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Forest Harvesting Bulletin

Promoting Environmentally Sound Forest Practices Worldwide

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Above: Reduced impact logging recognizes that tropical forests are places where people live.



Right: Sawing logs on-site can reduce extraction impacts.

Reduced Impact Forest Harvesting

Reduced-impact logging (RIL) techniques are being designed and implemented around the world in order to improve resource use efficiency and conservation in the management of forested areas for timber production. Forestry enterprises are consequently targeting more sustainable, polycyclic timber harvesting in permanent production forests. RIL, the harvesting element of a sustainable forest management programme, is fundamental to achieving this goal.

In this issue of the Forest Harvesting Bulletin, we examine some recent RIL activities and take note of other important efforts world-wide.

What is Reduced Impact Logging (RIL)?

The term “reduced impact logging” has come to mean improved forest harvesting. It is actually a package of practices and technologies and includes more than simply felling and

extracting timber. Killmann et al. (2001) defined RIL as: “Intensively planned and carefully controlled implementation of harvesting operations to minimize the impact on forest stands and soil, usually in individual tree selection cutting.”

RIL is not a new concept, rather a transfer of well-established approaches from temperate forests to the tropics (Dykstra 2001). Although practices vary somewhat according to local conditions and circumstances, RIL generally includes, but is not limited to, the following:

- Pre-harvest inventory and mapping of individual crop trees;
- Pre-harvest planning of roads, skid trails, and landings to provide access to the harvest area and to the individual trees scheduled for harvest while minimizing soil disturbance and protecting streams and waterways with appropriate crossings;

- Pre-harvest liana cutting in areas where lianas inter-connect tree crowns;
- The use of appropriate felling and bucking techniques, including controlled felling;
- Construction of roads, landings and skid trails that adhere to engineering and environmental design guidelines;
- Winching of logs to planned skid trails and ensuring that skidding machines remain on the skid trails at all times;
- Conducting a post harvest assessment in order to provide feedback to the concession holder and logging crews and to evaluate the degree to which RIL guidelines were successfully applied.

Research comparing RIL and conventional logging in Brazil, Ecuador, Guyana, Indonesia, Malaysia and Suriname has conclusively demonstrated that, at similar levels of extraction, RIL reduces residual tree mortality and better conserves the ecological integrity of managed forests. The results of economic studies on the benefits of RIL are less conclusive, although recent studies in the Eastern Amazon suggest that despite the perceived investment risks, RIL harvesting operations were less costly and more profitable than conventional logging.

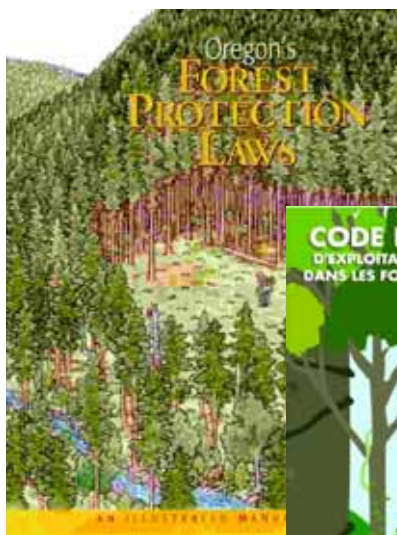
Promoting RIL

Oregon's Forest Protection Laws: An Illustrated Manual is a recent publication showing how improved forest practice may be implemented as law. This 160 page illustrated manual is designed to help forest landowners, operators and foresters manage forestlands under the rules of the Oregon Forest Practices Act. It describes the rules and rationale behind them, and illustrates how forest operations can be managed in compliance with them. Regrettably, the archaic measurement system of the United States is used throughout the manual.

This is an interesting manual for anyone concerned with improving forest practices. It shows how one jurisdiction has addressed the problem. It includes an abundance of high quality photos and graphics.

Copies of this manual can be ordered for ten dollars. Send a request to info@ofri.com.

FAO significantly advanced the concept of RIL when it produced the FAO Model Code of Forest Harvesting Practice. Building on this, FAO worked with the 29 member countries of the Asia-Pacific Forestry Commission (APFC) and various partner organisations, including



The FAO Forest Harvesting Bulletin

This is produced annually for distribution to about 5000 individuals, field projects, institutions and organizations interested in environmentally sound forest harvesting and transport, especially in developing countries and in countries undergoing the transition to market economies. The *Bulletin* forms part of the networking and technology transfer activities of the **Forest Harvesting, Trade and Marketing Branch** of FAO, the Food and Agriculture Organization of the United Nations.

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Cover photos: FAO photo library

ITTO, to develop the Code of Practice for Forest Harvesting in Asia-Pacific, which was published by APFC in 1998.

Attention has now shifted to the implementation of the code, developing national codes, training, and generating political commitment. Recently, FAO has been working with Central and West African countries to draft a regional code for that part of the world.

This code written in French, *Code régional modèle d'exploitation forestière à faible impact dans les forêts denses tropicales humides d'Afrique centrale et de l'Ouest*, will be available from autumn 2003. The English version will be published early 2004 and a detailed description of the model code will be provided in the next issue of the Forest Harvesting Bulletin.

RILSIM: A financial simulation modelling system for RIL

One important way of promoting RIL is to allow individual loggers a preview of the impact of RIL on their profits. In 2001, a team of international experts began developing software with the primary aim of assisting loggers, government forest officials, policy makers and the private sector to better understand the financial costs and benefits of reduced impact logging practices.

RILSIM (Reduced Impact Logging Simulator) is a discrete-event deterministic computer simulation model designed to permit users to rapidly compare the cost of reduced impact logging against the cost of conventional logging under identical local site conditions. Data entry is achieved through a series of "data forms" that users complete based on local conditions, wages, equipment costs, logging activities, production rates, and other factors relevant to the analysis. The analysis then shows the profitability of using RIL.



Aside from permitting rapid comparison of logging costs, RILSIM has also been designed as a teaching tool, with a "context sensitive" help system that describes the principles of financial analysis and guides users through each stage of a simulation run. It is intended to be useful for not only loggers but also for government foresters, specialists in development assistance agencies, university students, members of environmental groups, and the general public.

The model will be available from July 2003, at no cost if downloaded over the Internet (www.apfcweb.org) and for a

nominal fee on CD-ROM and can operate on computers with little memory and limited disk capacity. It is easy to install and use and requires no additional software. RILSIM is compatible with Windows 95 and all the later versions of the Microsoft Windows operating system.

The software has been written in Microsoft C++ and the source code is available to users who

might want to translate text into other languages or tailor the analytic procedures to their specific requirements.



Second Forest Engineering Conference Växjö, Sweden 12–15 May 2003

www.skogforsk.se/fec

The attendance at this second Forest Engineering Conference, the first was in Edinburgh in 1999, is expected to be over two hundred. These attendees represent more than thirty countries. Nearly sixty papers are to be presented along with a full poster session. Here is a sampling of the conference papers.

Environmental impacts of modern harvesting systems on soil, new results of a technological assessment Thomas Wehner (Germany)

A method was developed that connects subsurface pressure measurements with video studies of modern high performance harvesting machines. The influence of leverage, machine mass, driver behaviour, crane reach, chassis construction and much more can be determined. Under real operating conditions, the measured effects of harvesting machines can be substantially larger than expected. An intelligent combination of logging systems helps conserve productive forest acreage. It is very important to concentrate any impacts on a permanent, well-designed skid trail system.

Soil disturbance caused by forestry machines in Japan and the new technique to simulate soil deformation K. Aruga and Y. Shigeta (Japan)

Research on soil compaction caused by a semi-legged vehicle and a small feller-skidder were conducted using a cone penetrometer. Since the semi-legged vehicle relies solely on

the boom for locomotion, great forces are produced. A Distinct Element Method (DEM) was used to analyze soil deformation caused by machines. DEM can analyze noncontinuous materials since it represents soil as independent particles. DEM is being used for the development of wheeled and tracked vehicle models.

Measuring the goodness of the bucking outcome V. P. Kivinen, J. Uusitalo and T. Nummi (Finland)

The quality of bucking has mainly been measured by calculating the relationship between the demand log distribution and the actual output distribution by assigning the output matrix a value between zero and one. Some requirements for an ideal goodness-of-fit measure are listed and three alternative measures for determining the similarity between the demand distribution and output distribution are presented.

Expert Systems in Forest Roads Design Ahmad Che Abdul Salam, Abdul Rahim Nik, Siti Aisah Shamsuddin and Mohd Md Sahat (Malaysia)

Designed forest roads are essential for harvesting and transportation of timber. The application of computers in forest road design has long been attractive. This paper postulates the application of expert systems in forest road design to create and describe new solutions, to explore and understand the solution space and to move with confidence to the decision points. Expert systems can be used in designing forest

roads for tactical planning and for sustainable forest management.

Road maintenance with *Opti-Grade*®: maintaining road networks to get the best value

Mark Brown, Steve Mercier and Yves Provencher (Canada)

Road management systems rely on the availability of quality information to make good decisions. In the case of the Canadian forest industry, transportation costs are escalating along with the size of their road network. A lack of information on the state of their unpaved road network was leading to expensive inappropriate management decisions in maintenance scheduling and activity. To fill this information gap the Forest Engineering Research Institute of Canada (FERIC) developed a tool to collect important information on the condition of the road network on a regular basis; the *Opti-Grade*® road management system. *Opti-Grade*® is a low cost tool that provides information on the road roughness and travel speed as the equipped road user's vehicle travels on the road network. *Opti-Grade*® is currently used by a large sector of FERIC member forest companies with payback periods of less than four months.

Avoiding soil damages caused by forest machines

M. Ziesak (Germany)

The use of wheeled and tracked machines is a widely seen and well-accepted practice in European forests. For a wheeled machine, the important factors affecting the energy impact on the soil are: the load per wheel, the dimension of the wheel, the type of wheel and the inflation pressure of the tire. The ability of the soil to carry a certain weight without being damaged depends primarily on the soil type and the soil water content. Soil water content is the only parameter varying over the time; all other items are fixed. This knowledge made it possible to develop an easily used computer-based information-system to determine the maximum soil water content that will allow operation without soil damage.

Attitudes and perceptions of logging contractors, foresters and other participants in the wood supply system towards education and training opportunities

L. A. Grace, J. B. Auel and W. B. Stuart (USA)

The introduction of the Sustainable Forestry Initiative in the United States created a demand for increased education and training opportunities for logging contractors and other participants in the wood supply system. The initial set of four workshop modules covers topics including sustainable forestry, certification, biodiversity, endangered species, safety and a wide range of business management issues. Participants, over 3000 firms, have included logging contractors, landowners, forest industry employees, consulting foresters,

wood dealers as well as state and federal foresters. Attitudes and perceptions of various participant groups towards various aspects of the existing program were evaluated. Perceived needs for additional educational programs were also examined. The investigation has identified areas where cross-training between various segments of the wood supply system offers promise to improve overall system performance.

The impact of operator fatigue on harvesting machine productivity, time of day and total hours worked

Andrew Nicholls, Leon Bren and Neil Humphreys (Australia)

The owners of many harvesting businesses have been under pressure by falling margins to test various models of operating extended hours. However, after brief trial periods operating on extended hours, most businesses reverted to short-term solutions to meet peaks in demand for wood. Operator weariness can lead to a marked loss of productivity, as well as higher maintenance and operating costs.

Operator reaction time was increased by four factors. It increased in the mid morning coinciding with circadian tiredness and at night when less than the recommended amount of light was supplied by the harvesting machine. Reaction time also increased when cabin temperature and CO₂ readings reached higher than recommended levels. The average working shift was about ten hours. Operators were not highly conscious of their fitness and dietary health.

SmartDriver for forestry trucks: the Canadian experience in training truckers to reduce fuel consumption.

Yves Provencher (Canada)

The Forest Engineering Research Institute of Canada has developed a training package called "SmartDriver for Forestry Trucks". SmartDriver helps truck owners and drivers reduce fuel consumption by addressing all aspects of trucking from buying the truck to smart operating and maintenance strategies. The package is offered on a CD-ROM for "self-training", but also includes all the material required for classroom training. SmartDriver training has been offered in many Canadian forest operations with good success. The presentation discusses two ways of introducing the training package to drivers and evaluating the performance results. The paper also discusses how best to introduce the program to students.

New Staff Member in FOPH

Simonne Rose joined FAO on 1 April 2003. She will work



with FOPH in the field of post harvest impact assessments. A national of Guyana, she holds a PhD in Forest Ecology from Utrecht University, The Netherlands. Ms. Rose has spent most of her professional career with the Tropenbos-Guyana Programme where she has studied the effects of conventional and reduced impact logging on the residual forest stand.

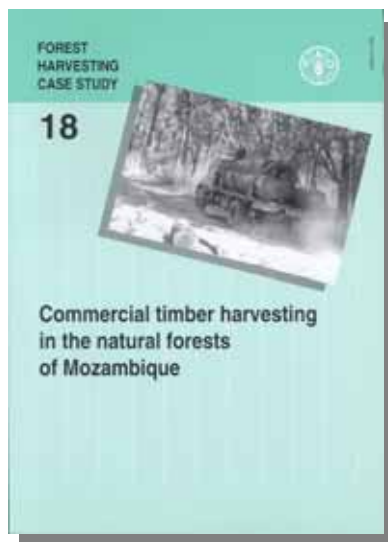
More recently she has been involved in restoration of fragmented riparian zones in Far-North Queensland, Australia.

Forestry Fairs, these are trade fairs with live demonstrations in a forest. See: www.forestryfairs.com

2003,	7-9 October	Austrofoma, Austria
2004,	21-23 April	Forexpo, France
2004,	16-19 June	KWF-Tagung, Germany
2004,	2-4 September	Metko, Finland
2004,	23-25 September	APF, UK
2005,	1-4 June	Elmia Wood, Sweden

Commercial timber harvesting in the natural forests of Mozambique

FAO Forest Harvesting Case Study 18



This case study was written by **Henning Fath** and published in 2002.

The forest industry in Mozambique is composed mostly of small-scale enterprises with production capacities below 2,500 m³ per year. This study analyzes five enterprises in northern, central and southern Mozambique to establish knowledge on the efficiency of commercial forest harvesting. Efficiency was evaluated by means of operational, organizational, energy, and financial indicators. Operational data were collected through time studies with continuous timing. Costs per machine-hour were calculated with the *Production and Cost Evaluation Programme—PACE* (FAO 1992). Intermediate results on output were then related to inputs, yielding indicators for operational, organizational, energy and financial efficiency.

The operating sites are characterized by the following data table. Note the striking variation in quantities measured among the sites.

Table 1: Operational characteristics

Study site	1	2	3	4	5
Extracted volume [m ³ /ha]	0.96	5.17	2.90	13.89	2.24
Skidding distance [m]	265	38	436	90	325
Hauling distance [km]	153.4	23.5	293.5	49.0	254.5
Annual production [m ³]	600	150	1,600	480	2,400
Break even point [m ³]	2,217	770	3,119	758	1,473

Some findings:

- Logging operations, although well synchronized and productive within work cycles, occurred in a scattered and unsystematic scheme. Harvest planning was lacking.
- Demand concentrated on a small number of harvestable species with maximum diameter, lack of harvest preparation, low recovery rates and improper working techniques in felling and crosscutting resulted in low extraction intensity.

Table 2: Productivity within work cycles [m³/ha]

Study site	1	2	3	4	5
Felling & crosscutting	2.13	1.11	5.83	1.99	6.79
Skidding	3.43	3.80	3.13	8.27	3.58
1 st Transport	1.62	0.94	1.79	0.18	1.50
2 nd Transport	2.50	—	0.61	—	1.39

- Transport was the main bottleneck in operational efficiency (see table 2). Poor road conditions and low load capacities of vehicles used in first (short-distance) transport and second (long-haul) transport prevented a consistent flow of raw materials and consequently held annual production volumes well below technological capacities.
- Financial efficiency varied depending on production volume, the degree of conversion of the final products and the distance between the logging area and sawmill or sale site.
- Second transport incurred the largest share of production costs per unit. Low annual production volume, low productivity and processing boosted unit costs and created pronounced deficits. Break even points for transport distances were 15 kilometres and 120 kilometres for first and second transport respectively.

Table 3: Financial characteristics [US\$/m³]

Study site	1	2	3	4	5
Product selling prices	75.00	100.00	130.00	262.50	50.00
Profit margin	-108.67	-205.51	-44.87	-101.64	13.78
Capital intensity	49.47	40.13	63.03	20.45	25.56

- Break-even points were in most cases beyond actual production volumes but still within limits of technological capacity. Four out of five companies had negative profit margins. Selling prices were varying largely due to different kinds of products. While Sites 1, 3 and 5 were selling logs and lumber respectively, Site 2 sold parquet scantlings and Site 4 truck decks.

A typical small-scale logging enterprise starts production on the basis of a cutting license granted for 500 to 2,500 m³ without investing in a management plan, road network, or spatial structuring. Scattered timber resources strangle raw-material flows right from the beginning. Extraction and transport bring high unit costs for fuel, lubricants, tyres, and wages, which internal accounting perceives as production costs. Sales revenues hardly cover the expenses of current production. In order to save apparent profit, the company reduces expenses for fuel and spare parts by slowing down current production rather than taking positive action. Many companies were entangled in this spiral of declining efficiency that finally forced them to suspend their harvesting activities.

Recommendations from the study focus on raising extraction intensity through harvest preparation and optimised use of all available commercial species, and on reducing production costs by restricting transport distances and allocating processing units as close as possible to logging areas.

International Labour Office (ILO)

Safety and health make economic sense

Life is often hard and dangerous for the tens of millions of people who work in forests or depend on them for a living. High accident rates and poor working conditions are not only detrimental to the workforce, they also constitute a major impediment to the implementation of RIL.

Most forestry work is still characterised by a difficult working environment, heavy physical effort and a high risk of accident. This often results in a vicious cycle of low productivity, poor wages and an unstable workforce. High labour turnover provides a poor base for skill development, which in turn is a precondition for the effective implementation of RIL.

Often eclipsed by the more visible accidents are the serious health problems associated with forestry, particularly those related to excessive physical workloads, noise and vibration. These can induce life-long impairments and serious illness and are a major reason for employees leaving their jobs prematurely.

Accidents cost money, often much more than meets the eye. Paradoxically, safety has tended to be neglected because of economic difficulties. In view of the cost of inaction, such difficulties should really have had the opposite effect and been a major stimulus for tackling safety issues. One reason why this has not happened might be that management often does not know the real cost of accidents. Many of the indirect costs are not obvious or easy to assess. A case-study from Malaysia (Manikam 1985) provides data suggesting that the indirect costs of poor work safety can be up to six times higher than the direct cost. See www.ilo.org.

Health and Safety

Tools, such as chainsaws and massive machines, pose hazards wherever they are used. The hazards are even more dangerous when environmental conditions such as rough terrain and inclement weather are included. Often the remote work locations make access to healthcare facilities difficult.

A U.S. safety and health organization provides a website, *Logging Technical Advisor*, designed to provide expert safety assistance for businesses and workers at: www.osha-slc.gov/SLTC/logging.



Another on-line site is provided by the National Timber Harvesting and Transportation Safety Foundation at: www.loggingsafety.com.

Safety with mechanization

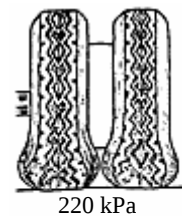


One of the ancillary benefits of mechanized harvesting systems has been a reduction in harvesting accident rates. Do radio controlled chokers yield such a benefit? Some technical details are available at: www.jlogging.com.

News and Notes

Central tire inflation

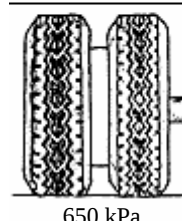
Central tire inflation allows an operator to vary the inflation pressure of a vehicle's tires while it is moving. Several agencies including FERIC, SkogForsk and USDA have documented the benefits of variable tire pressure. Reduced inflation pressure increases the tire "footprint." The result can be improved traction, improved vehicle ride, increased tire life, reduced road maintenance, extended hauling season and reduced environmental impacts.



Experience in operating and manufacturing the systems has resulted in reduced costs and greater confidence in the net benefits of these systems. Here are two websites for detailed information.

www.tirepressurecontrol.com

www.roadranger.com



Wild fern harvesting

Native ferns such as deer fern (*Blechnum spicant*) and sword fern (*Polystichum munitum*) are highly desired products in the nursery industry for use in landscaping and restoration. If managed correctly, wild fern harvesting, as with other Non-Wood Forest Products (NWFP), could be a sustainable and viable industry.

The FAO NWFP-Digest-L No. 2-03 notes that fern harvest prior to road building is clearly a salvage activity. Proposed and flagged logging roads in western Canada have been identified and selected for harvesting trials in order to help determine the ecological sustainability and economic viability of whole fern plant extraction.

Forestry dictionary

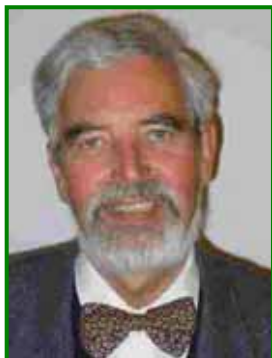
This forestry dictionary is a product of the members of the Forestry Demo Fairs. The need to find the right forestry word in different languages is increasing in our more globalized world. More than 2000 words are translated into English, German, French, Swedish, Finnish, Spanish, Portuguese and, on the Internet, even Latin for botanical species. The dictionary is continuously being developed by the members of the network. Find it on the Internet at: www.forestryfairs.com.



Education database

The forestry education database provides information on short courses available worldwide on forestry and related subjects. Users can search according to training area, institution and country. Besides providing information to students, the database gives education and training institutions the opportunity to advertise the short courses they offer. For more information, email: FREE@fao.org or check the database at: www.fao.org/forestry/for/for/free/education/courses.asp.

Farewell to Rudolf Heinrich



Dr. Heinrich is retiring from FAO after nearly 30 years of service.

Rudolf Heinrich would like to take the opportunity of his farewell from FAO to thank his staff members for their dedication and hard work throughout the years, and in making a substantial contribution in assisting FAO Member Countries in furthering the cause of forest development, sustainable forest conservation and utilisation.

He also wishes to thank all those who have through the years extended to him collaboration, friendship and support through his many professional and personal contacts during his work assignment with FAO.

Rudolf Heinrich has been associated with FAO since January 1972. His main work with FAO was in the fields of forest harvesting, engineering, trade and marketing, evaluation of the environmental impact assessment of forest operations, forest workers safety and health, ergonomics, forest road construction and road transport, environmentally sound forest management, sustainable forest practices and project management for sustainable forest development comprising environmental, social and economical factors.

In 1983 he was appointed Chief of the Logging and Transport Branch. Under his leadership, the Branch was renamed Forest Harvesting and Transport Branch, which in recent years became the Forest Harvesting, Trade and Marketing Branch of the FAO Forestry Department at headquarters in Rome.

During his assignment with FAO, Dr. Heinrich was frequently called to lecture at various universities throughout the world, such as, Munich (Germany), Oregon (USA), Val-

divia (Chile), Garpenberg (Sweden), Harbin (China), Los Baños (Philippines), Bogor (Indonesia), Chapingo (Mexico), Paraná (Brazil) and Vancouver (Canada).

He has also carried out a number of consultancies with International and Bilateral Organizations, such as, World Bank, WFP, ILO, UNIDO, UNDP, EU, ECE, IUFRO, CIFOR, ICRAF, FINNIDA, SIDA, GTZ, NORAD, Austrian Development Aid and USAID.

During his assignment with FAO, Dr. Heinrich has produced more than 70 publications in his field of expertise and carried out for FAO Member Countries more than 100 special missions.

From January 2000 to July 2001, Rudolf Heinrich was on sabbatical leave from FAO and served as a Special Envoy at the Austrian Embassy in Italy dealing with international forestry development projects.

Besides his tasks as Chief of the Forest Harvesting, Trade and Marketing Branch, Dr. Heinrich has been a member of the Secretariat of the FAO/ECE/ILO Committee on Forest Technology, Management and Training and presently he is Chairman of the IUFRO Working Group on Forest Operations in the Tropics.

Recently, he received the honour of being nominated as a permanent member of the Academy of Forestry Sciences in Florence.

The *FAO Forest Harvesting Bulletin* team wishes to express its gratitude to Rudi Heinrich for the longstanding successful leadership in publishing the *Bulletin* since 1992 and his close and cordial friendship.

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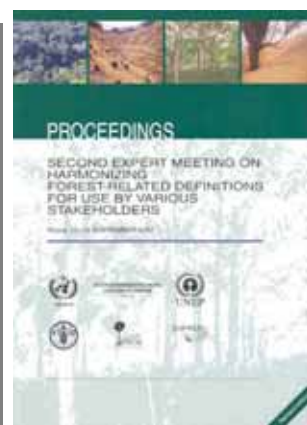
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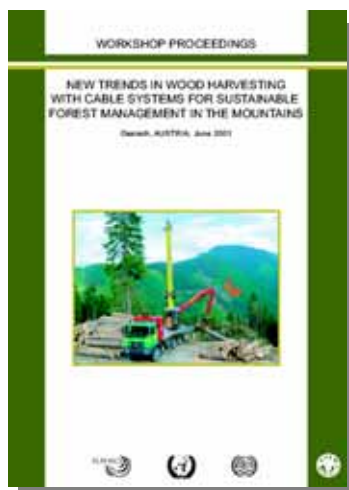


STATE
OF THE WORLD'S
FORESTS
2003



FAO 2003. *State of the World's Forests*. FAO reports every two years on the status of forests, recent major policy and institutional developments and key issues concerning the forest sector (see www.fao.org/forestry).

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Meetings

2nd International Precision Forestry Symposium, 15–18 June 2003, **Seattle, Washington**. Sponsorship and support by USDA Forest Service, FERIC and IUFRO (see the web site: www.cfr.washington.edu/outreach/PreFor).

3rd International Wind and Trees Conference, 17–24 August 2003, **Zurich, Switzerland**. Contact: Reinhard Lassig, Email: laessig@wsl.ch.

Council on Forest Engineering (COFE), 7–10 September 2003, **Bar Harbor, Maine, USA**. Annual COFE Meeting (see: www.cofe.org).

Forest Operation Improvements in Farm Forests, 9–14 September 2003, **Logarska dolina, Slovenia**. This workshop is organised by the Joint FAO/ECE/ILO Committee, IUFRO and the Slovenian government (for further information please contact Joachim.Lorbach@fao.org or see the web site: www.unece.org/trade/timber/tc-meet.htm).

XII World Forestry Congress, 21–28 September 2003, **Québec City, Canada**. “Forests, source of life” is the theme for this largest international meeting in the field of forestry (see: www.wfc2003.org).

High-tech Forest Operations for Mountainous Terrain, 5–9 October 2003, **Schlaegel, Austria**. A two day technical

conference followed by an optional visit to Austrofoma 2003, a live demonstration and presentation of forest machinery in Austrian forest conditions. The focus is on skyline harvesting technology and environmentally sensitive forest practices (see: www.boku.ac.at/austro2003).

Seminar on Close-to-nature Forestry, 14–19 October 2003, **Zvolen, Slovakia**. A seminar organized by the Slovak Forest Research Institute and the Joint FAO/ECE/ILO Committee (see: www.unece.org/trade/timber/tc-meet.htm).

International Conference on Quality Timber Products of Teak from Sustainable Forest Management, 2–5 December 2003, **Peechi, Kerala, India**. ITTO and IUFRO. Contact: K. M. Bhat, kmbhat@kfri.org, Kerala Forest Research Institute, website: www.kfri.org/html/k0500frm.htm

New Roles and Modes of Operation of Forest Services, September 2004, **Netherlands**. A seminar by the Joint FAO/ECE/ILO Committee (additional information will be available at: www.unece.org/trade/timber/tc-meet.htm).

Environmentally Sound Forest Roads and Wood Transport, 2004, **Hungary**. A seminar by the Joint FAO/ECE/ILO Committee (additional information will be available at: www.unece.org/trade/timber/tc-meet.htm).

Seminar on Forest Operations, 2004, **China**. IUFRO Division 3 (additional information will be available at: <http://iufro.boku.ac.at/iufro/>).