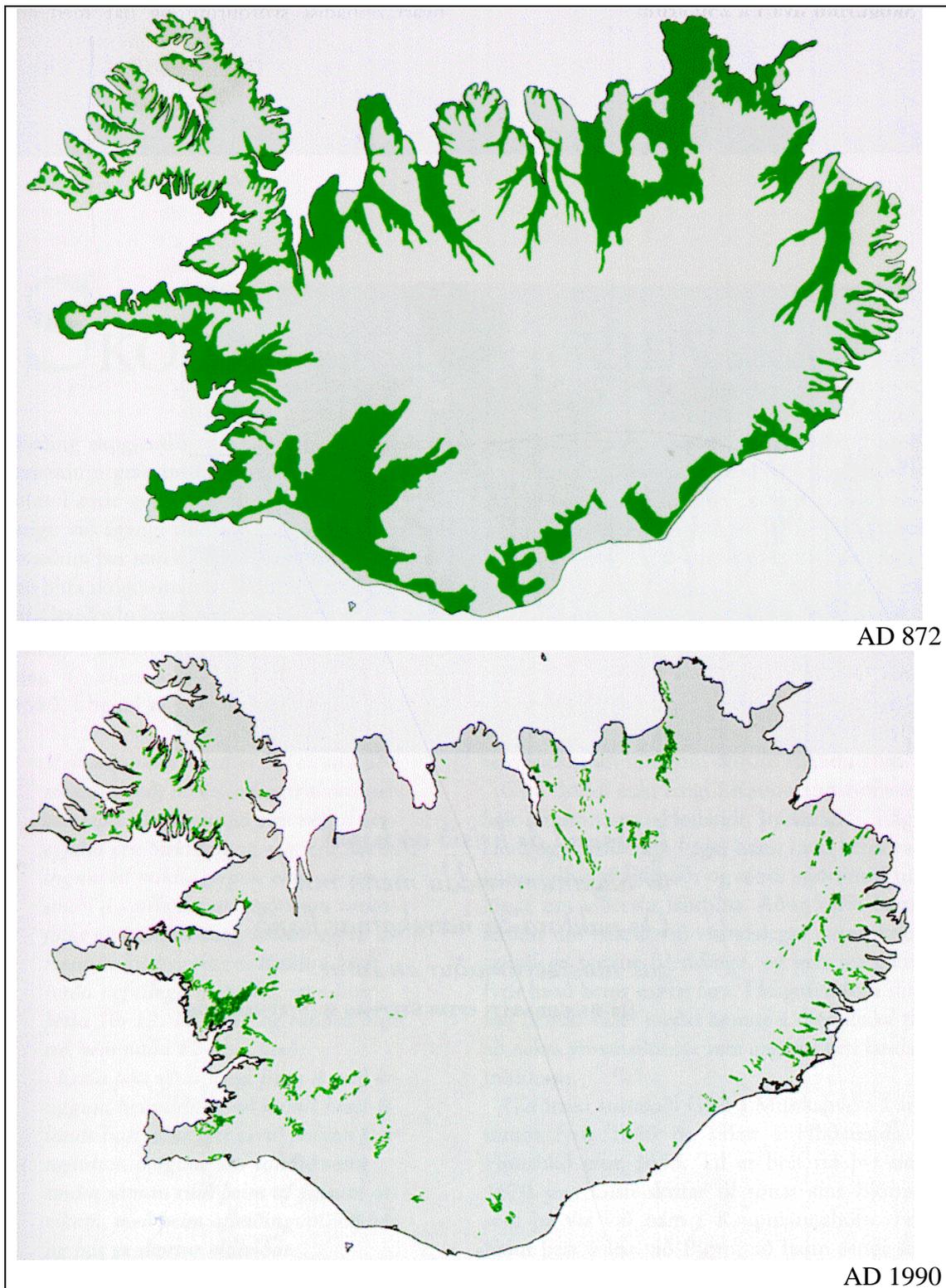


Figure 1-2. Maps showing the estimated extent of birch woodlands in Iceland at the time of settlement (27% of Iceland's land area) and the actual extent in 1990 (1.2%).

Planting by forestry societies and the IFS increased greatly during the 1950's, reaching over 1.5 million seedlings per year during 1960-'62, due solely to increased planting of exotic conifers, principally *Picea abies*, *Picea sitchensis*, *Pinus sylvestris*, *Pinus contorta* and *Larix sibirica*. Planting declined again after 1963 and remained at

500,000 to 1 million seedlings annually from 1963 to 1989. During this entire 40-year period (1950-1990), planting of native birch remained at similar levels or 100,000 plus/minus 50,000 seedlings per year, which means that birch comprised 5-15% of seedlings planted. For the most part though, these 40 years were a time when the emphasis in Icelandic forestry was on experimenting with different exotic species and provenances.

Afforestation through planting has increased again since 1990 to about 5 million seedlings per year at present, which corresponds to an increase in planted area of 1000-1500 ha per year. However during this period, planting of native birch has been increasing proportionate to the total, comprising almost 30% of seedlings planted in 1999 and 2000 and, at 1.4 million seedlings. Birch is again the most planted tree species in Iceland for the first time since 1951. *Larix sibirica* is planted to almost the same extent as native birch (30% each), followed by *Picea sitchensis* (12%), *Pinus contorta* (10%) and *Populus trichocarpa* (6%). Over 20 other species comprise the remaining 12% of trees planted in Iceland.

The IFS planted roughly half the trees planted in Iceland up to 1990, mostly on Forest Service lands. With the exception of some early direct seeding trials, this however included practically no birch since most IFS enclosures were established around remnants of birchwoods where natural regeneration was usually sufficient. For example, the area of birch cover in Hallormsstadur National Forest increased by 130 ha from 1906 to 1995 without a single birch tree being planted and in spite of 200 ha being converted to conifer forest (J. Gudmundsson unpubl. data). The total extension of birch within the enclosure was around 330 ha in 90 years, or an average of 3.7 ha per year, more than doubling the original forest area.

Planting by the IFS has been decreasing in recent years and now comprises less than 5% of the total afforestation planting in Iceland. The main functions of IFS today are managing the National Forests, research, planning and policy matters.

The other half of trees planted up to 1990 were planted by forestry societies, which were mostly involved in afforestation of treeless land. Since 1990, forestry societies have been the main actors in the Land Reclamation Forest project, a co-operative project between the Icelandic Forestry Association (an umbrella organisation for the local forestry societies), the Forest Service, the Soil Conservation Service (both state agencies) and the Ministry of Agriculture, within which about 1 million seedlings are planted annually. The aim is to afforest eroded or degraded land and 40-75% of seedlings planted annually have been native birch even though it is not always the most effective tree species for reclaiming degraded or eroded land.

From its limited beginnings in 1970, state supported afforestation on farms has become the main channel for afforestation activity in Iceland, comprising about 70% of the afforestation effort today. Originally, only farms located within the best areas for afforestation were eligible to participate and the only goal was establishment of plantations for wood production. Therefore, the emphasis was on planting exotics. Since the mid 90's, state support for farm afforestation has spread to all parts of Iceland and afforestation goals have become variable resulting in increased use of native birch and other non-timber species (Figure 2). Exotics are still and will

continue to be the mainstay of farm afforestation, namely, *Larix sibirica*, *Picea sitchensis*, *Pinus contorta* and *Populus trichocarpa* (Figure 3).

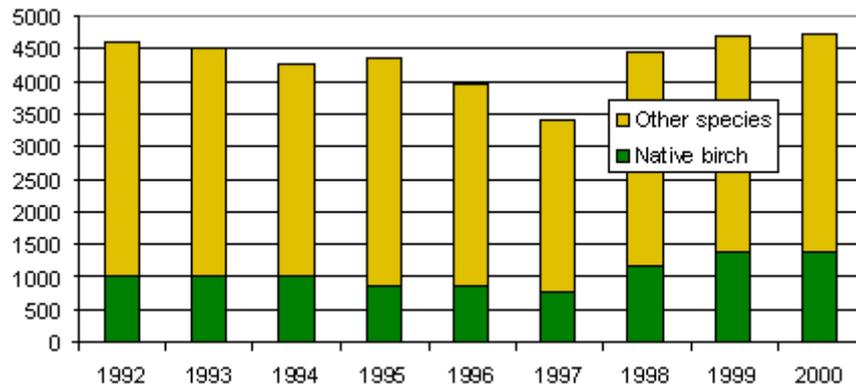


Figure 3. Proportion of native birch planted in afforestation 1992-2000. The trend from 1995 to 2000 represents a 50% increase in planting of birch.

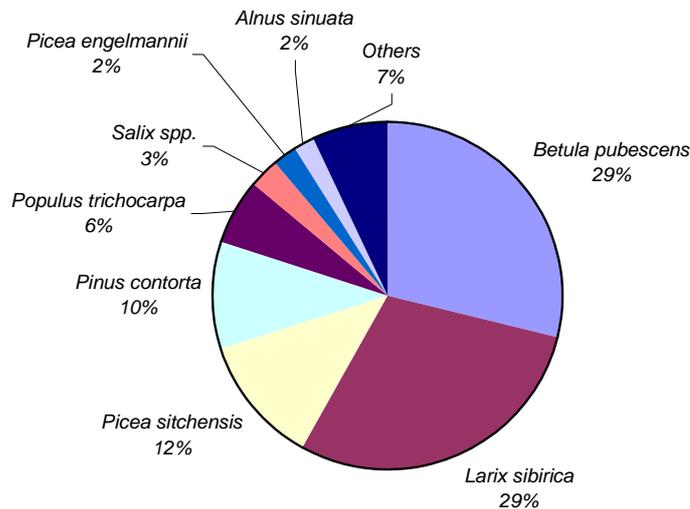


Figure 4. Trees planted in Iceland in 2000 (from Pétursson 2001).

As has happened within National Forests protected from grazing, birch is regenerating naturally within forestry society and farm afforestation enclosures wherever a seed source is available. In some cases, birch regeneration is happening as fast or faster than planting, resulting in interesting mixed woodlands or in some cases plans for planting being abandoned.

#### Policy goals and legal instruments

Various acts and regulations are in effect pertaining to forestry. Here are some of the main points therein that have policy implications.

- The Iceland Forest Service has as its mandate to: protect and preserve forests and forest remnants, establish new forests where appropriate and advise on forest management and other forestry matters (Forestry Act no. 3/1955).

- Forests may only be harvested through selective thinning (Forestry Act no. 3/1955).
- Clearing of forests and woodlands is prohibited except by permission of the director of the Forest Service, which can be given only if the area will be reforested or a comparable area elsewhere afforested within two years (Forestry Act no. 3/1955).
- Afforestation with the aim of timber production shall be carried out in Fljótsdalshérað, East Iceland through providing farm afforestation grants (Héraðsskógar Act no. 32/1991).
- Afforestation with multiple-use goals shall be carried out by Regional Afforestation Projects through providing farm afforestation grants (Regional Afforestation Projects Act no. 56/1999).
- The aim of each regional afforestation project is to afforest 5% of the lowland area (land below 400 m.a.s.l.) within its region in 40 years (Regional Afforestation Projects Act no. 56/1999).
- Contracted forest farmers shall have preference over others for employment within the project (Héraðsskógar Act no. 32/1991, Regional Afforestation Projects Act no. 56/1999).
- The Nature Conservation Agency shall work with the Forest Service on matters concerning conservation of natural forests and woodlands (Nature Conservation Act no. 44/1999).
- Plans for afforestation of areas over 200 ha in size, afforestation within protected areas and clearfelling of natural forests and woodlands are required to be submitted to the State Planning Agency for determination as to whether or not environmental impact assessment is required (Environmental Impact Assessment Act no. 106/2000)
- Protected areas include: national parks, natural monuments, nature reserves, state parks, areas protected by specific laws, Holocene volcanic formations, wetlands over 3 ha, waterfalls, hot springs, coastal mud flats, archaeological sites, groundwater protection areas, areas protected by international agreements such as the Ramsar and Bern conventions and areas protected through official local planning (Environmental Impact Assessment Act no. 106/2000, Nature Conservation Act no. 44/1999).
- Importers of exotic plants (including seed and other propagation material) shall report imports to the Natural History Institute (Regulation on exotic plant species no. 583/2000).
- Lists of approved and banned exotic plant species shall be created (Regulation no. 583/2000).
- Cultivating exotic plant species is banned in protected areas and above 500 m.a.s.l. (Regulation no. 583/2000).

The laws pertaining to forestry reflect the fact that forests form a very small part of the Icelandic landscape, the main policy points being that existing forests should be protected and afforestation of treeless land is encouraged. These goals have been in effect since the first Forestry Act of 1907. The goal of increasing forest cover through afforestation is re-affirmed by the Regional Afforestation Projects Act of 1999, where for the first time a concrete goal of 5% forest and woodland cover of lowlands within 40 years is set.

In recent years, checks have been put into place regarding certain aspects of forestry through the Environmental Impact Assessment Act and a regulation regarding use of exotic plant species. These legal instruments are the results of EU directives; in other words not the result of a perceived need within Iceland to put checks on forestry. Because of the costs involved, the Environmental Impact Assessment Act effectively puts a ceiling of 200 ha on the size of afforestation areas and prevents or at least discourages afforestation within protected areas. The regulation on exotic plant species has no effect on forestry practices as yet.

The Iceland Forest Service has put forth a set of guidelines to afforestation planners. Some points from these guidelines are:

- Tree species planted should be selected based primarily on site conditions and the goals of afforestation on that site.
- Planting of exotics within natural woodlands is discouraged. Instead planting should be directed toward treeless land to increase the total forest area.
- Wetlands should not be drained for afforestation.
- Care should be taken to avoid planting on sites of special value. These include sites where rare species have been found or rare habitat types, archaeological sites, special landscape features and much visited sites with scenic vistas.
- Planting species mixtures rather than monocultures is recommended.
- Forest edges should be designed specifically so that the cultivated forest blends as well as possible into the landscape.

These guidelines are currently being reviewed in co-operation with other state institutions and NGO's, after which they will be published.

The present population of Iceland is approximately 290,000. Icelandic demographic patterns are the same as those found in other European countries with a definite trend of rural depopulation. In 1991, 57% of the population was located in the capital area, by 2001 the figure had reached 62%.

## **2 Small-scale forestry practises**

### **2.1 State of the art and historical development**

#### **RAPs**

Starting with Héraðsskógar in 1991, six Regional Afforestation Projects (RAPs) have now been established to cover all of Iceland. They are governmental “mini-agencies” under the Ministry of Agriculture but financially independent of the IFS. Each has a board of directors composed mostly of local people and a staff of 3-6 including seasonal employees. The function of the RAPs is to manage the government grants scheme for afforestation on farms, each in its own region of the country. This includes making contracts with land-owners, production of afforestation plans, co-ordinating seedling production and distribution, education and extension (usually in co-operation with the IFS) and distributing the grants

Each farm afforestation grant covers 97% of establishment costs, including fencing, roads, site preparation, planting and the first thinning. It is the individual land owner who owns the resulting woodlots or forest stands and bears all legal responsibility. The land owners also usually do the planting, thereby receiving part of the grant as compensation for work. A forest-farmer afforesting a large tract of land can earn what amounts to as much as 2-3 months wages per year.

### **2.2. Small-scale forest holding**

The six RAPs were responsible for roughly 65% of planting in Iceland in 2001. Around 570 farms currently participate in afforestation and/or establishing shelterbelts and there is a waiting list to join of about 500. This is a total of over ¼ of Icelandic farms. Government funding for the RAPs was slightly less than 300 million IKR (about 3.409 million euros) in 2001 and remained unchanged in 2002.

### **2.3. Small-scale forestry practices**

Initially all afforestation was done by the IFS and the Icelandic Forest Societies. The introduction of the RAP's has changed this pattern such that presently approx.70% of all afforestation is done by individual landowners. After an area has been contracted for afforestation, the first step is the production of forest plan by a forester. Factors taken into consideration in producing the plan are:

- What expectations the landowner has for the future use of the forest
- Other land use patterns such as, grazing, herding and agricultural crops that must be taken into consideration during the planning process.
- Vegetation is mapped in order to determine site preparation and species suitability.
- Environmentally sensitive areas are mapped and detailed. These areas are not part of the formal afforestation plan. No funding is available for afforestation in these areas.
- Landscape, historical and cultural values of the area are mapped and detailed. Areas of high value are also not part of the afforestation plan, nor is funding available for afforestation in these areas.

All of the above factors are taken into consideration when preparing the forest plan. Although the plan is done by a forester, finalization is dependant on the approval of the landowner.

After the final afforestation plan is approved, afforestation operations may begin. Because of open grazing practices, fencing is necessary before site preparation and planting can begin. The above operations are usually carried out by the landowners themselves. As mentioned above forest owners receive nationally funded loans for 97% of capital costs. Wages are paid separately for the labour required to establish plantations. All forest operations are inspected by a RAP representative before payment is made.

Unlike other farm loan projects, repayment is subject to realisation of a profit by the forest owner. Funds recaptured are earmarked for future use in forestry.

## 2.5. Supporting and limiting factors for enterprise development in small-scale forestry and barriers to entrepreneurship

### Supporting factors

It is the policy of the Icelandic government to support any developments in small-scale forestry and related enterprise development as a part of its attempts to curb rural depopulation. This policy is reflected in recent shift of emphasis within the IFS and its continued support of RAPs.

### Limiting factors

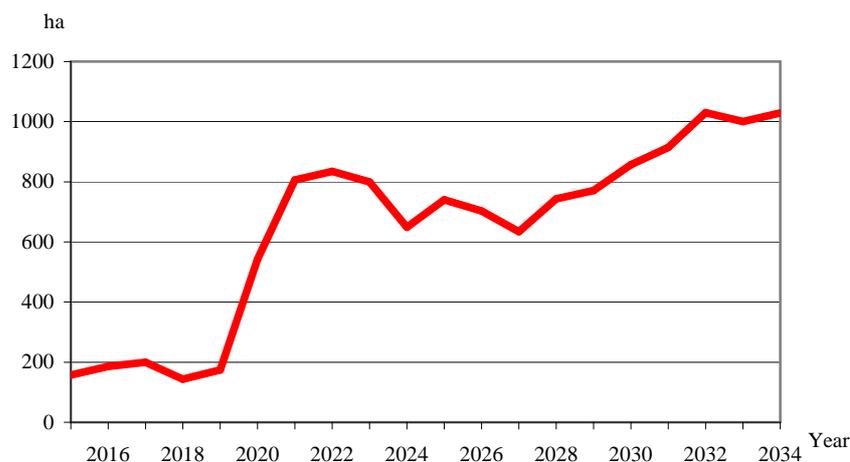


Figure 5. Estimated thinning required in Icelandic forests

Presently the major limiting factor is the absence of raw materials for manufacturing purposes. As shown on the graph below, the amount of small wood available will increase after the year 2020. During the interim, efforts are being made by the IFS and RAPS to locate future markets and manufacturing methods suitable for predicted timber harvests.

There will be a sharp increase in small wood thinned from Icelandic forests in the year 2019. Figures for small wood production will continue to increase well into the future. This provides what can become a valuable forest resource. (Ó. Eggertsson 2003).

### **3 Wood-processing industries**

It's evident that there is no wood-processing industry in Iceland. Thinning wood is processed in small units on behalf of the Icelandic Forest Service.

### **4 Non-wood forest products and services**

#### **4.1 State of the art and historical development**

The state of the art regarding non-wood forest products in Iceland reflects the young age of Icelandic afforestation efforts and a culture adapted through the centuries to life in a treeless landscape. It has only been within the past 20 years or so that Iceland had forests of adequate size to utilise for wood and non-wood products and services to any degree. Most research into forestry has been concerned with identifying suitable species for the growing conditions and the best methods of planting and caring for the young trees. The increased area of forest land and heavier demands for recreational use make increased research into all areas of non-wood resource use essential.

Research regarding non-timber products has been limited to three studies. Two of these were undertaken by the University of Iceland and analysed the chemical content of Downy birch (*Betula pubescens*) and Russian larch (*Larix sukaczewii*) as sources for medicines and food additive production. The third was a study done in eastern Iceland regarding the processing and marketing for culinary purposes of the larch bolete, an edible mushroom found in young larch plantations. None of these projects have been followed up with product development.

Non-timber forest services have received little attention by researchers, although at present there is a movement within the Iceland Forest Service to promote and expand this knowledge. Older research includes user surveys done in recreational forest areas close to the two largest population centers of Reykjavik and Akureyri. The first study was done by the Road Department of Reykjavik and the later by the Eyjaförður Forestry Society. Neither study has been published.

There are two ongoing research projects that address non-timber forest products and services. Both of these projects address both issues, products and services, and are being done within the Iceland Forest Service.

The first of these involves public attitudes towards forestry in Iceland, as well as public demands for services in forest lands. It also addresses to a limited degree the utilisation by the public at large of non-wood forest products. The study is based on a poll done by IMG Gallup and will be published in 2005.

The second ongoing program, Enhancing Local Activity and Values from forest land, is a co-operative effort involving Iceland, Norway, Sweden, Finland and Scotland and has been submitted to the NPP for funding approval. This project involves the development of sub-regional forest planning methods. Plans of this scale and type are necessary tools to prevent possible conflicts of traditional wood use and non-wood forest uses. A part of this project is to identify non-wood forest uses and to promote innovative new uses to provide income in rural areas. Such plans will serve as the basis for maximising forest resources in a socially, economically and environmentally sustainable manner.

As mentioned above, there has traditionally been very little use of Icelandic forests for non-timber purposes, with the exception of animal fodder in the past and recreational use more recently. However the demand for the development of non-timber products and services is increasing. There are several reasons for these increased demands.

With the formation in the last 15 years of the Regional Afforestation Projects the forest cover is increasing and will continue to do so. Many of these areas will not produce high quality timber on a scale that allows economically viable production. For these areas, non-wood resources can form an economic basis for rural enterprises SMEs

The largest demand is for forest services and comes from the urban areas. This demand is the result of changing demographics, economics and infrastructure. Until recently the population of Iceland was basically rural. In 1960, 17.7% of the population was in rural areas. Decreasing demands for sheep production and the introduction of new agricultural practices have drastically reduced the number of people in rural areas to 7.3% in 2003. (Rural areas are defined as areas with a population of 200 or less.) Road conditions in Iceland were historically such that travel within the country was difficult and many people chose therefore to take their holidays within the cities or abroad. The road system has improved as well as the economic standing of most families. Many people now have the necessary recreational vehicles that provide them comfortable access to their own country. Forests owned by forestry societies (NGOs ) and the Iceland Forest Service (IFS) are now seen as attractive holiday areas and are experiencing heavy use by recreationists. The 2004 IMG Gallup survey shows that 78.3% of Icelanders visited forestlands in the past 12 months and the average number of visits for this group was 14.7.

Harvesting of non-wood forest products is for the most part done on an individual basis and there are no figures available for the volume and type of products harvested. The same applies to the processing of these resources. Figures from the 2004 survey show that of those visiting forest lands 2.6% went to into the forest to harvest non-wood forest products, presumably mostly berries and mushrooms.

The IFS is the main provider of non-timber forest services. These are mainly recreational and educational services. The IFS has programs for educating both adults and children in and about the forest. The largest of these programs involves "forest classrooms". This is a co-operative effort by the IFS and the state education ministry. Each participating elementary school adopts a forest stand close to the school to be used as an outdoor "classroom". These classrooms are then used to integrate education in forests with all other facets of the curriculum. The IFS has supervised this program on a national and regional basis.

Information regarding the supply of other forest services is not available outside of the limited figures for visitor-nights kept by the IFS for its land holdings. However, the 2004 survey shows that 94% of visitors during the past twelve months went there because of the services available. (Services include all categories ranging from recreation to information.)

Icelandic law provides free access to all areas, both state and privately owned properties. Harvesting of resources for commercial purposes and camping on private property requires the permission of the land owner. On state owned land, the harvesting of non-wood products is allowed. There is however a provision in the law allowing the Ministry of the Environment to place restrictions on harvesting and the use of mechanised harvesting equipment in environmentally sensitive areas. It is forbidden to harvest naturally occurring materials in areas designated as protected by the Ministry of Environment.

There are no direct provisions in Icelandic law for the promotion of non-wood products. However, the Rural Development Offices, located in all regions of the country can financially support research and development of enterprises utilising these resources. They presently support some activities involving research and development for wood products, but there are no programs currently involving non-wood resources. The IFS is the agency responsible for researching forest resources along with all other facets of forests and forestry. Expertise can also be found in other agencies within the country, for example the University of Iceland, the Food and Drug Agency, the Agricultural University and many others.

University training specifically in the field of non-wood forest products is again not in place. However, university training in related fields such as forestry, chemistry and other related fields is available at the two major universities. Technical training is also available within the country. Graduate degrees in these fields are currently not generally available. Students must go abroad to earn such degrees. This practice is not attributable to lack of qualified teaching personal or facilities, but rather is the policy to promote a wider learning field for Icelandic students.

At present the IFS is the only agency conducting non-wood forest research within the country. The IFS has staff competent to carry out research in all aspects of non-wood forest resources. Several other institutions in Iceland such as the University of Iceland, the Icelandic Tourist Board and the Icelandic Food and Drug Departments are also competent to carry out such research. At present there are no publications concerning non-wood forest product and services in Iceland with general public accessibility.

#### **5.4 Main problems and research questions in forest resources and ownership for enterprise development in the forest sector**

For historical reasons there has been little utilisation of forest resources in Iceland. Therefore in order to utilise the forest resources resulting from current afforestation activities research and development of potential markets and manufacturing processes for all forest products is necessary. Those forest resources resulting from afforestation efforts are for the most part owned by individual landowners. Therefore possible conflicts regarding their harvesting are negligible. The only foreseeable conflict may involve ownership rights to carbon sequestration should this develop into a market commodity.

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Ólafur Eggertsson, unpublished paper 2003.