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1/2007

Co-operation in bioenergy research

Results of 10th Finnish National Forest Inventory

METLA

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COVER
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Photo: Metla/Erkki Oksanen

TRANSLATION
Philip Mottram

Metla's forest energy research supports best practises, pages 8-9.

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Forest's energy can be used to generate heat and electricity – also dependency on fossil fuels is reduced.

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New industrial revolution

In March targets set by the European Commission included increasing the proportion of renewables in all energy produced to 20 percent, and increasing the proportion of biofuel in all motor fuels to 10 percent by the year 2020. The European leaders call this the start of new industrial revolution. The splendid aim of the Commission's energy policy is to reduce carbon dioxide emissions and the growing dependence on imported energy by increasing the utilization of cost-efficient renewable energy. One could, however, wonder whether these targets are realistic and what kind of actions are needed to reach them.

Photo: Metla/Erkki Oksanen

At the moment biomass, mostly forest residues, contributes 5% of the Union's energy supply and 65% of the total renewable energy production. Forest biomass has potential to be one of the most competitive renewable energy sources, especially if integrated with forest industry operations. However, it should be kept in mind that the paper and wood products have better wood paying ability than bioenergy or biofuels and thus the wood supply should be optimized so that the optimal raw material is directed to high value added products and not to energy wood. In Europe 30% of the energy wood potential is harvested for energy. However, it is estimated that the amount of biomass used in heat and electricity production will double. As in the future the liquid biofuels are competing from the same raw material source, it is clear that the availability of cost-competitive, sustainably produced biomass will hinder the achievement of the Commission's targets. Therefore R&D resources have to be directed to the development of sustainable, cost-competitive biomass production chains, to technology and logistics of energy wood harvesting as well as to conversion technologies and integrated systems, and biorefinery concepts without forgetting development of new business models.

The forest industry has long traditions in biomass utilization. In its Technology Platform Vision document the European forest-based sector has committed to becoming a major producer of green electricity, biofuels and other bio-energy products. Integration of second generation of liquid biofuel production with pulp and paper production has a positive influence on profitability. However, to achieve far more acceptable revenues high added-value bio-products like green chemicals and polymers should also be extracted from the wood.

The 20-20-20 target set by the Commission is challenging and cooperation between the different players in the forest-based sector as well as between the forest-based sector and especially the energy sector and chemical industry is needed.

Leena Paavilainen
Director of Research

News

Metla – 90 years of forest research

An anniversary seminar at the "Forest Days" in Helsinki in March 2007 was one of a series of events held to celebrate the 90th Anniversary of Metla. The anniversary seminar was devoted to the topic "Innovations from the forest – new products and business opportunities". Over its 90 years Metla has grown into a leading forest research institute in Europe.

More information: www.metla.fi/tapahtumat/2007/metsapaivat/index.htm

New information service on Finnish forests available on Internet

Metla has launched a new information service on Finnish forests and their sustainable use. The service contains short movies that aim to provide information and facts about Finnish forests in a user-friendly way. The service is available in English, Finnish, German and Swedish.

The project was founded by the Finnish forest industry, the Union of Agricultural Producers, the Finnish Forest Foundation, Metla, the Forestry Development Centre Tapio and Metsähallitus.

More information: www.metla.fi/suomen-metsat/index-en.htm

International forest researchers meet at Saariselkä, Finland

IUFRO Division VI Symposium - Integrative Science for Integrative Management; August 14 – 20, 2007

Forest researchers from around the world are meeting in Finland this summer to participate in the Integrative Science for Integrative Management conference held at Saariselkä, August 14th - 20th. The conference, organized by the Finnish Forest Research Institute (Metla) and IUFRO, covers a subject area ranging from forestry and forest policies to nature and recreational tourism. A kick-off meeting for the new Forests and Human Health programme will also be held during the conference.

Integration is a fundamental part of modern life and the meaning of borders and boundaries is becoming less distinct everywhere. The Integrative Science for Integrative Management conference will raise discussion on how integration is manifested in forest sciences and the use of forest resources. Other topics to be covered include bioenergy, climate change, forestry and environmental issues, environmental economy and policies, controlling natural resources, and nature and recreational tourism.

– We expect interesting and innovative discussions on several fields from the point of view of socio-economic forestry , says Tuija Sievänen, Conference Coordinator in the midst of the arrangements. ▶▶

The kick-off meeting for "Forest and Human Health", a new thematic programme chosen by IUFRO (International Union of forest Research Organizations) will also be held at Saariselkä.

– The role of forests in promoting human health and well-being is gaining in importance for several reasons. Our aim is to enhance interactions between the different operating bodies, says Hannu Raitio, Director General of Metla, who is the coordinator of the Task Force.

Approximately 130 researchers representing the member countries of IUFRO have registered to participate in the conference. The most distant countries being represented in Finland are Japan, India, the United States and Canada. About half of the participants are from Finland. The participants in the conference represent forest research focused especially on social sciences and economics. The plenary presentation in the opening session will be given by Petri Heinonen, Environmental Manager from Metsähallitus.

IUFRO (International Union of Forest Research Organizations) organizes a global conference every five years and other annual meetings for forest science researchers.

More information:
www.metla.fi/tapahtumat/2007/iufro-d6/
www.metla.fi/tapahtumat/2007/iufro-tf-07/
www.iufro.org/


Photo: Metla/Erkki Oksanen

Coming soon: The State of Finland's Forests 2007 published in November

The report on the State of Finland´s Forests 2007 is a comprehensive report containing the most up-to-date information about the state of sustainable forest management in Finland. The report aims to provide key facts and figures about Finland's forests for policy and decision makers and to inform a wider public in a comprehensive and easy-to-read form.

The report will be published by the Finnish Ministry of Agriculture and Forestry. Metla, supported by an expert group of various stakeholders, is responsible for the compilation of the report. The Finnish version of the report was published in July 2007.

The University for Peace nominates Matti Palo as a Visiting Professor

In its meeting in Costa Rica on July 23, the University for Peace (Universidad para la Paz) nominated Professor Emeritus **Matti Palo** from the Finnish Forest Research Institute as a Visiting Professor. In his research Palo has concentrated on the disappearing rain forests and reduction of poverty in the tropical areas.

The University of Peace was founded in 1980 by the UN General Assembly. For more than 50 years Costa Rica has been a model of democracy, peace and security in Latin America. During this period Costa Rica has not had national armed forces.

At the Department of Environment, Peace and Security Palo will give lectures on "Forestry and sustainable development". Several civil wars in tropical countries have been funded in recent years with money that originates from illegal selling of valuable logs. Forests have also served as a haven for the civil population during combats. Palo has previously visited the University of Peace twice as an invited lecturer.

Palo will retain his position as Affiliated Professor at the CATIE University of Costa Rica, which is another international institute conducting research and teaching on the natural resources of the tropical areas in Latin America. His most recent lecture at CATIE was given in February this year.

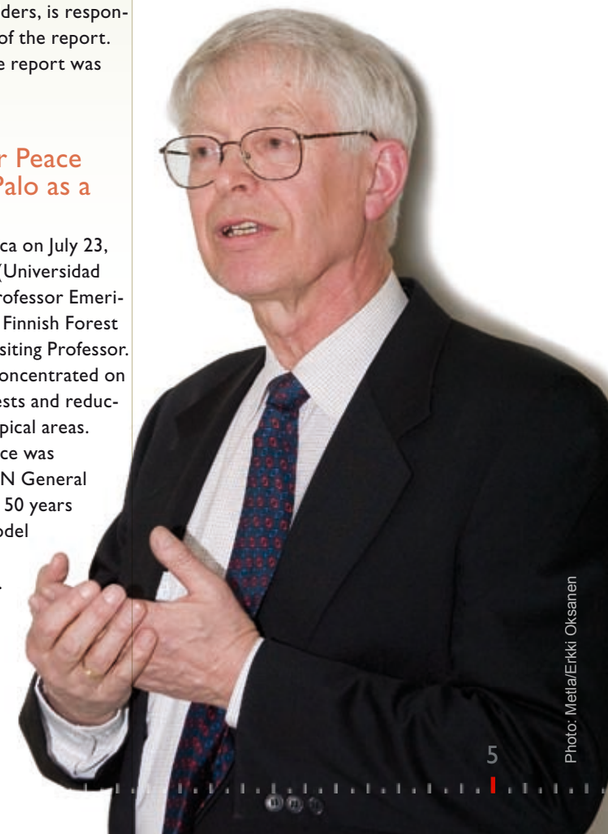


Photo: Metla/Erkki Oksanen

Events

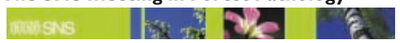
Some upcoming events at Metla or organised by Metla/partners

IUFRO Task Force (2007-2011): Forests and Human Health
Time and place: 14.08.2007 Saariselkä, Finland
Organised by: Metla, IUFRO
More information at: www.metla.fi/tapahtumat/2007/iufro-tf-07/

IUFRO Division VI Symposium: Integrative Science for Integrative Management
Time and place: 14-20.08.2007 Saariselkä, Finland
Organised by: Metla, IUFRO
More information at: www.metla.fi/tapahtumat/2007/iufro-d6/

Forest Policy Workshop of the Scandinavian Society of Forest Economics (SSFE)
Time and place: 14.08.2007 Saariselkä, Finland
Organised by: Metla, SSFE and the University of Helsinki, Department of Forest Economics
More information at: www.metla.fi/tapahtumat/2007/ssfe/

The SNS meeting in Forest Pathology



Time and place: 26.-29.08.2007 Hyytiälä, Finland
Organised by: SNS (SamNordisk Skogforskning)
More information at: www.metla.fi/tapahtumat/2007/sns-pathcar/

SIBLARCH Meeting
Time and place: 28.-30.08.2007 Punkaharju, Finland and Raivola, Russia
Organised by: Metla
More information at: www.siblarch.net

Annual International workshop of Task 31 "Biomass Production for Energy from Sustainable Forestry" of IEA Bioenergy
Time and place: 29.08.-3.9.2007 Joensuu, Finland
Organised by: Metla, IEA Bioenergy Task 31, Wood Energy Network (Wenet)
More information at: www.metla.fi/tapahtumat/2007/bpesf/iea-task-31-2nd-call.pdf

The 2nd Symposium of Scandinavian-Baltic Society for Parasitology
Time and place: 30.08.-01.09.2007 Rovaniemi, Finland
Organised by: Metla, Evira, University of Lapland
More information at: www.metla.fi/tapahtumat/2007/sbsp2/

BIOENERGY 2007, The International Bioenergy Conference
Time and place: 03.-06.09.2007 Jyväskylä, Finland
Organised by: FINBIO - The Bioenergy Association of Finland
More information at: www.finbioenergy.fi/bioenergy2007

Expert Consultation workshop: EU Forest-based biomass for energy: cost/supply relations and constraints
Time and place: 18.9.-19.9.2007 Joensuu, Finland
Organised by: JRC, Metla, EFI
More information at: www.efi.int/events/2007/

Meet in the forest

Moose - the political animal

Loved by hunters and hated by many forest owners the moose (Alces alces) is the largest animal that you can meet in the Finnish forests. E.g. in 2006 after the autumn hunting the stock was estimated as 79 000 - 93 000 individuals. After the calves were born in the spring, the number is again perhaps 50 % bigger by the beginning of this hunting season of 2007. Probably about 60 000 of them are shot this year.

Yet, so large a population of big active animals consumes huge amounts of food. Moose browsing e.g. on silver birch and Scots pine saplings cause extensive damage in forestry. So the stock has to be regulated. But how many is too many? Almost everybody has an opinion of it.

Moose hunting is big recreation for many, and a cherished tradition. Even the Director General of Metla invites some friends and partners into a moose hunt every year.

The value of moose meat e.g. in 2003, a good hunting season, was almost 60 million EUR.

Kids love to see them near or even inside cities, but in the traffic wildly roaming moose are a problem. In the darkest year, 2001, 3046 collisions between moose and cars were registered. In 2001-2005 on the average 270 people were hurt and 10 died in moose-related car accidents yearly.

Therefore moose is a political animal. Perhaps the most political of them all. But seeing it in the wild is always a treat. **EK** ■

Photo: Metla/Erkki Oksanen

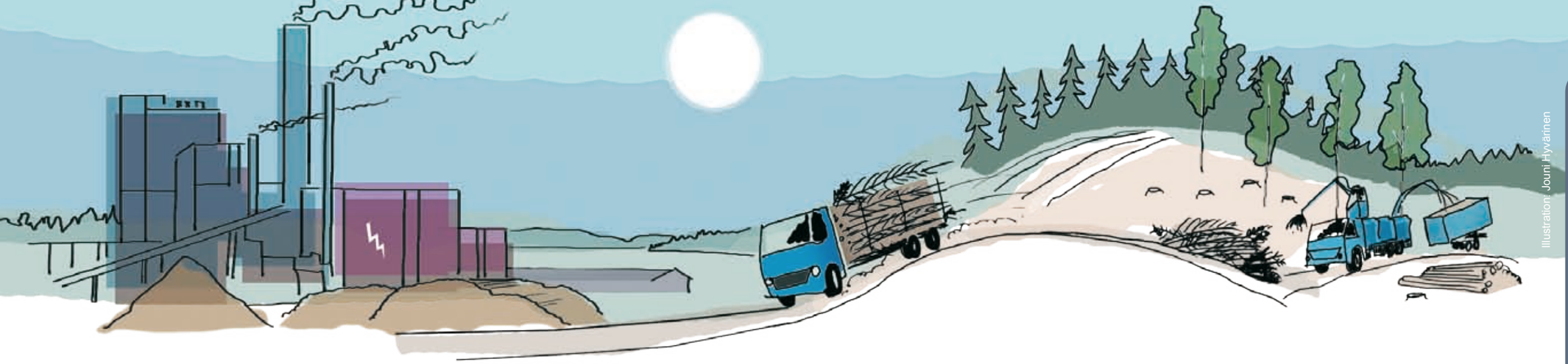


Illustration: Jouni Hyvärinen

Metla's forest energy research supports best practises in Finland and abroad

The Finnish Forest Research Institute's (Metla) bioenergy research covers the whole chain from biomass production to delivery of biomass to energy producers. In recent years Metla together with its partners has been developing and studying the competitiveness of new forest biomass supply technologies in several EU-countries.

The bottleneck in forest biomass utilization across the EU is the security and cost competitiveness of raw material supply. Forest-based energy production capacity cannot be created unless the needed feedstock volumes are guaranteed. "Our expertise supports the industries in biomass mapping and design of viable supply chains for end users ranging from small domestic boilers up to vast industrial CHP (combined heat and power) - and co-combustion plants" says professor **Antti Asikainen**, leader of Metla´s Bioenergy from Forests programme.

"Metla has built strong expertise through dozens of exercises in more than 10 European countries" says Asikainen and continues 'Maybe the most successful example is a case study done in Poland, where the client planned to replace a coal fired 100 MW unit with biomass retrofit. Metla and the Technical Research Centre of Finland (VTT) conducted a careful analysis both on the availability of forest and agrobiomass in the region together with a pre-feasibility study for the CHP plant design. Following this, the company recently decided to opt for forest biomass". The project is within the Climbus technology programme funded by the Finnish Funding Agency for Technology and Innovation (Tekes), which has also opened new markets for smaller energy wood harvesting technology providers. Similar studies have been completed in Slovakia and Czech Republic and will be carried out in France by the end of 2007. For smaller plants studies have been conducted in Catalonia, Spain and Scotland. Maybe the most exotic case study was done in Iceland, where wood from early thinnings will be used as a raw material in small scale chip boilers.

The EU's harvestable forest energy resources correspond to 25-35 Mtoes annually. 150-200 million m³ of forest biomass could be harvested for energy without endangering the raw material supply of forest industries. The largest forest energy sources are found in Germany, France, Sweden and Finland. Coal is the hardest competitor for forest biomass in the eastern EU. It is evident that without support measures such as feed in tariffs for green electricity and heating, forest biomass cannot compete with coal in large CHP plants. In small heating plants the competing fuel is often oil or gas. In these cases forest biomass has better cost competitiveness. The higher investment in the plant, however, should be subsidised. "Once a plant is raised, its running and fuel costs are much lower than those of oil and gas", says Asikainen.

The next step will be to move outside the EU to America and to North West Russia, where the greatest forest biomass potentials and also markets for bioenergy technology are located. Possibilities for the supply of solid wood fuels to the EU as well as the feasibility of wood fired CHP plants will investigated. Outside Europe Asikainen values contacts with the IEA (International Energy Agency) as a means of acquiring information about global trends in the bioenergy sector. He acts as a team leader in IEA Bioenergy's TASK 31 'Biomass production for energy from sustainable forestry'. "The last IEA Workshop in Vancouver convinced us that attitudes towards bioenergy have changed dramatically, especially in the Americas. The Russian forest sector is also seeing pellet production as a promising way to obtain added value from by products" says Asikainen. Metla has recently launched Bioenergy from Forests research programme. Programme contains several projects in Finland where the impacts of intensified forest biomass harvesting on forest ecosystem, regional economy and wood supply in general are studied comprehensively. The overall objective of the programme is to ensure long term viability of forest biomass supply and eco-effective solutions along the whole biomass supply chain. New field experiments have been established, but also experiments established in the 1960's are being used and measured again.

Practically all bioenergy projects are jointly implemented with domestic and international partners. Metla's strength stems from its strategic partnerships with all major forest research organisations in Europe and the access that these allow to local expertise and data sources. "Our aim is to produce objective and reliable research results, which all parties can use to make better decisions relating to biomass production and supply", concludes Asikainen. "Forest owners, harvesting entrepreneurs as well as wood and energy industries benefit from these results. In addition, the forest machine industry receives feedback and new ideas to develop their products further." **ML** ■

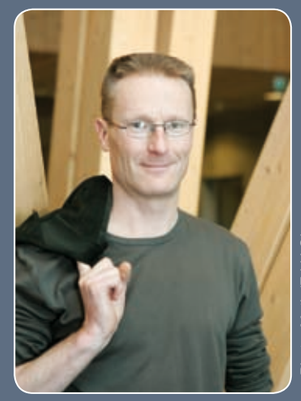


Photo: Metla/Erkki Oksanen

Prof. Antti Asikainen

Metla has conducted bioenergy research since it was founded in the 1920´s. During the past two decades Metla has participated in several national and international Bioenergy and Wood Energy Technology programmes. Metla launched its own Bioenergy from Forests programme at the beginning of 2007. About 50 of Metla´s researchers are directly involved in bioenergy research. Metla's expertise covers the production, mapping, harvesting and impacts of energy biomass production from the forests.

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Metla Joensuu
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Photos: Metla/Juha Laitila

Metla´s experts predict that within the next ten years in Finland the use of forest bioenergy will increase significantly. Bioenergy comes in the form of chips, wood from forest thinnings and sawmilling by-products. Satu Helynen of VTT (Technical Research Centre of Finland), one of Metla´s co-operation partners, suggests that forest-based biomass will also cover most of Finland's future bioenergy utilization. Residues and by-products from sawmilling and pulping processes (black liquor, bark and sludges) will be utilized more efficiently in the future.

"The utilization of forest-based biomass for the energy sector is one of the most competitive renewable energy sources because of its long traditions, high level of available technology, and because it can be integrated to operations of the forest industry, harvesting, logistics and combined heat and power production at mills" says Helynen. If prices of fossil fuels or emission allowances within the CO_2 trade are very high - or bioenergy is subsidized considerably,

Metla and VTT collaborate in bioenergy research

Forest biomass will challenge fossile oil and natural gas in the future

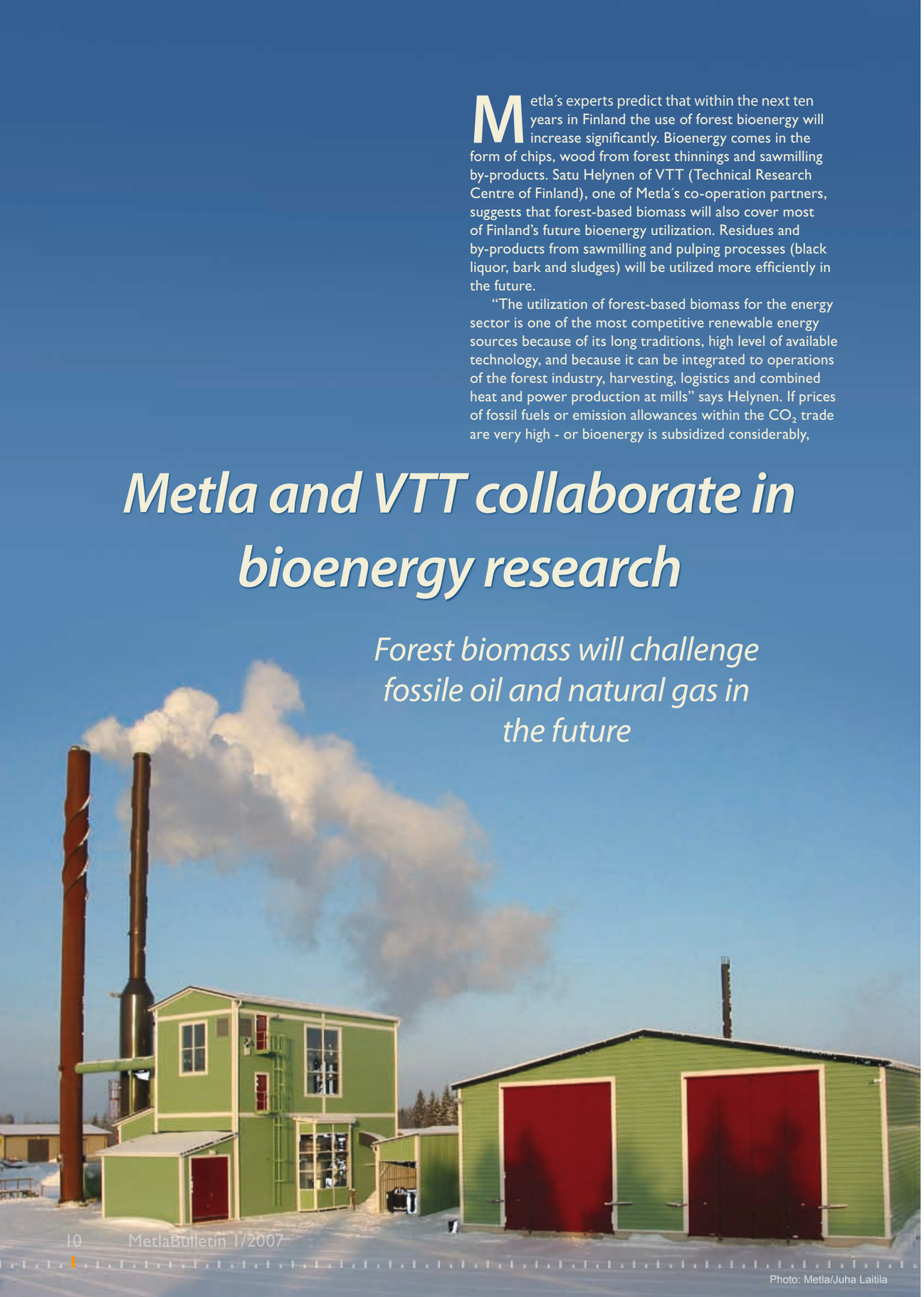


Photo: Metla/Juha Laitila

the competitiveness of biomass will increase. This will also increase the price of wood raw material for the forest industry. This has already been seen in some European countries where taxes on fossil fuels are very high or renewable energy has high subsidies.

VTT is developing new energy production technologies that can utilize forest biomass more efficiently and that can be integrated to wood procurement and also to mechanical or chemical processing of wood at mills. Metla and VTT have had a successful collaboration in several projects in the field of harvesting and logistic operations both in Finland and foreign countries.

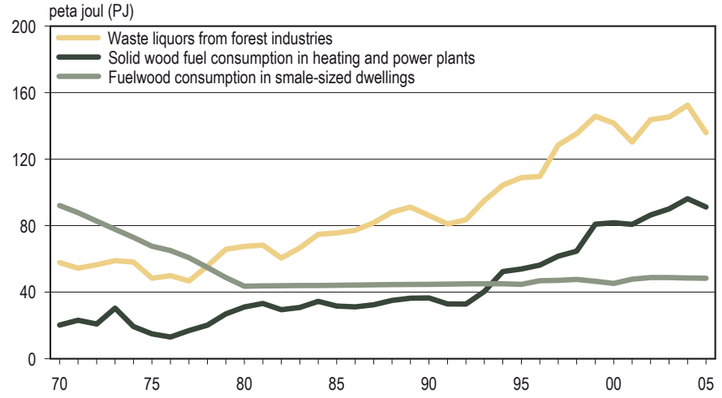
The benefits of wood-based fuels as an energy source seem clear but at the same time the limitations, and even threats have to be taken into account. Nutrient losses and other ecological restrictions set limits for the collecting of harvesting residues. In some countries, collecting of residues is favoured because of forest fires or for other reasons. Especially the positive opinions of forest owners are very important for the increased use of harvesting residues.

"Future collaboration between Metla and VTT could be increased considerably in international projects where expertise gained through long experience in Finland is transferred to other countries that are starting large-scale utilization of forest biomass for the energy sector" says Helynen. Forests and forest products as carbon sinks and other system studies will also be topics for collaboration. It is especially needed to avoid duplication of research work in a small country where funding of research is so small and where focus areas must be chosen carefully.

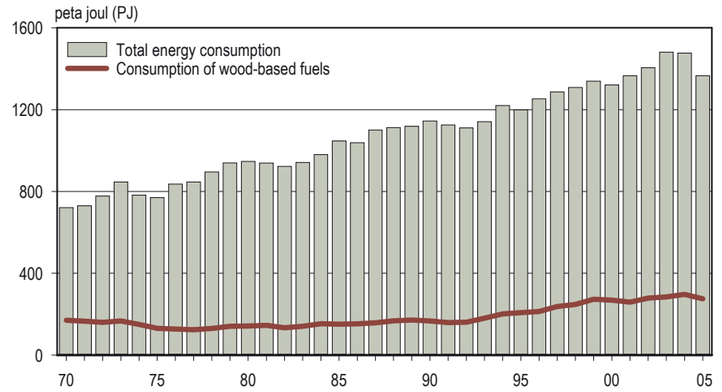
"Currently, forest-based biomass is used in Finland only for heat production in small municipalities or sawmills. The development of new high-efficiency combined heat and power (CHP) concepts, especially on a small-scale, is important. The development of new technologies for harvesting, logistics and other fuel handling operations is vital in order to decrease the costs of harvesting and to increase the availability. Research is also needed to ensure that new harvesting chains are sustainable" says Helynen.

She continues, "Forest biomass, because of its moderate cost level and the availability of large quantities at mills, will be seen in the near future as a very important raw material to replace fossil oil and natural gas". Further research, development and demonstrations are needed to develop new processes in which forest residues, bark, black liquor and other wood-based by-products are used to produce biodiesel and bioethanol economically for the transport sector.

"The use of forest biomass for energy production can and will increase significantly in Finland without decreasing the wood supply of our forest industry. Bioenergy, as a renewable source of energy, can be an important business area for the forest industry and other related industries. Pulp and paper mills and sawmills can have several new products, such as green electricity, pellets, biooils, synthetic natural gas, second generation liquid biofuels for the transport sector and hydrogen. And all those energy products are produced from forest biomass" says Helynen. **ML** ■



Consumption of wood-based fuels in Finland, 1970–2006. Source: State of Finland's Forests 2007



Total energy consumption and total consumption of wood-based fuels in Finland, 1970–2006. Source: State of Finland's Forests 2007

Dominik Röser & Lauri Sikanen

Technology and know-how make for efficient forest energy systems

Experiences from the Northern WoodHeat project

Photo: Metla/Lauri Sikanen

Finland has been a forerunner when it comes to the utilization of forest resources for local energy production. Knowledge about efficient and economically feasible energy wood harvesting in other areas in Europe is very dispersed or non-existent.

In order to promote the utilization of forest biomass as an energy source the Northern Periphery Program of the European Union has decided to support the Northern WoodHeat project with partners in Scotland, Iceland and Finland. The project started in October 2004 and will end in September 2007. The total budget of the project is approximately 1.7 million Euros. Metla acts as the national lead partner for Finland.

Credibility must be established

The Northern WoodHeat project was established to tailor and transfer existing and proven Finnish forest energy procurement expertise and technology to new operational environments in Scotland and Iceland. Finland already has large variety of forest energy systems from small farm-scale solutions to large industrial combined heat and power plants. From the early 1990's Finland has promoted the use of forest energy via several research and development programmes. Existing knowledge is now transferred to other European regions so that they can benefit by avoiding mistakes that have been made in the past. There are also great responsibilities involved when setting up new pilot cases. There are many unknown variables that have to be estimated beforehand. As a result things can go wrong. When setting up pilot supply chains there is always a lot of interest from the public and investors.

The fuel supply and boiler systems have to work properly in order to establish credibility among the local stakeholders and the public. If the pilot case does not work properly the forest fuels would be very difficult to promote. Also, the long term sustainability is very crucial to the systems. Before making any decisions on investments the long term sustainability has be ensured and proper calculations have to be carried out. If resources are being used extensively or the size of the plant increases, larger areas will have to be harvested in order to match the demand. This will increase the transportation costs, which will have an effect on the economics of the entire investment. Therefore, the long term supply has to be ensured and the local forest owner, private or public, will have to participate. Without their commitment and willingness to supply their resources a forest energy business is impossible to set up.

Most suitable technology is chosen

Metla's task in the NWH project is to carry out holistic forest fuel supply chain design. The holistic principle calls for an estimation of available forest resources that could potentially be used for forest fuel in a given area. Based on the available resources the most suitable technology to harvest, process and transport the fuel is chosen. It is essential to choose technology that is proven and familiar to local forest harvesting entrepreneurs. The technology has to be able to produce the fuel quality that is needed at the utilization place.

In the project Metla is carrying out four different case studies in which the forest fuel supply chain will be designed and its costs calculated in different regions across the Scottish Highlands. A feasibility study is being carried out in the eastern part of Iceland.

Metla is also offering training and preparing multimedia information materials that provide general information about forest energy related issues as well as specific information on such topics as cooperatives, and high quality chip production.

Iceland a success story unfolding

Many a time when we tell people of our plans for a forest fuel supply chain in Iceland they ask if there are any trees in Iceland. Yes, there are plenty of trees in certain areas of Iceland and a large plantation program is currently ongoing. However, the market for timber is limited so burning of the biomass is a logical solution. What about the cost-effectiveness of producing heat from biomass when plenty of geothermal heat is available at a much lower cost? Well, there are so called "cold" areas in Iceland where no geothermal energy can be found. They rely on fossil fuels such as gas, light fuel oil or electricity of their energy source.

The feasibility study has shown that enough fuel for a wood chip boiler providing heat for a school, hotel and swimming pool is available at a reasonable cost. Combined with the ambition and positive attitude of Icelanders this has now led to the founding of a heating company that will have the first wood chip heating facility in Iceland. This reflects really well how EU funded projects have a positive effect on rural areas and how they can contribute to the sustainable development.

The situation is similar in Scotland where one of our case studies in the town of Wick has shown that forest fuels can be produced and delivered to a heating facility at a competitive cost. The NWH project and Metla introduced new possibilities to produce Scotland's best known export product, whisky. The Pulteney Distillery in Wick renovated heat production as a part of the Wick district heating scheme. Metla made fuel wood availability estimations and cost calculations for a heating plant which supplies heat for the distillery and a nearby housing estate. Using carbon neutral fuel for distilling instead of gas or oil cannot be anything but positive for that industry of high refinement. ▶▶

Photo: Metla/Harri Liiri

The benefits of the project are not limited to areas outside Finland. In the spring of 2007 Metla organised training for fuel wood entrepreneurs in the Joensuu region in order to optimize supply chains for chopped fuel wood production. This training was aimed at entrepreneurs willing to take an extra step in order to produce a higher quality of fuel wood, for example, by properly storing the fuel wood and therefore promoting natural drying. Innovative methods to market fuel wood and offer extra services to customers were discussed during the training.

The experiences in the NWH project go beyond professional success. The project has been a great achievement in terms of cultural understanding and promoting the European philosophy. During the course of the project participants have learned to deal with cultural differences among the project partners and have grown together as a team. This was also aided by activities such as whisky tasting events in Scotland or riding of Icelandic horses through the local forest in Eastern Iceland.

Even though the project will be completed at the end of 2007 the work with partners in Scotland and Iceland is still continuing in the future. New projects are in the pipeline. ■

Northern WoodHeat is funded through the ***Northern Periphery Programme*** (NPP) comprising partners from Finland, Scotland and Iceland. NPP is one of 13 Interreg IIIB programmes aimed at encouraging and supporting transnational cooperation between the regions of Europe. It provides the opportunity for organizations from the Programme area to work together on joint projects concerning common issues and problems. Other partners in Finland are the North Karelia University of Applied Sciences and the Joensuu Regional Development Center (Josek).

More information about the consortium and the project activities can be found at: www.northernwoodheat.net

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Photo: Metla/Lauri Sikanen


Photo: Metla/Lauri Sikanen

Northern WoodHeat partners on a field trip near Eno, Finland

... and visiting a heating plant near Joensuu, Finland.

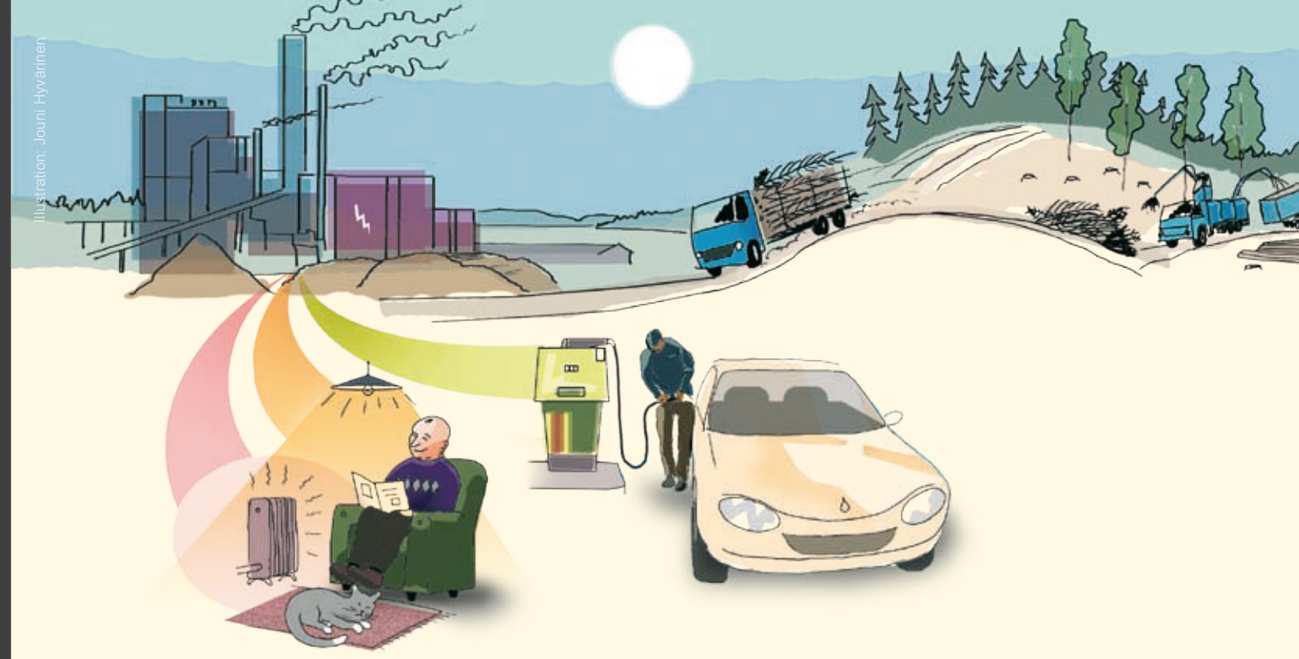
Illustration: Jouni Hyvärinen

Metla's research programme Bioenergy from Forest

Objectives of the programme

1. Generate research-based information on growth of forest biomass and criteria for its use as a source of energy, and on the resulting effect on forest natural resources
2. Improve the efficiency of forest energy resource mapping and planning methods
3. Be more active in acquiring forest chip technology and logistical solutions
4. Support the emergence of new entrepreneurs and new business models within the field of forest energy
5. Combine Metla's bioenergy research resources and increase information exchange and project work cooperation between disciplines
6. Evaluate the effect of increased felling for forest energy on the forest sector as a whole, including forest owners, forest machine enterprises, the forest and energy industries and political decision makers.
7. Study and develop wood biomass and its refinement processes starting with the raw material needs and the markets for bio-refinery energy and other products

Programme resources

- programme comprises more than 20 research projects
- more than 50 researchers are participating
- total financing is estimated as 3-4 million €/year
- programme will run from 2007 until 2011

National and international cooperation

Strategic partners in Finland

Technical Research Centre of Finland (VTT)
Metsäteho
MTT Agrifood Research
EFI
Finland's universities
Major customers
Finland's Ministry of Agriculture and Forestry, and Ministry of the Environment
Forest owners
Forest industries
Energy producers
Forest machinery manufacturers and operators

Strategic partners outside Finland

Skogforsk, Sweden
Skov og Landskab, Danmark
EFI
Forestry Commission, United Kindom
Technical University of Munich
IVALSA, Italy
Medi ambiente, Spain
IEA-collaboration network

More information: prof. Antti Astikainen, Metla
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A new IUFRO Task Force to tackle issues of forests and health

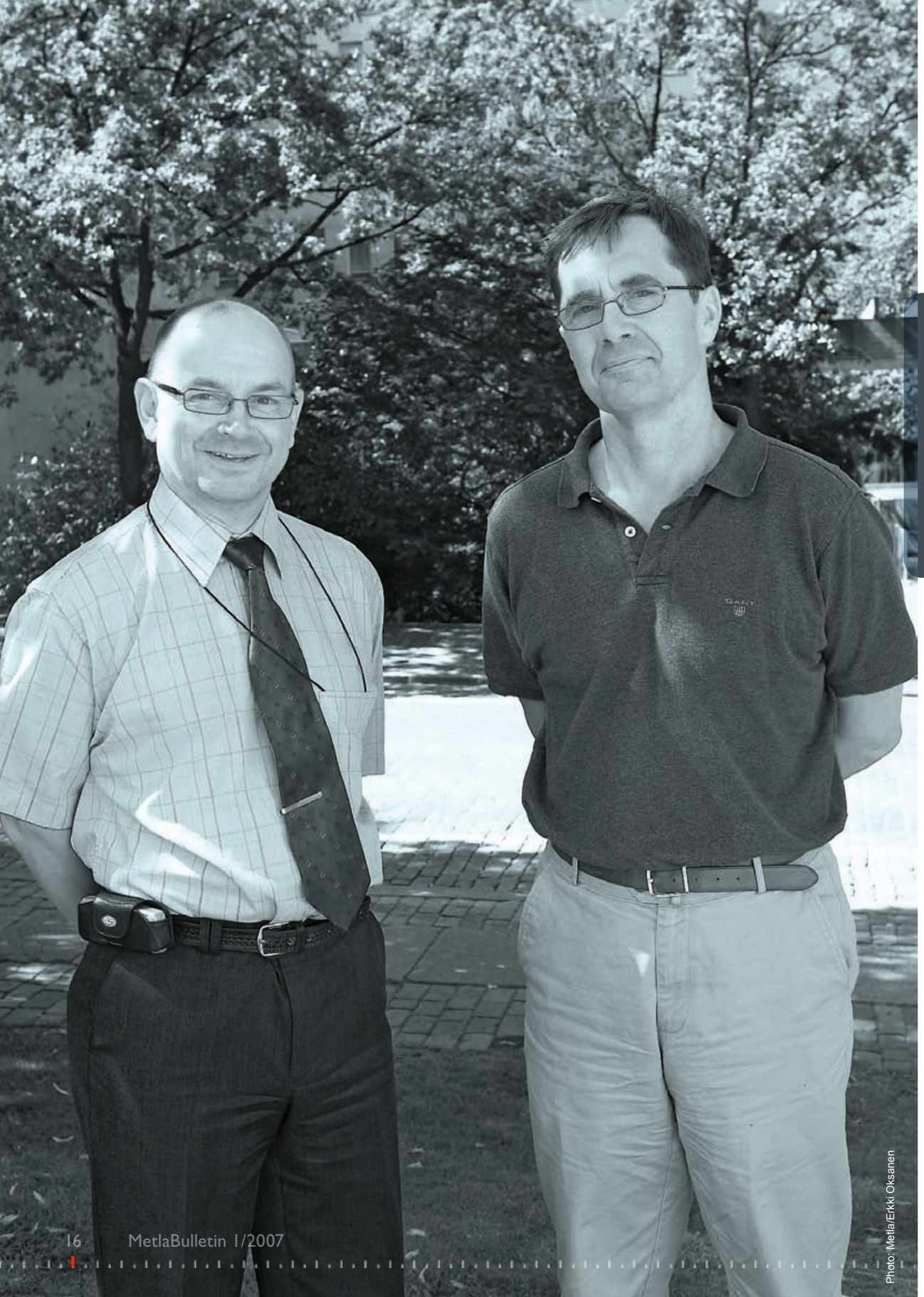

Photo: Metla/Erkki Oksanen

The Coordinator, professor Hannu Raitio (left) and the Deputy Coordinator, Dr. Matti Rousi, of the Task Force: "Forests are a source of health, but of diseases as well. In different parts of the world and at different times the emphasis may be on one or the other aspect of this equation. Both are important to understand."

IUFRO has launched a new Task Force Forest and Human Health. Its work will continue until 2011. The kick-off meeting will be held in connection with the IUFRO Division VI Symposium, 14-20 August, in Finland.

The main purpose of the Task Force is to increase and enhance the dialogue between the various players in this field, such as scientists representing various disciplines, implementing agencies, policy-makers, research financiers and other stakeholders. Cross-sectoral co-operation, especially between forest and health professionals, is planned.

The Task Force will cover the effects of forests and trees on mental and physical health as well as health-related forest products. Accordingly, the Task Force will have two priority areas:

1. Food and medicinal products, and
2. Mental and physical health and well-being.

The Coordinator of the Task Force is professor **Hannu Raitio**, Director General of the Finnish Forest Research Institute (Metla). The Deputy Coordinator of the Task Force will be Dr. **Matti Rousi**, also of Metla.

A well-known forest scientist in Finland, earlier Dr. Rousi has been involved e.g. in research on production of salicin in willow. Salicin is the most notable active compound in willow bark and willow leaves. Chemically it is a low molecular weight phenolic glucoside. Aspirin and various other related products are based on either natural salicin or its synthetic versions. That makes willow bark undoubtedly the most famous example of a popular drug based on a herbal remedy.

The properties of willow bark in treating fever and alleviating headache and rheumatic and other pain were already known in many ancient civilizations, such as those of China, India, Egypt, Greece, and Rome. The earliest records of willow use as a folk medicine date back to times almost immemorial, more than a thousand years B.C.

Dr. Rousi has studied methods of growing willow efficiently to give high yields of salicin. Recently also the question of the impact of the climate change on trees has been on his research agenda.

The coordinators look forward to a visionary project with great emphasis on the future.

"The importance of the human-forest interaction has always been great for almost all civilizations and cultures of the world. Even at this technological age it is still the case", says Hannu Raitio.

"In fact it may be even more important in the future", adds Matti Rousi. "Climate change and the discussion of the carbon balance of the atmosphere has led to more emphasis being placed on forest-related issues in general."

"In addition to timber and various wood products that have been a major part of the basis of the Finnish economy for most of our history, for us Finns the forests have traditionally also been a source of many health-promoting non-wood products, like berries and mushrooms. Finnish folk knowledge of various natural medicines has not been totally forgotten either."

"The diseases carried e.g. by mites (like Kumlinge disease), mosquitoes (like the Sindbis virus) or voles (like the Puumala hantavirus infection carried by the bank vole Myodes [Clethrionomys] glareolus) have not been so common in Finland that they have disturbed the basically benevolent image of forests that is shared by most Finnish people."

Yet in many areas of the world it is quite different. Several globally or regionally important diseases are related to forests or forest ponds and other waters. In many cases the deterioration of forests as habitats of wild animals has resulted in increases in the frequency of contacts between people and various wild animals that carry many diseases. This is one reason why forests are a health concern in many regions of the world."

These are just a few of the many serious issues related to the area of the Task Force.

"We hope to have a Task Force that is both bold and visionary. If we can help in bringing together the professionals that are working around these kinds of complex issues in various fields of forestry, medicine and even urban planning or other areas, we will think that we have succeeded and been of use", says Hannu Raitio. EK ■

More information:
www.metla.fi/tapahtumat/2007/iufro-tf-07/

The form for Expressions of Interest:
www.metla.fi/tapahtumat/2007/iufro-tf-07/interest-form.htm

Spotlight

Questions to

Prof. Klaus v. Gadow

visiting professor at Metla

Metla has continuously played host to visiting forest researchers and professionals coming from around the world. One familiar face at Metla is forest management planning professor, Klaus v. Gadow from the University of Göttingen in Germany. Prof. v. Gadow has served for several years as a member of the Scientific Advisory Board of Metla, has been working in 2007 for three months as a visiting professor at Metla in Joensuu, and describes Finland as a forestry country with a concentration of expertise in a wide range of forest research applications.

Q: Why did you decide to spend a sabbatical in Finland and why at Metla?

G: There are important professional reasons that make Finland particularly attractive for visiting scientists. This is especially true in Joensuu where Metla and the University of Joensuu together provide a unique and influential centre of forestry expertise. Finland plays a dominant role worldwide especially in my field of forest growth and forest planning, and Joensuu is a paradise for researchers specialising in forest design.

For more than 30 years I have been working at universities in different countries, but never in a research institute. Research institutes provide specific opportunities, which are not easily found at a university. An important factor is the closeness to practical forestry. An outstanding example of the large scale practical application of the "multiple path principle" is the MELA/JLP system, which is being used widely in forest management planning.

Metla provides both an atmosphere of quiet efficiency and specific research opportunities which are directly related to immediate practical problems. Metla/Joensuu has an excellent research infrastructure. This includes a critical mass and broad range of scientific expertise. The closeness to the University of Joensuu is particularly fruitful.

Q: The Finnish National Forest Inventory...

G: Finland's National Forest Inventory has a very long tradition and it appears to be very well organized. The potentials of GIS and Remote Sensing technology are used to full advantage. The purpose of a sample-based National forest inventory is to obtain representative information on the resource at a given point in time (including not only the timber growing stock, but also biodiversity indicators and other variables). The national forest inventory covers all ownership types and can be used to generate a variety of scenarios, including regional harvest scenarios. Their capacity for spatially explicit and ownership–specific forecasting and planning are limited however.

The role of the national forest inventory is sometimes confused with the role of a management inventory, resulting in duplication of efforts and unnecessary data collection (perhaps not in Finland, but certainly in other countries). Management inventories are used to initialize compartment data, they are spatially explicit and permit the use of advanced systems like JLP and Monsu, which require stand-specific data as input and ownership-specific silvicultural programs. Spatially explicit forest assessment and multi-objective design require approaches that are different from those of a national forest inventory and large-scale scenarios. It is important that these two issues are not confused.

Q: Where is the focus of forest research at the moment in Germany?

G: There are three more or less related issues that make political headlines. The first issue deals with the impacts of Forest Management on the Carbon Budgets; the second one is concerned with Forests as a Source of Renewable Energy, concentrating on production potentials and sustainable use. The third major issue deals with the possible implications of expected climate change on forest management, with particular emphasis on tree species selection. Important research topics include the potential impacts on forest growth and species choice, and the incidence of pests and diseases. Maps have been published depicting the current and potential future distributions of common trees under several CO2 climate change scenarios. These studies do not always consider the significant impact of forest management activities, which modify the species composition and tree size distribution.

Q: Keyword "climate change". The earth's average temperature is estimated to rise to about 6 degrees by 2100. Do we have to rethink our forest management systems because of a changing climate?

G: Scientists are often asked to find quick solutions to environmental threats and a typical response is progressive differentiation and specialisation within the disciplines, or reorganisation of research institutions. There used to be much talk about climate change, but less research, and insufficient funding. However, this is changing and we see several new initiatives emerging.

> *"There used to be much talk about climate change, but less research, and insufficient funding.*

We have to be prepared for constant re-orientation. The traditional practice of standardizing silviculture is ineffective because it assumes that social, economic and environmental conditions remain constant over time. This is not the case. During my stay in Joensuu, we have proposed new ways of adaptive forest design and management, together with specialists from Metla and the University. We believe that the "Multiple Path Concept" provides a suitable basis for medium-term forest planning on the enterprise level. The basic idea is not entirely new and has been implemented in mathematical programming models, which have been used, predominantly in commercial forestry, for more than 30 years in North America and Northern Europe. Metla's MELA/JLP system is a good example. The concept is easy to understand. It is a practical basis for designing forests with the aim of delivering multiple services.

I think there are good reasons why we should abandon the traditional practice of standardizing silviculture over the entire rotation. Long-term perspectives are always needed, but so are regular re-evaluations of the different options at our disposal in what we call the "time window" approach. It is interesting to note that forest ecologists and forest economists are finding the Multiple Path concept a useful common theoretical framework. ▶▶

Q: How can science help practical forestry?

G: I think we can be of service in several ways. For example, by developing and testing new technology (such as laser scanning) which makes forest assessment more cost effective. We can also help practical forest management to provide a desired mix of services by applying improved planning concepts and methods.

In reality, however, periodic reorientation and frequent changes of forest policy are quite common. The history of silviculture is not characterized by constancy, but rather by continuous change in policy. Concrete examples of this vicissitude are changes in the preferred silvicultural systems (clearfelling vs selective harvesting; planting vs. natural regeneration), the preferred tree species (beech, spruce, "exotic" species) and the preferred forest structures (even-aged monocultures; uneven-aged multi-species forests). Science can develop new concepts and practical tools to assist practical forestry to adapt.

Q: Where would you see the role of the renewable energy "forest biomass" in total energy production?

G: Current forest research is dominated by three more or less related issues which may be summarized under the keywords "Impacts of Forest Management on Carbon Budgets"; "Forests as a Source of Renewable Energy" and "Implications of Climate Change on Species Selection and Silviculture". Wood is used as an environmentally sound source of energy that provides a potential substitute for fossil fuels and has the ability to help reduce greenhouse gas emissions.

Credible estimates of timber yields are based on empirical research, and one objective of field experiments is to assess tree growth rates and timber yield potentials under varying site conditions and in response to different treatments. Many forest yield plots have been remeasured for extended periods of time, providing valuable information on long-term developments. However, changing environmental and economic conditions sometimes confront us with new questions requiring immediate answers. This applies in particular to bioenergy plantations which require different approaches in the design of field experiments than traditional growth and yield plots, because the age and condition of the root stock has such a great influence on shoot growth, for example in willow coppice plantations.

There seems to be general agreement that some basic relationships exist between the productive potential, site conditions and management practice. Different tree species, different environmental conditions and silvicultural treatments may produce greatly diverse volume-age relations, which is an indication of the uncertainties that still exist despite the great number of yield studies that have been established and evaluated in the past. For this reason, new field trials are often essential, especially in fast growing bioenergy plantations.

Q: Finland as a precursor. Where would you see Finland's chances in the sector of "forest biomass" and forest based energy production?

G: Metla has a concentration of expertise in many traditional areas of forest research, in the design of field experiments and data analysis. The forest-based energy production is a promising area. But this requires basic research and specialised know-how, for example in chemical engineering. To make an impact in this area probably requires some major investments. Close cooperation with relevant university departments and industry would also be required. **ML**

Photo: Metla/Mikko Kurttila

Resume Klaus v. Gadow

Academic

Degrees:
- *1979 PhD (University of Stellenbosch, South Africa)*
- *1986 Dr. Habil (Ludwig Maximilians University, München, Germany)*
- *Honorary degrees (Agricultural University in Tartu; Chinese Academy of Forestry)*

Academic employment

History:
- *1978–90 (Lecturer, Professor University of Stellenbosch, South Africa)*
- *since 1990 (Professor, Georg-August University, Göttingen)*
- *since 2007 (also Extraordinary Professor, University of Stellenbosch, South Africa)*

Major international positions of trust and honours:
- *1996-2005 Coordinator IUFRO Div 4*
- *visiting Professor USA, Spain, etc.*

Current research interests:
- *quantitative silviculture; forest modelling and analysis*

Results of 10th Finnish National Forest Inventory

Annual increment of growing stock approaching 100 million m³

According to the latest surveys carried out by the Finnish Forest Research Institute (Metla), the growing stock of Finnish forests amounts to 2.189 billion cubic meters. The annual increment of growing stock is approaching 100 million m³, being 98.5 million m³. The results are based on the measurements over the years 2004–2006 of the 10th National Forest Inventory (NFI10).

Half of the growing stock is Scots pine (1.09 billion m³), about one third Norway spruce, 16% common white and silver birch, and 3% other deciduous and coniferous stock. Compared to the previous inventory (NFI9, 1996–2003), timber resources of Finnish forests have grown from 2.091 billion m³ to 2.189 billion m³ The increase consists of Scots pine and deciduous stock, whereas the volume of Norway spruce has decreased. This is explained by the different age structures of the tree species: on average, Scots pine and broad-leaved forests are younger stands at the stage of rapid growth and older Norway spruce forests have had more cutting possibilities. Since the late 1960´s, the volume and increment of growing stock in Finnish forests have both continuously risen.

In the NFI10, the methodology for field measurements was changed so that measurements are made throughout the country each year. This made it possible, for the first time, to get up-to-date inventory results for different regions concurrently. The main users of the forest information are national forest and environment authorities, the forest industry and the Regional Forestry Centres that also have participated in the data collection in the last inventory.

Finnish forest resources and the state of forests have been monitored by Metla through National Forest Inventories since the 1920´s. The inventories produce objective and up-to-date information on forest resources, forest health conditions and their development for national and regional decision-making.

The inventory results are published annually in the latest Statistical Yearbook of Forestry. **ML**

More information:
www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm

More information on NFI:
www.metla.fi/ohjelma/vmi/vmi10-info-en.htm

Photo: Metla/Erkki Oksanen

Photo: Metla/Erkki Oksanen

Research News & Publications

Restoration by controlled burning benefits endangered beetle species during the year of burning

Controlled burning on restoration sites in Northern-Finland caused a distinct increase in the numbers of beetle species. The numbers of individual beetles increased five-fold, whereas in areas where no restoration procedures were carried out the numbers of species and individual beetles remained almost unchanged. The burned restoration sites attracted five endangered species onto them, whereas the control sites attracted none.

More information at:
www.metla.fi/tiedotteet/2007/2007-04-24-ennallistaminen-en.htm


Photo: Metla/Erkki Oksanen


Photo: Metla/Erkki Oksanen

New tools for prevention and detection of Scleroderris canker

The conidia of *Gremmeniella abietina*, the fungus that causes Scleroderris canker spread in rainy weather. Dispersion occurs throughout the growing season, but the main dispersal takes place from the start of the growing season until the end of July or beginning of August. Nursery seedlings are most susceptible to the disease towards the end of their first growing season, at the time of bud development. During the following growing seasons, seedlings are very susceptible to the disease at the height-growth phase. A high number of spores, humidity and cool weather after infection, as well as a slow start for growth increase the severity of the disease. Frosts in late summer and early autumn make the damage worse. A monoclonal antibody was developed for detecting conidia of *G. abietina*. It serves a tool to determine the time and level of conidia dispersal.

More information at: www.metla.fi/tiedotteet/2007/2007-04-11-versosurma-en.htm

Several plant species in Finland support rapid spread of cronartium rust and white-pine blister rust

Metla has conducted a study to determine the dispersion potential of rust fungi through alternate hosts. The study involved the cronartium rust and resin top disease that are commonly found in Finland (*Cronartium flaccidum, Peridermium pini*) and an alien white-pine blister rust (*C. ribicola*). Based on earlier results, the following new alternate hosts for cronartium rust were found among the cow-wheat family (*Melampyrum spp.*): common cow-wheat, wood cow-wheat and field cow-wheat (*M. pratense, M. nemorosum, M. arvense*). The alternate hosts that were already known, Swallow-wort (Vincetoxicum hirundaria) and Small cow-wheat (*M. sylvaticum*) showed themselves to be highly susceptible to the rust. In contrast, all of the alternate hosts were highly resistant to white-pine blister rust. Rust spore sources from northern Finland infected more tested species than the corresponding rust spore sources from southern Finland.

More information at: www.metla.fi/tiedotteet/2007/2007-02-07-tervasroso-en.htm

Forest condition in Finland has remained stable

The average level of defoliation has remained relatively unchanged in Finland over the past few years. In 2002-2005 needle loss of Scots pines growing on mineral soils was approximately 9% and that of Norway spruces 18%. Needle loss of broad-leaved trees was about 12%. The results are presented in the report on the forest condition monitoring programme (Forest Focus/ICP Forests) carried out by the Metla.

More information at:
www.metla.fi/tiedotteet/2007/2007-03-23-metsien-kunto-en.htm

Wood industry companies in Northwest Russia want additional markets in Europe

Wood industry companies in the Leningrad and Vologda regions consider large market size and good logistic connections to be their most important competitive advantages. The price of roundwood, though reasonable from the Finnish point of view, is not considered a particularly significant asset. Constant timber supply is a more significant competitive advantage.

More information at:
www.metla.fi/tiedotteet/2007/2007-01-24-lisamarkkinat-en.htm


Photo: Metla/Erkki Oksanen

Cloning of leaf-variegated birches for landscaping

The birch (Betula pendula Roth) has two naturally occuring forms, "golden-veined" birch (GV) and "white-flecked" birch (WF). They are characterized by specific leaf colourations. The reason for the gold-coloured veins of GV birch is still unknown. The leaf colouration of WF birch has been shown to be associated with drought during growth, and its cloning was found to be easy with micropropagation and grafting.

More information at:
www.metla.fi/tiedotteet/2007/2007-03-26-kirjokoivu-en.htm

Finnish Forest Cluster Research Portal opened

Renewal is one of the key targets of the Research Strategy of the Finnish Forest Cluster and the Strategic Research Agenda of the European Forest-based Sector Technology Platform. Efficient tools are needed to enable researchers from traditional and completely new areas to contribute to the implementation of the national and Europe-wide research agendas.

More information at: www.metla.fi/tiedotteet/2007/2007-01-23-portaali-en.htm and www.forestclusterportal.fi

Survey on development of environmental specimen banking and shared use of environmental samples in Finland

Metla in collaboration with research institutions, universities and museums of natural history, has carried out a survey on the development of storage and shared use of environmental sample materials collected in Finland.

More information at:
www.metla.fi/tiedotteet/2007/2007-01-22-naytepankki-en.htm

Utilization of peatland forests should be increased

Forest resources on drained mires are underutilized. Silvicultural investments have helped to increase the annual increment of the growing stock in peatland forests to almost 24 million cubic metres, but the volume of fellings is no more than a third of the growth volume. The profit on investments will be left unutilized and the good development of forests may be jeopardized if commercial thinnings, especially in young peatland forests, are not increased.

More information at: www.metla.fi/tiedotteet/2007/2007-02-28-turvemaiden-metsat-en.htm

Metla´s publications

Research results and other forms of expertise are published in Metla's scientific journals, other publication series, monographs and in articles and scientific posters. In addition, the research results are also frequently presented in media releases, newspaper articles as well as various seminars and conferences.

More information at: www.metla.fi/julkaisut/index-en.htm

Metla publishes two scientific journals (published jointly with the Finnish Society of Forest Science), the **Metsätieteen aikakauskirja** and **Silva Fennica**.

Dissertationes Forestales – series for doctoral dissertations in forest sciences and related disciplines published jointly with the Finnish forestry faculties and the Finnish Society of Forest Science.

Working Papers of the Finnish Forest Research Institute publishes preliminary research results and conference proceedings.

Statistical publications – **Statistical Yearbook of Forestry**, **Forest Statistical Bulletins**, **Forest Finland in Brief**, and national reports on forest condition monitoring in Finland – include diverse statistical information on forests and forestry.

The Finnish Forest Sector Economic Outlook is published annually.

Statistical Yearbook of Forestry 2006

The Statistical Yearbook of Forestry provides an exhaustive statistical overview of forestry and the forest industries in Finland. The book covers the Finnish forest sector as a whole, ranging from forest resources to international trade in forest-related products.

The Statistical Yearbook of Forestry is published annually in the beginning of December. All figures and tables are also available in English at: www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm

Chapters

- *Forest resources*
- *Forest health and biodiversity*
- *Silviculture*
- *Roundwood markets*
- *Harvesting and transportation of roundwood*
- *Multiple-use forestry*
- *Forestry sector's labour force*
- *Wood consumption*
- *Forest industries*
- *Foreign trade by forest industries*
- *Forest sector in Finland's national economy*
- *International forest statistics*

Photo: Metla/Erkki Oksanen

METLA

FINNISH FOREST RESEARCH INSTITUTE

Established in 1917. The biggest forest research organization in Europe, with more than 900 permanent employees and a network of research centers all over the country and numerous projects and partners worldwide.

Mission: To build the future of the forest sector by producing and disseminating information and knowhow for the well-being of society.

Core values: reliability, occupational skills, competence and well-being, interactivity, proactivity and creativity.

We anticipate future needs for information and develop our practices with an open mind and without prejudice.

Strategic objective: We conduct research and development activities that have high scientific standards and positive impacts aimed to enhance sustainable use of forests as well as economic competitiveness of the forest sector.

Our research priorities:

1) Forest-based enterprise and business activities
2) Social impact of forests
3) Structure and functioning of forest ecosystems
4) Information databanks on forestry and the forest environment

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