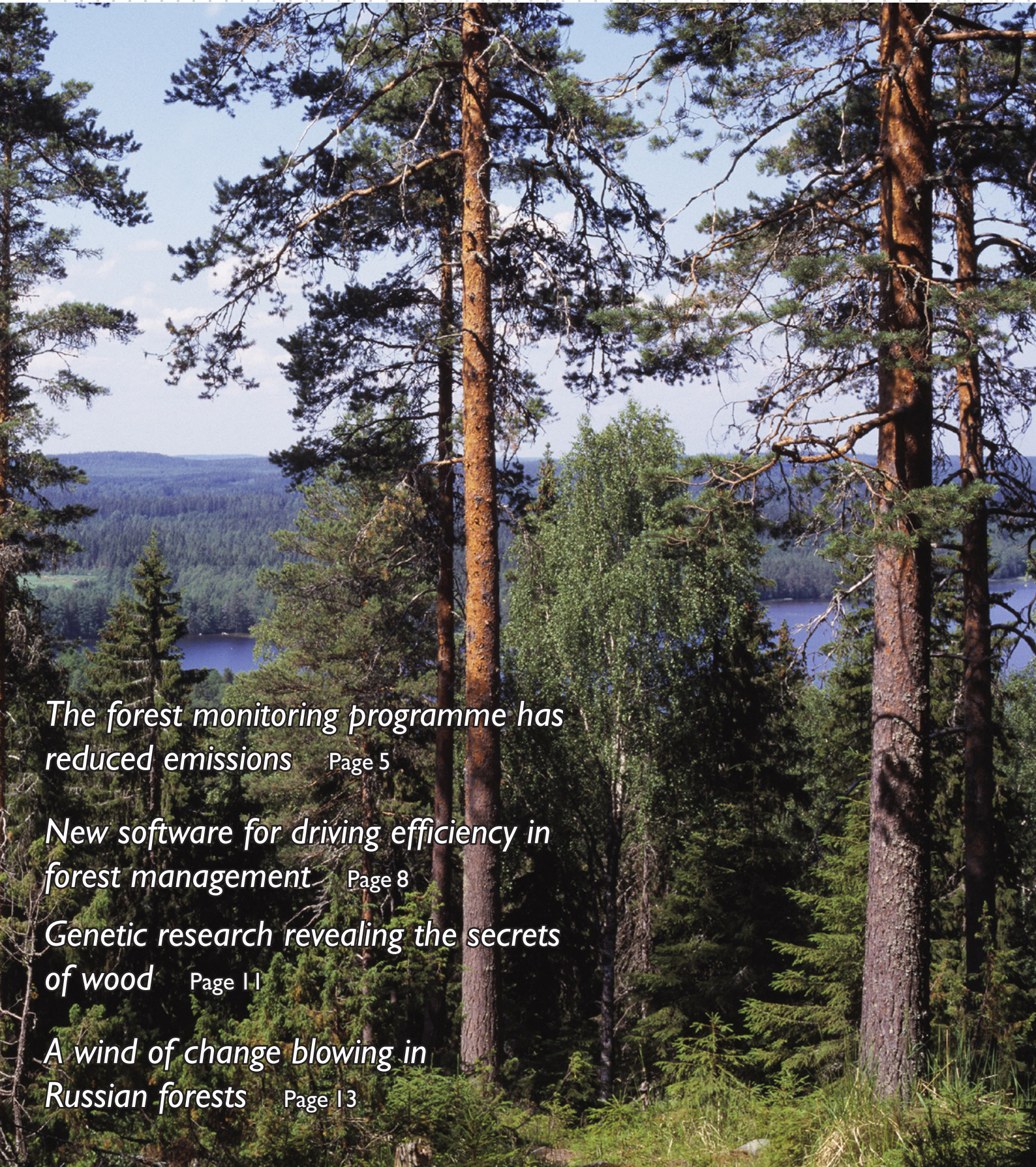
MetlaBulletin

Volume 1 Number 1 Sept 2006 www.metla.fi



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METLA Bulletin

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Metla Bulletin 1/2006
Bulletin of the Finnish Forest Research Institute (Metla). Published twice a year in PDF format (requires Adobe Acrobat Reader).

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The Metla Bulletin

A platform for dissemination of forest-related information

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Hannu Raitio
Director General, Metla

We are very happy to present the first issue of the on-line journal Metla bulletin to its international readership. The idea to create a bulletin was born at a communication workshop of our institute last year. The number of stakeholders involved in addressing forestry matters is large and the need for the best available and updated information has been increasing during the past years. The seminar ended with the conclusion that the exchange of up-to-date forest related information and the dissemination of results between forestry practitioners and scientific institutions is already on a good track but could still be improved.

Metla is strengthening its international activities due to several reasons in our research environment. The most important global winds of change affecting Metla's activities include the development of globalization of the world economy, the changed impact of Russia and the Baltic area on Finnish forestry and timber management, the expansion of the EU, global environmental changes, increasing awareness of environmental issues in consumer values and behaviour in Finland and the most important countries where forestry products are sold, and the increasing use of bioenergy. Changes at the national level include, for example, changes in the forest owner structure, changes in the profitability of private forest ownership, the changed structure of research funding and the increased requirements set for productivity in the public sector.

The Metla bulletin aims to establish a platform for dissemination of information on forest-related issues and to increase the visibility and public awareness of forest research. Our mission is to keep our international readers up-to-date on Metla's current research projects and latest research findings. The target audience of the Metla bulletin includes for instance the public, the scientific forest community, forest professionals, forest industry, forest owners, forest decision-makers and NGO´s.

Hannu Raitio
Metla
Director General

Notes from the Editorial Board

Most of the articles in this volume have been published earlier in our Finnish customer journal *Metsäntutkimus*. The articles have been compiled by interviewing our scientists on their special field of research. Those statements are combined with the latest research results and edited by Metla´s communication team. We selected articles which might be of interest for the forest community outside Finland. The Metla bulletin will be published on-line two times a year including a special edition dealing with a certain topic. The first Metla bulletin covers topics such as the forest focus programme, forest management planning programs, genetic research and Russian forestry. In addition the Metla bulletin provides you with the information on Metla publications, Metla services and upcoming events at Metla and partner organisations.

The Editorial Board is aiming to maintain the above mentioned goals also in the future. We wish our readers interesting and useful reading. We invite you to provide us with your feedback on this Metla bulletin.

Editorial Board
Anne Luhtala, Leena Paavilainen, Jari Parviainen and Ari Turunen

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Metla - Focused To Serve Customers

The implementation of Metla's new strategy started at the beginning of the year 2006. This followed a year and a half of hard work, numerous meetings, seminars, and interviews. It was the first time that Metla's strategy has been created as part of an extensive interaction by Metla's staff, interest groups and the owner, taking their expectations into consideration.

Renewing the strategy was appropriately timed, because the old one was outdated and changes had been made in the operating environment.

The main message from the interest groups and the owner was that Metla's operations should be run in a customer-oriented, inter-disciplinary and networking manner serving the entire forest sector. It was clearly time to take a saw firmly in hand, prune away the runners and redirect our research activities.

The new Metla strategy is implemented in the pursuit of research and development activities that have scientifically high standards and positive social impacts, that enhance sustainable use of forests as well as economic competitiveness, and support the formulation of forest policies, serving as part of the national innovative system. The objective is to develop possibilities for forest-based production and services, and to promote sustainable use of forests by increasingly directing research towards improving business operations and supporting the formulation of forest policies. The research priorities are 1) Forest-based enterprise and business activities, 2) Social impact of forests, 3) Structure and functioning of forest ecosystems and 4) Information data banks of forestry and the forest environment.

Regarding resources and finance, the aim is to focus resources on production, acquisition and implementation of research information, to improve abilities to react and the cost-effectiveness and socioeconomic impact of activities. The targets regarding working skills and capabilities include a company culture supporting continuous improvement of skills and lifelong learning. Regarding organizational performance and functionality, Metla's organizational structure and operational culture are built to support the needs of our customers.

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Typical Finnish landscape picturing private owned farm and forest land.

The basis for Metla's future activities will be listening to customers' expectations, and being more proactive in passing research findings on to customers. In a nutshell, our principle is "bilateral communication". Research is mainly conducted in extensive and multi-disciplinary research programmes. In 2006, we will start a new R&D programme on cost-effectiveness and quality of forestry, and preparations will be made for two new programmes. One of them deals with bioenergy and the other with forest inventory systems and forestry planning. "Potentials for the utilisation of roundwood and wood raw materials in relation to the wood product markets" and "Safeguarding forest biodiversity - policy instruments and socio-economic impacts" are examples of the current programmes.

These research programmes clearly demonstrate our new strategic priorities.

Hannu Raitio
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Additional information on Metla´s new Strategy 2006-2010:
www.metla.fi/netra/metla-strategia-2006-2010-en.htm

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The forest monitoring programme has reduced emissions

Air pollution has not grown into as big a threat to forest health as was predicted in the 1980´s. A new threat to forest ecosystems is posed by climate change.

Sinikka Jortikka

The forest health monitoring programme, nowadays known as Forest Focus, has had a major impact on setting restrictions on emissions in Europe. Hence, air pollution has not grown into as big a threat to forest health as was predicted in the 1980´s. A new threat to forest ecosystems is posed by climate change.

The results were presented in the reports on the forest monitoring schemes published by the EU Commission. The Commission reports annually on the results achieved in European monitoring.

Positive results from the forest monitoring programme

– The monitoring programme demonstrated that there is a connection between forest damage and air pollution in Central Europe. The results had a major impact on political decision-making and agreements aiming to restrict emissions. The effects of the decisions are evident in the form of improved forest health, especially in areas where sources of emissions are numerous, says **John Derome**, Forest Focus Coordinator in Finland representing Metla.

No link to emissions has been found to explain variation in forest health status in Finland. However, Finland has benefited from agreements restricting sulphuric emissions, since sulphuric compounds carried with winds have declined. Wind-borne emissions are carried to southern Finland from the area of St. Petersburg, north-eastern Estonia, Central Europe and southern Scandinavia. Sulphuric emissions have also been reduced by Finnish industry as required by the decisions regarding European countries.

The decline in sulphuric emissions in Europe and Finland is partly due to the disintegration of the Soviet Union in 1991. The disintegration caused a radical drop in industrial production in the former Soviet countries and in certain parts of Eastern Europe.
Emission sources of sulphur are discrete industrial units, which means that restricting their emissions is possible but expensive. As a whole, sulphuric emissions have been reduced in Europe, but there are still areas where concentrations exceed the limits recommended to protect forest health.

Nitrous emissions are hard to restrict

– In addition to sulphuric compounds, nitrous depositions exceed critical limit values. In Finland, concentrations measured from needles of coniferous trees are not high, and the results indicate that no clear change, one way or the other, has occurred in the concentrations. In Finland, nitrogen is still a growth-limiting factor and vegetation quickly takes up all extra nitrogen available in soil, explains Derome.

The essential emission sources for nitrogen are traffic and agriculture.
Since emissions are derived from countless small sources, it is difficult to restrict them. In spite of attempts, we have not managed to reach the desired level of nitrogen emissions in Europe.

An increased amount of nitrous deposition leads first to increased growth of trees. Along with the increased growth, the need for other nutrients increases and as a result, the forest may suffer a deficiency of other nutrients indispensable for growth. Hence, the increased nitrogen level may lead to unbalanced nutrient composition and weakened health of forests. A high nitrogen load also increases damage caused by fungi and insect pests.

"The monitoring programme demonstrated that there is a connection between air pollution and forest damage in Central Europe. The results had a major impact on political decision-making and agreements aiming to restrict emissions. The effects of the decisions are evident in the form of improved forest health, especially in areas where sources of emissions are numerous."

The crown is a sensitive indicator

A tree crown can react to various environmental factors such as climate, insects, fungi, imbalance of nutrients or air-borne impurities such as sulphuric or nitrous depositions. Therefore, monitoring the condition of tree crowns has been used as a general indicator of tree health. In practice, this means assessing defoliation, i.e. premature loss of needles and leaves.

During the past twenty years large variation has been observed in levels of defoliation when different European areas have been monitored at different times. The crown condition of major tree species deteriorated until the mid 1990´s. Between 1995 and 2002 defoliation of the major tree species did not show much variation. After that, defoliation started to increase again. The recent defoliation is due to the hot and rainless summers of Europe.

– Finland has not suffered from excessive defoliation. Defoliation in Finland is mainly due to aging of trees, unfavourable climate and weather conditions and damage due to fungi and pests, Derome comments.

Approximately 10 percent of trees of the main tree species in Finland are classified to have suffered of 21-50 percent defoliation.

In Europe, defoliation has increased the most in Bulgaria, France, Italy and Switzerland, when the results of 1993 were compared with those of 2004. On the basis of decreased defoliation, forest health has improved the most in Denmark, Estonia, Latvia, Lithuania and Byelorussia. Also in Poland defoliation has diminished but still, 35 percent of major tree species trees are classified as having prematurely lost 21-50 percent of needles and leaves. ▶▶

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Forest health consists of many factors

– Behind forest health and its variation there is always a complicated chain of interactions. Seldom can just a single factor be highlighted. When forest health status improves, it is extremely difficult to distinguish the contribution to this due to reduction in air pollutants as against that due to natural variation, John Derome reflects.

According to Derome, in countries where nitrous depositions have unmistakably caused forest damage, the forest health status has been improved as a result of reduced sulphuric emissions.

In Europe, there are also countries where the forest health status has deteriorated. The change for the worse is often due to effects of climate, storms, drought, fungi and insect pests. Also neighbouring areas of emission sources are affected by the pollutants, even though the problem does not affect the whole country.

Furthermore, "natural factors", such as the age of trees, also affect forest health. Increased defoliation was the first alarm signal warning that something was going wrong in nature; that is why annual monitoring of defoliation is extremely important.

Climate change is a new threat

The results of the forest monitoring programme indicate that the factors threatening the health of European forests have changed during the past twenty years. A new threat has emerged: climate change and its effects on forests and biological diversity.

© Metla /Jouni Hyvärinen

Dr. John Derome, Forest Focus Coordinator in Finland, is a busy man. In all seasons, assignments relating to the programme make him travel from Finland to other Nordic countries and

– The average global temperature has apparently risen a little. However, this global warming does not mean that temperature is rising equally everywhere. In spite of warming, in some areas the climate may turn colder, instead. The local changes in temperature and precipitation result from the changes in the regular movement patterns of air masses as a result of the warming, explains Derome.

The Intergovernmental Panel on Climate Change (IPCC), representing the views of the world's leading climate researchers, has reported that the reason for global warming is, above all, greenhouse gases (GHG) caused by human activities. The most important GHGs are carbon dioxide (CO_2) and nitrous oxide (N_2O). Approximately 75% of all GHGs are caused by fossil fuel combustion, but other sources include deforestation, agriculture, landfills and industry.

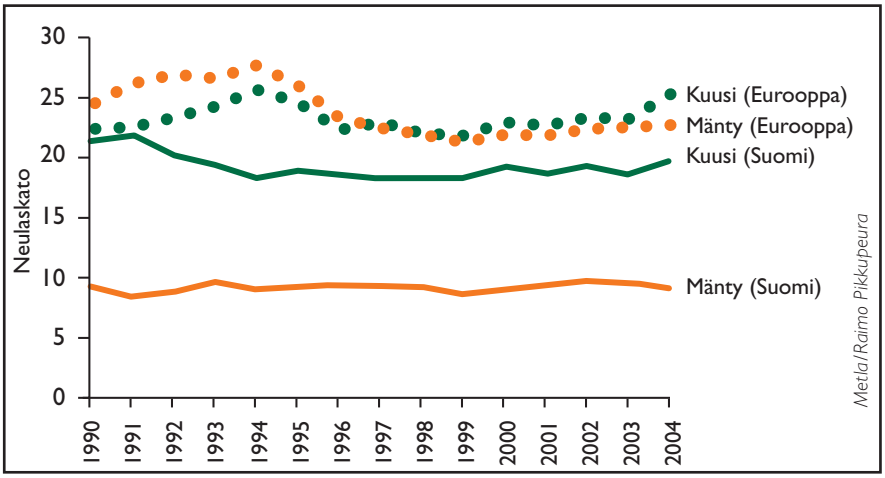
European forests have increasingly been affected by changes related to heat, drought and storms. Storms have felled wide forest areas in, for example, France, Germany and the Baltic countries. Early this year approximately 75 million m^3 of forests, almost the amount of an annual cutting, were storm-struck in southern Sweden.

Climate change does, however, have some positive affects as well. In Finland it causes a lengthened growing season and improved tree growth.

– As a result of warming, it is likely that

The average defoliation (neulaskato) of Scots pine (mänty) and Norway spruce (kuusi); needle depletion is more intensive in Europe (Eurooppa) than for the same species growing on Finnish (Suomi) mineral soil. The difference is especially noticeable for Scots pine.

Reference: United Nations Economic Comission for Europe. Europe`s Forests in a Changing Environment. Twenty years of Monitoring Forest Condition by ICP Forests.



new species will spread into Finland, and along with them will come insects and fungal diseases that are detrimental to forest health. Furthermore, species that require cooler climate conditions will move further north. The changes taking place in nature may be good in some respects but bad in others, reflects John Derome.

Climate change is likely to affect also the clearly defined seasons in Finland. The long and warm autumn we had in 2005 may be quite common in the future.

– If the proportion of snow in the annual precipitation decreases, it may cause increased leaching of nutrients from forest soil. This will also affect biological diversity: some species become extinct, others will emerge, Derome explains.

– Another topic of concern is also the depletion of the ozone layer in the atmosphere. The thickness of the ozone layer has always varied, but the current concern is the possible hole in the ozone blanket, says John Derome.

The atmospheric ozone dampens the ultraviolet radiation from the sun, making it safe at various latitudes. Excessive ultraviolet radiation leads to chemical changes in the human, animal and plant DNA structure. Some of these changes are adverse.

Biological diversity and carbon stocks to be monitored

The forest monitoring programme is confronted with changes. From the beginning of 2007 it will no longer be an independent, statutory programme in Europe and it will not receive earmarked finance. The European Union has initiated the change, aiming to combine all programmes on environmental research and monitoring into one entity.

– The monitoring of forest health is very likely to be continued in Finland, but the extent and targets will be different. The future programme will be better tailored to take into account the threats posed to forest habitat. The new monitoring system will have to be built in tight collaboration, especially with the Nordic and the Baltic countries. The EU's new financing schemes will also have to be taken into consideration, points out John Derome, the programme coordinator in Finland.

– Finland must also develop collaboration between the forest monitoring and National Forest Inventory projects. At the moment, both projects monitor the same parameters but to a different extent, Derome says.

– When we combine data obtained from the forest health monitoring and National Forest Inventory, the result will be a more accurate description of the significance of Finnish forests as carbon stocks. Knowing whether the forests in Finland are currently a carbon stock or source, and knowing how climate change will affect the current status, is very important for political decision-making and the national economy in Finland, Derome explains. He adds that both projects would make a sound foundation for the development of a forest biodiversity monitoring system as well.

The monitoring data collected during decades can also be used when we face new challenges. Essential in monitoring is to remember that certain basic facts are annually recorded and the targets and monitoring methods remain the same. This guarantees that the results are reliable and they can be compared within and between countries, and that reliable conclusions can be made on the basis of the monitoring.

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Level I monitoring is performed on approximately 600 plots in Finland and Level II monitoring takes place on 31 plots. The total number of Level I and Level II monitoring plots in all participating countries is approximately on 6000 and 860 test plots, respectively. This is one of the most extensive monitoring networks in the world.

Additional information:

- Executive Report 2005 The Condition of Forests in Europe > www.icp-forests.org/Index.htm
- Jubilee Brochure 20 Years of ICP Forests > www.icp-forests.org/Index.htm
- Reports by the Intergovernmental Panel on Climate Change > www.ipcc.ch/
- Finnish Programme for the Intensive Monitoring of Forest Ecosystems > www.metla.fi/hanke/8153/info.htm#top

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New software for driving efficiency in forest management

Forest management is not a game of chance

Satu Rasa

Management practices in Finnish forests increasingly benefit from research findings. For example, both MELA and MOTTI programs were developed on the basis of research conducted by Metla; they support decision-making and are used in calculation of diversified predictions of tree stand development. Due to their extensive and detailed features, these software tools are forerunners also in international forestry.

The forest management planning programs MELA and MOTTI are based on models of forest growth dynamics and development produced over decades of research at Metla. MELA was developed to serve as a large-scale forestry model, whereas MOTTI is a stand-level tool for comparing alternative silvicultural practices.

MELA has two main purposes: large-scale forest calculations and conventional property- and company-specific forest planning.

– In large-scale calculations the analyses can cover, for example, possibilities for alternative forest use and development of, for example, a regional forest research centre or the entire country. MELA has been utilized in making alternative calculations for regional forest programmes, creating the national forest management programme and the preceding country-wide forest management programmes, as well as for preparing programmes of forest conservation, to mention just a few examples. In more traditional forest management planning, calculations are needed to determine alternative practices to be used as grounds for recommended forest use and silvicultural practices by industrial forest companies, the National Board of Forestry and the regional Forest Research Centres, explains Professor **Tuula Nuutinen**, from the Joensuu unit of Metla.

In both modes of approach, a forest stand simulator is first used to calculate handling and development alternatives at stand level. These calculations are based on modelling the development of individual trees. The program's optimization module is then used to perform actual analyses at regional scale. The appropriate criteria for cutting are selected so that the regional cutting targets and limitations are complied with.

Continuous development

MELA's development work was started as early as in the 1970´s. Originally the software was developed for use in cutting calculations made on the basis of the materials obtained from national forest inventories. Since the 1980´s MELA has also been used in hands-on forest management planning. A major leap was made in 1996, when the software was made commercially available. Since then, one annual revision has been released on average.

According to Nuutinen, the newest version, MELA 2005, contains three major changes.

– The novelties of the new version include, for example, biomass variables; biomass expansion factors are currently important in calculating assessments of carbon balance and energy wood yield. Another important new feature is calculation of economics variables both for stumpage and delivery priced roundwood. The third important issue consists of margin variables that make it possible to examine uncertainties involved with future prospects. Every new version of MELA is slightly better than the previous one. Improvements are initiated both on the basis of feedback received from users and as a result of research performed at Metla.

The system is adapted to users' needs, because the program contains thousands of variables that can be freely adjusted to meet customers' needs. The program is also localized into different fields: since soil and climatic conditions vary a great deal in Finland, the models describing forest development are equipped with variables that describe the physical locations of the targets.

– Prospects for the future are also discussed by the software development team. The software may later be used to assess the impact of climate change, states Nuutinen.

NettiMELA – information brought closer

The fully mature MELA software was accompanied during autumn 2005 by NettiMELA - a program that enables forest calculations to be made also in the Internet. Clients can use the constantly updated Internet service and utilize Metla's research results faster than ever. The NettiMELA service is based on the research and development of Metla's research programme Forest Management Planning that aims to develop a new-generation planning system.

The service is aimed at companies and organizations that need tools for the management of their own forest properties or those of their clients.

– The idea of NettiMELA is to be a more user-friendly version of MELA, which may be difficult to handle due to its size and complexity. Now the client can order calculations from the Metla server without having to determine exact computational parameters, explains Nuutinen.

There is also a second network application of MELA: DemoMELA illustrates MELA's operational principles and possibilities. DemoMELA can be used as an auxiliary tool in teaching, for example.

Download MOTTI free of charge through the Internet

Since October, the MOTTI program has been available from Metla's website free of charge. Just as MELA, MOTTI was originally prepared for use by Metla's own researchers as a tool to create and test prediction models of tree development. During recent years the software has been used in several research projects as an analysis tool for stand-level calculations.

The user can investigate the effects of alternative silvicultural practices on stand-level growth dynamics and yield. The aim of the simulator is to supplement other silvicultural support services provided by Metla and it can be used as a decision-making tool in various types of forest management.

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Professor Jari Hynynen (left) and the network application of MOTTI. Professor Tuula Nuutinen (right) and the network application of MELA.

– Plenty of research data is available about Finnish forests, so several options are open in today's forestry as alternative practices. With MOTTI, each user can customize a forest management model to meet his specified needs. I believe that these programs help to disseminate understanding and know-how on forest management, says Professor **Jari Hynynen** from the Vantaa unit of Metla.

The software helps to create scenarios to see what happens in an individual stand when different practices are applied, Hynynen explains.

– In practice, the forest owner can use the program to check which is more profitable: to perform thinning immediately or after ten years and which tree species should be cut. The user can also calculate forest economics relating to silvicultural procedures.

The software is used, for example, by organizations involved with forest guidance; for them the software is a good support tool in counselling. MOTTI is also compatible with information systems applied in private forestry.

– The software was developed as a result of long-term research work and the results have been applied in the form of mathematical models. In addition to the results from our growth dynamics and yield research, the software contains diversified information on stumpage prices of timber and roundwood assortments, silvicultural costs and interest rates. The software is constantly being developed on the basis of Metla's studies, and in the future, the idea is to use modelling also to make increasingly reliable assessments of environmental changes and the effects of various damages, says Hynynen.

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Studies relating to MELA and MOTTI

MELA

Forest simulator (2000–2006). The objective is to build a forest simulator that will meet the foreseeable requirements regarding operating characteristics and information contents of forestry analysis and forest management planning. Interference calculation, adopted as the iterative application method, is under prototype testing, while characteristics needed in computational simulation are being supplemented. Additional information: www.metla.fi/hanke/3284/index-en.htm

A forest management planning method based on integrated simulation and optimisation (2000-2003). The first version of the J software for forest modelling and planning applications was completed for more general test use. The software contains a simulator language for defining forest simulators and a linear optimisation module applicable for forest planning. The software is freely available for teaching and research at: www.metla.fi/products/J/ . Additional information: www.metla.fi/hanke/3285/index-en.htm

MOTTIStand structure, competition dynamics and site productivity in growth models (2000–2005). The objective is to develop methods to increase the usefulness and reliability of stand growth predictions and to create more extensive models for tree and stand structures and stand development. Additional objectives include creating a system for predicting site productivity on the basis of site variables; the system can be used to compare site-specific productivity in different parts of the country and between different tree species. Additional information: www.metla.fi/hanke/3283/index-en.htm

Economic-ecological interactions in sustainable use of forest resources (2001–2006). The project comprises research into economic optimisation of silvicultural measures and wood harvesting for an even-aged stand and for larger forest properties. In the case of an individual stand, the results indicate that the financial gain actually achieved by the forest owner may be significantly reduced if the forest owner's decision-making is not based on financial targets, but instead, on maximal cubic metre-yield, or if he neglects the impact of interest rates. The research results enable a theoretically explicit analysis of, for example, roundwood price and timber supply. Additional information: www.metla.fi/hanke/3318/index-en.htm

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The forest sector in Eastern Europe facing challenges in forest management

Researchers of Metla are studying lessons learned and challenges ahead in the transition process.

Ján Ilavský

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The political movement at the end of the 1980s led to substantial changes of the political map of Central and Eastern Europe. New countries were established after the disintegration of several states. The former centrally planned economies started a new process of transition towards market economy conditions.

The forest sector represents one of the most important sectors in many of the countries concerned. Forests and other wooded land cover 980 million hectares of the region (including Russia), which is about one fourth of the world's total forest area. Forestry is an important sector in the majority of countries due to the extent of their forests. Forests are important as an economic factor, however, their contribution to environmental stability, biodiversity conservation, their social, cultural, recreational and other non-productive functions are of even higher importance. Therefore there was an urgent need to analyse and to understand the impacts of all political, economic and social changes on the forest sector as an important segment of the process of transition to the market economy. Since 2003 the Joensuu Research Unit of Metla has been studying the transition process, its results and future emerging activities.

The transition is a long lasted process

Activities on assistance and co-operation with the forestry and forest product sectors of countries with economies in transition (CIT) have been going on for more than 15 years. However, renewing the forest sector will still take several years, in some countries even several decades. The changes are connected with development of know-how and structures in the new private forest sector, with improvement of efficiency in forest management, in implementation of innovative but effective and environmentally friendly technologies, and with investments in infrastructures, information, communication and industry.

Tailored solutions need research based knowledge

Different levels of the transition reforms have been achieved in different countries. However, progress with the transition has been mixed, and conditions now vary enormously among these countries. Therefore, the strategy on the future cooperation with CIT has to take into account also the stage achieved by countries in the transition process and specific conditions in particular countries. Appropriate strategies and tailor made solutions needed to deal with specific problems of different countries should be based on scientific analysis of lessons learned during the transition process and their future needs.

Despite of the fact that it is not possible to set up a unique transition pattern that can be followed by each country, Metla's analysis show that there is the possibility to cluster countries reflecting some similarities in the basic problems of the transition process to help to structure them. This helps to identify appropriate actions needed and to select the best possible solutions to foster the transition process.

New EU members are the forerunners of the transition

The transition process in those countries was officially finished when they joined the EU in May 2004. Nevertheless, the process of movement towards full integration, mainly economic, will continue for several decades. There are some aspects of the reform in the forest sector, which countries should still deal with for several years. However, the new EU members have accumulated a huge amount of experience and knowledge during their forest sector reform. These lessons learned could be transferred to other countries in transition to help them to speed up the reforms. Their bridging role between the traditional market economies and the transition countries is irreplaceable. It can be recognized that those countries feel some obligation to extend the positive outcomes of the international cooperation to those who are going through the same exercise. The new EU members have begun to play an active role in international scientific cooperation and in dissemination of knowledge by organizing seminars, workshops and other events.

EU applicant countries benefiting from the accession process

This group of countries has made substantial progress in the transition process. Despite of the fact that each of them has its specific problems, there are some common issues to be dealt with in the transition process. Capacity building in the non-state forest sector as well as capacity building in the state forest administration is of crucial importance among those common issues. Also implementation of ecologically, socially and economically balanced forest management, improving cost efficiency in the forest management practices, implementation of innovative, environmentally-friendly and efficient technologies, improvement of mar-

keting and pricing skills, increasing investments in the forest industries and increasing investments in the infrastructure are of high importance.

Countries in S-E Europe and CIS seeking an international cooperation

There is a huge variation of natural, economic, social and other conditions in those countries. That is the reason why it is not so easy to put forward few generally useful proposals for actions. Also the starting position was in almost all of those countries different to that in the new EU member and applicant countries. Basic institutional structure should be established in the majority of .countries as a precondition for continuation of the transition process. Data track on forest resources and the system for forest inventory, data collection, processing and dissemination is missing in some countries. Research, educational, training and extension institutions are weak or even missing. Additionally, the private forest sector is very weak or does not exist. In some countries, post-war reconstruction is also needed. Nevertheless, the experience from the transition process in other countries could be, at least partly, used. Also many outcomes and recommendations adopted by the workshops and seminars could be a good source of inspiration during the next stage of the transition process. Of course, there are many new specific emerging issues which should be taken into account when the future actions of international cooperation are proposed. These issues include law enforcement, illegal logging, corruption, forest fires and other.

Research is bridging the barriers

The crucial issue in the transition process is to have people ready to deal with the problems and fully committed to solve them. The complexity of sectoral and cross-sectoral aspects of the transition of the forest sector towards the market economy needs new knowledge and information. Therefore the international cooperation in research is of crucial importance for the successful accomplishment of the transition in the entire region. ■

Additional information:

15 years of economies in transition: Lessons learned and challenges ahead for the forestry sector. Finnish Forest Research Institute Working Papers 2006.
www.metla.fi/julkaisut/workingpapers/2006/mwp024-en.htm

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Genetic research revealing the secrets of wood

Due to its complex structure, there are many possible applications of wood that are, as yet, unknown. Through genetic research scientists try to affect the characteristics of trees and to prevent diseases that could cause extensive damage to forests

Ari Turunen

The genome mapping of man and other higher life forms has paved the way for new disciplines and research methods. Modern information technology methods are being used to study how genes pass building instructions to cells. Genes handle immense data sources to control the development of living organisms and their tasks are gradually being revealed. The state-of-the-art technologies are applied also in forest research for identification of gene characteristics. Plant breeding results can be improved, if a certain gene affecting a specific plant characteristic can be detected. Genetic research is used to explore the vitality of a tree population and adaptation during climate change.

– A major challenge in genetic research is to combine the different research approaches and the data produced by them, says Metla`s Docent **Tuija Aronen**.

Aronen thinks that the new technologies should be increasingly used in conjunction with traditional breeding and population genetics. Researchers should also be trained to know how to exploit the new IT methodologies.

From wood preservatives to lignin

Tuija Aronen, together with her research group, studies gene variation that provides information on how an individual gene functions. According to Aronen, basic research is expected to give birth to a large number of various practical applications.

– It is important to find the gene or genes that affect the specific characteristic of interest and to find out how they work. Natural variation can then be utilized for practical applications.

Trees can, for example, represent a source of new drugs. Furthermore, extremely toxic wood preservatives could be replaced, if they could be produced through biosynthesis.

One of the goals is to develop tools to control the amount and characteristics of lignin. Along with cellulose and hemicellulose, lignin is one of the major compounds in wood. The process of making pulp mass from wood typically contains the phase of lignin removal, which involves chemicals that are both expensive and environmentally detrimental.

– One way to approach the problems involved with pulping is to refine the wood raw material to reduce the amount of lignin. So far, according to a study conducted by Metla, the chemical characteristics of lignin were successfully changed but the results showed no affect on the lignin amount.

If we can locate the gene that affects the lignin amount, it can have a substantial economic impact. It has been estimated that reducing the lignin content by 5-7 percent in roundwood would increase the pulp yield by 2 percent. This would mean cost effects of ▶▶

millions of euros.

Results gained from a gene study performed in North America have already been applied in practice. They have established nurseries of Loblolly pines that include transgenic trees that are not only fast growing but also carry a gene associated with low-lignin production.

The group led by Aronen has studied two genes that affect the physiological functions in Silver birch. The activity of the COMT gene has already been shown to affect the chemical characteristics of lignin. The interaction between the 4-CL gene function, seedling growth and the amount of lignin are currently being studied.

Tuija Aronen thinks that the genetics research on trees will be useful for researchers in other disciplines as well.

– To provide an example, genetic control may involve some universal regularities that may be useful also to gene researchers focusing on topics other than forest trees. One interesting topic is to explore mechanisms through which trees and other organisms communicate at the molecular level. We can also try to clarify how various defense mechanisms or stress responses of trees are created and how diseases and vectors try to avoid these defense mechanisms.

Genetic research may even help in adaptation during climate change.

– If we know how gene genotypes can adapt in different environmental conditions, we can better predict how successfully the current tree populations will survive in the future. This has a major economic and social impact, says Aronen.

Fighting against diseases and climate change

In terms of damage caused, root rot is the worst fungal disease in coniferous forests. Wood damage due to rot costs 40 million euros per year, and 80 % of this is caused by root rot. It is a good example of a disease that can become more severe with global warming.

– The role of diseases in commercial forests is continuously increasing. In addition to changes in timber harvesting methods, climate change may increase disease damage in our forests, warns **Katri Kärkkäinen**, Metla`s Professor of Forest Genetics.

Kärkkäinen, whose research is focused on the genetic basis of the re-adaptive characteristics of forest trees, is worried: We know relatively little about the genes affecting disease resistance in coniferous trees. Research should be directed onto this in Finland.

In forest breeding the focus has been on improving height growth and phenotypic characteristics of trees. Many countries, however, have started to pay attention to disease resistance as well. Kärkkäinen believes that breeding programs can learn a great deal from recent research results. There are several key questions. Does disease resistance depend on one or several linked genes? Is it possible to identify these genes?

Resistance to root rot is studied by exposing seedlings to the disease and then taking a DNA sample from the tree. The DNA is first isolated from the samples, and polymerase chain reactions (PCR) are used for propagation to identify the root rot genotype. PCR can be used to transcribe billions of copies of a specified DNA region. The method is used in criminal investigation to determine the DNA fingerprints. Certain regions contain considerable variation between individuals, which facilitates the identification task.

PCR amplification is used in forest genetics to investigate why individual trees of the same coniferous tree species have so different predispositions to catching fungal diseases. It is essential to know which of the important genes is the one that causes the differences between individuals. It is a challenging task to identify natural genetic variation in coniferous trees, in which the amount of DNA is so substantial.

– The task is not as hopeless as it was believed to be just a short while ago. Even though the volume of DNA is great, coniferous trees do not have many functional genes. Besides, identification of natural gene variation has benefited from recent research results indicating that the same genes seem to be responsible for causing natural variation in different species. It is our job to find the most important genes, says Kärkkäinen.

Kärkkäinen has studied thale cress (Arabidopsis thaliana) and detected a gene that explains adaptive variation in different species. Genes that affect the growth rhythm of trees have also been found in thale cress. Only a few "candidate" genes like these have been discovered. Candidate genes can cause similar characteristics in many different species. However, it is difficult to determine the genetic basis of natural variation statistically.

– Fortunately we can exploit the statistical analysis methods developed for human genomics. Effective methods were developed for genomics research of human diseases in order to determine candidate pathogenic genes and to evaluate the detected gene variation and its effect on man. We apply the same methods when we study climatic adaptation and disease resistance of trees, Kärkkäinen explains.

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Professor Katri Kärkkäinen.

The human DNA strand contains three thousand million base pairs, but in coniferous trees the amount is many times this. Methods of biotechnology are used to identify disease-carrying strains, in mapping microbial species and mycorrhizae, as well as in research into diseases spread by voles.

Even though research problems are different, technology brings multi-disciplinary research closer together and facilitates research initiatives. The techniques of analyzing DNA isolated from individuals are very similar, whether the sample is taken from a tree, fungus, or a virus carried by a vole, says professor Katri Kärkkäinen from Metla.

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METLA Bulletin
Number 1 Volume 1 Sept 2006

A wind of change blowing in Russian forests

Researchers of Metla are analysing the changes

Reeta Eskola

There are substantial markets in Russia for Finnish expertise in forestry and Finnish forest products. At the same time, approximately 80 percent of the imported timber used by the forest industry in Finland originates from Russia. ***Timo Karjalainen,*** *Professor of International Forestry at METLA, states that it would bevery difficult or even impossible for the Finnish forest industry to operate at the current pace without Russian timber. METLA's researchers are analysing the changes taking place in Russian forest sector and their effects on Finland. The research is focused on the Russian forest policy, rationalization of forest use, investments in the forest sector and Russia's role in the world market of roundwood and sawn timber.*

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Professor Timo Karjalainen in front of a map of Northwest Russia.

The Russian forest sector is currently experiencing a number of changes, because the forest legislation, administration and management practises are being amended. The main aim of the changes is to enhance economic use of forests.

– Amendments have been made in the existing Russian Federation Forest Code (1997) by the Ministry of Natural Resources parallel to preparation of new Forest Code, Karjalainen explains.

The amendments cover, for example, the responsibilities and jurisdiction of federal, regional and municipal organizations. Forests that were previously managed by agricultural organizations were now made subject to regional management. The maximum rental time of forests was extended from 49 years to 99 years, and a new federal organization was founded to monitor the utilization of natural resources and to prevent illegal cuttings.

In addition to these initiatives by the Russian Ministry of Natural Resources, the RF Ministry of Economic Development has made preparations for a new Forest Code. Current version of the new code is already the 29th and should go to the second reading in the Duma this autumn. That this new Code will be approved, is not, however, certain.

Until further notice, forests would remain under federal ownership and they could be rented through public auctions, for a maximum of 49 years. Specific protected forests and urban forests could be also in private ownership. It would be also possible to rent forests without auction if strategic investments are made. Among other things, responsibility for forest regeneration and other silvicultural works would be passed to the long-term lessee. In addition, processing of roundwood is to be increased and its exports are to be decreased.

Resources for technology and intensified monitoring to secure the future

Recently there has been a trend that vertically integrated conglomerates have been founded around larger forest industry plants; together these companies can attend not only to wood processing but also to wood harvesting and silviculture. In particular, those companies that have concentrated merely on wood harvesting have been rather unprofitable. This may be also due to taxation practices. One of the most critical difficulties in wood harvesting is a poor network of roads. Therefore, during the next few years federal investments should be also focused on the construction of forest roads.

– The shortage concerns particularly roads suitable for year-round use, says Karjalainen.

The level of technology will also be improved.

– Good news for the Finnish logging machinery industry is the fact that the cut-to-length method is becoming more popular in Russia, Karjalainen is happy to note. They also want to boost both domestic and foreign investments on forest industry.

The new monitoring system of logging applied by the Forestry Agency is based on satellite imagery and high altitude aerial photography, which have proven effective in testing performed in the areas of Krasnoyarsk, Irkutsk and Archangel. The aim is to implement the system through the entire area of intensive forest use this year. The objective of the Forest Agency is a uniform record and control system of forest recources; the monitoring system of cuttings is part of this system, too. Karjalainen believes that the system will facilitate better prevention of illegal cuttings.

The changes provide interesting topics for research

According to Timo Karjalainen, the amendments to the Russian Federation Forest Code comprise an interesting target for research. Particularly interesting for him are the process implementation, the actual content and the effects of the law.

– Naturally, the amendments and increased use of wood in Russia have effects also on exports of timber to Finland.

The current amendments and the analysing of the Russian forest sector will continue to employ researchers at Metla. Karjalainen assumes that the changes will have effects for a long time to come. He expects that it will be interesting to follow the de-

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velopments to see how the division of duties and collaboration will be changed and diversified in Russia and how it will affect the Finnish forest sector.

Understanding cultural differences is the key to successful international collaboration

Metla has several cooperation partners in Russia. In addition to the many northwestern collaboration partners, cooperative agreements have been made with a few institutes under the Ministry of Natural Resources and the Moscow State Forest University.

Karjalainen thinks that it is good that these cooperation partners also will participate in the research. The Metla project Development of sustainable forest management in Northwest Russia, for example, included Russian partners that were obligated by the Federal Forest Agency to create new forest management recommendations for the northern areas of northwestern Russia. Together with these partners Metla's researchers were able to participate in the creation of the forest management recommendations. Similarly, about half of the researchers in the research consortium coordinated by Metla (www.metla.fi/hanke/3384/index-en.htm) under the Academy of Finland programme Russia in Flux are Russian.

Cultural differences are always a part of international collaboration. Of the forestry-related projects at Metla, Timo Karjalainen finds especially interesting the one led by Professor **Pekka Ollonqvist**, whose group is studying among others cultural differences. In this project, Natalia Vinoukurova from the Moscow State Forest University together with Metla's researchers is analysing cultural differences as part of the communication between companies and key players in the field.

Karjalainen thinks that cultural factors have to be kept in mind when dealing with international issues.

– The conditions and habits of the target country will have to be taken into consideration and things should be understood from the local point of view, as well. We must join international collaboration with an open mind and deal with international is-

Centralized information about Russian forestry

Expertise in Russian Forestry, started in 2002 and completed last spring, is an example of the Russia-related research projects conducted by the Finnish Forest Research Institute (Metla). The project was carried out based on an analysis made by Metla and the University of Joensuu regarding the information needs expressed by the key players in the Russian forest sector. The results of the analysis indicated a need for information on topics such as forest resources, forest management and forestry practices in Russia, export and trade of timber and safeguarding biodiversity in the neighbouring areas.

– The study made it clear that there was no specific institution in Finland that could answer inquiries sent by, for example, the small- and medium-sized enterprises (SME). This additional need for information was fulfilled by the Expertise in Russian Forestry project, says Professor Timo Karjalainen.

Northwest Russian Forestry in a Nutshell is the final publication by the Expertise in Russian Forestry project. It is a compact package of the current state of forestry in northwestern Russia. This is the first description of the different sub-sectors of the Russian forest sector in Finnish, printed in pocket-book size. This publication is availabe in English at: www.metla.fi/julkaisut/workingpapers/2006/mwp030-en.htm

To enhance wider dissemination of currently valid forest information, a forest information service (Internet info service of forestry in NW Russia) was also started, and it is still being updated though the Expertise in Russian Forestry project has ended. The website is now maintained by the Russian, Central and Eastern European Forestry Info Service project. The network service was opened in spring 2003 and it contains a comprehensive basic package of up-to-date information about Russian forestry and the roundwood trade in Finnish and partly in Russian. The website also contains a news service and reports by Councellor **Hannu Kivelä**, the Forest Expert at the Embassy of Finland in Moscow.

A user survey was made on the website in spring 2005 showing that the users feel that the service should be continued and expanded to cover the whole of Russia, the Baltic countries as well as the Central and East European countries with economies, now or in the recent past, in transition. Information about the transition-economy countries will be added to the service. Metla's research into international forestry is, after all, specifically focused on these countries, in addition to Russia.

The Info Service of forestry in NW Russia website is available at: www.idanmetsatieto.info.

Partners in the Metla project Development of sustainable forest management in Northwest Russia

Finnish Forest Research Institute (Metla), Finland
University of Joensuu, Finland
Pellervo Economic Research Institute, Finland
European Forest Institute, Finland
Petrozavodsk State University, Forest Engineering Faculty, Russia
St. Petersburg State Forest Technical Academy, Russia
All-Russian Research Institute for Silviculture and Mechanisation of Forestry, Russia
All-Russian Institute of Continuous Education in Forestry, Russia
Moscow State Forest University, Department for International Co-operation, Russia

More information at : www.metla.fi/hanke/3384/index-en.htm

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Manual felling in Ledmozero, Republic of Karelia.

METLA Bulletin
Number 1 Volume 1 Sept 2006

Column
Out of sight - out of funds?


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Dr. Jari Parviainen

Decision-making in forest policy and forest management requires comparable and reliable up-to-date information. Numerous international conventions, instruments and bodies as well as national processes such as National Forest Programmes base their discussions on existing forest data and forest information. The implementation of action plans as well as the evaluation of the progress of sustainable forest management include monitoring, assessment and reporting of forest-related data.

The forest research community is a key producer of forest related data for national and international use e.g. on resources and health of forests, on the supply of and demand for timber and other forest products, on forecasts of future development of forest resources and their utilization. A good example of international forest research and the use of its data is the process conducted by the Ministerial Conference on the Protection of Forests in Europe (MCPFE), for which data on European forests is collected using harmonized criteria and indicators. However, data alone is not enough. To facilitate international use and informed decision-making, jointly agreed definitions of terms, and the content and scope of forest characteristics are also needed.

It is often the case that researchers have their sights set on an academic career. Research positions are gained on the basis of success with numerous publications in international journals. The greater the number of individual, narrowly specialist, peer review articles he has published, the higher the individual scientist's academic standing. Success is measured on the basis of theory, modelling and development of new methods.

However, serving the needs of academic career building is inadequate in applied forestry. Financiers and decision-makers need to understand the benefits, applications and social impact of research findings. It is a pity, if information is lodged in the academic community and in rows of journals collecting dust in libraries. If applications or expertise are not placed centre stage, it will not count enough when it comes to applying for custom orientated projects or funds.
Researchers should increasingly participate in discussion on forests, both in public forums as well as between specialists and with those presenting forest issues for political decision-making.

There should be analysed alternatives for discussions otherwise ordinary citizens consider extremist non-governmental organisations as their most reliable sources of information. Analysed information and arguments based on facts are needed to back-up forest-political discussion. Researchers must also attend meetings where international forest and environmental agreements are being prepared. These meetings are a genuine and direct channel where research information can be used to influence the contents of communications and decisions. Researchers have the best informed guess about substance matters and they should provide this input for discussion.
There are many important forest issues on which researchers remain silent, but more research results and arguments are needed. These topics include forest certification, illegal cuttings, gene modification in forestry, protected forest areas, carbon trade and climate change, timber as renewable raw material, forest based energy issues and their environmental effects, social responsibilities of the forest industry, ethics in forestry, green chemistry of forestry and globalization of forest industry. ■

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The Metla House in Joensuu, constructed during 2003–2004, is the first large wooden office building in Finland.

METLA Bulletin
Number 1 Volume 1 Sept 2006

World traveller in the service of forest research

Metla's professor **Risto Seppälä**'s five-year-term as the President of the International Union of Forest Research Organizations (IUFRO) came to its end on December 31, 2005. In his view, forest research should concentrate on future challenges rather than constantly looking backwards.

Ari Turunen

The IUFRO congress in Brisbane attracted more than 2000 forest researchers from almost 100 countries, causing a spectrum of colours and languages greater than hardly in any previous scientific event. In the Grand Auditorium of Brisbane Convention & Exhibition Centre, Risto Seppälä did not start his speech in Anglo-American fashion with jokes. He was polite but straight talking. As soon as he had welcomed the audience to the XXII IUFRO World Congress, he started to list his topics of concern. Forest research has been too contained within a small circle, cooperation with other fields of science has been inadequate, decision-makers are unaware of forest research, and research results have been poorly communicated. Something needs be done if the status of forest research is not to be impaired. The audience received Seppälä's comments in complete silence.

In the evening, when Seppälä mingled during the Welcome Reception arranged at the Convention Centre, most of the participants expressed their agreement with Seppälä.

Towards an international science panel on forests

When Seppälä started as the IUFRO President in 2001, he was determined to increase IUFRO's level of influence on forest-related decision-making. His starting point was that research results must be openly available not only to colleagues in research but to all other stakeholders, as well.

– IUFRO has clearly opened up towards the world outside the academic community, approaching decision-makers and the decision-making process. IUFRO has actively participated e.g. in the work of the United Nations Forum on Forests and since 2003 it has been a member of the Collaborative Partnership on Forests (CPF), Seppälä lists the achievements during his term.

CPF is an important cooperation forum for global forest issues. Its objectives include improving sustainable forest management and increasing international collaboration. Seppälä hopes that an international science panel on forests will be founded under CPF. The Intergovernmental Panel on Climate Change (IPCC) could be used as a model; IPCC has played an important role when climate protocols have been created.

– I have proclaimed this for years, first within IUFRO and recently at various international forest-related meetings. The task of the panel would be to provide research-based expertise to support international forest policy processes and possible agreements concerning forests.

Finnish forest research highly valued abroad

As part of his tasks for IUFRO, Seppälä has travelled around the world. He declines to count the number of countries he has been to. However, the milestones along his global journey have not escaped the notice of the colleagues he worked with for several years in the United States, Austria and England. In 2002, he was awarded an honorary doctorate by the Faculty of Agriculture and Forestry, University of Helsinki, and the Moscow State Forest University, and in 2004 the Chinese Academy of Forestry granted him the title Honorary Professor for his contributions to international research collaboration.

When Seppälä's term came to its end, he was the third Finnish scientist to have nominated to lead one of the most international and oldest research organizations in the world. In 1936, A.K. Cajander, the then Director General of Metsähallitus was elected as the President, but it was against the rules to nominate an administrative official for the post. Hence, Cajander continued in IUFRO as "Honorary President", so far the only one in IUFRO's history. Erik Lönnroth was IUFRO's President between 1937 and 1948. According to Seppälä, the fact that Finns have been appointed to these positions of responsibility reflects Finland's major international role within forest research.

– Finnish forest research is highly regarded worldwide. Finland is extremely prominent in international journals on forestry and the forest industry. In issues of forestry, you do not need to justify your words too much if you happen to be a Finn, Seppälä says with a quick smile.

As examples, Seppälä mentions forest inventory methods and forest planning.

– The process of forest planning and the related modelling are of high quality in Finland. Our forest inventory methods represent the world's leading edge, though it seems that we are not taking full advantage of this.

Seppälä, a statistician by education, has been a forest researcher for practically all his career. His education in statistics has given interesting angles of approach also to forest research, whether dealing with forest owners' behavioural patterns, modelling of the forest sector, inventory methods or wood harvesting.

Know-how relating to green chemistry must be increased

Risto Seppälä points out that forest researchers and research institutes all over the world need to look for strategic partners from other disciplines of science, such as chemistry, as one of the important ones. We should know more of the chemical and physical properties of wood. Know-how and skills in the "green chemistry" has been around in Finland since the discovery of tall oil soap. The Finnish Science Award 2005 was granted to Professor Bjarne Holmbom from Åbo Academy University. Holmbom, a specialist in wood and paper chemistry, has studied phenolic compounds in tree stems as part of the plant defence response system. Lignin constituents obtained from knots can be used as active components in drugs and functional foods, as antioxidants, and biological control agents.

It has been recommended that a green chemistry research programme and enhanced collaboration in the field be initiated in Finland. Seppälä is strongly in favour of these initiatives. Right now there is a problem, since Metla is studying the front end and, for example, KCL, the paper and pulp industry research organization, is studying the rear end of the process. These ends should be made to meet, as has been done in the USA, for example.

– In the campus area of the North Carolina State University research has been transformed into a process. In one end of a building there is a unit studying genetic variation in silvicultural practices. In the other end there is a small pulp and paper mill. Whenever a novel innovation is developed at the forest end, it can immediately be tested at the industrial end at the product level. This would be a good model to introduce in Finland as well.

More investments in social sciences

The activities of Greenpeace have long provoked the forest sector. The forests in Finland have been the main target of Greenpeace campaigns. Greenpeace does not accept the PECF (Pan-European Forest Council) forest certificate adopted in Finland, and it actively campaigns to support the pro-conservation FSC (Forest Stewardship Council). Sweden has adopted the FSC certificate and therefore, Greenpeace has not been as active in Sweden as it has been in Finland.

The international criticism received by the Finnish forest industry is seen as being biased and unfair. It is difficult to understand why Greenpeace is creating an uproar in a country where the number of forest trees is growing year after year. Why doesn't Greenpeace campaign, for example, in Indonesia, where the majority of harvesting is illegal?

– Finland is a good target country, because forests are so important for Finland. That is why we have been under the spotlight. Greenpeace knows how to use the media. In Inari, Northern Lapland, there is competition between forestry and reindeer herding, but rarely does it make the news that the income earned from tourism is twice as much as that gained from reindeer herding and forestry together. The major dispute concerns only one municipality, but Greenpeace has chosen not to reveal this fact in its newsletters. Admittedly, at the local level there are important targets for conservation and of importance to reindeer herding, but in Greenpeace newsletters the area is linked with the role of ancient forests as global climate stabilizers, though harvesting in Inari has no such global significance. Furthermore, the newsletters also indicate that the entire source of livelihood for the Saami people would be endangered, even though there are mixed feelings about harvesting even inside the local herding area.

Still, the tension between environmental organizations and the forest industry shows that studies related to social sciences are going to be more needed in the future.

– Proactive research is needed. Forest research must be able to "sniff out" changes that take place in society. This also includes changes in the values and attitudes of people towards nature and conservation. The profile of forest research must change and become more inter-disciplinary, Seppälä comments.

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Professor Risto Seppälä.

Gigantic IUFRO

IUFRO (International Union of Forest Research Organizations) aims to enhance international collaboration in forestry, with more than 15,000 researchers and almost 700 different organizations as its members from 114 different countries. Even the International Council for Science, ICSU, that represents all scientific disciplines has fewer member countries than IUFRO.

IUFRO has almost 300 international research groups, and almost 100 scientific conferences and meetings are organized every year by IUFRO in different parts of the world. As a member of IUFRO, a forest researcher can participate in global forest research collaboration. IUFRO is open to all individuals and organizations interested in forests and forest research. Founded in 1892, IUFRO is one of the world's oldest international institutions.

Resume Risto Seppälä

Academic degrees:

1971 D.Sc. (Statistics), University of Helsinki, Finland

1967 M.Sc. (Statistics), University of Helsinki, Finland

Academic employment history:

since 1976 Professor at the Finnish Forest Research Institute (Metla), Finland

1980–1982 Founding Leader of the Forest Sector Project of the International Institute for Applied Systems Analysis (IIASA), Austria

1986 Academy Professor at the Academy of Finland

1987–1988, 1991 and1993-94 Research Director of Metla

1992 Leader of the Establishment Project of the European Forest Institute (EFI)

1994–1995 Full-time Chairman of the 20th World Congress of the International Union of Forest Research Organizations (IUFRO)

Major international positions of trust and honours:

1996–2000 IUFRO Vice-President for Science

2000–2005 IUFRO President

1990–1998 Member of the IIASA Council, Austria

1994–2000 Member of the EFI's Scientific Advisory Board, Finland

since 2002 Member of the Board of Directors, Institute of Forest Biotechnology, Raleigh, USA

Post-Doctoral Research Fellow, University of California, Berkeley, USA, *1971–1972*; Visiting Professor at Dartmouth College, Hanover, USA, *1979*; University of Bradford, England, *1980*; University of Washington, Seattle, USA, *1989*; University of California, Berkeley, USA, *1990*

Honorary Scholar, IIASA, Austria, *1998*

Honorary Doctor, Moscow State Forest University, Russia, *2001*

Honorary Doctor, Faculty of Agriculture and Forestry, University of Helsinki, Finland, *2002*

Honorary Professor, Chinese Academy of Forestry, China, *2004*

Current research interests: long-term strategic problems and future studies of the forest sector; modelling and systems analysis

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Number 1 Volume 1 Sept 2006

Metla´s research projects

Research at Metla is organised into problem-oriented projects, each managed by a principal research officer. Over 150 projects are usually underway annually. A large number of the projects are joint, national or international projects carried out in collaboration with universities, research organisations and other R&D organisations.

In addition to research projects, Metla has a number of service-oriented development and administrative projects. More information on current research topics at:
www.metla.fi/tutkimus/index-en.htm

Metla's latest research news

Metla provides the latest research results and up-to-date information about forests to the scientific forest community, forest professionals and forest decision-makers. More information on current research topics at: www.metla.fi/ajankohtaista/index-en.htm

Wood ash application does not pollute berries or mushrooms

Metla conducted a study to determine the short- and long-term effects of wood ash application by measuring heavy metal concentrations from berries and mushrooms growing in upland forests and on drained peatlands. A follow-up study showed that heavy metal concentrations in berries and mushrooms growing on test plots treated with ash fertilization remained mostly at the same level or was even reduced. Fertilization of forests with wood ash was shown to be safer than expected for forest berries and mushrooms. More information at: www.metla.fi/tiedotteet/2006/2006-07-28-tuhkalannoitus-en.htm

Potential for utilizing forest energy in eastern and western Europe is promising

Forest chips represent a promising option to replace coal as a source of energy in northern Poland. The term "forest chips" refers to fuel chips recovered from logging residue, thinnings or stumpwood. Incentives for the use of energy wood include trade in carbon dioxide emissions, higher market price of electricity produced from renewable energy sources, the good image of bioenergy and environmental protection fees. More information at:
www.metla.fi/tiedotteet/2006/2006-06-19-climbus-en.htm

More reliable detection of thinnings using bi-temporal aerial photographs

A technology has been developed at the Finnish Forest Research Institute for more reliable detection of thinnings using aerial photographs. By comparing aerial photographs taken in two different years 84% of thinned stands were classified correctly. More information at:
www.metla.fi/tiedotteet/2006/2006-08-09-ilmakuvat-en.htm

Increased needle density of Scots pine correlates with reduced height growth

Annual height growth varies more than the amount of needles developing in a shoot. Therefore, needle density is dependent on the length of annual shoots; in years of low height growth the needle density is high and vice versa. More information at:
www.metla.fi/tiedotteet/2006/2006-08-11-neulastiheys-en.htm

Combined use of satellite imagery and aerial photography improves accuracy of forest mapping

A combination of satellite images and aerial photographs brings better results in forest mapping than either of these image generation methods alone. According to a Metla study, accuracy was improved by as much as 17 percent compared to using mere satellite image interpretation. More information at:
www.metla.fi/tiedotteet/2006/2006-07-25-kaukokartoitus-en.htm

Clone research: Fast growth rate reduces wood density and strength properties of Norway spruce

The effects of growth rate on the wood density and strength properties of Norway spruce cutting clones were studied in a collaboration project of Metla, the University of Helsinki and VTT (Technical Research Centre of Finland). The results of the study performed on three different sites located within the boreal zone indicate that the wood density and mechanical strength properties were best in areas where the growth rate was slowest. More information at:
www.metla.fi/tiedotteet/2006/2006-08-15-kloonipuut-en.htm

Ectomycorrhizal fungi associated with growth rate of trees

Ectomycorrhizal fungi (ECM) are vitally important to the growth and wellbeing of trees; the diversity of ECM species is enormous, though the number of their host tree species is but a few. The diversity of tree species is known to have an effect on the underground mycorrhizal community but the effect of variation between individual trees of the same species on the mycorrhizal community is largely unknown. According to the study conducted by the Finnish Forest Research Institute (Metla), the growth rate of trees is associated with the diversity of the ECM community and structure. The results indicate that for tree growth, more important than the size or morphology of the root system is the ECM community structure. More information at: www.metla.fi/tiedotteet/2006/2006-08-16-ektomykorritsa-en.htm

Metla 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 the forests and forestry.

The **Finnish Forest Sector Economic Outlook** is published annually.

Statistical Yearbook of Forestry 2005

The Statistical Yearbook of Forestry, with all the figures and tables also in English, 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 foest-related products.

Chapters of the Statistical Yearbook of Forestry 2005: 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

Statistical Yearbook of Forestry is published annually in the beginning of December. Version 2005 also available at: Statistical Yearbook of Forestry 2005

Some upcoming events at Metla and organised by Metla / partners

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

International Boreal Forest Research Association (IBFRA) Conference
Time: 28.-30.08.2006
Place: Umeå , Sweden
Organiser: IBFRA, Faculty of Forest Sciences
More information at:
www.sfak.slu.se/ShowPage cfm?OrgenhetSida_ID=4763

Actual topics in growth and yield study in Germany and Finland
Time: 29.08.2006
Place:Vantaa, Finland
Organiser: Metla
More information at:
www.metla.fi/cgi-bin/tapahtumakalenteri?nayta=1548

International Truffle Orchards Workshop
Time: 16.-17.10.2006
Place: Juva, Finland
Organiser: Metla, TKK, Juva municipality
More information at:
www.metla.fi/cgi-bin/tapahtumakalenteri?nayta=1337

Roots, mycorrhizas and their external mycelia in carbon dynamics in forest soil
Time: 09.-13.09.2006
Place: Rovaniemi, Finland
Organiser: Metla, University of Joensuu
More information at:
www.metla.fi/tapahtumat/2006/rootcarbon/index.htm

Northern Europe in the 21st Century: Nature, Culture, Economy
Time: 24-27.10.2006
Place: Petrozavodsk, Russia
Organiser: Russian Academy of Science, Karelian Research Centre
More information:
confernce2006@krc.karelia.ru

IUFRO Division VI Symposium: Integrative Science for Integrative Management
Time: 14-20.08.2007
Place: Saariselkä, Finland
Organiser: IUFRO, Metla
More information at:
www.metla.fi/cgi-bin/tapahtumakalenteri?nayta=1508

METLA Bulletin
Number 1 Volume 1 Sept 2006

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The nine Research Units of Metla

Joensuu, Kannus, Kolari, Muhos, Parkano, Punkaharju, Rovaniemi, Suonenjoki, Vantaa


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The Finnish Forest Research Institute (Metla) is a specialist organisation running nine research units in locations spread over Finland. Metla's mission is to enhance, through means of research, economically, ecologically and socially sustainable forest management and use. Metla was established in 1917. Metla is an independent research organization under the supervision of the Ministry of Agriculture and Forestry.

The Institute's key strengths are its highly professional staff, high standard scientific research, and active national and international cooperation.

Research activities are organized into problem-oriented research projects and multidisciplinary research programmes at nine Research Units. Metla employs over 800 people on a permanent basis, of whom 250 are researchers.

Metla manages a total of 90,000 hectares of research forest and operates a large amount of permanent field experiments producing extensive measuring data. Metla administrates the Koli national park, the Malla and Vesijako nature parks, and several smaller nature reserves.

Metla's information and expert services

Metla serves information end users and other interested parties by disseminating other interested parties by disseminating research information through a number of channels:
-information and expert services
-official duties and public services
-Metinfo forest information service
www.metla.fi /metinfo/
-commissioned projects
-presentations and consultant services
-publications
-forecasts and outlooks

In addition to research and information reserve management, Metla creates forecasts relating, for example, to the health status of forests, harvesting prospects, and the timber trade. Additionally,

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

Metla's laboratories

The laboratories of Metla serve research activities by developing and maintaining various laboratory services in order to produce high-standard research data. The analysis services are also available for external customers.

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