



Photo: Tomas Nordfjell

## SNS-project:

# Bioenergy harvesting in young stands is commercially viable with new technology

**Large volumes of bioenergy in the Nordic forests could become available with new harvesting methods. Boom-tip technology, corridor harvesting and multiple-tree handling were some of the techniques in focus in the SNS-sponsored project “Harvesting of bioenergy in young stands”, involving all Nordic countries.**

Today, untended, dense young forest stands often pose a problem in forestry, increasing the costs of commercial harvesting and making associated mature stands less valuable. However, these young stands also represent a considerable potential source of bioenergy, provided that the wood can be harvested at a reasonable cost. Estimates from Sweden indicate that

there are almost 700,000 hectares of pre-commercial thinning forest with a dry matter content exceeding 30 tonnes per hectare, amounting to a total of 33 million tonnes of dry matter. This is a large potential energy source. However, with current technology, stands need to contain 60–70 tonnes per hectare to justify commercial harvesting.

The project concludes that new approaches involving boom-tip technology could reduce the commercial threshold to stands with 30 tonnes of dry matter per hectare. This would mean that large volumes would become available.

The study also concludes that there is no current technology that can efficiently combine the production of pulpwood and small-dimension timber with biomass chipping. It is

questionable whether such technology will ever be possible – it would be too complicated and expensive.

## Sweden

### **Boom-tip technology**

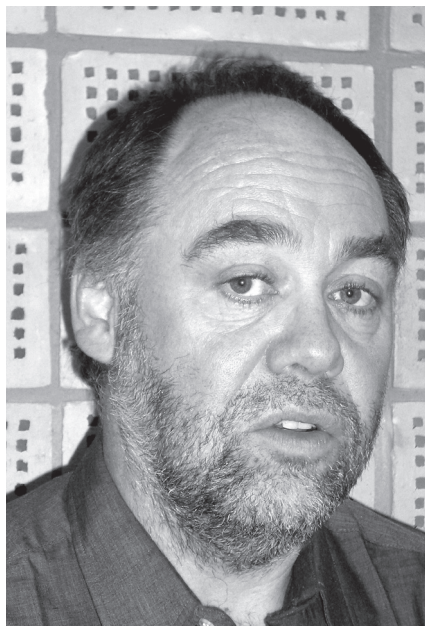
The Swedish contribution to the project focused on corridor harvesting using boom-tip technology that allows many trees to be processed.

A harvesting head mounted on a boom with a long reach harvests small trees in narrow corridors. The studies showed that the technology could double the productivity of young first thinnings and triple it in late, and dense, pre-commercial thinning. The small trees could be coarsely debranched, and five trees could be handled in the same grip. For larger trees (dbh 12–15 cm), two trees could be handled in the same grip.

## Finland

### Multistem harvesting

The Finnish studies showed that heads capable of multiple-stem harvesting increased productivity by 12–25%. The bundles of stems could be processed near strip roads, or at the stump. With the latter method, logging residues were more evenly spread out in the stand, which improves nutrient availability.



In another study, strip debarking of the stems as a means of increasing the drying rate and reducing moisture and bark contents was examined. A harvester head was modified to facilitate the debarking. However, only marginal effects were achieved with the modified equipment.

## Denmark Models

The Danish part of the project focused on developing models of the chain including handling, transportation and processing of the fuelwood produced by pre-commercial thinning. The model was not fully developed by the time the final report was published.

Technology for tending young beech stands is also due to be tested. A crane-mounted hedge trimmer will be used to thin young stands (1.5 m), allowing the remaining stems to grow to a size that can be utilized for fuelwood.

*“Only in Sweden, there is a potential source of 33 million tonnes of dry matter in the young stands which we could utilize with the new technology,” says Tomas Nordfjell*

## Norway

### Equipment for farm tractors

Norway took part in the project, but with funding from outside the SNS. They showed that a production rate of 8 m<sup>3</sup> per hour could be achieved with multi-tree processing equipment mounted on a farm tractor; this is useful for harvesting on former agricultural land.

## Iceland

### Mechanized harvesting

The Icelandic partners contributed by organizing workshops and excursions; they also carried out a thinning trial using an excavator. This was the first mechanized harvesting ever to be undertaken in Iceland!

*SNS project 96 – Harvesting of bioenergy in young forest stands.*

**Project leader:** Professor Tomas Nordfjell, SLU, Sweden

**Other participants:** Metla (Finland), Forest & Landscape Denmark, Heraldskogur (Iceland) and The Norwegian Forest and Landscape Institute

## Shortcuts

### Lodgepole pine surpasses beech

The introduced lodgepole pine has climbed to the position of seventh most abundant tree species in Sweden, on a volume basis. The standing volume is now 23 million cubic metres, and it thereby surpasses the native beech, with 20 million cubic metres.

Source: [www.slu.se](http://www.slu.se)

### Nordic Ministers promote forest research

Selfoss in Iceland hosted the Nordic ministers in August, when they discussed sustainable forestry. They concluded, among other things, that high-quality forest research is necessary, and that increased Nordic cooperation will help our countries maintain their position at the forefront of international research.

*The statement can be downloaded from [www.nordicforestresearch.org](http://www.nordicforestresearch.org)*

### NovelTree – new EU project

The new NovelTree research and development project was launched in June this year. The project focuses on improved breeding strategies and has a budget of 6,3 million Euro. Finland and Sweden are among the partners in the project.

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# Bioenergy – a hot product from Nordic forests

In the Nordic countries, the proportion of overall energy consumption provided by bioenergy has increased steadily over the past 25 years and it is expected to continue to increase. The political incentives are obvious – bioenergy, in contrast to fossil fuels, is considered to be climate neutral. And bioenergy can be produced within each country, making the energy supply less dependent on an insecure international market.

The Nordic countries, sparsely populated and covered by forests, are in a prime position for developing energy products from wood. SNS consider bioenergy to be one of the most important research fields, and a vast number of projects are currently underway in the region.

Proportionally, the highest consumption of bioenergy occurs in Finland and Sweden, amounting to 20 and 19%, respectively, of their total

energy needs.

In Norway, a country with its own oil resources and hydropower, bioenergy accounts for only 5% of the total consumption. In Denmark the proportion of energy from biomass is 12%, while Iceland (with hydro- and geothermal energy) hardly uses any bioenergy.

Sources: Swedish Energy Agency; Danish Energy Authority; Statistics Finland; Statistics Norway; Statistics Iceland.

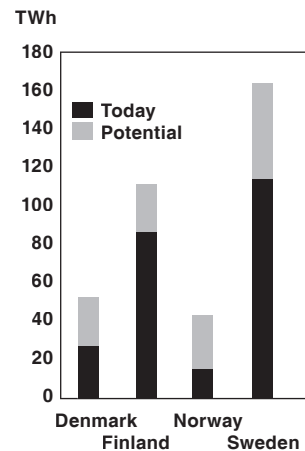
The diagrams show the share of consumed energy from various energy sources



## Potential to grow

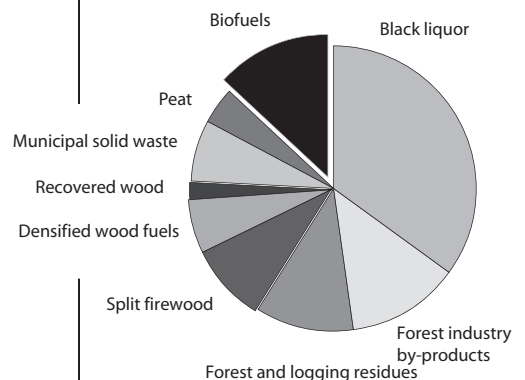
Current and estimated potential for bioenergy use in the Nordic countries.

Source for both graphs on the right: Facts and figures on the use of bioenergy in the Nordic countries, Econ Pöyry, Report 2008-054.



## Bioenergy from many sources

Bioenergy can be produced from many sources. The diagram shows the situation in Sweden in 2005.



Downloaded By: [Hannerz, Mats] At: 07:39 28 March 2011

## Bioenergy research around the Nordic countries

### Norway: New centre for bioenergy research

In September this year the new joint Norwegian centre for bioenergy research was opened.

The centre was established in cooperation with the Norwegian Forest and Landscape Institute, Bioforsk (Norwegian Institute for Agricultural and Environmental Research) and UMB (Norwegian University of Life Sciences).

The vision for the new centre is to become the leading research location for renewable energy based on biomass. The research will include topics such as biogas, second generation biofuel and life-cycle and sustainability analyses.

Source: [www.umb.no](http://www.umb.no)

### Norway: New project at centre for rural research

In Norway, an increasing number of firms have recently started to produce and deliver bioenergy.

In a new project ("Analysing supply chains for bioenergy and factors for development in different regions"), the experiences of all the actors involved in small and medium-sized supply chains will be investigated in three forest regions.

The project will encourage better access to raw materials and stimulate the development of logistical solutions from "forest to heat". The critical factors for the development and supply of bioenergy in different regions will also be identified.

The partners involved in the project are Hedmark University College Fylkesmannen in Nord-Trøndelag and Møre and Romsdal County. The project is led by the Centre for Rural Research at the Norwegian University of Science and Technology in Trondheim. It runs from 2008 to 2011.

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Centre for Rural Research, Trondheim.

### Finland: Bioenergy from forests

The Finnish national forest policy has the goal of increasing the annual energy wood harvest. A project running from 2007 to 2011 was established by Metla with the aim of providing detailed information on the impacts of energy harvesting on forests, new harvesting models and wood supply chains.

The programme will finance the equivalent of 30–50 full-time scientists annually.

Examples of topics to be studied:

- Integrated roundwood and energy wood harvesting during thinning
- The ecological, silvicultural and forest health consequences of stump removal
- The international trade and global market for bioenergy and bioenergy technology.
- New knowledge of products such as chemical compounds and ethanol production.

Source: [www.metla.fi](http://www.metla.fi)

Programme director: Professor Antti Asikainen

### Denmark: Fuel for life

Fuel for life is an initiative of the Faculty of Life Sciences of the University of Copenhagen, aimed at strengthening the development of sustainable primary production for bioenergy. The programme integrates research competences from a large number of institutes in fields such as agriculture, forestry, plant breeding, plant biology, economics and ecology. Some examples of research programmes within Fuel for life:

- Pretreatment and recirculation of wood ash
- Development of second generation bio-ethanol
- Wood properties and pellet production

Source: [www.fuel.life.ku.dk](http://www.fuel.life.ku.dk)

### Sweden: The EES-programme

"Increasing the efficiency of forest bioenergy systems" is a joint collaborative venture between the forestry and energy sectors. The four-year project (2007–2010) will focus on:

- Reducing logging-residue processing costs by 30%
- Increasing the use of biofuel and, thus, increasing its value by 10%
- Reducing fuel consumption in all operations by 10%

The programme is led by Skogforsk (the Forestry Research Institute of Sweden), but with many collaborators from the industry and other research organisations.

Source: [www.skogforsk.se](http://www.skogforsk.se)

Programme manager: Rolf Björheden, [rolf.bjorheden@skogforsk.se](mailto:rolf.bjorheden@skogforsk.se)

### Sweden: The Bioenergy portal

"Bioenergiportalen" aims to become the central meeting place for bioenergy activities connected to farming. Bioenergy from the forest will be an important part of the portal.

Source: [www.bioenergiportalen.se](http://www.bioenergiportalen.se)



## Why Nordic cooperation?



*Mikael Sandvik, SNS Observer from Åland and Director of Forestry Section, The Government of Åland*

– The Åland Islands form a small archipelago comprising more than 6.700 islands and skerries. Approximately 40 % of the area is productive forest land. The forestry is similar to that found in Finland and Sweden, but we don't carry out any forest research on our own. Therefore, cooperation is very valuable and offers us important contacts in the Nordic countries. Furthermore, a united voice from the Nordic countries can make a great impact on the international scene.



*Jón Loftsson, SNS board member from Iceland and Director of the Iceland Forestry Service*

– Nordic cooperation in the field of forestry research has been priceless for Icelandic foresters. We have been able to participate in research projects with world class scientists. Because of that, we have taken part in both Nordic and European research projects in which we have been legitimate members. Although no other country in Europe has so few forests as Iceland, the country offers other nations a useful environment to research changes in ecosystems caused by the greenhouse effect. Therefore, we have been treated as valued members of all kinds of cooperative projects related to forest ecosystems.



*Josh Kolltveit, SNS board member from Norway and special adviser at the Research Council of Norway*

– Increased international cooperation is necessary for the development of the forest sector. Most innovative research occurs at the international level, but applications must be developed at the national scale. Joint Nordic research projects help us to compete internationally, and make us an attractive partner for cooperation in European projects. We are small countries, but we share the same climatic, geographic and economic conditions. The Nordic countries therefore have a great opportunity to cooperate and share resources. This is why SNS is needed.

### Contact News & Views

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More info about SNS:

[www.nordicforestresearch.org](http://www.nordicforestresearch.org)

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