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Timber Committee
European Forestry Commission

Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training

Workshop on Forestry Information Systems (FIS) 2000

Hyytiälä (Finland), 16-20 May 2000

REPORT

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INTRODUCTION

1. The workshop on Forestry Information Systems 2000 was held in Hyytiälä, at the invitation of the Government of Finland from 16 to 20 May 2000. The meeting was organised by Finnish Forest and Park Service (Metsähallitus) and the Ministry of Agriculture and Forestry. More than 100 participants attended from the following countries: Australia, Austria, Belarus, Belgium, Canada, Croatia, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Latvia, the Netherlands, Poland, Portugal, Russian Federation, Slovakia, Sweden, United Kingdom and United States of America. The European Forest Institute (EFI), the European Joint Research Centre, ISPRA and the International Union of Forest Research Organizations (IUFRO) were also represented.

2. The seminar was opened by Dr. Aarne Reunala (Finland) Director of the Department of Forestry in the Ministry of Forestry and Agriculture in Finland and addressed by Mr Jorge Najera UNECE representative of the Joint FAO/ECE/ILO Committee, Mr Kaarlo Ouni (Finland) director of the Pirkanmaa Forestry Centre, Dr Antti Uotila (Finland) director of the Hyytiälä Forestry Field Station and Mr Tuomo Kotimäki (Finland) director of the Metsähallitus Consulting Ltd. In his opening Dr Reunala highlighted the new information needs and need for transparent information in forestry. The increasing information needs especially for management of the forests and supporting the forest owners and their associations, as well as forest industry were highlighted by Mr Ouni. Both speakers shared the opinion that in future more and more detailed information and systems for managing and disseminating it will be needed. Dr Uotila presented an overview about the multidisciplinary activities in the Hyytiälä Forestry Field Station and Mr Kotimäki presented the activities of the Finnish Forest and Park Service and the importance of forest information systems in their work.

AGENDA AND MEETING OFFICERS

3. The agenda prepared by the organisers was adopted for the meeting.

4. Messrs. T. Kotimäki (Finland) and H. Höfle (Germany, Chairman of the Joint Committee) chaired the meeting. The sessions were led by:

Session 1	Mr Kotimäki and Professor Atroshchanka
Excursion 1	Mr Räsänen
Excursion 2	Mr Hiltunen
Session 2	Ms Jolly and Dr Hecker
Session 3	Messrs. Höfle and Kotimäki.
Working Groups	Mr Kotimäki.

Rapporteurs were named for each session among the participants and Mr. Najera and Dr Varjo from FAO/ECE reported the meeting to the Joint Committee.

OVERWIEV OF INFORMATION SYSTEMS

5. Under this item papers were presented by Mr Tapani Mäkinen (Finland), Ms Anne Jolly (France, a paper co-authored by Mr Luc Hablot), Mr Najera and Dr Varjo (FAO/UN-ECE, a paper co-authored by Mr Alexander Korotkov [UN-ECE]), Prof. Jukka Vanhala (Finland), Mr Robin Quenet (Canada, a paper co-authored by Mr. Rick Morrison, Mr Brian Low and Mr Jim Wood), Mr Chijien Lin (Finland), Mr Jarmo Saarikko (Finland, a paper co-authored by Prof. Risto Päivinen, Mr Tim Richards and Ms Margherita Sini), Mr Ratko Matosevic (Croatia, a paper co-authored by Mr Branko Mestric). and Walter Mayer (Austria).

6. The discussion highlighted the need to combine several data sources into working information systems. In addition, the effect of the new FIS technologies to the total costs of the forest inventory and management planning was discussed. The publicity and availability problems of the produced forest information were also considered important and the need for good and easy to use user interfaces were highlighted.

7. The workshop considered the new wear PC technology to be general in nature and the practical applications in forestry will find their place. The need to make forest information more accessible to the public but also the problems related with publicity were recognised and the possibilities of utilising the internet in both decentralised data handling and especially in the dissemination of data and results were noted.

GIS IN FORESTRY

8. Under this item papers were presented by Dr Jeremy Fried (USA), Prof. Hanns Höfle (Germany), Mr Ismo Minkkinen and Mr Jarmo Leskinen (Finland), Mr Ben Dichburn (United Kingdom), Mr Roger Coppock (United Kingdom), Mr Esa Ärölä (Finland, a paper co-authored by Mr Aki Nalli), Mr Erik Willen (Sweden), Prof. Oleg Atroshchanka (Belarus), Ms Claire Howell (Australia, a paper co-authored by Ms Melissa Wood), Dr Timo Saksa (Finland, a paper co-authored by Dr Taneli Kolström, Mr. Vesa Leppänen, Mr. Mikko Lehikoinen and Mr Olavi Kelle), Dr Miroslav Gecovic (Slovakia, a paper co-authored by Mr Tomas Bucha), Dr Martin Cerny (Czech Republic, a paper co-authored by Mr Radek Russ, Ms Jana Beranova and Mr Pavel Moravcik) and Dr Tetsuhiko Yoshimura (Japan, a paper co-authored by Mr Kenta Kano).

9. The discussion highlighted the requirements of metadata and business analysis for FIS planning. The need to store historical information for mapping spatial events was also considered very

important and scalability was also highlighted. In addition, the development of capabilities towards multi-source technologies and information integration towards more stable, reliable and easy to use FIS was highlighted.

10. The workshop recognised the increasing diversification in the forestry sector including ownership, business practices, information holdings and information needs. The decentralisation and centralisation of the data model and analysis system were discussed and needs for improved information links especially in multi-organisation and/or international initiatives were detected.

TOOLS FOR OPERATIONAL FORESTRY

11. Under this item papers were presented by Mr Mikko Utunen (Finland), Dr Leena Finer (Finland, a paper co-authored by Mr Rune Solberg [Norway]), Mr Jean Favreau (Canada), Dr Tuomas Häme (Finland, a paper co-authored by Ms Eija Parmes, Mr Anssi Lohi, Mr Tapio Räsänen and Dr Pauline Stenberg), Mr Tani Höyhty (Finland, a paper co-authored by Mr Mikael Holm and Mr Seppo Väättäinen), Mr Lauri Vesa (Finland), Dr Audrey Martin (Ireland, a paper co-authored by Mr Nicholas Holden, Mr Philip Owende and Mr Shane Ward), Mr Mats Johansson (Sweden), Mr Peter Rauch (Austria), Mr Juha Kauppinen (Finland), Mr Tapio Räsänen (Finland), Mr Nikolay Rostovski and Mr Valery Saraykin (Russian Federation) and Dr Tetsuro Sakai (Japan, a paper co-authored by Dr Tetsuhiko Yoshimura).

12. The discussion highlighted the need for cost-efficient and easy to use IT solutions for forestry. Much development was detected in separate areas related to operational forestry. The GPS systems are already applied in timber transportation and are coming to harvesters as well. There has been a great deal of research in areas such as remote sensing and combining remote sensing with GPS. In future, the combination of these systems and results will form a basis for more effective, precise and accurate IT systems for supporting raw material supply harvesting and logistics of the whole chain.

13. However, the seminar recognised the large difference in mechanisation of harvesting in Scandinavian countries and the rest of the region. In addition, it was expected that the need for further developed IT systems would require more IT professionals in forest organisations at a time when the number of traditional forestry jobs have been decreasing. In these circumstances it will be challenging to make sure that forestry knowledge will be properly combined into the new FIS. The need for continued research and cooperation between practice, research and IT development was seen as a key factor towards effective, user-friendly and thus accepted FIS.

POSTER PRESENTATIONS

14. Posters were presented by Dr McCormack (Australia), Mr Bronner (Austria), Dr Holopainen

(Finland), Mr Höyhty (Finland), Mr Kauppinen and Mr Ylijoki (Finland), Mr Leskinen (Finland), Mr Penttinen (Finland), Dr Hecker and Mr Ressmann (Germany), Mr Ilushkin and Mr Mojaev (Russian Federation), Mr Kochnev (Russian Federation), Mr Romanjuk (Russian Federation), Mr Antonio and Mr Lara (Chile) and Mr Thiers (Chile).

15. CONCLUSIONS

(1) The workshop successfully demonstrated that computer and remote sensing technologies combined with advances in databases and GIS technology have finally been developed to a stage that provides **usable operational tools for foresters**. Similar advances in the practical application of research in these fields can be expected in the near future. In particular GIS are now becoming integrated into main information and management systems and not simply used as a mapping tool.

(2) The whole information production chain is facing numerous **new challenges**. The amount of the information required in forestry related decision making is constantly increasing and new issues are surfacing. Consequently additional data needs are arising.

(3) **Forest management and environmental management planning** are inextricably linked together. At a high political level there is a clear and understandable definition for sustainable forest management (SFM) - and much effort has been given to defining the criteria and indicators for SFM. However, there seems to be an increasing need for identifying and collecting credible data for describing the SFM status at the operational level.

(4) The role of the information systems is to **integrate** different data collection, transferring, processing, storing, retrieving, updating, modelling and dissemination functions. Cost efficiency is integral to all of these.

(5) The requirements of the information system for credible **up to date information** is extremely important. When aiming for comparable time series information, useable archives, event tracking and agreed reporting time frames are necessary. The information systems and the information produced have to be **user friendly** and flexible.

(6) Generally, the increasing amount of information to be processed sets high requirements for database and information **administration**.

(7) Differing scales and the '**whole of ecosystem**' **approach** set very high demands on data integration and thus, information systems.

(8) **Interactivity in information handling** and in the use of information systems are increasing in importance.

(9) It is apparent that users have to **participate** in the development of interoperable information systems. IT system developers must therefore be able to understand and respond to the needs of users. In addition, the users should participate in the design of information systems and in the development of user friendly tools that allow for easy access and customisation.

(10) **International organisations** have an important role in supporting the development of common definitions and terminology, which makes it easier to apply relevant parts of the data and information systems across national borders.

(11) **New technologies** including the World Wide Web and wireless communications, visualisation and data mining are increasing in importance in both decentralisation of the information systems and in the dissemination of all information.

16. **RECOMMENDATIONS**

A. Addressed to member countries

(1) The **security** of information against fraudulent or accidental corruption and misuse must be guaranteed.

(2) **Free access to environmental information** should be promoted.

(3) Communication and feedback mechanisms with **all relevant stakeholders** should be established and facilitated in the application of information services

(4) It is essential that the **methodologies and terminology** should be consistent, coherent, commonly agreed and understood at all hierarchical levels

(5) **Continuous education** should be promoted as an essential supplement to the basic training provided in the course of introducing information systems.

(6) Defining the usable data for describing **criteria and indicators for sustainable management of all forests** in inventories is not only a data problem. There may be a lack of knowledge and experience on how the criteria and indicators (c&i) should actually be applied in practice at the different levels: stand, forest holding, range, district, country and global. Data requirements should be well defined and in terms that are easily understood.

- (7) It is clear that the data have to be credible in describing the c&i. They have to be current, cover a range of spatial and temporal scales and be readily available. They must also cover the forest as an ecosystem and related ecological processes, not only the commercial forest portion. **Creation of metadata** should form part of the data collection protocol.
- (8) Future information systems should be designed to include all **available knowledge** in existing management planning tools in an understandable way. This requires further development and use of metadata tools.
- (9) New IT systems should be fully integrated to support **planning, implementation and monitoring forest operations** in a transparent process.
- (10) The member countries should support the **exchange of experiences** and production of the metadata describing the underlying models and information from information systems.
- (11) Development of the **global forest information service** should be encouraged.

B. Addressed to the Joint Committee

- (1) Information about the **current methods** and technologies should be disseminated on a broad scale. The Joint Committee should be charged with undertaking the task of setting-up the structures to allow this to happen. The Internet might be used as a medium for discussion about this topic
- (2) Users should be encouraged to be fully aware of **data and information quality** issues including such things as accuracy, resolution, currency, data gaps and other factors affecting the interpretation and use of the original, derived and value added data and information. The Joint Committee should sponsor the development and operational implementation of a forestry information Web-site to address these issues.
- (3) The **costs** of the development and use of information systems are high. Ways should be found to encourage networking, sharing and co-operation in order to decrease costs.
- (4) The Joint Committee as well as other international organisations should assist in addressing the requirements of **countries in transition**.
- (5) Countries have their own needs and objectives in information systems development, which may differ considerably, however, **standards should be developed and published**. This would create advantages for further work, essential in facilitating the development of systems, contents, knowledge

and information. Similarly, international efforts should be directed towards bringing more resources for making information systems more accessible for international information needs.

(6) The **international organisations and especially the Joint Committee have a major role** in monitoring this development and harmonising the national efforts to an internationally applicable and comparable level. There may be a need for a follow up process for real and operative application of c&i on national level for SFM and biodiversity. This may be achieved, for example, by requesting the Joint Committee to organise a follow up meeting on the topic at 2-3 year interval, after the member countries have organised their domestic activities.

C. Addressed to research institutes and IUFRO

(1) Full utilisation of the increasing amount of information requires the development of automated methods such as expert systems and data mining. However, these **methods should not prevent the users making their expertise heard in the decision making process.**

(2) Further development and application of **visualisation tools** are required to make increasingly complex information clear and understandable for all.

(3) Some of the above requirements may be achieved through the production of internationally comparable **meta-data.**

OTHER BUSINESS

17. The organizers provided the participants with the proceedings on CD-ROM at the beginning of the workshop. The proceedings will be up-dated with additional papers presented at the workshop and will be available at the Joint Committee website (www.unece.org/trade/timber/joint-committee).

18. Two study visits, on 'Forest industry logistics' and on 'Forest management and forest certification' were organized on Thursday 18 May. A brief account of these visits are set out in Annexes I and II.

19. The seminar expressed its heartfelt thanks to the Governments of Finland and to all those who had contributed to the organization of the workshop and the study visits and for the generous hospitality extended to participants.

ADOPTION OF THE REPORT

20. The meeting entrusted the secretariat to draft the report based on the texts prepared by the rapporteurs and on the conclusions and recommendations as adopted at the closing session of the workshop.

ANNEX I

EXCURSION 1 - FOREST INDUSTRY LOGISTICS

34 participants, PM-Kymmene Forest

1: Korkeakoski sawmill

Demonstration of Korkeakoski sawmill of UPM-Kymmene Group, Wood Products division. The sawmill is a middle size sawmill within the company producing mainly pine sawn goods. Automatic quality grading systems are in use at the sawmill. Demonstration of processing.

2: UPM-Kymmene Forest Headquarters in Valkeakoski

Presentation of the UPM-Kymmene Group and UPM-Kymmene Forest. Presentation of the wood origins, wood procurement operations and the management systems, especially timber transport management and optimisation systems. Presentation of the company's forest land owning and the politics and principles of the forest management. Presentation of the GIS systems used in forest management and wood procurement operations. Demonstration of OstoGIS that is used as a help for searching suitable forest lots to be purchased. The system is based on digital estate borders and the forest maps of Finnish National Forest Inventories.

3: Harvesting logging residues for fuel wood

Demonstration of new developed techniques and machines for harvesting logging residues from spruce dominated clear-cuts. The residues are collected after they have been left for drying for 0,5 – 1 year. There are two different machine concepts in practical use for producing fuel wood chips at the roadside. The methods have been developed by the entrepreneur company, machine manufacturers and UPM-Kymmene. There is a set goal in UPM-Kymmene to increase the use of wood for energy production at their own mills. Harvesting the logging residues from spruce clear-cuts is the most prominent origin of energy wood. This is because of the relatively great volume of residues, the fact that the loss of nutrients does not effect very much on future growth on fertile soils and because the harvesting makes the site preparation and planting easier to carry on, so that the forest owners favour it although nothing is paid for the wood.

4: Harvesting site

Demonstration of a spruce clear-cut and the logging methods. Presentation of a timber truck with GPS, digital maps and data communication systems. Presentation of Timberjack harvesters with special emphasis on the merchandising computers and the bucking automatics.

Presentation and discussion: systems for controlling the bucking according to the mills' needs for different timber assortments and log dimension distributions, harvester standard for forest data and communication (StanForD), timber measurement by harvester and controlling it, use of GPS and digital maps in the harvesters for helping the harvester driver, possibilities of recording GPS-coordinates together with measurement data for different purposes (e.g. updating the borders of the logging site).

ANNEX II

EXCURSION 2

FOREST MANAGEMENT AND CERTIFICATION OF FORESTS

47 participants

Introduction to the excursion (in the auditorium)

Presentation of administration and management systems of the state enterprise Metsähallitus - Forest and Park Service. Clarification of the concepts “landscape ecological planning” and “certification of forests”. Their links to the Finnish Forestry Act and the Nature Conservation Act. *Discussion:* especially, the cost of biodiversity enhancement and the distinctions as well as similarities between separate certification systems.

1: Brook

Demonstration of the effects of the Forestry Act and PEFC certification on cutting and reforestation of immediate surroundings of brooks and rivulets. *Discussion:* the criteria of being close to virgin state. The absence of logic of certification in certifying timber management (stands) and products.

2: Diverse regeneration area

Demonstration of application of alternative regeneration methods. Compliance with landscape ecology. Information in thematic maps. Certification aspects. *Discussion:* target densities of sapling stands. Maintenance of stand register data and compartment geometry. The role of linear programming in selection of stands to be cut. Logging methods, especially those of logging residue.

3: Typical even-aged stand in the first thinning stage

Demonstration of a commonplace site, thinning schedule, target stocking and species composition.

Discussion: rotations, logging methods, timber assortments, acceptability of heavy thinning for low harvesting costs. Certification considerations.

4: Typical regeneration area

Demonstration of an ordinary clearing, with special emphasis on the selection of standards, also in relation to forest certification. *Discussion:* cultivation methods, desirable tree species composition, prescribed burning, insect damage, herbicides and pesticides.

5: Cliff

Demonstration of an important forest habitat. The practical consequences of being considered particularly valuable. Distinctions between Forestry Act and certification standards.

Discussion: similarity with corresponding German regulations.

6: Large sawmill

Demonstration of processing of sawn goods. Presentation on wood procurement and marketing.

7: Unkila farm

Demonstration of a well managed, larger-than-normal farm. Key facts were presented on page 9 of the handout. *Discussion:* sources of income, share of forestry, role of the forest owners' association, subsidies from the EU for farming and forestry, the share of farm forestry of private forestry as a whole, forest management planning, farm tourism, game management. Certification and QMS.

8: Regeneration area in a private forest

Demonstration of a clearing, where site preparation, planting and sowing were appropriately carried out. The standards and seed trees were assessed. Presentation was given on the co-operation between a forest owner and their association.

ANNEX III**LIST OF PAPERS PRESENTED AT THE WORKSHOP****Session 1 "Overview of Information Systems"**

<i>Title of the Presentation</i>	<i>Authors</i>	<i>Country</i>
The Role and Importance of Modern Forest Information Systems in the Implementation of the National Forest Program in Finland	Mr Tapani Makinen	Finland
The G.I.S. at the French Forestry Office : A first step towards an integrated forestry information system	Ms Anne Jolly	France
UN-ECE/FAO Temperate and Boreal Forest Resource Assessment-2000 - An International System for Collecting, Processing and Disseminating Information on Forest Resources	Mr. Jorge Najera, Dr. Jari Varjo	UN-ECE/FAO Finland
WearPC - the Future on Personal Electronics Building a National Forest Information System for Canada	Prof. Jukka Vanhala Mr Robin Quenet	Finland Canada
European Forestry Information and Data Analysis System - EFIDAS	Mr Chijien Lin	Finland
Information server prototype for Global Forest Information Service - GFIS	Mr Jarmo Saarikko	Finland
Using WinGis2000 in forest operations	Mr Walter Mayer	Austria
hs2000 - A Concept of Information System	Mr Branko Mestric & Mr Ratko Matosevic	Croatia

Session 2 "GIS in Forestry"

<i>Title of the Presentation</i>	<i>Authors</i>	<i>Country</i>
Geospatially enabled information systems supporting forest decisions at the millennium: a U.S. perspective	Dr. Jeremy Fried	USA
The State of Forestry Information Systems in Germany	Professor Hanns Hoefle	Germany
The Finnish Forest and Park Service's Geographical Information System	Mr Ismo Minkkinen & Mr Jarmo Leskinen	Finland
Managing the Change to GIS in Forest Enterprise	Mr Ben Ditchburn	United Kingdom
The Development of GIS for Forest Enterprise's GIS	Mr Roger Coppock	United Kingdom

<i>Title of the Presentation</i>	<i>Authors</i>	<i>Country</i>
Modelling local participation and multiple use in sustainable forest management based on spatial landscape analysis	Mr Esa Arola	Finland
Improved follow-up of forestry measures with tools for satellite image analysis	Mr Erik Willen	Sweden
Information Forestry Management System of the Republic of Belarus	Prof. Oleg Atroshchanka	Belarus
"Counting our trees" - the Australian National Forest Inventory	Ms Claire Howell & Ms Mellissa Wood	Australia
Remote sensing material in forest regeneration monitoring	Dr. Timo Saksa	Finland
Using Landsat TM Data for Classification of Tree Species on National Level	Dr. Miroslav Gecovic	Slovakia
Field-Map: software tool for computer aid field data collection	Dr. Martin Cern	Czech Republic
Navigation and Field Data Collection in the Japan Collection in the Forest Using a GPS-mounted computer	Dr. Tetsuhiko Yoshimura & Mr Kenta Kano	

Session 3 "Tools for Operational Forestry"

<i>Title of the Presentation</i>	<i>Authors</i>	<i>Country</i>
Forest Information Systems in StoraEnso operations	Mr Mikko Utunen	Finland
Forest Environmental Monitoring and Management System - FOREMMS	Mr Rune Solberg & Dr. Leena Finer	Norway/Finland
Interface 2000: Software for Calculating the cost of Integrated Harvesting and Regeneration Operations	Mr Jean Favreau.	Canada
Combining digital airborne data and satellite images for stand-wise forest variable estimation	Dr. Tuomas Höme	Finland
Possibilities of Digital Aerial Imagery for Forest Monitoring	Mr Tani Höyhtyä	Finland
ForestCalc Forest mensuration and inventory application	Mr Lauri Vesa	Finland
Measuring DGPS performance with respect to peripheral canopy on forest roads	Dr. Audrey Martin	Ireland
A description and experiences of a tool for operational forestry planning in AssiDomän	Mr Mats Johansson	Sweden

<i>Title of the Presentation</i>	<i>Authors</i>	<i>Country</i>
Wood-production chain in Austria and possibilities for optimal value added	Mr Peter Rauch	Austria
Mobile Data Communication in Harvesting and Transportation Management - case: The Forest and Park Service	Mr Juha Kauppinen	Finland
Tree data warehouses - new methods for pre-harvest information	Mr Tapio Rösönen	Finland
Global Information Analytical Trade System	Mr Nikolay Rostovski & Mr Valery Saraykin	Russian Federation
Forest and Timber information system using WWW for market and & producer	Dr. Tetsuro Sakai & Dr. Tetsuhiko Yoshimura	Japan

Note - *The full text of the papers are available on CD-rom or can be downloaded from the Joint Committee website: www.unece.org/trade/timber/joint-committee.*