New technology for stabilizing the paper web

Pekka Eskilinen, Raimo Virta and Vesa Vuorinen, Finland, have been awarded the sixteenth Marcus Wallenberg Prize, for their trailblazing development of "blow boxes" which enable higher velocities to be used in the drying phase of paper-making.

Presented by the Swedish King

The prize is two million Swedish crowns, or ca. €225,000. The prize will be shared equally between them.

The award will be presented to the winners by H. M. King Carl XVI Gustaf at a ceremony to be held in Stockholm in the fall of this year.

Air turbulence causes problems

In the drying section of a paper machine, the paper web (supported by a fabric base) runs in contact with a number of rotating steam heated cylinders.

Fast moving surfaces drag air along with them. The air nearest to the surface moves almost as fast as the surface itself. These boundary layers of air produce excess pressure in the closing nips that are formed between the cylinder and the fabric approaching the cylinder. This excess pressure and air turbulence tend to blow the web away from the fabric, with the result that the web flutters and often breaks, leading to production losses and reducing the operating efficiency of the paper machine.

More than 10,000 blow boxes

The three Finnish researchers have identified the cause of this problem and developed an unique air blowing technology, that makes it possible to avoid the overpressure and air turbulence in the nip, and thus eliminate the problem. It is done by means of a specially designed blow box, that blows air from the nip against the running direction of the fabric and the cylinder, preventing the air that is dragged by the nip from flowing into the nip.

The basis for this technology is since long known aerodynamic laws, which have been applied in a unique way.

This blow box technology has enabled a substantial increase of the productivity and efficiency of paper-making machines and more than 10,000 blow boxes of this design have been installed. It has contributed significantly to the reduction of costs for the manufacturing of several important paper grades, which are now produced at speeds between 1,200 and 1,700 m/min.

The Wallenberg Prize-winners

Pekka Eskilinen

Raimo Virta

Vesa Vuorinen

The Marcus Wallenberg Prize

The Marcus Wallenberg Prize is an international award, established in 1980 by STORA, a Swedish forest company now merged with the Finnish company ENSO.

The Prize was instituted to recognise, encourage and stimulate research and development of a pioneering nature that significantly increases knowledge and technical progress in areas of concern to forest industries.

The prize is named after Marcus Wallenberg, who served as a member of the STORA Board of Directors and was its Chairman for many years.

More about the Prize can be found on the Internet: www.mwp.org

A new future for aspen in Finland

Finland has recently launched a new aspen research project. The main objective is to improve the fibre quality of European aspen (*Populus tremula*) and hybrid aspen (*P. tremula x tremuloides*) by both breeding and silvicultural practices. The ultimate aims are to find clones that allow large quantities of homogeneous raw material of high quality to be grown – and different grades of paper to be produced from different clones.

"The Nordic eucalyptus"

The Nordic forest industries have an increasing need for short-fibre wood, especially for making high graded paper. This is partly a consequence of the IT-revolution, and the rising demand for paper with uniformly high quality for modern printers. Paper made of eucalyptus and acacia is taking a leading role in the world paper market. These species are not viable alternatives for the harsh Nordic climate. But we do have aspen, a species with similar fibre properties.

So, there is increasing interest in this "Nordic eucalyptus". One example: a paper machine in Kirkniemi, owned by Metsäliitto, a Finnish forest industry enterprise, is now producing a fine graded paper that includes a substantial amount of aspen fibre. The machine needs 300,000 cubic metres of aspen annually. Today, only half of this volume comes from Finland, the rest is imported, largely from the Baltic states. To meet this new demand for short fibre wood, Metsäliitto plans to establish 1,000 hectares of aspen annually over the coming years.

Improving the raw material

Currently, aspen shows a large variation in fibre quality characteristics. The objective of the new research project is to learn more about the factors affecting the fibre quality– and how they can be manipulated.

The project will involve several, linked research efforts, focusing on aspen genetics, pathology, silviculture and fibre quality.

Old plantations valuable source

There are a number of older aspen plantations in Finland. These are "relicts" from the 1950's and 60's, when a vibrant match industry had a great need for aspen.

Wood samples from these old plantations, and from old clonal tests, will be analysed for fibre characteristics.

The best individuals will be selected for further clone-testing. Aspen clone trials in Sweden will also be used in the breeding programme.

One important target is to find efficient ways for micropropagation of aspen, using bud-tissue from old specimens with desirable characters, to make copies of good trees.

Another sub-project will deal with protection systems against moose, hare and vole. The aim is to find the most cheap and convenient methods to protect the young plants in the field.

Management experiments, with different spacing and thinning practices, will also be established.

The project has an annual budget of ca. €300,000. Some of the activities will last for at least five years.

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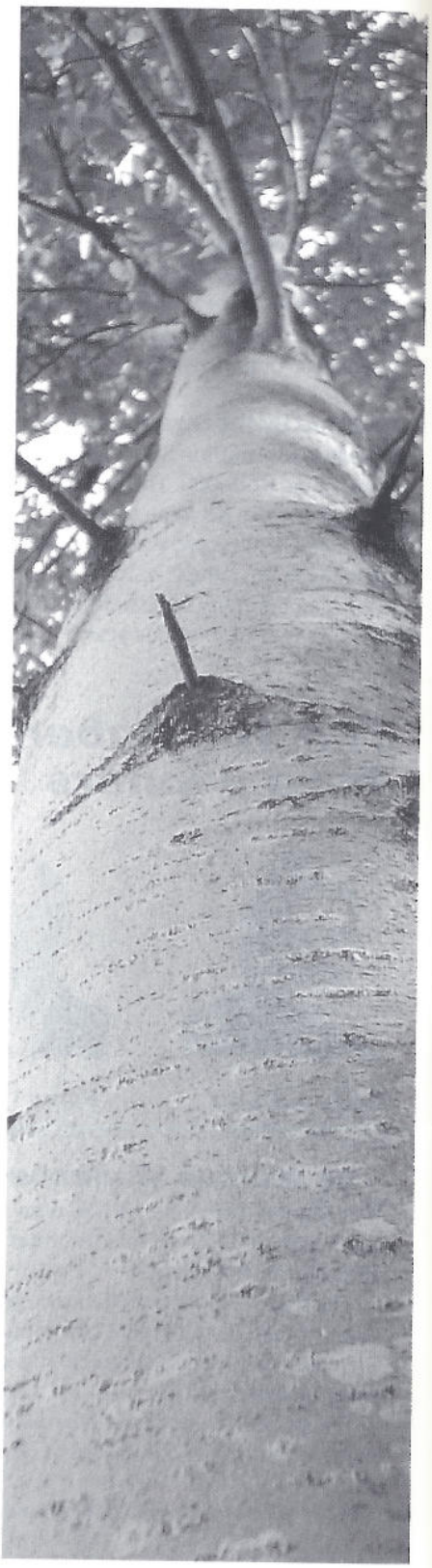
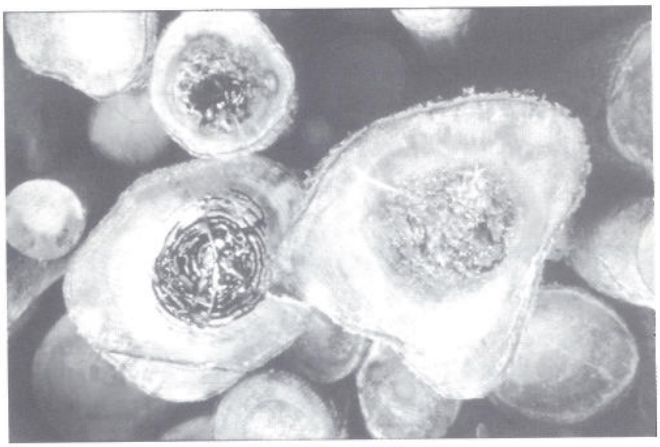


Clippings from Finland

Advocates for stump treatment against root rot

In an article in a Finnish forestry journal, Prof. Kim von Weissenberg, at the Helsinki University, argues for general stump treatment with the fungus *Phlebiopsis gigantea* in *all* summer cuttings in pine and spruce forests. He says it is an efficient way to prevent infections of root rot, (causal agent: *Heterobasidion annosum*). Stump treatment gives a substantial reduction in the number of stems damaged by rot in forthcoming cuttings. He also claims that all the required knowledge is available today. There is no need for more research. The only exceptions from the general recommendation are very young stands, with an average stump diameter of less than 10 cm. He is also a little doubtful about stands that have already been severely damaged by root rot, since the positive effect of treatment is then less obvious. *Source: Skogsbruket 4/99.*

In Sweden, stump treatment is carried out in most summer thinnings in spruce stands. Some researchers believe treatment should be economically favourable in clear cuttings too, since new research findings show that it can reduce root rot in the forthcoming first thinning by ca. 10–20%. *Source: SKOGEN 3/99.*



Less of this with stump treatment

Clippings from Denmark

DNA markers for aphid resistance

The green spruce aphid, *Elatobium abietinum*, is a harmful pest of sitka spruce, *Picea sitchensis*, in Denmark. After mild winters, it can cause heavy needle-losses from younger trees, reducing their growth, and in some cases even killing them.

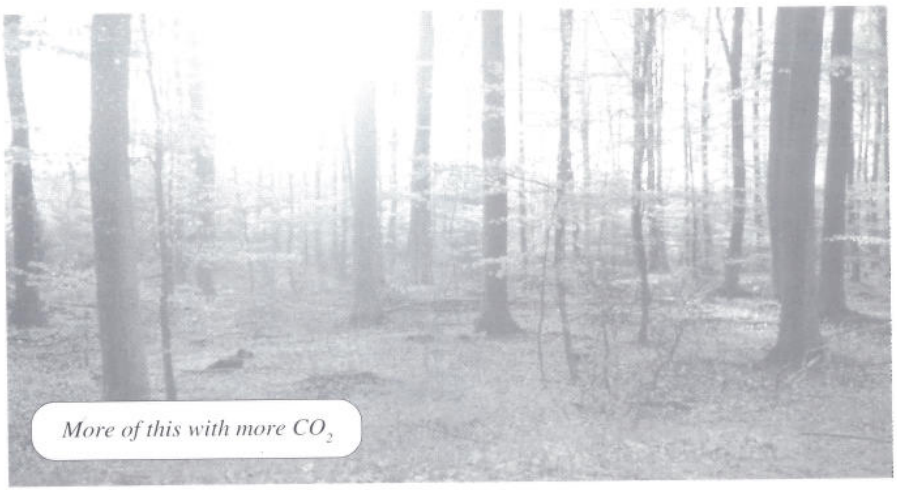
Studies in a Danish seed orchard have indicated there are substantial differences in resistance between families. A DNA-study of two families showed that the resistance was linked to three DNA-markers out of 1,000 studied.

This is the first time a link between DNA markers and forest-related properties has been found in Denmark. The link can be used in the sitka-spruce breeding programme. The DNA-markers can be analysed in seedlings, and progenies with the desired DNA-profile can then be selected for mass propagation. *Source: SKOVEN 4/1999*

Beech grows better with more CO_2

In a climate chamber study in Denmark, beech plants (*Fagus silvatica*) had an increased growth rate when cultivated in an environment with enhanced concentrations of atmospheric CO_2. This was true for all temperatures studied, and most apparent when the temperature was raised 2.5 degrees C over the normal.

The conclusion was that greenhouse effects, with higher temperatures and more CO_2 in the air, would increase the photosynthetic rates of the trees, and decrease transpiration – as long as there was enough water and nutrients for them. It is, however, uncertain if any growth increment would appear in less favourable conditions, for example if water supply was limited. *Source: SKOVEN 4/1999.*



More of this with more CO_2

The Nordic Forest Research Co-operation Committee, SNS:

New joint research projects supported by SNS

In 1999, five new Nordic collaboration projects have received support by SNS. Two of these are described here. Like the three described in the previous issue, these projects will have a duration of three years (1999-2001) and have also been granted substantial national co-funding.

SNS

SNS 1. Nitrogen downfall–effects on forest growth

Nitrogen is considered the main limiting factor for forest growth in most areas in Scandinavia. The nitrogen cycle in forest ecosystems is generally tight, with very little leaching from the system. With increased nitrogen input, however, there is a question of the long term ability and capacity of the forest ecosystem to retain incoming nitrogen.

A recent investigation in Denmark has shown that 70% of the forests stored the incoming nitrogen within the system, whereas 10% of the forests were saturated with nitrogen, with leaching of nitrate equalling the amount of nitrogen deposition.

Simulated increased nitrogen input to NITEX Gårdsjön site showed that in the short term there are little risks of nitrogen saturation.

It is still unclear whether the increased nitrogen supply will lead to actual increases in tree growth. The ability of the trees to take up incoming nitrogen may be connected to the avalaibility of the nitrogen.

Experimental evidence to date indicates that the main part of the anthropogenic nitrogen is taken up by the soil microflora, whereas uptake by forest trees may be somewhat delayed.

In order to evaluate the long-term effects of increased nitrogen deposition in forests, there is a need to understand the key soil processes that determine the eco-system's ability to store nitrogen.

The project is based on an earlier co-operation within the EU-supported 'NITREX' project. The main objectives of the project is to quantify the effects of increased nitrogen deposition on the tree increment and on the processes that regulates the systems ability to bind nitrogen and carbon. The following aspects will be studied:

1. Forest tree vitality and growth, and needle chemistry
2. Nitrogen mineralization in different organic layers
3. Stability and mobility of nitrogen in the forest ecosystem
4. Secondary effects on carbon mineralization and CO_2 production

Project: Effects of enhanced nitrogen deposition on nitrogen-limited forest ecosystems ("SNS-72")

Co-ordinator: Dr. O. Janne Kjønaas at the Norwegian Forest Research Institute, Ås, Norway.

Participating countries: Denmark, Norway and Sweden.

SNS grant: appr. €42,000 per annum.

SNS 2. Abies lasiocarpa, the perfect Christmas tree?

The subalpine fir, *Abies lasiocarpa,* is native to the western regions of North America. In recent decades it has been increasingly used in the Nordic countries for Christmas tree production, and the interest is expected to rise even more in the near future.

Abies lasiocarpa has certain characteristics that makes it attractive as a Christmas tree, such as a narrow crown, a great variety of needle colours and good needle retention ability. However, growers in the Nordic countries have experienced a range of problems in cultivating this species, leading to sub-optimal quality. Although climatic and soil conditions may differ, many of the problems encountered are shared by the Nordic countries.

The project focuses on a number of issues: choice of proper genetic material for specific environmental conditions, cultivation methods (weeding, fertilization, time of planting, etc.). As a background for selection of genetic material, variability between provenances in fall, winter and spring frost hardiness will be identified.

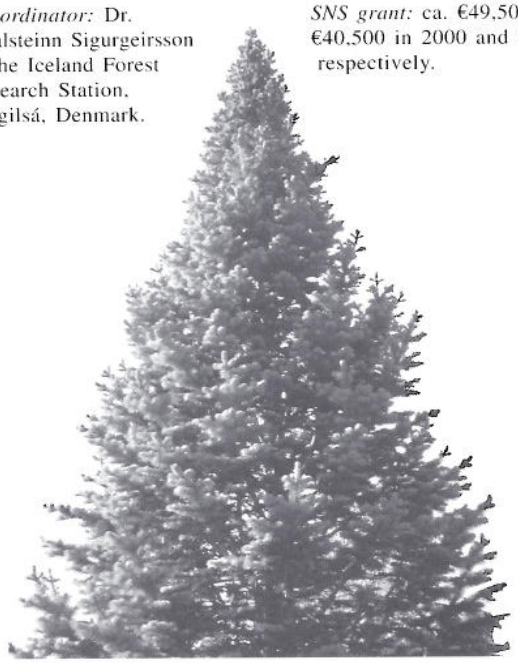
Further, experiments will be carried out to study the effects of different times of harvesting and temperature treatments on the retention of needles and needle colour.

Project: Abies lasiocarpa for Christmas tree production in the Nordic countries ("SNS-73")

Co-ordinator: Dr. Aðalsteinn Sigurgeirsson at the Iceland Forest Research Station, Mógilsá, Denmark.

Participating countries: Denmark, Finland, Iceland, and Norway.

SNS grant: ca. €49,500 in 1999; €40,500 in 2000 and 2001, respectively.



Clippings from Norway

Lichens in coastal spruce forests can survive thinning

Studies in older Norwegian coastal spruce (*Picea abies*) forests, show that lichens can survive a thinning. Two species, *Pannaria ahlneri* and *Pseudocyphellaria crocata* are, however, so rare, that a thinning can remove the last few individuals from a locality. The remaining area of coastal spruce forests is so reduced today that it is doubtful if re-colonisation from surrounding stands is possible. For this reason, a lichen inventory should be made before thinning.

Source: Norsk skogbruk No. 2 1999.

Lodgepole pine – an alternative in areas with harsh climates

In Norway, there are large areas where a harsh climate makes it almost impossible to grow Scots pine, *Pinus silvestris*. Frosts during the vegetation period and low summer temperatures give favourable conditions for *Gremmeniella abietina*, a fungus that often kills young trees.

On dry and poor sites, lodgepole pine, *Pinus contorta*, is an interesting alternative. But, dense moose populations can give the lodgepole pine a tough time. An effective counter-measure in such cases is to plant extensive areas simultaneously, reducing the impact of the moose. Another measure is to plant dense stands, which are more resistant to moose damage and less attractive to the moose.

Source: Norsk skogbruk No. 2 1999.

To thin or not to thin

In Norway, there is an ongoing discussion about whether thinnings in spruce forests are profitable or not. On one hand, stands with a low number of stems will give low productivity and low quality. On the other hand, a too dense stand will give good quality, but trees with poor dimensions.

Economic calculations in Norway, based on normal circumstances and available yield prognoses, show that thinnings are not profitable. However, the differences between thinning and not thinning are quite small.

In the other Nordic countries, there is no such discussion about the profitability of thinning. This may depend on differences in the yield prognoses describing the production with and without thinning.

Source: Norsk skogbruk No. 2 1999.

Clippings from Sweden

High-intensity fibre-production – a viable alternative?

Is intensive fibre-production with Norway spruce an alternative in some Nordic forests? This is the main question for a Swedish research project, managed by the Swedish University for Agricultural Sciences.

High-intensity forestry could, it is thought, be practised on limited areas, leaving other areas free for much less intensive forestry–or as reserves.

Optimal-fertilization is the basis for such forestry. In theory, the trees would get all the nutrients they need all the time. In some experiments this has doubled production in southern Sweden, and in northern Sweden it has been even more successful: trebling growth!

The possibilities and practicalities are now being assessed in seven sub-projects:

1. Planning. What sites are suitable for this intensive spruce forestry? And, how should forestry and other interests, such as recreation, farming, environment etc., be balanced.
2. Methods for optimal fertilization. How should the trees be given the fertilizers they actually need, while avoiding leaching of nutrients, and how should needle analyses be deployed?
3. Environmental control of fertilized areas, and assessment of ground water.
4. Optimal fertilization in very fertile stands
5. Effective establishment. How should an intensive forest be established, while avoiding problems with parasites and weeds?
6. Wood and fibre-structure of intensively grown trees.
7. Growth and environmental effects of fertilization with sludge, applied as pellets.

This is a four-year project with an annual budget of ca. €270,000, and is a co-operation between the university and a number of Swedish forest enterprises.

Source: Fakta Skog No. 1 1999.

What is the impact of forest fertilization on the environment?

Swedish forestry needs to find answers to three questions by the end of 2002 if it wants to avoid a ban on fertilization under the provisions of the Swedish Forest Stewardship Council's standard.

The questions are:

1. Does nitrogen fertilization of forest land pose a threat to the natural processes in the soil and its productive capacity in the long term?
2. Can it adversely affect other ecosystems?
3. Does it pose a threat to biodiversity?

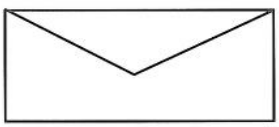
To answer the questions, a major research programme on the environmental impact of forest fertilization is now being launched at a cost of some €600,000 over three years.

The research programmecomprises 17 individual projects. A large number of researchers from SkogForsk, the University of Agricultural Sciences (SLU) and the Swedish Environmental Research Institute (IVL) will be involved in the work, which will include field trials, lab tests, a review of the existing literature, surveys and simulations.

A preliminary report is to be published in summer 2002.

Source: SkogForsk News No. 1 1999.

Letters to the editors



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