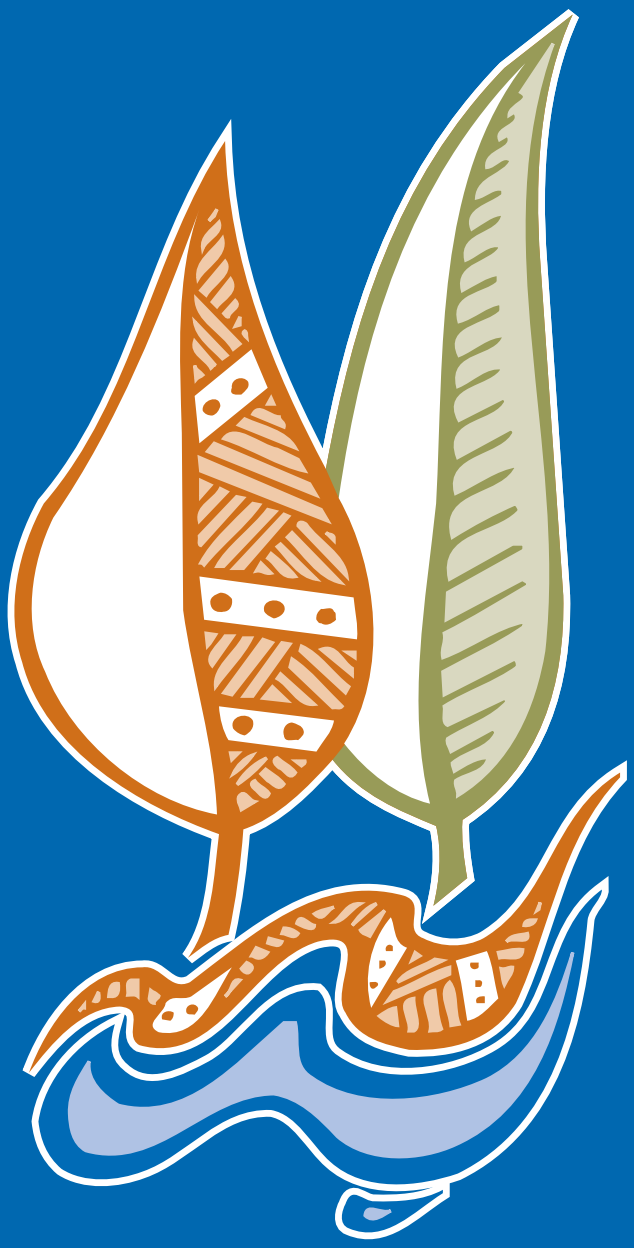


XXII IUFRO WORLD CONGRESS

8 – 13 AUGUST 2005
BRISBANE AUSTRALIA

Forests in the Balance: Linking Tradition and Technology

CONGRESS REPORT

INTERNATIONAL HOST

IUFRO

AUSTRALIAN HOST

Queensland Government
Department of Primary Industries and Fisheries

ISSN 0727-6273
QI 05125

Disclaimer

Manager, Publications
Department of Primary Industries and Fisheries
GPO Box 46
Brisbane Qld 4001

Contents

Preface

After waiting 113 years to host the IUFRO World Congress the Aussie organising team and their many volunteer supporters pulled out all stops to entice, enrol and ensure participants enjoyed the 22nd Congress.

Over 2100 participants from 90 countries shared their passion for forestry research, innovation and application in the friendly city of Brisbane. And there were many opportunities to supplement professional discourse with cultural entertainment and local sightseeing.

The weather was "Queensland perfect" for outdoor events such as the tree planting where young indigenous performers inspired the attendees with their vigour and messages on what trees mean to them. The sun shone for the in-congress tour day when 1400 delegates boarded buses and ferries and were whisked off to over 75 different inspection sites within the southeast region.

The Scientist Assistance Program made it possible for over 80 younger scientists from developing countries to be invited to attend Congress. The majority were women and many were able to participate in the pre-congress training courses. An innovative 'Making the Most of Congress' session gave 200 new attendees a taste for what to expect and pointers on optimising their involvement.

Five keynote speakers provided inspirational platforms for later panel discussions. While all presenters came from different disciplines the Congress theme of "Forests in the Balance: Linking Tradition and Technology" provided an apt, linking focus, whilst the recurrent use of the newly resurrected dinosaur tree (Wollemia nobilis) offered a real life example.

The range of technical session coverage augmented by quality posters was simply awesome. A rich and diverse program matrix gave the majority of delegates almost too much to choose from. Add in the spectacular showcases within the concurrent Exhibition, memorable national entertainers from Australia and Korea, special lunchtime presentations from IUFRO awardees, a novel President's Discussion and Research Directors Forum, and a plethora of Divisional and satellite events and free time was at a premium.

The gala exit function typified the Aussie informal approach that sought to ensure delegates had multi-themed spaces and entertainments for personal farewells.

Many visitors took the opportunity to recover from the hectic pace of the Congress week to explore more of the Australian landscape and that of its near neighbours in scheduled and private post –congress tours.

Now that you are back home and the flush of travel and fellowship has ebbed from the cheeks the organising team would like to thank you all for your support. This Congress report provides a potted reminder of your experiences 'downunder'. We trust that the exciting mix of professional, social and cultural experiences will linger long in the individual and collective memory.

Congress organising team

Gary Bacon (Chair), Geoff Binge, Kendra Dean, Kris Gounder, Russell Haines, Mark Hunt, Rod Keenan, Ian Last, Keith Low, Amity Mills, Paul Murray, Sadanandan Nambiar, Kristine Pattel, Stephen Walker, Amanda Yeates and OzAccom Conference Services.

Congress Program

	Sunday 7 August	Monday 8 August	Tuesday 9 August	Wednesday 10 August	Thursday 11 August	Friday 12 August	Saturday 13 August
07.30					Departures from 07.30 hours		
08.30		Registration	Keynote Plenary Session	Keynote Plenary Session	In Congress Tours	Keynote Plenary Session	Keynote Plenary Session
09.00							
09.30			Refreshment Break	Refreshment Break		Refreshment Break	Refreshment Break
10.00		Opening Ceremony Keynote Plenary Session	Sub-Plenary Sessions & Panel Sessions	Sub-Plenary Sessions & Panel Sessions		Sub-Plenary Sessions & Panel Sessions	Sub-Plenary Sessions & Panel Sessions
10.30							
11.00							
11.30							
12.00	Registration Opens		Lunch Poster Viewing	Lunch Poster Viewing		Lunch	Lunch
12.30		Lunch					
13.00							
13.30		Sub-Plenary Sessions & Panel Sessions	Technical Session	Technical Session		Technical Session	Technical Session
14.00	Tree Planting Ceremony (South Bank)						
14.30							
15.00							
15.30		Refreshment Break	Refreshment Break	Refreshment Break		Refreshment Break	Refreshment Break
16.00		Technical Session	Technical Session	Technical Session		Technical Session	Technical Session
16.30							
17.00	Making the Most of Congress Intro Session						
17.30							
18.00		Welcome Reception					
18.30							
19.00			IUFRO Business Sessions & Technical Sessions	IUFRO Business Sessions & Technical Sessions		IUFRO Business Sessions & Technical Sessions	Farewell Gala Event
19.30							
2000							
20.30							
21.00							

Opening Ceremony

Opening Ceremony program

Monday 8 August 2005

Great Hall, Brisbane Convention and Exhibition Centre

MC – Stephen Walker, Department of Primary Industries and Fisheries, Forestry

Indigenous Welcoming Ceremony performed by Yuggera Aboriginal Dance Troupe

IUFRO flag raised through a canopy of *Araucaria cunninghamii* (Hoop Pine) and *Wollemia nobilis* (Wollemi Pine)

Presidential Address, Professor Risto Seppälä, IUFRO President

Opening Address, Senator The Honourable Ian Macdonald, Australian Government Minister for Fisheries, Forestry and Conservation

Presentation of Inaugural IUFRO Host Nation Scientific Award to Dr Sadanandan Nambiar and Dr Garth Nikles by Senator Ian Macdonald

Smart State Welcome Address, The Honourable Gordon Nuttall MLA, Queensland Government Minister for Primary Industries and Fisheries

Presentation of Scientific Achievement Awards

FAO Greetings, Dr Hosny El-Lakany, Director General, Forestry, FAO

Chair, Congress Organising Committee, Welcome Address, Dr Gary Bacon (with a backdrop of the Australia Post definitive native tree stamp series)

Keynote Address, *'Conservation Challenges to Tropical Forestry'*, Dr Ariel E Lugo, USDA Forest Service, International Institute of Tropical Forestry, Puerto Rico

[Sponsors acknowledged on continuous powerpoint loop at the beginning and conclusion of the Opening Ceremony]

Aboriginal performers

Indigenous opening firemaking

Presidential Address

Professor Risto Seppälä
IUFRO President

Honourable Ian Macdonald, Federal Minister for Fisheries, Forestry and Conservation,

Honourable Gordon Nuttall, Queensland Minister for Primary Industries and Fisheries,

Dr Hosny El-Lakany, Assistant Director General for Forestry, FAO,

Dr Gary Bacon, Chairman, the Congress Organizing Committee,

Sehr geehrte Gäste aus aller Welt,

Estimados colegas,

Mesdames et messieurs,

Ladies and gentlemen,

I would like to acknowledge the traditional custodians of the land on which this Opening Ceremony is taking place. I am very privileged to say this after we have witnessed the extraordinary presentation of the Yuggera Aboriginal Dance Troupe.

It is my great pleasure to welcome you all to this 22nd Congress of the International Union of Forest Research Organizations. It is the first time in IUFRO's history that our World Congress is being held in the Southern Hemisphere. For a 113-year-old organization it was really time to come 'downunder'.

The theme of the Congress is *'Forests in the Balance: Linking Tradition and Technology'*. This theme is particularly relevant here in Australia where traditions and traditional cultures are important and highly respected, and where at the same time, science and technological innovations are considered keys to social wellbeing.

IUFRO has four official languages: English, French, German and Spanish. Only English is used in the plenaries of this Congress. Expenses allocated for translations in the earlier Congresses have now been used to cover additional free registrations for the participants of the Scientist Assistance Program. The IUFRO Board felt that this would support the global forest research community better than expensive simultaneous translations in plenary sessions. However, IUFRO still wants to put an emphasis on the richness of different languages. To demonstrate this, a multilingual pocket glossary on forest terms and definitions has been prepared by IUFRO's SilvaVoc Project for this Congress.

Ladies and Gentlemen, several major trends affect the future of the global forest sector. Deforestation, forest degradation and loss of biodiversity continue at an alarming rate. A shift in timber production from North to South is happening, and it means also a shift from natural and semi-natural forests to intensively managed plantations in growing industrial wood.

Although the high-level political attention has shifted away from forests to address other concerns, such as poverty alleviation, both international and national policies external to the forest sector will increasingly drive the development of the sector. Environmental and gradually also social sustainability are replacing economic sustainability as a major driving force. This will support the march of non-wood and intangible products, such as environmental benefits and recreation.

A shift in consumption of forest products from Western Europe and North America to Asia, Eastern Europe and Russia will lead to a shift not only of timber production but also the forest industry production to new regions. At the same time, information and communication technology has begun to influence paper demand toward reducing the use of some major paper grades as demonstrated by an IUFRO Task Force in this Congress.

These global trends mean that the leading forest sector countries have to find new products and new business opportunities in order to survive. The industry has to convert pulp mills to biorefineries whose outputs are not only traditional forest industry products but also bioenergy and wood chemistry products, as well as ingredients for medicines and functional food products.

The changes in the forest sector create challenges to forest research. This week many of these research challenges will be discussed in different Congress sessions. However, it seems to me that during the past few decades traditional forest research has not succeeded very well in responding to the emerging changes. A clear symptom is that despite the general global increase in research funding, traditional forest research has experienced budget cuts in many countries and has partly lost ground to other disciplines.

The weakened position of forest research and education is partly the fault of the science community itself, at least in industrialized countries. We forest researchers thought that we had a monopoly on all forest-related research and, consequently, we continued to be a closed society for too long. Instead of seeking collaboration with scientists representing other disciplines, we often considered them – if not enemies – at least competitors. We did not see early enough that an alternative to co-existence could be non-existence.

The financial and institutional problems and uncertainties, and drastic changes many forest research and education institutions are facing, will be brought up in the President's Discussion that will take place on Wednesday afternoon at 1:30 pm. I welcome your participation to learn how organizations in different regions of the world have responded to the challenges and threats, and in some cases also succeeded in finding feasible solutions to emerging problems.

Ladies and Gentlemen, in addition to being a showcase of forest research and a forum for meeting colleagues, these IUFRO World Congresses, in their plenary sessions, are also the general assembly of the members of the Union. This opening session is one of the plenaries where the President may inform the Congress about any matter he believes should be brought to the attention of the members. I pick up only one matter: IUFRO's future strategy.

During its long history our Union has made significant contributions to strengthening forest research, building capacity and serving its members and forest researchers worldwide as a forum for networking. Voluntary contributions by members and officeholders, and the leadership of IUFRO in global forest research are a very valuable part of the tradition and culture of the Union. However, the context within which the forest sector and forest research now operate is experiencing major changes as I just described. Therefore, it is essential also for IUFRO to periodically review its activities and strategic orientation.

IUFRO has been formally reviewed three times. The first review in 1987 was an internal review of the IUFRO Secretariat. Its recommendations to strengthen the capacity of the Secretariat were implemented rather quickly.

The next review took place 12 years later in 1999. It was carried out by a semi-external team and covered the whole Union, not only the Secretariat. The recommendations of the review aimed at strengthening the Union and clarifying the roles of various IUFRO organs. Most recommendations were implemented during this ending five-year period, and the changes put into place were marked by evolution rather than revolution.

The most recent IUFRO review took place a year ago. In addition to assessing IUFRO's current structure and activities, the external Panel was asked to provide guidance on how to adjust and position IUFRO in the future. To summarize the outcome very briefly, the Panel considered it essential for IUFRO to expand the sphere of influence of the Union by increasing activities related to policy and human wellbeing.

One of the concrete recommendations of the Review Panel was to develop a new IUFRO Strategy. Following this recommendation the IUFRO Board decided to prepare a Strategy document that will be discussed by IUFRO's International Council later this week. The draft Strategy, together with the draft of the Congress Resolutions, is on view for all Congress participants via eForum software, available for delegates to provide real-time feedback. I hope that you will use this opportunity to make comments and thus influence the future directions of our Union.

Dear IUFRO colleagues, because many forest-related scientific issues have left the confines of current forest research institutions, there is a danger that IUFRO with its traditional structure and membership may become marginalized and we may no more be able to respond to the challenges of the evolving world.

IUFRO's primary niche and mission is to provide physical and virtual platforms where scientists can meet. However, if we are not able to translate our scientific information to the knowledge and know-how of policy makers and other clients, our research findings and our scientific fora will be of little value. It is really vital to the research community that research results are used in decision-making and forest management at all levels.

IUFRO can work toward this goal by strengthening its role as the global focal point of science-based information and expertise related to forests. I hope that with your help our new Strategy will lead not only to strengthening research and expanding strategic partnership and cooperation but also to enhancing communication with policy makers and society at large.

Ladies and gentlemen, all of us who attend this Congress are very grateful to the Queensland State and Australian Federal Government Agencies, and all our corporate sponsors for the irreplaceable support which has made this Congress possible. I would also like to put on record IUFRO's and my own sincere gratitude to the Congress Organizing Committee and the Congress Scientific Committee for their hard work in preparing this Congress. I am, however, saving my final thanks to these people until the last day of the Congress. Let us see first how they handle this event!

Minister Macdonald and President Seppälä with Wollemi Pine

Opening Address

Senator The Honourable Ian Macdonald, Australian Government Minister for Fisheries, Forestry and Conservation

Thanks very much Professor Risto Seppälä the President of this very august organization, and thank you very much for your generous introduction.

Ladies and gentlemen, it is a very great honour for me to be with you today and to extend to you all on behalf of the Prime Minister, the Government and the people of Australia, a very warm Australian welcome to this conference.

I do also want to recognise my Queensland State counterpart, the Honourable Gordon Nuttall, the Queensland Minister in charge of Forestry and, particularly, to the other very distinguished guests here today.

Can I mention the distinguished past President of your organisation, Jeff Burley, who, I know, was in charge when a lot of the preparation was done. And, also, it's great to see a person very well known and regarded in the annals of forestry, research, science and management, Dr Hosny El Lakany from the FAO, a gentlemen whom I've had the pleasure of meeting before. It's a delight to welcome him as well to this country.

And, indeed to all international delegates, particularly those who have travelled a long way to be here, my very personal welcome and welcome on the behalf of the Australian people.

It's also, ladies and gentlemen, a personal honour for me to be associated with such an important gathering of international forest scientists, and to meet again some of you – some of the leaders in the scientific and management of forests – whom I have had the honour of meeting previously.

This Congress is a very valuable opportunity to showcase international forest research and to demonstrate the important role research plays in underpinning sustainable forest management.

IUFRO is one of the world's oldest non-government organisations. For 113 years, it has facilitated networking and cooperation among forest research scientists.

I understand that, as well as being 113 years old, you actually have 114 member countries, some 15,000 associated scientists involved in the organisation, and that the organisation represents something like 700 different organisations throughout various parts of the world.

With a gathering of such international moment you can understand why I, as an Australian, have a great deal of pride in my country hosting such a high calibre forum as this one.

This Congress also allows Australia to profile the contribution our scientists have made to forest research.

The Australian Government is delighted to be a major sponsor of this conference, contributing something like $300,000 towards the event. And it gives a very tangible demonstration of our government's and our country's commitment to the survival and prosperity of forestry, both at home and abroad.

Australian governments and industry continue to invest strongly in the forest knowledge base. Through world-renowned institutions like CSIRO, our state and federal universities, our research agencies, our state agencies, our cooperative research centres and our research and development corporations, we have continued to support research into all facets of forest management and processing.

Indeed, research underpins our native forest management and has given us the knowledge to develop our plantation forest estate, and a world-class wood processing industry.

Reporting on Montreal Process Criteria and Indicators of sustainable forest management has allowed us to learn a great deal about the state of our forest resources.

Australia has the world's sixth largest area of forest with 163 million hectares of native forests and 1.7 million hectares of plantations.

Wood production in Australia is now some 27 million cubic meters per year, valued at just over $1.4 billion. More than 1,100 mills and processing facilities turn this fibre into more than $18 billion worth of products, including over three million tonnes of paper and paper products, four million cubic meters of sawn wood and some two million cubic meters of panels.

The forest and wood products industry in Australia is our fourth largest manufacturing sector contributing 7.5 per cent of the total manufacturing output of this country, and it provides direct and indirect employment to more than 130,000 Australians. Now while by European, Asian and North American standards that may seem relatively small, it accounts for about one per cent of Australia's working population.

While this economic contribution is very significant we also value our forests for biodiversity conservation, water quality and carbon storage. And who can deny the magnificent settings they provide for a host of recreational activities.

Through the Regional Forest Agreements, which were negotiated between the Australian Government and the various state and provincial governments in our country, we have developed a world-class conservation system, with some 22 million hectares of forests now in reserves. That represents something like 15 per cent of the total forest estate with more than 70 per cent of the area of assessed old growth forests protected from harvesting.

According to UN Food and Agricultural Organisation (FAO) statistics this gives Australia the third largest area of forests in reserves in any country in the world. And, just to put that in perspective, Australian forest reserves are almost as large as the total land area of the United Kingdom; they're as large as the total forested area of Finland and more than twice the area of the forested land in Germany.

Ladies and gentlemen, Australia is committed to ensuring forest management is ecologically sustainable. The Australian Forestry Standard (AFS) was developed based on sound science and in consultation with a wide range of stakeholders, to ensure that consumers can have confidence in the quality of management of our forest resources.

The Australian Forestry Standard is considered equivalent to those in Europe, North America and many other countries by the Programme for Endorsement of Forest Certification (PEFC), which has, in fact, endorsed and accredited the AFS.

A further example of our commitment to sustainable forest management is the recent signing of the Tasmanian Community Forest Agreement between the Australian and the Tasmanian governments.

For those of you who are not native to Australia, Tasmania is our island state to the south of the Australian mainland, and is our premier forest state.

This recently signed agreement represents a balance between workers' jobs and the environment. It provides for continued employment for people living and working in regional and country parts of Australia, and it results in the addition of another 170,000 hectares of native forests to conservation reserves.

This means that in this little island state of Tasmania 45 per cent of its forests, and one million hectares of old growth forest, will be protected, and that means 100 million old growth trees are permanently locked away from harvesting. Both the clearing of native forests for plantations and the clear-felling of old growth forests are being reduced, and some $250 million has been spent, and will be spent, on revitalising the forest industry to protect jobs.

The example in Tasmania is just another step towards ensuring that Australia is at the forefront of a very competitive world market. The wood product coming from Australia is sustainably harvested and is premium quality. I have long supported the process of certification as a means of combating some of the misconceptions that are popularised by radical green movements, both in Australia and abroad.

The world market doesn't need to take my word for this though, they only need to have a look at the third party auditing by the AFS and PEFC to see how Australian companies are among the world's top performers, both economically and, importantly, environmentally.

Elsewhere, the nature of forest businesses, like our forests, continues to change. Plantations, for example, now supply more than 60 per cent of industry's raw material.

Using our strong scientific base, the plantation forest sector has expanded rapidly, with an average of 75,000 hectares of new plantings a year for the past five years, largely on cleared agricultural land. Governments and industry have developed a shared goal of some three million hectares of plantations by the year 2020, and we are on track to achieve that.

I firmly believe we need to underpin sensible public debate on forests and forest management with accurate information. And that's why I'm pleased today, ladies and gentlemen, to use your Congress, if I might do so, to announce the release of the latest *Forests at a Glance 2005* booklet, produced by the National Forest Inventory in the Australian Government's Bureau of Rural Sciences.

This is a very small booklet, but it contains a wealth of information on different values and uses of Australian forests. I'm happy to tell you that we've actually produced this for this Congress so that all of you will have at a glance all the information you might ever need on Australian forests and forestry. You can all collect a copy of this booklet at my department's stand at the exhibition in the Congress building.

Ladies and gentlemen, the theme of this Congress *Forests in the Balance: Linking Tradition and Technology* has very special significance for Australia. And you've seen in the opening ceremony a demonstration of the culture of our Indigenous people and of their very close associations with the forests. And these trees behind us, the Wollemi Pines, are a result of very good work and research and nurturing by the Queensland Department of Forestry, come from a species that is millions of years old. And those of you who attended the planting yesterday will understand just how significant these trees are.

But this Congress's theme *Linking Tradition and Technology*, as I say, has very special interest and significance for those of us in Australia.

Indigenous Australians have lived in, used and managed our forest resources for thousands of years, and they have had a marked influence on the Australian landscape.

We've recently launched our National Indigenous Forest Strategy, and through that, the Australian Government is working with Indigenous communities to enable them to take better advantage of the economic opportunities that are presented by the forest sector.

But one of the very great concerns that our Indigenous groups have is the tendency of our state governments, who have land management powers under the Australian Constitution, to create national parks and reserves which lock Aboriginal people out of the forests they have nurtured for thousands of

years. I hope that, as international scientists, this concern of Indigenous peoples – I think everywhere around the world, but certainly in Australia – is one that could be very usefully addressed.

Ladies and gentlemen, Australia shares many challenges with developing countries, our climate and geography are similar to many regions in the developing world, and we face many of the same forest and land management and degradation problems. Australian forest science knowledge is highly valued in addressing international development challenges.

Deforestation and forest degradation are reducing the capacity of forests to supply services, services such as clean water, soil protection and recreation, that societies need for a sustainable future.

Issues such as illegal logging, the impact of and adaptation to climate change, wildfire and the contribution of forests to poverty alleviation and rural development are considerable challenges for the forest research community.

What was true in the past is equally true now. The world needs sustainable forest management that is underpinned by sound science, and we need to act in a coordinated and focused way to achieve sustainable management goals.

I think Australia's disappointment at the outcome of the recent negotiations for the future International Arrangements on Forests at the UN Forum on Forests (UNFF) in New York will come as no surprise to you.

But that has not lessened our commitment to developing a more focused, regional approach to implementing sustainable forest management in the Asia-Pacific region. We are keen to work with partner institutions, including research groups like IUFRO and the Centre for International Forest Research, to achieve more effective regional dialogue and action on shared policy goals.

Finally Mr President, can I congratulate you on a very, very fine opening speech – a speech that really did provoke some thought for your Congress. I certainly will look forward to hearing the results of some of the issues you raised.

I do also want to very sincerely and proudly congratulate Dr Gary Bacon and his organising committee for bringing this congress to fruition. Their tireless efforts have brought together the largest gathering of forest scientists the Southern Hemisphere has ever seen and I'm sure this event is destined to become a major success.

Ladies and gentlemen, and delegates, please enjoy the benefits of mixing with such a large group of your scientific peers. I hope that you can renew old friendships and start many new ones. I also invite you to take the time to enjoy the delights of the magnificent host city of Brisbane, I hope you have the opportunity to stay and enjoy the wonderful attractions of my home state of Queensland, and many other parts of the country we call home – and that is Australia.

And, ladies and gentleman, with all of that it gives me very great pleasure to declare the 22nd World Congress of IUFRO open.

Thank you very much and have a great time.

IUFRO flag raising

Presentation of inaugural IUFRO Host Nation Awards

The establishment of a Host Nation Award within the IUFRO suite of Honours and Awards was an initiative of the Brisbane Congress Organising Committee (COC), and in particular a foundation member of the COC, Dr David Flinn. It arose from a desire to recognise a truly outstanding scientist from the Congress host country/countries who has best elevated the profile of forest science and research accomplishments. The inaugural award was made to two Australian forest scientists with national and international reputations, E K Sadanandan NAMBIAR and D Garth NIKLES by the Australian Government Minister, Senator The Honourable Ian Macdonald. The award consisted of a Certificate and a honorarium.

Smart State welcome address

The Honourable Gordon Nuttall MP Queensland Minister for Primary Industries and Fisheries

Senator Ian Macdonald, Federal Minister for Forestry and Conservation and Fisheries

Professor Risto Seppälä, President of IUFRO

Dr Hosny El-Lakany, FAO Assistant Director General of Forestry

Members of the IUFRO International Council and Board

The 2000 delegates from all 90 countries represented here today.

I would like to acknowledge the traditional custodians of the land on which this event is taking place today.

On behalf of the Premier of Queensland the Honourable Peter Beattie MP, I welcome you to Brisbane and I welcome you to Queensland – Australia's Smart State. I understand the Premier will be officially opening the trade show tonight.

Queensland's Department of Primary Industries and Fisheries is the Australian host for this, the 22nd IUFRO World Congress and, as Minister for that department, I am very proud to be here today at this special congress opening ceremony.

IUFRO is the only world-wide organisation devoted to forest research and related sciences and, every five years, the 15,000 scientists from the more than 100 countries involved in IUFRO are invited to meet under one roof for this World Congress.

It is fitting that a meeting of innovative minds, research and science should be held, for the first time in the history of this congress, here in the Southern Hemisphere, and here in Queensland – the 'Smart State'.

Queensland is very proud of our State's long-standing focus on smart innovations and research.

Initiatives that create the 'jobs of tomorrow' for our children and their children, and initiatives that have established Queensland as 'the Smart State' of Australia.

The 'Smart State' vision for Queensland is to have a State where knowledge, creativity and innovation drive economic growth to improve prosperity and quality of life for all Queenslanders.

This vision is being realised throughout all levels of our Government and, since its establishment seven years ago, it is clear that the Smart State vision is fast establishing Queensland as an even better place to live in, and invest in.

Every day the Department of Primary Industries and Fisheries works towards a vision of 'profitable primary industries for Queensland'. and research and development certainly plays an important role in successfully delivering on this.

While many of our strategies look to the future and plan ahead, to explain and put into perspective the future achievements of the department, we also need to look to the past and to its strong tradition of delivering innovative research and development initiatives.

It is the department's long tradition of commitment to research and development initiatives that has underscored many of our achievements and lead the DPI&F to be the world leader in tropical and sub-tropical forest and timber research that it is today.

It was this focus on research and development that meant 'the dinosaur tree' – the Wollemi Pine – was placed, by the Sydney Botanical Gardens, in the safe hands of Queensland's DPI&F scientists.

And it is DPI&F's smart science that is seeing the Wollemi successfully propagated and brought back from the brink of extinction today.

These rather distinctive Wollemi's you see around me on the stage, will be ready for commercial sale later this year – a key example of economic growth and prosperity for Queensland that is driven by smart research and development strategies.

It was core investment in research and development that allowed Queensland foresters to be the first to commercially grow a rainforest emergent in plantations and many of you will see this first hand at Mt Mee and in the Mary Valley hinterland in south-east Queensland during some of the in-congress tours on Thursday.

Today's researchers from DPI&F are working in partnership with the timber industry and furniture manufacturers to improve export opportunities for other high-value local timbers, including spotted gum.

We have developed scientifically based recommendations for the design and use of Queensland spotted gum that guarantee quality and create new opportunities for our timber in high-value European and Asian markets. There's no doubt that our spotted gum is set to take the world by storm.

The Smart State examples I cite today are smart initiatives that are providing a solid and secure future and delivering on our vision of profitable primary industries for Queensland.

The very fact that we are hosting this prestigious event is a clear indication that the Queensland forestry industry continues to play a vital role in our state's contemporary economic, social and environmental wellbeing.

And this is especially so in many rural and regional communities.

As we speak, DPI&F is conducting research and development trials on properties at the Hill Growth Station – GIDARJIL in MiriamVale in central Queensland.

This community venture – an innovative eucalypt wood fibre industry based on plantations –is working with the local community and, as part of this, a forest training scheme has commenced with the local Bundaberg TAFE in the State's Wide Bay region.

Forestry is now a $2.7 billion industry in Queensland and an industry that employs 19,000 Queenslanders in 2200 businesses, and I believe we owe much of this success to the DPI&F's strong research and development foundation.

A certain, secure and viable future for native hardwood plantations in Queensland is being provided through a strong commitment to research, development and innovation – Queensland smart science making a sustainable industry even stronger.

These next five days will be a wonderful opportunity to share our latest achievements, research and findings and develop stronger relationships with our international colleagues.

I have no doubt that in five years at the next IUFRO World Congress, Queensland will be able to look back on at the fruits of our commitment to research and development. I can only dream of what is ahead for this exciting industry in Queensland.

Ladies and gentlemen, on behalf of the Australian Host for IUFRO, and on behalf on Queensland, I welcome you to our Smart State and I wish you well in your deliberations this week.

Presentation of IUFRO Scientific Achievement Awards

IUFRO Scientific Achievement Awards (SAA) are made for research results published in scientific journals, proceedings of scientific meetings or books, or appropriate patents or other relevant evidence that clearly demonstrates the importance of the scientific or technical achievement to the advancement of forestry or forest research. Other criteria of judgement are dissemination of results, implementation of knowledge, methods or techniques in practical forestry and skilled research management. Dr Karel Vancura, Chair of the IUFRO Honours and Awards Committee, read the citations and the SAAs were presented by Dr Eric Teissier du Cros, IUFRO Vice-President (Science) assisted by Dr Peter Mayer, IUFRO Executive Secretary to:

Joseph BUONGIORNO
Shashi KANT
David KARNOSKY
Victor LIEFFERS
P K Ramachandran NAIR
Dave PETERSON
Rémy PETIT
John SPENCE
John TURNER
S Y (Tony) ZHANG

FAO Greetings

M. Hosny El-Lakany
Assistant Director-General
Forestry, Food and Agriculture Organization of the United Nations

Excellencies,

Colleagues, Ladies and Gentlemen,

It is an honour to address this opening session of the XXII IUFRO World Congress on behalf of FAO. It is also a pleasure for me to be back in Australia and Brisbane. My first visit to this wonderful part of the world dates back some 30 years when – as a young Egyptian forest geneticist who did much of his training in the rainy parts of British Colombia, Canada – I tried to find a place in the sun. The participants in this Congress, especially those visiting Australia for the first time, will soon learn that the genuine warm hospitality of its citizens more than matches the welcoming climate in Queensland, the country's Sunshine State.

Mr Chair, FAO and IUFRO have been collaborating for nearly 60 years under an Agreement signed in 1948, only three years after FAO was established. Operational to this day, the

Agreement is proof of the importance that FAO places on science and research in fulfilling all aspects of its mandate. Past collaboration includes FAO hosting the Secretariat of IUFRO until it moved to Vienna in 1958. Current and ongoing team–work involves the active participation of IUFRO in discussions of FAO statutory bodies such as the Committee on Forestry (COFO) and regional forestry commissions. In addition, the Assistant Director General of the FAO Forestry Department is a member of the Board of IUFRO, and FAO staff are involved in the activities of almost all of its divisions, taking part in scientific reviews, task forces, training sessions and workshops, among others.

FAO is especially pleased to collaborate with IUFRO on the Special Programme for Developing Countries, the aim of which is to strengthen capacity and cooperation in forestry research. We are also working with IUFRO to support regional networks such as the Asia-Pacific Association of Forestry Research Institutions and the Forestry Research Network for sub-Saharan Africa. I am confident that the close working relationship between the Special Programme for Developing Countries and the regional chapters of IUFRO will strengthen forestry research and more fully integrate the work of the chapters into the organization's mainstream activities, thereby enhancing the contributions of developing countries to the mission and objectives of IUFRO.

Mr Chair, three years ago, IUFRO accepted an invitation to become a member of the Collaborative Partnership on Forests (CPF) which FAO chairs. In doing so, it joined 13 other forest-related organizations, institutions and secretariats to strengthen inter-agency cooperation and help countries achieve sustainable forest management. The request to become part of these efforts clearly recognizes the role that science and research has in addressing global forest policy issues and in advancing the intergovernmental forest debate.

As an indication of its competence and capacity, IUFRO is leading one of the most important joint CPF initiatives: the Global Forest Information Service – an internet gateway that provides access to forest-related information around the world through a single entry point.

Mr Chair, ladies and gentlemen, the world expects much from this scientific community and IUFRO is delivering. For the first time, to my knowledge, the international forestry research community is at the table, actively participating in discussions that are going on in the United Nations Forum on Forests, to shape the future international arrangements on forests. The age-old complaint that scientists are absent in most debates and decisions concerning forests is not as valid as ten years ago but we're not there yet. Policy matters are still mostly in the domain of diplomats who have little background in science and research, but the involvement of IUFRO is proof that this situation is changing for the better. One of my predecessors, as ADG of the FAO Forestry Department, once said that IUFRO is the conscience of forestry. I challenge you to continue living up to this statement.

Mr. Chair, the theme of this Congress *'Forests in the Balance: Linking Tradition and Technology'*, couldn't be more appropriate and timely. Although traditional knowledge has a definite place in sustainable forest management, issues are only now being discussed in the global arena. The topic is both complex and multi-dimensional, encompassing such questions as land tenure, access, benefit sharing and intellectual property rights, including the collective property rights of indigenous communities. Loss of language and culture represents a real threat to its survival in some parts of the world, yet this aspect is receiving scant attention.

Some would argue that the use of traditional knowledge is merely a matter of incorporating it into modern science. Personally, I do not share this view and caution that we should not be fooled by the term 'traditional'. Such knowledge is *de facto* a modern science in its own right by virtue of its evolution over generations, changing over time in response to new information, experiences and techniques. Finding ways to more closely link today's technology with traditional forest-related knowledge and practices requires creative thinking and a new way of doing business.

I congratulate the organizers for having chosen this theme for the Congress. I also commend them for having developed such a comprehensive program, one that truly reflects the range of today's issues, including the role of science in formulating public policy for sustainable forest management. Some of you are aware that more than 40 multilateral and international institutions report to have programs on forests, many of which are substantial – the conventions on biodiversity, climate change and desertification, to name a few. Some of you also know that the forest community is not well represented either in terms of policy or of science in these fora. As a result, decisions that directly impact on forests and forestry are taken by those outside the sector.

Equally worrisome is the fact that forestry is all but absent in major efforts to alleviate poverty, including the Millennium Development Goals and national development strategies. How can we foresters have let this happen when forests are critical to the health of the planet and the wellbeing of all its inhabitants for the range of functions they perform? As I approach retirement, passionate about my profession for almost 40 years, I have more questions than answers. However, I do know one thing for sure. We need to get our act together. Forestry, once prominent on the international agenda, has been displaced by other social and economic issues such as globalization, poverty and hunger.

I leave you with these few thoughts to ponder as you work through this week's program. I look forward to discussions and wish you well in your deliberations. Thank you.

Chair, Congress Organising Committee welcome address

Dr Gary Bacon
Chair, XXII IUFRO World Congress Organising Committee

Colleagues all,

The Congress logo, commissioned from a local aboriginal artist, acknowledges an indigenous presence on this land.

It was in the far off dreamtime that the two tree species, *Araucaria cunninghamii* and *Wollemia nobilis* which adorn the stage this morning were last seen together on the ancient Australian plateau. Innovative science has bought them together today in celebration of our Congress theme *'Forests in the Balance: Linking Tradition and Technology'*.

The gestation period required to give life to a Congress of this magnitude and complexity is nigh equivalent to that required for a short rotation eucalypt plantation established on any of the world's continents.

The organising team have in that planning interval attempted to provide a Congress framework within which professional inspiration, social discourse and cultural interplay can occur and enrich the 'downunder' travelling experience.

However, to give zest and vitality to this inaugural, austral IUFRO World Congress and enhance shared experiences, I invite you all to participate fully within the matrix of events and activities that are listed in your programs.

We have critical mass to effect positive outcomes from the Congress.

Some foresters suggest that the productivity of a planted forest is optimised when MAI equals CAI, i.e. when Mean Annual Increment equates with Current Annual Increment. I can report in similar fashion that Mean Annual Interest now equates with Current Annual Interest, as expressed in terms of participation numbers at this profile event, and our target of 2000 has been reached.

Significantly, 90 countries are represented at this, the 22nd IUFRO World Congress. That is a high representation from the diverse countries that comprise the Union and emphasises the global reach and the continuing appeal of these signature events.

Thank you delegates for your support.

In addition to the mature travellers in our midst we welcome many new Congress attendees. Last evening over 200 attended the inaugural 'Making the most of the Congress' session. Over 60 participated in pre-congress training programs held last week in Gympie under the Special Program for Developing Countries initiative. And over 85 young scientists from 36 developing countries were invited to Brisbane by the Scientist Assistance Program (SAP).

Through affirmative action, more than 60% of SAPers were women. That makes good sense for our forestry and forest science sector. We need the X factor and, as you will recall, females have two X chromosomes and hence twice the X factor than mere males.

This is an appropriate time to acknowledge and sincerely thank our sponsors, of both SAP and the Congress proper. They are listed on Congress collateral and shown on slides and posters. In particular, I acknowledge that all Australian state and federal public forestry agencies have collaborated and assisted in the staging of the Congress. Queensland's Department of Primary Industries and Fisheries is the local host and the Australian Department of Agriculture, Fisheries and Forestry is the principal sponsor. AusAID contributed generously to SAP.

I urge you to look over the splendid array of display booths set up in the adjacent Exhibition Hall. The majority of our sponsors and other collaborators are represented there.

Australia Post has issued today a set of five native tree stamps to coincide with the opening of Congress in keeping with the theme *'Forests in the Balance: Linking Tradition and Technology'*. Philatelic items are available in the Exhibition Hall.

In printed order the tree stamps are:
Snow Gum (*Eucalyptus pauciflora*)
Wollemi Pine (*Wollemia nobilis*)
Boab (*Adansonia gregorii*)
Karri (*Eucalyptus diversicolor*)
Moreton Bay Fig (*Ficus macrophylla*).

It is noteworthy that the diversity of trees and landscapes captured in these stamps and images mirrors somewhat the diversity of origin, forest types and range of geographic lands that constitutes the core strength of the IUFRO constituency.

The Congress organising team warmly welcomes this diverse IUFRO cohort to Brisbane, Australia.

Please enjoy *your* Congress.

Thank you.

Delegates, I now draw your focus to the first of the Congress Keynote speakers.

Dr Ariel Lugo has joined us from the Caribbean which, like Queensland, purports to be 'beautiful one day and perfect the next'.

Dr Lugo is the Director and Research Leader of the International Institute of Tropical Forestry, a unit within the USDA Forest Service. The Institute was created in 1939 in Puerto Rico to research tropical forestry issues.

Dr Lugo's personal research interests have focussed on the ecology of tropical forest landscapes, including carbon and nutrient flow, system response to disturbance, and strategies for management and conservation.

Today Dr Lugo will address us on the topic *'Conservation Challenges to Tropical Forestry'.*

Delegates, please welcome our first plenary speaker, Dr Ariel Lugo.

XXII IUFRO World Congress Opening Presenters

Keynote Addresses

Keynote address: Monday 8 August 2005

Ariel E. Lugo
Director, International Institute of Tropical Forestry, USDA Forest Service
Puerto Rico

Conservation challenges to tropical forestry

Tropical forest conservation has made much progress over the past 25 years. The debate has shifted from one that focused on the need to conserve forests to agreeing on how to conserve forest biodiversity. In the process, the rate of tree plantations has increased, forest rehabilitation and restoration are recognized as mainstream conservation activities, agro forests are valued for their biodiversity as well as their productivity, and the notion of ecosystem services has been established with an eye to conserve forests for their sake rather than only for their products. In spite of the progress made, significant challenges remain. For example, there is still net tropical deforestation and fragmentation in spite of all the efforts to reduce these processes. However, the greatest challenge to tropical forest conservation is the increasing scale of anthropogenic disturbances. Human effects on the biota are now global and include actions that fundamentally change the conditions that determine the state and species composition of forests. For example, changes in the gas composition of the atmosphere change the stoichiometry of the Earth while land cover changes due to urbanization and deforestation change the conditions for forest succession. A fundamental research question is to determine to what extent these changes in conditions are related to changes in species composition and the success of invasive species. More importantly, do changes in species composition necessarily mean that forests are less capable of delivering vital services to humans? Tradition and technology meet in conservation efforts when both incorporate biodiversity into solutions to the new global threats to tropical forests.

Keynote Address: Tuesday 9 August 2005

Eugene van As
Chairman, Sappi Limited, South Africa

The Importance of wood science and forest science in helping developing countries develop viable forest industries

Mr Chairman, Ladies and Gentleman

Thank you for asking me to make this keynote address. It is a great honour to be asked to do this particularly when you ask an industrialist and a non-scientist to talk to you about the role of science and technology in developing the forest products industry in developing countries.

You take a bit of risk when you do that because you are getting the view, not of a scientist, not of a forester, not even of somebody who works very closely with timber but for what it is worth the view of somebody who has spent more than a quarter of a century in managing a forest products company. What can I contribute to this debate?

Let me try and give you a broad overview from the perspective and a background from which I come.

Science and technology plays a significant role in all our lives and in every industry but particularly and in an unsung way, in the forest products industry and more particularly so in the developing world. Let me set the scene.

When you come from a relatively arid country where trees are quite scarce as I do, it is quite a worrying statistic that 53% of the world's timber harvested is actually burnt for fuel! When one realizes that only 14% is burnt in the G8 countries, and that is probably used for fuel in a fuel-efficient manner using waste to create what we all know today as green energy,

it becomes more alarming! In the developing world at least 76% of wood harvested is used for fuel, most probably in a very inefficient way because it will not be "green energy" but open fires etc.

In the poorer countries it means cutting down whatever lives in tree form to generate heat and power for cooking, lighting etc. Inevitably this means that a precious resource is largely wasted in the developing world and de-afforestation becomes a major risk.

Wood products supply about 1.2% of the world's GDP but if you look at some of the developing world countries you find that the percentage is bigger. In South America it is 2.1% and in Africa, it is 1.5% so says the FAO in spite of the fact that so much of it is burnt in those countries. This shows the potential of forest products to contribute to growth but perhaps is also a measure of the lack of development of those economies particularly in the high tech and service sectors.

It is perhaps ironic that it is in the developing world that plantation forestry has started to thrive. You all know that plantation forestry is not new. I think there are records of plantations being managed 800 years ago in China and certainly in Europe there has been evidence of some form of plantation management some centuries ago. But in the developing world what has happened is wood is farmed. Where I come from in South Africa you might say we farm trees like other parts of the country farms corn and this is essentially a 20th century development.

It was driven originally by need in arid countries like South Africa because everything had to be imported in the way of lumber, mine props and many other uses. Plantation forestry is therefore a very recent development.

In South Africa, for example, by 1940, there was only about 180 000 hectares of pine only, a few hundred thousand hectares of eucalyptus existed in Brazil, and there was virtually no pine in Queensland. But today plantations cover millions of hectares in Asia, 3,5 million in Africa and nearly 10 million in South America. Sustainable forestry practices are of course becoming the norm in the developed world but many of those forests are self-regenerated. The developing world was planting trees for fuel, but increasingly now for lumber and more particularly for the pulp and paper industry.

The forest products industry has become a global industry in the last half century and a lot of this has been driven by the activities in the new world. I will come to the reasons for that later. You have seen global companies develop in the manufacture of pulp and paper, panel products, even chemicals. In some cases they are no longer originate from the traditional countries which dominated industrial development in this industry. Countries I am thinking of are Canada, the Scandinavia countries and USA.

Global companies have started developing from small developing market countries based on their forest product development. My company, which is the largest producer of coated fine paper in the world is an example originating from South Africa. We have another company in South Africa, Mondi, which has also become a global business. You had others from New Zealand, and of course from Finland itself a developing country not so long ago. How does this happen?

Successes were built on low cost timber resources and technology. You see this in many developing countries. The enormous development of pulp and paper companies in Indonesia and also in the South American countries are all built on the competitive advantage which technology brought to them in their respective countries. Most of this based originally on forest technology and first world production know how.

The development in Finland, although based on an abundance of wood, was also driven to a large extent by technology – but in this case manufacturing technology which did give Finnish (and other Scandinavian companies) a competitive edge. It is now becoming available to the world.

If you take the global production of pulp as a proxy for what has happened in this industry, we can see that North America declined from 60% of the world's supply to somewhat over 40% and in Europe it declined in spite of the huge importance of the Scandinavian industry from 35% to about 28% of the global supply. Why did this happen and how did it happen?

We have to recognize that much of the developing world and in particular the arid countries had a desperate need for wood. There was no natural forest, you had to grow it and what happened originally in a very unsophisticated way that they used technology to be able to select species that they could grow in their climate and they applied that technology to increase yields.

Another part of the developing world had experienced large scale de-afforestation or alternatively had forests which were unsuitable for commercial exploitation.

Both of the worlds, both of them in developing countries, started to use technology to help resolve their timber needs. Not surprisingly some more successfully than others.

Sophisticated technology enabled the improvement process to flourish. Testing to identify the best suited species for a region, seed selection and recurrent selection of the best individual trees to allow for continuous improvement. Then came clonal selection and the production of rooted cuttings and also controlled pollination.

Some tree breeders will say that this process is closer in nature to animal breeding in many ways than to plant breeding. It is a bit like the constant refining of the thoroughbred racehorse. The biotechnologists will argue for genetic engineering and tissue culture.

I can't offer an answer as to who might be right. What I can say is that technology has enabled developing countries to increasingly develop growing stock that can be planted, propagated rapidly and which has provided superior yields, most of this technology did not come originally from the developing world, the developing world required and the developed world developed technology to use new fibres.

I am old enough to remember when eucalyptus was a strange foreign pulp. It is hard to believe in the first decade of the 21st century that less than 50 years ago, eucalyptus was considered an unknown inferior fibre and nobody had thought, as far as I know, that eucalyptus could emerge as a preferred fibre in producing fine papers and tissue products. Today that is the norm.

At the other end of the forest products industry process technology made other major breakthroughs. In many parts of the developing world the countries are arid. We have this conference in such a country today, I come from another one. Water resources were scarce and pollution of the water system a major problem. Long before people started becoming aware of the aox risk inherent in chlorine bleaching, the need to eliminate chlorine from the system for other reasons led to the development of oxygen bleaching.

That was developed by my company, Sappi, in 1970 not that long ago, developed in the developing world out of sheer need! Again it was a partnership. Sappi did not do that alone. It did it with air liquide and the old kamyr organization but it led to a dramatic reduction in the effluent load of the pulp process. Today it is the preferred process for all modern pulp mills.

Dry countries have particular needs. They do not have the available water to make pulp and paper products the way they used to be made in the traditional papermaking countries but they often have the heat units and the rainfall in some areas to grow timber at an exceptionally advantageous rate. So technology became a major factor again in growing this industry in the developing world. Tree selection, specie selection and cloning started to produce fibre products specifically developed for the process for which they were to be used.

In manufacturing a partnership between the major equipment supplying companies of the first world and the developing world found mills being built that could operate in a water starved or sensitive areas. The ngodwana mill in South Africa is an example – for many years it was the mill using the lowest volume of water per ton of pulp and paper produced in the world probably still is. The recovery process was highly sophisticated, forced by need.

But these innovations were all built on a fundamental competitive advantage:- that fibre could be produced more cost effectively in many of the developing countries than in the world of natural forests where the bulk of the raw material was located.

Plantations today account for 100% of the commercial wood coming out countries like New Zealand and South Africa and between 60 and 80% of countries like Spain, Brazil and Argentina. Yields in these countries have increased dramatically.

Formal measured yields for pine plantations in many developing countries where the climatic conditions are right, site selection is right and technology has enabled us to plant the right species, range from 18 – 25m³ per hectare per year. These are not spectacular yields. We have all heard the many stories of significantly higher yields but what I am quoting here today are yields which are attained over large commercial areas for pine. Compare these with yields of 7m³ per hectare per annum in the southern USA and yields as low as 3m³ per hectare per annum in the cold north of Scandinavia, Canada and even the north-east United States.

When we look at eucalyptus, again we have yields of 18 – 25m³ and up to 30 and more in certain special environments in Brazil and the Congo. This develops a huge competitive advantage for the developing world and it is based on the technological understanding of what can be done to improve the fibre yield per hectare.

We have long since gone past the idea that growing bigger trees, faster gives you advantage. In many countries and many companies, we have set about developing products that create fibre yield, pulp yield per hectare.

Selecting and breeding trees, not for their size but for the fibre content that they produce per hectare per annum.

We all know that in pulp mills the most expensive part of the process is dealing with the lignin from the timber we produce and breeding selected trees at even higher fibre to lignin ratio has a dramatic effect on the profitability of the overall operation. The holistic approach to this concept can have a dramatic impact on the return on capital of an entire industry. Just as a sawmiller would love to have his forestry company deliver him square logs, a pulp miller should be measuring his potential success on the basis of the lignin content or alternatively the cellulose fibre content of the log. The 100% fibre log would be the ultimate achievement! Maybe one day we will start approaching this almost unthinkable goal.

The forest products industry in the developing world is a great job creator and a potential creator of wealth. Sadly – in recent years it is also an industry which has failed to earn its cost of capital. That is another story! In most countries it is one of the highest domestic value creators for its suppliers of any industry because in most countries so much of its input cost is local. Once having bought the equipment the operating cost is frequently almost entirely spent in the local economy.

A study which we did in South Africa a decade ago indicated that the pulp industry was a much greater wealth creator per dollar of input than any other local industry even for example

the automobile industry which in South Africa has become the largest single earner of foreign exchange.

Today forest products companies are large earners of foreign exchange for many of the developing world countries. Their share of world trade has risen exponentially. Dominant producers are rapidly migrating to developing countries on the back of technological development of the industry.

How did a company like Sappi become the worlds leading coated paper manufacturer or Aracruz the largest single site pulp producer in the world? The basis has all been on a lower cost, higher margin production facility and you trace that to its origins, based on the technological development, not so much of the manufacturing process (although this is important) but of tree growing, tree breeding and all its associated disciplines.

Today in Sappi in southern Africa we select the specie for the site. We select the specie for the facility and breeding and cloning has brought us closer to getting a much higher yield of pulp per ton of wood out of our plantations than we did a decade or two ago. Research and technology has led the way for this development. It has focused researches on the needs of their customer and has shown results.

The forest products industry has started to globalize (and there are many examples of this happening) but it is still a very fragmented industry. Slowly you are getting a consolidation of players who will have a global footprint in panel products, in newsprint, in coated fine paper, uncoated fine paper, packaging papers and eventually probably also in pulp. They will migrate inevitably to the manufacturing areas where they can achieve the greatest commercial advantage.

Technology leads them to make pulp in countries where trees grow quickly but not just trees, there is no sense ladies and gentlemen in growing a wonderful 10 or 15 year old tree for the pulp industry if when you harvest it the yield is so low that you have wasted much of your harvesting and transport cost.

Technology has to take us to the right product for the right purpose. If you are making acetate pulp, dissolving pulp or paper pulp, either hardwood or softwood, there will be preferred fibres, there will be preferred species that give the fibre with the right characteristics and the right yield. We need to understand that and look at the commercial advantages of following that route.

The development of global plantations and global companies is a given. I am personally of a belief that it will be very many years before the developing countries become the dominant producers of wood fibre products because of the overwhelming volume of timber that is to be found in the cold northern climates but that the southern hemisphere and in particular to the developing countries will be the most profitable places to operate, will be the ones that grow fastest and will be the ultimate winners in the competitive war is almost a given.

The irony is that in the third and the second world people have used technology to give them a competitive advantage over the first world from whence the technology often comes.

More and more forest products companies will be looking at what in my country is called the triple bottom line, the return for shareholders, the impact on the environment and the impact on people. In the arid world timber uses water, a precious resource and the conversion of fibre with the minimum consumption of water is a real factor.

Many of you come from countries where the criticism that you endure is that you are destroying the natural forest because you harvest it, you use it commercially. Clear felling is a major problem. In other parts of the world, the criticism of the environmentalists is different. It is around the destruction of the pristine grasslands by planting single specie or single type of forests.

The development of the plantation forests in the developing world has had a massive positive impact on the environment. In the first instance in many countries there would be no indigenous trees left if somebody had not introduced exotics to provide for the timber resources and the fuel resources of the country. That said eucalyptus or pine are alien species and some of the concerns are valid and need to be addressed in many parts of the world. Many environmentalists vehemently oppose the plantation concept. They see it as an invasive specie and they see it as a destruction of pristine areas very often grassland which is rich in diversity. Of course part of their perception is correct but the reality of plantation forestry in the developing world is that is has the effect of preserving the small pockets of natural forest in many arid countries. I would be the first to recognize that countries like Brazil are different where they have massive natural forests but even there fast growing alien species, genetically developed and built for purpose has a long-term beneficial effect on the destruction of the natural environment.

Man has a constant battle with the balance between conservation, preservation and development.

In my experience the greatest destruction of the environment is poverty and anything we can do in the developing world to create gainful employment, long-term job security and the creation of wealth has the ultimate effect of preserving something worthwhile. This applies to people as much as the rest of the environment. We sometimes forget in the wealthy countries that people are also part of our natural heritage.

Technology in the forestry industry in its broadest sense; growing trees and utilizing the trees productively; minimizing the impact on the environment through the treating of the footprint of the process sensitively, has the potential to create an enormous wealth in many developing countries to provide the world with one of its oldest and most important products, paper.

Tsai Lung the Chinese Minister of Agriculture in about 100AD who invented paper could never have imagined that today we have machines that produce 8 to 10m wide sheets at a rate of 1500 – 2000m a minute, enough to encircle the globe in under 14 hours but he laid the foundation for a remarkable industry and you as the scientists that provide the feedstock for the wood products industry, be it pulp, paper, lumber or panel products or for that matter chemicals, you have a particular role to play in preserving that legacy and what the environment by using technology to provide the resources for the future with the smallest possible environmental footprint:

(a) from a forestry point of view and

(b) from a manufacturing point of view.

Can I leave you with a particular challenge? The pulp and paper industry is one of the world's most capital intensive businesses. To produce an integrated pulp and paper mill without its forestry resource costs of the order of $1 500 per ton of annual production depending on the grade of paper that price can be quite a lot higher. The value of the product is today of the order of $500 - $900 per ton which means that you turn your capital in the manufacturing facility only once in 2 ½ - 3 years. If you add the investment in the developing world in the plantations which have to feed that resource, the factor becomes more like 1 – in – 4 years.

I mentioned before that the pulp & paper industry as a whole had not earned its cost of capital for most of the past decade. That cannot continue. Better management can correct that, at least in part, by more careful management of expansion particularly in Asia but there is another challenge.

The challenge for the future of the industry is for technology to bring capital costs down. We have been making paper much the same way as the foudrinier's did in the early 1800's and the kraft pulp process of the 19th century is still the basic process for making pulp. Whilst it is extremely important to develop the fibre resource to yield the maximum cellulosic fibre per cubic meter or ton of wood, it is equally important to find a way to produce bleached pulp and paper in a new way which will be less capital intensive, have a smaller environmental footprint and enable this extraordinary product, which is thousands of years old, to continue with a new lease of life.

I started this presentation by warning you that I am not a scientist but surely in the next decades there has to be a way in which biotechnology could enable us to delignify wood and bleach it in a cheaper, friendlier, more elegant way which would ensure the long-term future of this industry.

That is a challenge which is exciting and worthwhile. I think we are going to see the developing world use technology to make this industry, in its broadest sense, an even larger contributor to the GDP of developing countries. Global companies will start to source their main raw materials from these competitive areas.

It is an exciting opportunity, a demanding challenge and a future, ladies and gentlemen, which is in your hands.

Keynote Address: Wednesday 10 August 2005

Joseph Gosnell
President, Nisga'a Tribal Council, New Aiyansh, British Columbia Canada

Harvesting and Management of Natural Resources under the Nisga's Final Agreement

Bio - Joseph Gosnell was born in the Nisga'a village of New Aiyansh in the rugged and isolated northwest corner of British Columbia. As a young man he worked as a commercial fisher before entering tribal politics. He served in a variety of positions on the local band council and later became active in the Native Brotherhood of British Columbia, where he served as chairman. A former member of the Northern Native Fishing Corporation, Chief Gosnell also served on the Pacific Salmon Commission. Active in Nisga'a Tribal Council politics for more than a quarter century, Chief Gosnell was elected President in 1992, twice winning re-election. He was lead negotiator for the landmark Nisga'a Treaty, which was initialed on August 4, 1999, in New Aiyansh. For his role in negotiating the landmark treaty, Chief Gosnell received an Honorary Doctorate of Laws Degree from Royal Roads University in Victoria on October 17, 1997. He was elected President of the new Nisga'a Lisims Government in November 2000.

Chief Gosnell is the recipient of the Order of British Colombia, as well as a Humanitarian Award from the Canadian Labour Congress and two honorary doctorates. Chief Gosnell lives in New Aiyansh with his family.

Keynote Address: Friday 12 August 2005

Lisa Sennerby Forsse
Secretary General, FORMAS, Sweden

The role of science in developing sound environmental policies that transcend national boundaries

Lisa Sennerby-Forsse and Rodney Keenan

The role of science in developing sound environmental policies that transcend national boundaries

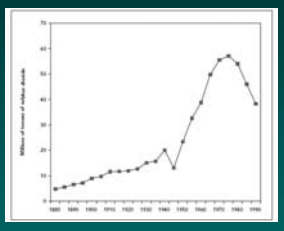
Lisa Sennerby Forsse
XXII IUFRO World Congress 2005
Keynote Address

Research *has* made a difference in environmental policy

- Acidification
- Stratospheric ozone
- Climate change

The Acidification Issue

- 1967 Newspaper reports in Sweden drew attention to the complexity of acidification and alerted the policy community
- 1972 UN Conference on the Human Environment in Stockholm
- 1977 OECD report: established imports and exports of sulphur between European countries



European sulphur emissions

The Acidification Issue

- 1980s forest decline in focus
- "More science needed" as a political response
- International agreements and monitoring protocols under the Conventon on Long-Range Transboundary Air Pollution
- 1985 CLTRAP Protocol commits countries to a 30% reduction in sulphur emissions

The stratospheric ozone issue

- 1974 Sudden awareness of problem following press statements by American scientists Molina and Rowland
- 1977-78 Political responses (Norway and Sweden ban CFC aerosols, as does Oregon)
- 1980s Discovery of the ozone hole led to international agreements / connection to climate change
- 1987 Montreal Protocol on Substances that Deplete the Ozone Layer

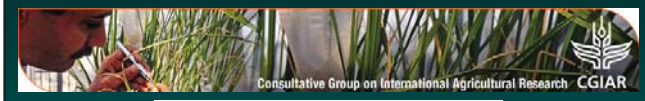
Global environmental problems

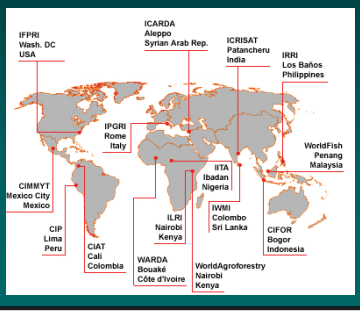
- Poverty
- Climate change
- Water
- Loss of biodiversity

The Climate Change issue

- 1980s Increasing alarm amongst scientists - IPCC report led to growing political awareness
- 1992 UN Conference on Sustainable Development led to Framework Convention on Climate Change
- 1995 IPCC 2nd report: Continued high-level political combat
- 1997 The Kyoto Protocol / the long-term perspective
- 2004 Kyoto Protocol ratified

North – South collaboration





Milestones in global environmental agreements

- 1972 UN Conference on The Human Environment, Stockholm
- 1987 The Brundtland Report
- 1992 UN Conference on Sustainable Development, Rio de Janeiro
- 2002 UN World Summit on Sustainable Development, Johannesburg
- 2005 UN Conference on Millennium Development Goals, New York

People and Forests

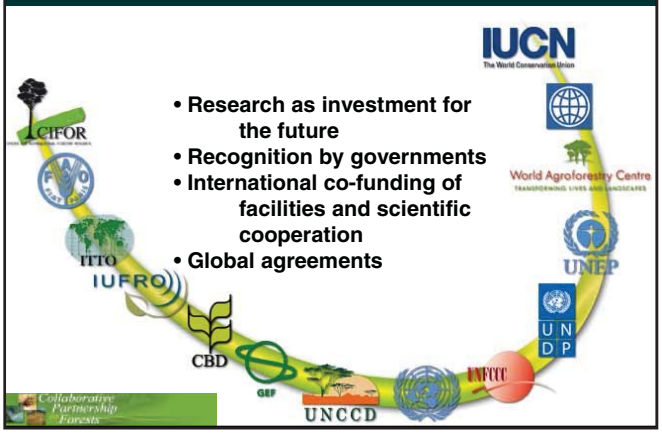
- **1.6 billion people** rely heavily of forest resources for their livelihoods
- **60 million** indigenous **people** living in the rain forests of Latin America, Southeast Asia and West Africa depend heavily on forests
- **350 million people** live in, or next to, dense forests and rely on them for subsistence or income
- **1.2 billion people** in developing countries use trees on farms to generate food and cash

Learning and capacity building

"I hear and I forget, I see and I remember, I do and I understand"
Confucius

- Identify key questions
- Provide training and hands-on experience
- Strengthen institutions

Financial resources



- Research as investment for the future
- Recognition by governments
- International co-funding of facilities and scientific cooperation
- Global agreements

Obstacles for the interplay between science and politics

- Academic conservatism
- Lack of research competence in governments
- Lack/uncertainty of ownership
- Reluctance of the political system to take risks
- Scarcity of fora for dialogue at national levels

Lessons learned……

How can we improve the interplay between Science and Politics?

- Holistic approaches in science
- Scenario-type synthesis
- Quality-assured research
- International cooperation
- Political ownership
- Research competence
- Risk-taking ability
- Fora for dialogue

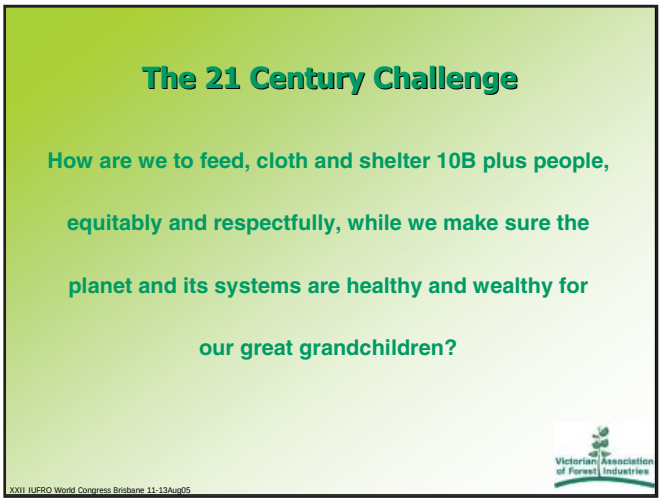
Science and environmental policies

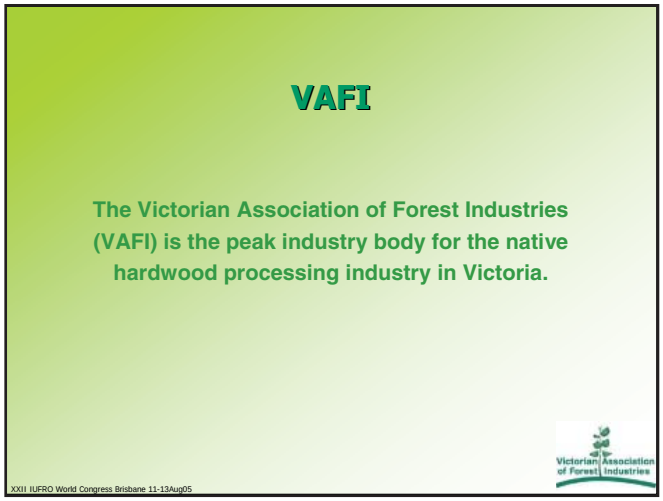
Research is one of the necessary corner stones for a world striving towards sustainable development.

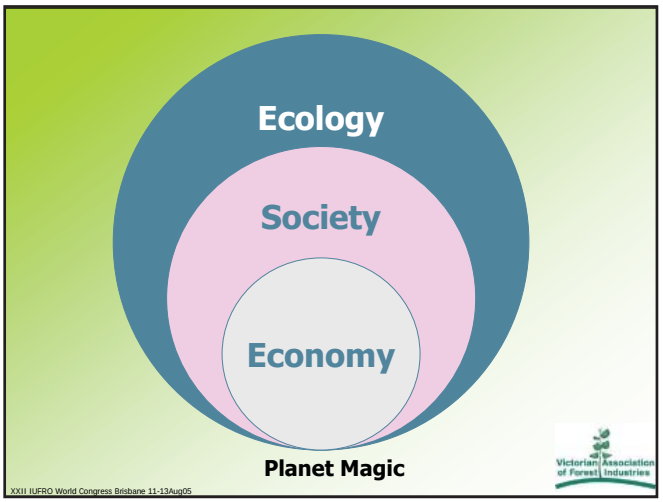
Keynote Address: Saturday 13 August 2005

Tricia Caswell
CEO, Victorian Association of Forest Industries, Australia

The contribution of forest industries to global sustainability







The Rise of Global Sustainability

Environmentalism ⇨ Global Sustainability

The Brundtland Definition

Earth Summit (UNCED) Rio de Janeiro 1992

World Summit for Sustainable Development (WSSD) Johannesburg 2002

Towards Global Sustainability

UN Millennium Ecosystem Assessment

- " The overall conclusion…. is that it lies within the power of human societies to ease the strains we are putting on the nature services of the planet, while continuing to use them to bring better living standards to all….."
- Achieving this, however, will require radical changes in the way nature is treated at every level of decision-making and new ways of cooperation between government, business and civil society. The warning signs are there for all of us to see. The future now lies in our hands.

Scenarios: Global Orchestration, Order from Strength, Adapting Mosaic, Techno Garden

Towards Global Sustainability

Sustainable Development

"…development (i.e. economic, environmental, social development) that meets the needs of the present without compromising the ability of future generations to meet their own needs…

…Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs."

(World Commission On Environment And Development (1987) Our Common Future, Oxford University Press, Geneva, Switzerland)

Towards Global Sustainability

The Planet is in Trouble

UNITED NATIONS

⇧ UN Millennium Ecosystem Assessment April 2005

⇧ 1,300 Experts in 95 countries found:
- ⇧ 60% of ecosystems threatened or degraded
- ⇧ freshwater, fisheries air and water regulation, regional climate change, natural hazards & pests

We are Living Beyond our Means; Consequences in 50 years?

Towards Global Sustainability

Drivers: Global & Local

Economic and Political Globalism
- Trade, Capital Flows, Communications, Media, Travel
- Born Global
- Anti-globalisation Demonstrations/Campaigns

People and Populations
- ↑ Population in the Developing World
- ↓ Population in the Developed World
- Urbanisation, Migration
- Renaissance of the Local

The "Deep Divide"
- Gaps between Rich and Poor, Urban and Rural, GDP, Access to Capital, Debt, Stability, Conflict/War, Fundamentalisms, Technologies

Industry/Market/Investment/Regulation
- Global – National – Local;
- Codes ⇔ Legislation
- Voluntary v Mandatory
- Organics
- Certification/Verification/Ecolabelling/Indices
- Risk/Insurance
- Green Consumerism

Crises
- Corporate Collapses
- Insurance Blowouts
- Environmental Disasters
- Climate Change
- Refugees

Technology
- Information and Communication Revolutions
- Scientific and Medical Innovation
- Alternative Energy and Technologies
- New processes, Dematerialisation, Zero Waste, Product Stewardship

Activism, Awareness & Trust
- Planetary Public Opinion & ↑ Critical Theory
- Communities (Global, Local, Cyber)
- NGOs
- BINGOs
- Shareholder Democratisation
- Ethical/Socially Responsible Green Investment
- Consumer Boycotts
- Corporate Social Responsibility
- Protests, local and global

Towards Global Sustainability

Global Sustainability:

New Knowledge & Industry

- **New Language: Concepts, Measures, Approaches**
  Natural Capitalism and Cradle to Cradle
  Natural Advantage of Nations
  Sustainability Science: (Harvard)
  Complex Systems and Networks Therories: (CSIRO)
  Triple Bottom Line Plus One (GSI@RMIT)
- **Government Policies & Institutions**
- **NGO's Advocacy, Campaigns**
- **⇧ Industry Business Models**
- **⇧ Universities**
  Alliance for Global Sustainability: 4 Universities, Multidisciplinary, Multicultural, Team Based
  ⇧ GSI @ RMIT
- **⇧ Sustainability Industry & Markets**
- **⇧ Sustainability Scenarios**

Towards Global Sustainability

Global Sustainability & Scenarios

World Business Council for Sustainable Development

Global Scenario Group – Tellus Institute, Boston

Business Council of Australia

Pentagon

Millennium Ecosystem Assessment

Towards Global Sustainability

Environment

- Sustainable Landscape Design & Management
- Ecological services, methanol, water, soil, air
- Carbon in trees, wood & paper products
- Sustainable Yield
- Zero Waste
- Ecological Footprint
- Life Cycle Analysis, Stock & Flows, Materials Analysis
- Harvesting Codes of Practice & Audits
- Environment Management Systems (EMS's)

Towards Global Sustainability

Scenarios


Boiled Frogs


Geopolitical Crises


Jazz Players


Conventional Worlds


Barbarization


UN Millennium Ecosystem Assessment


Riding the Wave


Stormy Seas


Changing the Crew


Imagining the Unthinkable


China Goes Green

Towards Global Sustainability

Social & Cultural

- Community Support
- Regional & Remote Communities
- Employer of Choice
- Skills & Training Development
- Indigenous Traditions
- Employee Relations
- Occupational Health & Safety
- Tourism

Towards Global Sustainability

Triple Bottom Line + 1: GSI @ RMIT University

- Environment
- Social & Cultural
- Economic
- Governance

Towards Global Sustainability

Economic

- Prices, Profits, Markets
- Resource Productivity
- Value Adding
- Advanced Technologies
- Resource Security & Sovereign Risk
- Trade Deficit
- Illegal Logging & Dumping
- Trade in Environmental Services, Carbon, Biodiversity, Water, Soil, Pharmaceuticals
- Competition With Other Products

Towards Global Sustainability

Governance

- Whole Systems Approach
- Best Forest Management
- Stakeholder Engagement; External & Supply Chain
- Sustainability Reporting
- Good Local Citizens
- Third Party Certification, Ecolabelling
- Public and Private, Large & Small
- Codes of Conduct eg Protester Codes
- Right to Harvest

Towards Global Sustainability

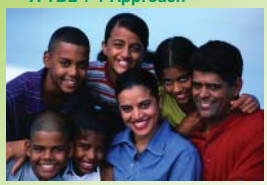
Images of the Past

About 1900

Grenades and Blockades

Industry Transformation is Key

- The Planet, its systems and species
- Society, its Systems & Technologies
- Shelter, Food & Clothing for 10 Billion of us by 2030
- A TBL + 1 Approach



Towards Global Sustainability

Images of Now

About 2000

Towards Global Sustainability

Industries Transforming

- Chemical Industries
- Mining & Minerals
- Agriculture
- Waste
- Energy
- Water
- Landscape Management
- Forest Industries
- Urban Planning

Towards Global Sustainability

Images of the Future

Victoria, a working model

of

Healthy Forests & Healthy Forest Industries

Towards Global Sustainability

Ecology

Australia

21% of Australia's land mass is forests (native & plantation, public & private)

164M ha is native forests (public & private)

70% of native forests are private

13% of all native forests (public & private) are formally protected

7% is available for harvesting

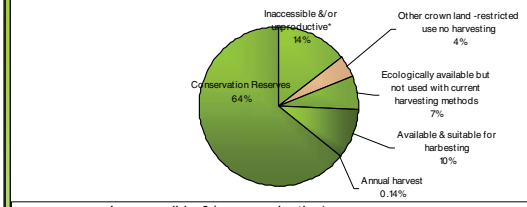
<1% of forests available is harvested each year

15 out of 17 forest types exceed IUCN's target of 10% protection

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Victorian Public Native Forestry



- Inaccessible &/or unproductive*
- Other crown land -restricted use no harvesting
- Ecologically available but not used with current harvesting methods
- Available & suitable
- Annual harvest
- Conservation Reserves

15 out of 17 Forest types better the IUCN – target of 10%

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Governance & Stakeholders

- People of Victoria
- VicForests, DPI, DSE, Treasury, Department of Victorian Communities, Premier
- Political Parties
- Regional Communities
- Environmental NGOs, global ⇔ local
- Federal Government
- Local Government
- Other Resource Industries
- Employees, Unions
- Architects, Planners, Builders
- Household Consumers
- Supply Chain
- Other forest users (tourism, recreation, fishing, hunting)
- VAFI Engagement, Community Council, External Advisory Groups for Environmental Services, Business Services, Investment Panel

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Victorian Public Native Forestry

"Improvement in the protection of environmental values in our public natural forests in the 1960's have been continuous and substantial reductions in

- Area available
- Sawlogs sold
- Area harvested

Increases in areas reserved

Improved utilisation/hectare"

Graeme Gooding: Continuous Improvement in the Protection of Environmental Values in Public Native Forests in Victoria Since the 1960's.

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Economics

Australia

Total value	$6.6 billion (2002)	1% of GDP
	(agriculture, forestry & fisheries = 3%, manufacturing 17%)	
Turnover	$15 billion	
Total employment	78,000 people	
Trade Deficit	$1.8 billion	

Victoria

Total Value	$1.5 billion	1% of GDP
Total employment	10,000	

Mostly family companies, regional communities

Illegal, unsustainably harvested logs are imported

Sawmills - 500 in 1970's 60 remain in 2005

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Macro Level Reservation & Protection

Since 1970 ⇧ Reserves

1989 Timber Industry Strategy

1990's Regional Forest Agreement

Comprehensive Adequate Reserve System (CAR)

- ⇧ No rainforest harvesting
- ⇧ Special protection zones
- ⇧ Further studies
- ⇧ Further reservations

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Controls on Victorian Public Native Forestry Harvesting in State Forests Outside CAR System

1986	Timber Industry Strategy: Forest Management Plans, Flora and Fauna Surveys, Public Consultations
1988	Flora & Fauna Guarantee
1989 & 1996	Code of Forest Practices for Forest Management: Coupe Plans 40ha maximum & Dispersed Sawlog Traceability; Minimum Forest height (> 28m)
1992	Regional Forest Agreement
2002 - 2003	Sustainable Yield Management: Yield ⇩ 30% Practical constraints and hidden reserves Stream buffers & wildlife corridors Non commercial species unmapped streams
2003	Unmapped Streams: Audit of Compliance, EPA
2004	Sustainable Forests (Timber) Act – pricing, allocation, sustainability criteria.

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

A Line in the Sand

⇩

VAFI's Vision 2025

XXII IUFRO World Congress Brisbane 11-13Aug05

Victorian Public Name Forestry Improved Utilisation

Resource Productivity and Value Adding

1. Better logs ⇨ value adding
2. Improved processing and new markets
3. ⇧ Use of non-sawlog grade/residual ⇨ pulp for paper

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

VAFI's Vision 2025

Industry leadership, credibility & recognition around sustainable forest issues and change

World's Best Practice; Industry & Ecology

- **TBL + 1 Approach**
- **Third Party Certification**
- **Highest Quality Products**
- **Employers of Choice, Skills & Jobs**
- **Sustainability Reporting**
- **Sustainable Yield, Best Codes of Practice**
- **Resource**

Native forests, plantations, agroforestry, public & private

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05

Hot Spots in Victoria

- Old Growth
- Red Gum
- Certification
- Pricing & Allocation; monopoly supplier, new commercial authority
- Community Forestry
- Water & Catchments
- Five Star Energy Ratings for Buildings
- Timber Promotion & Marketing

Grenades & Blockades

XXII IUFRO World Congress Brisbane 11-13Aug05

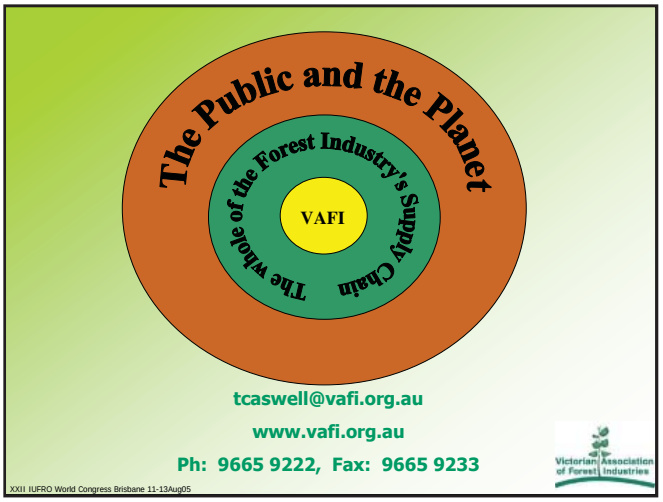
VAFI's Vision 2025

Whole of Supply Chain Presence and Co-operation

- **Good Industry Relations with Government**
- **Long Term Plan & Incentives**
- **⇧ Research, Science & Innovation**
- **New Products & Markets**
- **Redressing the Trade Deficit**
- **No illegal log imports**
- **⇨ 100% Resource Recovery/Use**
- **Value Adding & Niche Markets**
- **Socially responsible investment**

Towards Global Sustainability

XXII IUFRO World Congress Brisbane 11-13Aug05



Scientific Program

The year 2005 saw a major change in the way that sessions and papers were solicited for the IUFRO World Congress. Instead of allocating sessions across the IUFRO Divisions based on the number of units within each Division, a competitive process was instigated with potential session organizers having to demonstrate how they would address one or more of the ten themes identified by the Congress Scientific Committee and overall IUFRO membership as being important. This enabled more active areas of research to feature more strongly within the Congress, but also resulted in some important areas being under-represented because no sessions were proposed. It also enabled new areas of research to be addressed, and one of the outcomes of the Congress has been the establishment of a number of new Research Groups.

A second change was to disassociate specific Research Groups with specific sessions. Research Groups were not prevented from identifying with particular sessions, but sessions organized jointly by several groups were encouraged. Research Groups were also encouraged to orient their sessions to the sub-themes of the Congress. As a result of this change, a number of sessions were organized by individuals with no previous affiliation with IUFRO. This is seen as a positive development.

In line with wishes expressed by participants to previous Congresses, the number of parallel sessions was reduced. This resulted in an overall improvement in the quality of sessions, but also necessitated the scheduling of sessions well into the evening of each day. Consequently, some sessions were rather poorly attended.

IUFRO continues to place a great deal of emphasis on posters. These are an extremely effective means of communication, but it is an unfortunate fact that many research administrators and scientists themselves continue to consider poster presentations as being inferior to spoken presentations. This is not the case and, as shown in the session reports below, many posters received more attention than spoken papers.

Although the proportion of 'no-shows' was dramatically reduced by insisting that all presenters register, there were unfortunately a number of posters that were not displayed and two sessions were cancelled.

In all, 2456 unique abstracts were submitted for possible inclusion in the Congress. Of these, 95 were rejected as unsuitable, and 163 were voluntarily withdrawn. A further 700 were eliminated when the authors failed to register for the Congress by the required deadline. Of the papers that remained, 643 were accepted as verbal presentations and 843 as posters. The abstracts of these were published pre-Congress in *The International Forestry Review* (Vol 7 (5) 2005) and this publication and a companion CD were provided to each delegate at Congress.

A final change that was introduced in 2005 was the abolition of a set of full Congress proceedings. The Congress Scientific Committee decided that this was not the most efficient way to disseminate the high quality papers submitted to the Congress. Instead, papers will be published in a variety of more specialized outlets, ensuring that they receive the recognition that they deserve. In the session reports below, the place of publication has been included where known.

The following summaries represent those received from the respective Session Organisers.

Integrating approaches to achieve multiple goals: Intensive management, extensive management or conservation?

Session organizer: Klaus von Gadow (University of Göttingen, Germany; email: kgadow@gwdg.de).

Different social, economic and ecological goals are considered when decisions on forest management are made. Balancing between different goals requires integration of different approaches. In this session, applicable advances in the knowledge of planning methods, socio-economic decision environment, and interaction between human activities and ecosystem were presented.

In the first paper, Tuula Nuutinen (Finnish Forest Research Institute, Finland) presented a case study illustrating the potential of integrated stand and forest level optimization (the so called multiple-paths principle) in the simultaneous location of set-asides and management activities of forest stands.

Then, Juan-Manuel Torres-Rojo (Centre for Research and Teaching of Economics, México) introduced the challenges and potentials related to the management of common property forest lands. In the third paper, Chris Goulding (Ensis, New Zealand) emphasized the role of research in the design of plantation management systems to meet simultaneously social, ecological and economic requirements derived for example from the needs of indigenous people and certification schemes applied in the forest product markets.

In the fourth and fifth papers, the importance of empirical research in the evaluation of management alternatives was demonstrated. In a particularly interesting paper, Martina Mund (Max Planck Institute for Biogeochemistry, Germany) showed how carbon pools vary by forest management types. In the last paper, Robert Szaro (U.S. Geological Survey, USA) discussed the role of large-scale experiments when adapting management actions for multiple goals.

Selected papers from this session will be published in the Allgemeine Forst- und Jagdzeitung.

Rapporteurs: Tuula Nuutinen (Finnish Forest Research Institute, Finland) and Klaus von Gadow (University of Göttingen, Germany)

Biodiversity and plantations – oxymoron or opportunity? Integrating approaches to achieve multiple goals – intensive management, extensive management and conservation

Session Organizers: Alain Franc, Jeff Sayer and John Parrotta

This session generated a great deal of interest and more papers were proposed than could be accommodated in the time available. A number of contributions were therefore adapted for inclusion in the poster session. A lead paper 'Biodiversity and plantation forests: an overview', authored by Franc, Jactel, Sayer and Parrotta and presented by Parrotta, provided a synthesis of an inter-divisional conference on Biodiversity in Plantation Forests held in Bordeaux, France in April 2005. It provided a typology of planted forests and addressed the issues both of the value of planted forests in achieving biodiversity conservation objectives and the value of biodiversity in improving the productivity and resilience of plantations. The general conclusion was that planted forests often have far higher biodiversity values than is commonly recognized and that biodiversity can indeed contribute in different ways to improved plantation performance. Mechanisms by which plantation operators might derive financial benefit from measures that they take to conserve biodiversity were discussed.

The potential values of planted forests for biodiversity were addressed in a paper by Brockerhoff using examples from New Zealand. Several species of native plants and animals are now more abundant and secure in planted forests than they are in the relict native forests which have been severely impacted by invasive alien species. The paper noted the dangers of establishing plantations land previously covered in native forest but went on to propose measures to enhance the biodiversity value of planted forests.

Other papers dealt with the ways in which plantations in Australia (Cummings and Read), south-east Brazil (Engel, Onofre, Almeida and Sartori) and Kalimantan, Indonesia (Otsamo, Marjokorpi, Otsamo and Tyynela), had received special management treatments in order to enhance their biodiversity value. A poster by Gillison showed new approaches to assessment techniques for biodiversity. Pollard (WWF) discussed the issues relating to the position that environmental NGOs might take in relation to the rapid expanse of plantation forestry, both past and anticipated. He indicated a willingness for environmental groups to work with plantation companies to assist them in achieving outcomes favorable to biodiversity. Other contributions dealt with arthropods in Canadian forests, genetic variability in plantation seeds in Europe and the diversification of coniferous monocultures.

A discussion followed the presentations in which a number of issues that have led to tensions between plantation foresters and environmental groups were discussed. The conclusion of the discussions was that IUFRO should continue to work on these issues and that relations with environmental conservation interests should be intensified.

Wood quality from intensive management

Session Organizer: Dave Cown (ENSIS, New Zealand; e-mail: Dave.Cown@ensisjv.com).

The five presentations in Session 016 addressed two highly relevant topics related to wood quality and forest management: 1) how current silviculture influences the quality of the products to be harvested in the future, and 2) how to measure and/or model the wood quality of existing stands.

In his keynote presentation, Jean-Michel Leban (INRA-Nancy, France) summarized nearly 20 years of work on modeling timber quality in softwood plantations. The objective has been to develop tools for better wood utilization and to provide a support system for choosing appropriate silvicultural methods, especially in short rotation forestry. The approach has been "backwards modeling": growth of the individual tree is simulated from data on diameter (DBH), height and age in order to assess the quality of presently standing timbers. Today, the software provides detailed 3-D prediction of wood quality features within the single tree, as well as possibilities for modeling wood quality and its development for the whole forest resource within a certain district.

Peter Carter (fibre-gen, New Zealand) presented new acoustic tools for measuring wood stiffness on standing trees, logs, and sawn wood in green or seasoned condition. The tools rely on the fact that the square of sound velocity within a certain material is directly related to the modulus of elasticity divided by material density. Sound velocity can be measured using either a resonance approach (logs and boards) or the flying time of a sound signal between two transducers (standing trees). As wood density is closely linked to moisture content, moisture has a marked influence upon the results. A strong relationship is found between sound velocity in green logs and the stiffness of sawn wood and veneers. A relationship between sound velocity and spiral grain has been demonstrated, and a similar effect of microfibril angle is expected.

A comparison between old growth (~135 years old) and large trees (~100 years) from intensively managed Norway spruce plantations was presented by Gero Becker (Albert-Ludwigs-University, Germany). On the average, plantation trees had lower wood density and more taper. The faster growth of the planted trees resulted in more spiral grain but due to pruning they contained more clear wood in the butt log.

The effect of silvicultural management on the timber quality of Douglas fir was demonstrated by David Briggs (University

of Washington, USA) applying Process Capability Analysis. Compliance to customer specifications was demonstrated for various properties, following different thinning intensities from zero to 75% reduction of the initial stocking.

An example of sawlog quality in Eucalypts grown under different climatic conditions was reported by Leif Nutto (Albert-Ludwigs-University, Germany). Trees from Brazil (55 cm DBH / 12 years) were compared to trees from Galizia, Spain (68 cm DBH / 28 years) regarding knots, mechanical properties and growth stresses. It was concluded that the quality of short rotation sawlogs is comparable to slow grown trees, provided that pruning is performed and that intensive thinning is applied in order to minimize growth stresses.

Rapporteur: Andreas Bergstedt (Royal Veterinary & Agricultural University, Denmark)

Integrating wood production within sustainable forest management

Session Organizer: Robert Deal (USDA Forest Service, Pacific Northwest Research Station, USA; email: rdeal@fs.fed.us).

Sustainable forest management is a compelling issue from the local, regional, national and international perspective and issues relating to the ecological, social and economic frameworks of sustainable forestry will play a major role in future wood production worldwide. This session included seven oral presentations and twelve posters from researchers in Europe, North America, South America and Asia who are interested in producing wood while maintaining other forest resource values.

The session included two state-of-the-art presentations and perspectives from North America and Australia. Richard Haynes (USDA Forest Service) gave a paper on wood production and sustainable forest management in the United States where he discussed the influence of forest products markets and management decisions on sustainable forestry. Ian Ferguson (Professor Emeritus, University of Melbourne) discussed the development of conservation reserves and changes in forestry policy in Australia and the different tradeoffs associated with particular forest management policies.

The session also included five short presentations from speakers representing New Zealand, Scotland, India and the United States. Hugh Bigsby (Lincoln University, New Zealand) gave an interesting paper on different perspectives regarding environmental, social and economic aspects of forest management in Tierra del Fuego, Argentina. Bill Mason (UK Research) gave a fascinating paper on changes in Scottish forestry and the challenges and opportunities for plantation silviculture in a country that until recently had a small forest land base. Daniel Mendham (CSIRO, Australia) and colleague K.V Sankaran (Kerala Forest Research Institute, India) discussed eucalypt plantations in India and some of the challenges associated with declining productivity from successive rotations. Bob Monserud (USDA Forest Service) provided an interesting talk on changes in wood products in the Douglas-fir region of the Pacific Northwest, USA. Finally, Mathew Kelty (University of Massachusetts, USA) gave a presentation comparing important issues for sustainable forest management in oak forests of Massachusetts, USA and mahogany forests in Mexico.

Posters associated with the sessions covered a wide set of topics and ranged from oak silviculture in USA (Sam Foster, USDA Forest Service) to Nothofagus forests in Chile (Gustavo Cruz, University of Chile) and Maria Manso-Martin, University of Freiburg, Germany) to Norway spruce forests in the Czech republic (Emil Klimo, Institute of Forest Ecology, Czech Republic). A particularly well presented poster was given by Robert Schneider (University of Laval, Canada) that discussed a model for predicting rot in Populus tremuloides in Quebec.

In summary, the sessions were very interesting and covered a wide range of topics on issues important for sustainable wood production throughout the world. Fourteen selected papers from this session and an associated session on emerging issues for sustainable forest management will be published in a special issue in the *Journal of Sustainable Forestry* in 2006.

Rapporteur: Robert Deal (USDA Forest Service, Pacific Northwest Research Station)

Designing policies for the protection of biodiversity in forested environments

Session Organizer: George Hoberg (Faculty of Forestry, University of British Columbia, Canada; email: george.hoberg@ubc.ca).

The main themes of this session were the problems associated with policy design, implementation and harmonization, and measures used to assess biodiversity conservation. Unfortunately, two of the session's speakers were unable to attend, David Lindenmeyer from Australia and Manuel Gariguate from Canada.

Graham Wilkinson discussed the protection of biodiversity from an Australian perspective, focusing on the relationships between land ownership and biodiversity management in Tasmania. He criticized the use of percent cover values as measures of biodiversity and emphasized a need for advances in policy development, measurement and implementation. George Hoberg presented policies for protecting biodiversity in Canada highlighting the differences in management approaches across provinces and stressing the need for

socioeconomic balancing in management . He discussed the utilization of use categories and three matrix instruments as measures of protection, while emphasizing the need for socioeconomic balancing.

Danny Chheang introduced the 'Emerald Triangle' biodiversity conservation program; a trans-boundary initiative between Cambodia, Laos and Thailand. Key issues in the development phase were identified as enhancing conservation while increasing local participation and involvement. Eeva Primer presented the preliminary findings of her Ph.D. research analyzing the organizational practices of biodiversity management in Finland. Through an examination of normative, cognitive and structural patterns, she is approaching biodiversity conservation through individuals, routines and practices 'on the ground'.

In the discussion the use of percent area as a measure of protection was generally perceived as inadequate, and the need for 'adaptive management' practices that are flexible to changing economic and social values was a recurring theme.

There were five posters associated with this session. Davey and Keena illustrated the intersection of policy issues and the value of ecosystem services over forest products from an Australian perspective. Haminen and Kallio showed the impacts of alternative conservation on supply, demand or trade using results from a static multi-periodic multi-regional model in southern Finland, while Horne used various scenarios of actions based on improved conservation to develop new instruments that reduce conflicts between stakeholders in the same region. Kohaska et al. delivered a very graphic representation exploring and contrasting the emotional and scientific arguments for conservation, and Nicholson et al. displayed methods of conservation planning using models of species distribution to estimate extinction risk and optimise both landscape configuration and conservation.

It was apparent that current methods of biodiversity conservation are proving inadequate around the globe. New methodologies and policy frameworks need to be developed that are both flexible and unified, for biodiversity to be adequately protected.

Rapporteur: Judi Krzyzanowski (Sustainable Forest Management Research Group, University of British Columbia, Canada).

Environmental planning for harmonizing forest biodiversity conservation and sustainable development

Session Organizers: Dr. V.B. Mathur and Dr. Asha Rajvanshi, (Wildlife Institute of India, Dehradun; email: vbm@wii.gov.in and ar@wii.gov.in).

Development projects are often identified as the most obvious indicators of economic development. They also offer perhaps the greatest challenge for biodiversity conservation. The global scientific community and development planners have been grappling for strategies to meet the conflicting objectives of biodiversity conservation and sustainable development for an improved economy.

In this session, four interesting papers were presented. Professor James Burger (Virginia Polytechnic Institute and State University, USA) discussed the results of a long-term forest land reclamation programme initiated in 1980 to develop reclamation techniques for mined land specifically in relation to the restoration of native forest and concluded that post-mining forests can be as diverse and productive as the native forests, if reclaimed using proper reclamation techniques. Dr. Toivo Zoete (Golder Associates, Canada) presented the experience gained from conducting EIA of large pipeline projects and discussed the best management practices to ensure that biodiversity considerations are incorporated throughout the life cycle of pipeline projects, citing examples from projects in the Canadian Arctic, the interior plains of South America and Central Thailand.

Dr. V.B. Mathur (Wildlife Institute of India, Dehradun) highlighted the significant impacts on biodiversity of two hydropower projects, the Narmada River in India and the Mahaveli River in Sri Lanka. He stressed the importance of incorporating knowledge of wildlife ecology and behavior in developing mitigation plans. He concluded by saying that neglect of people's participation in development planning can seriously undermine the prospects of biodiversity conservation.

In a particularly interesting paper, Dr. Bruce Marcot (USDA Forest Service) cautioned that relying on threatened, endemic, indicator, flagship and umbrella species will not suffice when evaluating the impacts of developmental projects. There is a need to look across taxonomic and functional groups and also to better account for local extirpations of species, sub-species, demes and metapopulations. He concluded by saying that population density and growth in countries like China, India and Mexico will determine what our planet will be capable of producing and supporting for centuries to come.

Rapporteur: Dr. Rudolf Kropil (Technical University, Slovakia; email: kropil@vsld.tuzvo.sk).

Uneven-aged silviculture: From temperate to tropical forests

Session Organizer: Kevin L. O'Hara (University of California – Berkeley, USA; email: ohara@nature.berkeley.edu).

Uneven-aged silviculture describes a group of treatments designed to develop or maintain forest stands with multiple age classes of trees. This area of management and research is extremely important in modern forestry where biodiversity, natural processes, and structural diversity are receiving greater emphasis. The origins of uneven-aged silviculture are generally traced to temperate forests of central Europe. These practices have spread from temperate to tropical forests but there has been relatively little collaboration between scientists from these two types of forest. The objective of this session was to bring scientists from temperate and tropical forests together to link these two areas of research. The meeting was cosponsored by the "Uneven-aged silviculture Research Group (1.14) and the "Forest dynamics and yield regulation systems for tropical/subtropical moist forests" Working Party (1.07.18).

Seven papers were included in this session including two introductory papers on temperate and tropical forests. Three of the papers featured tropical forests and four temperate. Dr. Armin Seydeck gave an overview of yield regulation in tropical forests that integrated concepts related to stand dynamics with yield and yield regulation. One of his primary conclusions concerned the incompatibility of high harvest intensity and natural stand dynamics in many forest types. Dr. Plinio Sist discussed the implications of reduced impact logging techniques in the three major regions of tropical forest management in the world.

In temperate forests, Dr. Hubert Hasenauer presented an overview of selection management in central Europe. Two other papers discussed the effects of partial shade on tree form. Dr. Nobuya Mizoue discussed effects of string and group cutting systems on regeneration in Japan and Dr. David Azadfar discussed light requirements of beech in Iran. In a paper added to our session, Dr. Sander Wijdeven presented a study where he reconstructed to growth of various species in the Netherlands to demonstrate their growth rates in partial light environments. He found differences in competitiveness that were largely related to shade tolerance.

An overall theme of this session was that both temperate and tropical uneven-aged silviculture face similar problems related to determining appropriate intervention levels to secure adequate and timely regeneration. Differences were more attributable to terminology and tradition rather than species or growth rates. There appears to be considerable potential for interaction and collaboration between temperate and tropical scientist working in uneven-aged silviculture.

Rapporteur: Kevin L. O'Hara (University of California – Berkeley, USA).

Properties and utilization of plantation timbers - Plantation wood as a substitute for native forest fesources

Session Organizers: Kee-Seng Gan (Forest Research Institute Malaysia (FRIM), Malaysia; email: ganks@frim.gov.my) and Gary Waugh (University of Melbourne, Australia; email: Gary.waugh@bigpond.com).

Plantation timbers are becoming increasingly important as substitutes for timber trees from the natural forest even in tropical countries which have for many years depended on trees from natural forests. The session therefore offered a good avenue to discuss the state of scientific research and knowledge on plantation timber through oral and poster presentations. Five scientific papers and five posters on varying subjects and species were presented for discussion by 10 scientists from seven countries.

A comparison of growth rate and within stem density distribution in naturally grown and hybrid plantation grown aspen (Populus tremula) was presented by H. Herajarvi and R. Junkkonen. Annual growth rate in a 50+ year old matured aspen from natural forest averaged 5 to 8 mm before a slight decrease after 50 years compared to growth rate of 10-14 mm for hybrid aspen. The density of 363 kg/m3 for hybrid aspen was uniform but lower compared to 376 kg/m3 for natural aspen. The paper from Argentina by Sachez Acota and four others looked at physico-mechanical properties of Eucalyptus grandis from that country. They concluded that average density of 578 kg/m3 was higher than normal with a volumetric shrinkage of 16.9%. From China, Zhou Yangdong and Jiang Xiaomei looked at sawing characteristics of four Eucalyptus species and concluded that a high deviation in longitudinal and tangential strain resulted in bow and split deformations. An interesting paper on stress grading of tropical lumber in the Philippines presented by Allan Manalo and his team of seven scientists gave a harmonized model framework for lumber stress grading rules in producing and consumer countries and concluded that the benefits from grading outweigh the added costs. Kang Ho-Sang ended presentations for the session at 17:40 on 8th August 2005 with a case study on clonal forestry for conservation of natural tropical forest in Indonesia and concluded among others that clonal forestry has a strong potential and highlighted the need to implement a short- and long-term breeding programs.

The five posters presented for the session came from Malaysia (two posters), China (one poster), Chinese Taipei (one poster) and Australia (one poster). They covered five plantation species (cedar, teak, eucalyptus, rubberwood and acacia) with subjects including basic properties on cedar, sapwood variation in plantation teak, sawing and sawlogs in Eucalyptus and sound absorption property of rubberwood and Acacia mangium. Some authors of the posters did not follow the

approved guidelines and format while others needed some editing. In general competition for selection of a best poster was less competitive because of the aforementioned factors. The poster presented by Lim and three others from Malaysia was adjudged the best.

All the 10 presenters deserve special commendation. However, scientists are encouraged to contribute more to the session in future to enhance quality and competition in this most important group.

Rapporteur: Andrew A. Oteng-Amoako (Forestry Research Institute of Ghana (FORIG), Kumasi, Ghana; oamoako2002@yahoo.com).

Modelling multi-dimensional forest dynamics for multi-purpose

Session Organizer: J.P. Skovsgaard (Denmark).

The session focused on the development and operational use of models for the prediction and assessment of forest multi-functionality. An introductory overview of European experience and perspectives (H. Pretzsch and J. P. Skovsgaard) brought up most of the issues that were discussed in the following presentations. Forest ecosystem management can be seen as the definition and implementation of the actions needed to transform a forest in a way to change from an actual stage to a target stage. The target stage must be defined by negotiation, taking into account scientific knowledge, forest managers' experiences, and the stakeholders' needs. Forest management is therefore a dynamic issue continuously adapted to new scientific achievements and society needs as the succession of model approaches in forestry – from experience tables through normal yield tables, models for stand growth, diameter distributions, and individual tree behaviours, to landscape management systems – clearly reflects. Model development should be seen as a scientifically based client-driven dynamic process. Model acceptance by stakeholders is not straightforward, perhaps because model development has been a top-down approach with too little dialogue with users. A bottom-up approach leading to improvements or adaptation, so that models provide what future users really need, may be promising. The methodologies for model development also show a clear trend – from empirical statistics-based models towards more process-based models and involving an ecosystem-based approach.

The classical statistical approaches are still an important component of present models as was shown in the presentation by R.A. Monserud and S. Huang on the modelling of lodgepole pine productivity from climatic parameters in Alberta. This type of model is essential for the implementation of dynamic landscape management models that allow for species interchange and or plantation of new areas. The FORECAST model (with the latest development presented by Lo and Kimmins) is a good example of a model which has already incorporated a variety of different ecosystem processes (e.g., nutrient cycling, understory competition). These are being extended to include climatic components as well as three other components: hydrology, wildlife and fire. Another example of the use of mechanistic complex models for the analysis of the sustainability of current forest management practices taking into account the three major realms was brought by H. Sverdrup, P. Wallman and S. Belyazid.

M.R. Ngugi, D.B. Botkin, B. Jones and A. Williams shared their experience on the use of forest dynamic models to mimic long-term changes in forest composition as an evaluation of the ability of current management practices to achieve and number of different objectives. These include biodiversity conservation, habitat diversity and the protection of rare and endangered species. Methods for the evaluation of cavity tree abundance were discussed by H. Temesgen, T. Barret and G. Latta. The involvement of model users in the process of model development was the subject presented by J. Vanclay who described his experience with participatory modelling in helping people to learn, to anticipate and to change their behaviour.

The concluding discussion focused on the integration of the issues brought up by the presentations. There is a need to select the models according to the problem that needs to be analysed or solved. In relation to this the discussion also focused on the complexity versus simplicity of models. Topics in the final discussion: How complex should models be in order to integrate social and ecological aspects? How much should we sacrifice accuracy for comprehensiveness?

Rapporteur: Margarida Tomé (Portugal)

Monitoring and indicators of forest biodiversity - towards a harmonised system at country, landscape and stand scale

Co-organized by Tor-Bjorn Larsson (European Environment Agency), Anna Barbati and Marco Marchetti (Accademia Italiana di Scienze Forestali, Italy), and Frits Mohren (Wageningen University and Research Centre, The Netherlands).

The session was a follow up of the IUFRO conference "Indicators of forest biodiversity in Europe – from ideas to operationality", November 2003, Florence, Italy. The objective was to report to the IUFRO World Congress on the outcome of this European event but also to further analyse the way forward to improve forest biodiversity assessments with respect to:

- Reporting of biodiversity state and change from countries to international processes (Montreal, MCPFE, CBD etc.),

identifying gaps in information flow and ways forward to meet the needs;

- Landscape-level assessment of forest biodiversity building on innovative technologies and assessment frameworks; identification and application of reference, 'base-line' conditions;
- Optimising stand-level methods to assess forest biodiversity.

The program started with a brief report on the IUFRO Conference by the main organizer, Professor Marco Marchetti. This was followed by three presentations highlighting ongoing important processes in European Union related to forest biodiversity:

Assessing progress towards the 2010 target of halting biodiversity loss in forest ecosystems (Dr Jo Van Brusselen);

Developing a biodiversity module in the ongoing European biomonitoring scheme for forests (Dr Pat Neville)

Establishing a European level scheme of forest types to enable assessments of forest biodiversity (Dr Anna Barbati).

A final invited keynote by Professor Maria Paiva shared experiences of insects as indicators of forest biodiversity.

Several abstracts from other conference participants were allocated to this session. Given the time constraints only two could be included in the programme; one presenting ideas on fungal and bacterial diversity that seem entirely new in this context (Prof Steve Woodward) and a stimulating presentation of a study on beetles and spiders in satoyama 'habitat' in Japan.

This session established a link to the session on 'International Research to Monitor Sustainable Forest Spatial Patterns' organized by Christine Estreguil and Kurt Riitters. We will in future cooperate, for example over development of the MCPFE indicator 'Landscape pattern'. Gordon Hickey, organizer of the session 'Research demonstration: Evaluation of sustainable forest management' invited three of the papers presented here to be published in a special issue of the journal 'Ecological Indicators'.

Managing forests for biodiversity conservation

Session Organizers: Dr S.A. Hussain and Dr Ruchi Badola (Wildlife Institute of India, Dehra Dun. 248001, India; email: hussain@wii.gov.in and ruchi@wii.gov.in).

Forest biodiversity is important in all aspects of sustainable development. The only way to maintain income, opportunities and environmental services that poor people depend upon is to keep species from being depleted and to maintain the ecosystems that support these systems. However, during the last millennium almost half of Earth's original forest cover has been lost, much of it destroyed within the past three decades. Such loss has not only affected the world's natural capital directly, but also has caused loss of biodiversity leading to losses in the gene pool.

All over the world Protected Areas (PAs) form the cornerstone of efforts to conserve biodiversity. Forest Protected Areas cover around 8% of the available forests of the world. Despite such measures, forests and biodiversity are declining. It is unlikely that many governments would set aside more than 10-15% of tropical forests as PAs. Most PAs are facing biotic pressures and are often surrounded by incompatible land-use practices. Most governments lack the capacity to implement conservation policies in face of competing claims over forests. Therefore, although PAs are one element of successful conservation strategy, they cannot be the sole element for conserving forested ecosystems. Other elements of successful biodiversity conservation need to be explored. The major objectives of this session were to:

- address the issues, problems and prospects of biodiversity conservation specially in tropical regions,
- discuss some innovative management practices with help of case studies dealing with the role of PAs as well as non-protected forest landscapes in biodiversity conservation, and to
- debate on human dimension and collaborative management practices in biodiversity conservation and forest management.

The session commenced with an overview of the principles and trends in management of forests for biodiversity conservation. Subsequently, five oral and four poster presentations on best management practices were made. The presentation by Yalçın Kuvan gave an overview of the status and management issues of the Protected Areas in Turkey and proposed recommendations for solving several problems there. K.P. Acharya discussed the possibilities for the integration of biodiversity conservation issues into community forestry in Nepal. Ruchi Badola and S.A. Hussain presented the Indian experience in biodiversity conservation both in protected areas and in managed forests. This presentation traced the impacts

of larger political and economic developments on forests in India and their relationship with other stakeholders.

In a highly technical presentation Sarah Munks discussed the conservation of habitat for hollow-dependent fauna in the dry eucalypt forests of south-eastern Tasmania. Models developed using a subset of several environmental variables were coupled with GIS data to develop a map of predicted occurrence of trees with potential hollows based on which estimation were made of the rate at which trees with potential hollows were captured. Bradley B. Walters from Canada presented the ecological effects of small-scale cutting of Philippines mangrove forests. This presentation highlighted the significance of small-scale cutting disturbance in mangrove ecology, raising interesting issues concerning the long-term conservation of mangrove forests.

In the poster session Miroslav Svoboda, Vilem Podrazsky and Jiri Remes compared the active and passive management approaches to the management of the Sumava National Park elaborating on the risks of passive management of National Parks. Amelia Koch, Sarah Munks and Don Driscoll presented a model to predict the use of a particular tree by hollow-dwelling vertebrate fauna to be used when selecting habitat trees for retention. The influence of fire on the loss of hollow trees and glider dens and their impact on the population structure of the glider Petauroides volans in Queensland forests was presented by John Kehl, Geoff Smith and Luke Hogan. Alois Skoupy and Jaroslav Simon presented a procedure to optimize forest operations, based on the latest knowledge about operational reliability of machines, technical logistics, and qualimetric procedures of assessment. Woo-Shin Lee and Young-Su Park gave an overview of the differences in breeding success of tits using artificial nest boxes between hog fat supplied and non-supplied coniferous forests in South Korea.

During the concluding discussion the participants agreed on the possibility of experimenting in various ways for managing forests for biodiversity conservation and maintenance of ecological process of forested landscapes. Selected papers from this session are expected to be published in full in a compilation by the Wildlife Institute of India.

Rapporteur: Dr. Ruchi Badola (Wildlife Institute of India, Dehra Dun, India; email: ruchi@wii.gov.in).

Managing forest landscape mosaics for production and conservation

Session Organisers: Geoffrey Smith, (Queensland Environmental Protection Agency, Australia; email: geoffrey.smith@epa.qld.gov.au) and David Taylor (Queensland Department of Primary Industries and Forestry, Australia; dave.taylor@dpi.qld.gov.au).

The integration of forest production with sustainable biodiversity objectives is a major challenge for forest managers in the 21st century. Steve Read (Forestry Tasmania) introduced the session, outlining the "landscape" of verbal and poster presentations and the emerging themes of the presentations:

> Theme 1 - the role that disturbance, at varying spatial and time scales, has in determining biodiversity patterns through the landscape;
>
> Theme 2 - the importance of maintaining production and conservation ethics on and off-reserve tenures in support of biodiversity objectives;
>
> Theme 3 - the need for strategies, strategy review and decision-support tools that can integrate conservation with production objectives most efficiently.

Among the verbal presentations, Rob Deal (USDA Forest Service) highlighted the importance that variability in time and space of conifer and alder stands in Alaska contributes to biodiversity values (Theme 1). Stephen Mitchell (University of BC) outlined the role natural disturbance plays in determining patterns in the forest landscape of Canada and the landscape factors contributing to natural disturbance events (Theme 1). Richard Loyn (DSE, Victoria) indicated that native eucalypt plantations in highly fragmented landscapes outside the reserve system play an important role in biodiversity conservation (Theme 2), but that their effectiveness is context driven (i.e., relationship to larger forest reserves, Theme 3). Fred Duncan (Forest Practices Board, Tasmania) reported on the importance of maintaining conservation objectives across tenures (Theme 2) and outlined initiatives aimed at retaining habitat values of grassy blue-gum forest in Tasmania (Theme 3).

Simon Grove (Forestry Tasmania) assessed initiatives by the forestry sector to maintain biodiversity, suggesting that accomplishments have been variable depending on spatial scale, context and choice of indicator organism (Theme 3). Rod Kavanagh (NSW DPI) outlined a decision-support tool under development for integrating wood production schedules with spatial and temporal models of habitat availability, in order to optimize production and conservation objectives (Theme 3).

Among the poster papers, Brad Law (NSW DPI) demonstrated that micro-bats respond to forest stand attributes following post-harvest regeneration (Theme 1). Ivar Gjerde (Norwegian FRI) presented a tool for identifying important biodiversity hotspots at forest stand level (Themes 2 and 3). John Hickey (Forestry Tasmania) outlined a system of silvicultural heterogeneity in tall old-growth forests (Theme 3). Geoff Stoneman (CALM, WA) discussed the management of forest mosaics in Western Australia and Tom Hughson and Peter Baldwin (Conservation Commission, WA) outlined strategies for protecting old-growth forest in Western Australia (Theme 3).

Selected papers from the session may be published in Conservation Biology, Elsevier.

Rapporteur: Geoffrey Smith (Queensland Environmental Protection Agency, Australia).

Utilizing genetic resources to further sustainable forestry

Threats to forest genetic resources and approaches to gene conservation

Session Organizer: Judy Loo (Canadian Forest Service, Natural Resources Canada; email: jloo@nrcan.gc.ca).

Three speakers represented three continents, addressing different problems and identifying different approaches for solutions. Wickneswari Ratnam described impacts of forest harvesting on genetic diversity of several tree species in Malaysia. Csaba Mátyás addressed the question of adaptation to climate change and gene conservation planning considerations in view of environmental changes in Europe. The third paper was delivered by Jonathon Cornelius, who described experiences with participatory domestication of tree species in the Peruvian Amazon.

A series of genetic diversity studies in Malaysia examined the impact of fragmentation and partial harvest on the population genetic structure of tropical dipterocarp and non-dipterocarp tree species. Wickneswari Ratnam reported that changes in levels of genetic diversity occurred as a result of logging, with loss of alleles and heterogeneity observed after partial logging for a Shorea species. The vulnerability of species to the threat of genetic erosion, resulting from high-grading in a selective logging system, was found to be highly correlated with early growth requirements and abundance of the species. Logging systems could be designed to avoid loss of genetic diversity.

Csaba Mátyás generated a lively discussion with his observations regarding impacts of climate change on species' ranges. He noted that hot days in Eastern Europe are closely correlated with mortality in spruce and that spruce has almost disappeared from his area of Hungary. He recommended that conservation efforts should be focused on the lower distribution limits of species' ranges because of the anticipated loss of these populations as climates warm. Efforts should also be expended on discovering and conserving genetic material from those populations with greatest phenotypic plasticity with respect to climatic variables, because such genotypes will be increasing important in the climates of the future.

Deforestation and associated habitat loss is of increasing significance in the Amazon region of South America and one approach to reducing the impacts on native tree species is to ensure that native tree species are used as much as possible on farms. Farming communities in Peru depend on 250 tree species for an array of products, but the combination of over-harvesting particular species and deforestation for agriculture and other land uses is steadily eroding the quantity and quality of this resource. Jonathon Cornelius described his programme aimed at domestication and quality improvement or restoration of several of the valuable species. An important intended outcome of his work will be expansion of farmer participatory programmes to include more species, with the objective of making quality material from a wider variety of native species available for farmers.

Genomics – Present status and progress

Session Chair and rapporteuer: Giovanni G. Vendramin (Italy).

Understanding the genetic basis of adaptation is of primary interest in evolutionary biology. The classical theory of quantitative genetics predicts that adaptive variation is mostly based on a large number of loci with small effects. Genetic diversity is the basis of the ability of organisms to adapt to changes in their environment through natural selection. Populations with little genetic variation are more vulnerable to the arrival of new biotic and abiotic stresses. Gene conservation management aiming to save adaptive genetic diversity should be based on the knowledge of the genetic basis of adaptation.

In recent years, the majority of studies aiming to monitor the level and distribution of genetic diversity in natural populations were based on the use of neutral markers. Indeed, molecular markers, such as allozymes or microsatellites, provided useful information on historical demography and population evolution. On the other hand, neutral markers do not generally reflect selective processes or are related to fitness, which is an indicator of the level of adaptive variation within populations and, therefore, of the population adaptive potential to changing environment.

Traditionally, in forest trees, dissection of complex adaptive traits was done through genetic linkage analysis (QTL mapping) based on DNA polymorphisms in highly structured populations with known pedigrees. The study of the pattern of variation of adaptive traits benefited from classical tree breeding

experiments, which provided information about families particularly adapted to specific environmental conditions. The development of molecular markers in functional regions (genes, promoters, etc.), such as SNPs (Single Nucleotide Polymorphisms), and the discovery of candidate genes via transcript profiling, together with an extraordinary effort on EST (Expressed Sequence Tags) sequencing have created the opportunity to bring together population genetic and functional genomic studies by identifying candidate genes controlling target traits or underlying QTLs (Quantitative Trait Loci), and subsequently using polymorphisms that are in strong linkage disequilibrium (LD) with phenotypic traits ("association mapping").

The study of adaptation is fundamental to forestry and forest genetic conservation. There is a need for developing rapid and informative diagnostic techniques for evaluating large numbers of adaptive genes. Genomics provides new tools to study adaptation in trees. Using modern genotyping technologies, association studies and bioinformatic tools they can determine allelic diversity for candidate genes in forest tree populations and directly measure adaptive allelic diversity for thousands of genes simultaneously.

The four presentations within this session were focused on the topics mentioned above. Antoine Kremer (INRA, France) gave a presentation focused on the imprint of natural selection in forest trees at the genome and gene level. It is known from provenance and progeny tests that most phenotypic traits exhibit large within and between population diversity, resulting from diversifying selection pressures. With the availability of genes related to these traits, potential signatures were tracked and compared under different selection scenario. Outi Savolainen (University of Oulu, Finland) reported about detecting adaptation in patterns of sequence variation with population genetic and molecular evolutionary method. Natural selection leaves its signal on sequence polymorphism, influencing levels of diversity, frequency spectra, linkage disequilibrium and other aspects. However, these signals are influenced by stochastic variation and demographic effects, such as migrations, colonizations and bottlenecks. Population genetics and molecular evolutionary methods were used to examine the genome of Pinus sylvestris for traces of selection. Gail Taylor (University of Southampton, UK) focused her presentation on genomic approaches to understand adaptation of trees to elevated CO2. There is an urgent need to understand more about long-term adaptation and genetic change in future CO2 environments. Using poplar, these Authors identified ninety-two QTL for twenty six traits of plants in ambient CO2 and 79 QTL for plants in elevated CO2. In a second approach, the large developing genomic resource in Populus were used, undertaking global gene expression analysis using poplar microarrays when the parents of the mapping pedigree were exposed to elevated CO2, ozone and drought. Tatsuya Kushida (National Institute of Advanced Industrial Science and Technology, Japan) described some data models of biosynthesis and the regulatory pathways of plant hormones and how these data are organized in data bases.

An interesting discussion followed each presentation mainly focused on the potential applications of genomic approaches to understand adaptation in tress and to dissect complex adaptive traits.

Interspecific hybridization for sustainable forestry - Breeding and deployment

Session Organizer: Bailian Li (North Carolina State University, USA; email: Bailian@NCSU.EDU).

Speakers and posters in this session summarized the latest research progress in breeding and deployment of interspecific hybrids of pine, poplar, and Eucalyptus in five different continents. These hybrid breeding programs have become significant parts of intensive plantation programs in the world. High productivity and desirable wood properties from hybrid breeding and deployment programs have made great impacts on the supply and value of the forest products and have contributed significantly to the sustainable forestry in the world.

The Pinus elliottii (PEE) and P. caribaea var. hondurensis (PCH) hybrid breeding program in Queensland, Australia, was reported by Mark Dieters (The University of Queensland, Australia) and co-authors. The genetic improvement of pure species improvement and their F1 hybrid families have improved productivity and wood properties. Recent work showed that:1) F1 and F2 populations are comparable in both mean and variance for growth traits, 2) the genetic control of most traits in the hybrid populations is largely due to additive or additive × additive epistatic genetic effects, 3) F1 hybrid performance is difficult to predict from pure-species performance without the use of reciprocal hybrid testing, and 4) optimal gains can be obtained using a strategy that seeks to develop a stabilized, advanced generation synthetic hybrid. These results have led to radical changes in the direction and strategy applied to the breeding of PEE × PCH in Queensland, i.e. to produce a synthetic hybrid between these two species, creating synergies with the clonal program and reducing the total resources required. Zheng Yongqi (Chinese Academy of Forestry) has also reported that this hybrid is the most successful hybrid pine breeding program in China. Analysis of a 15-year-old hybrid trial showed that volume of the best hybrids was 1.66–2.88 times larger than the parental species, while the average basic wood density and fiber length were between the two parental species. The challenge in both Australia and China is to develop more efficient seed production systems or large-scale nurseries vegetative production for the hybrids.

An overview of Populus genetic improvement in North America was given by Brian Stanton (GreenWood Resources, USA). Populus cultivation in North America has relied primarily upon inter-specific hybridization. Key taxa are P. x generosa (P. deltoides x P. trichocarpa) in the Pacific

northwest, P. x canadensis (P. deltoides x P. nigra) in the north central region, and P. tremuloides x P. tremula in western boreal Canada. P. suaveolens in hybrid combinations with P. nigra and P. deltoides has recently stirred interest in the Pacific Northwest and north central regions. Inter-specific hybrids give way to P. deltoides in the southeastern United States where maintaining adaptation to the local photoperiod has precluded crosses with distinct species acclimated to northerly latitudes. First generation hybridization is used in P. x generosa improvement in the Pacific Northwest to exploit heterosis of yield resulting from a combination of complementary species-specific traits. Worldwide cooperation among Populus breeders in conducting population improvement programs for key parental species will likely become an integral step towards sustained genetic advancement in future hybridization programs.

Breeding and deployment of clonal forestry with eucalypt hybrids in Brazil have had significant impact on the wood and fiber supply for forest industries, which was summarized by Gabriel Rezende and co-authors (Aracruz Celulose S.A., Brazil). The development of the Eucalyptus clonal forestry in Brazil was based on high level of heterosis for growth and also resistance to diseases, especially to the eucalypt canker. Hybridization has become the dominant eucalypt breeding strategy in the country, being adopted by the main companies, for many different purposes. The most popular hybrid combination is Eucalyptus grandis x E. urophylla. Recently the E. globulus hybrids, with expected gains in wood quality for pulp production, become more important for pulp companies. The deployment of clonal eucalyptus is currently by using mini-cuttings.

In another presentations, Stephen Verryn, (Environmentek, CSIR, South Africa) and co-authors discussed various eucalypt hybrids and their breeding and deployment in South Africa. Eucalyptus hybrids involving the favored E. grandis have been deployed to pioneer marginal bio-climatic regions, in particular, dry and cold sites.

An overview of the results of preliminary studies of Corymbia hybrids in tests in Queensland was presented by David Lee and Garth Nikles (Department of Primary Industries and Fisheries, Queensland, Australia. The research questions were proposed on gene action of important traits in the parents and hybrids, and likely options for efficient hybrid breeding. The outline for research and development work necessary for progressing the breeding of Corymbia hybrids efficiently is discussed. The development of the breeding program would ensure to deliver improved hybrid families and clones over time for sustainable industrial use.

Genomics and tree breeding for sustainable forestry

Session Organizer: Bailian Li (North Carolina State University, USA; email: Bailian@NCSU.EDU).

Speakers and posters in this session summarized the latest research progress in forest breeding and genomic applications to tree breeding for sustainable forestry. The topics ranged from the long-term provenance testing results, progeny test and genetic parameter estimates, selection for multiple traits, breeding strategy development, molecular marker applications in population studies, and latest results from QTL mapping.

The result from the IUFRO Douglas Fir (Pseudotsuga menziesii (Mirb.) Franco.) provenance trial at the age of 32 was reported by Dalibor Ballian and co-authors (University of Sarajevo, Bosnia and Herzegovina). The heights, DBH, survival rate, and total volume per hectare at age 32 showed statistically significant difference between the provenance at the trial site Gostovi and Crna Lokva, but not in the Blinje site. The average mid-height in the trial site was between 18.65 m up to 21.48 m, and the diameters varied between 24.21 cm and 26.65 cm. The mid-range volume per hectare in the trial sites varied between 117.08 m3/ha and 221.87 m3/ha. The results showed that there were differences between the provenance and this information needs to be used for introduction to different sites.

Genetic variation in growth and adaptive traits in full-sib families from factorial mating of in *Picea abies* at age 7 was presented by Gheorghe Parnuta (Forest Research and Management Institute, Romania). Based on two factorial matings, there were significant differences due to maternal and paternal effects. The intensity of the significance is different in accordance with the type of hybrid, trait, and location (especially the altitude level) of the experimental trial. The genetic variation is higher in narrow x normal crowned hybrids than in reciprocal ones, and is more limited and low significant in high altitude (1500 m) than at middle (1100 m) and low (750 m) altitude.

Mark Dieters (The University of Queensland, Australia) and co-authors presented the strategy for genetic improvement of P. caribaea (PEE) in Queensland for deployment both as a pure species and as a parent of the F1 hybrid with P. elliottii (PEE). The breeding strategy adopted will involve genetic improvement within four small subpopulations of P. caribaea – two derived from the Mountain Pine Ridge provenance of PCH, one from the coastal and Guanaja provenances of PCH, and the last from P. caribaea var. caribaea. A broad range of crosses will be produced and evaluated prior to deployment in family blocks.

Om Rajora (Dalhousie University, Canada) and co-authors summarized genomic studies in black spruce and hybrids. Black spruce (Picea mariana) and red spruce (Picea rubens)

were used to study genetic structure and function and construct a high density map. With the saturated genetic maps of black spruce and black spruce x red spruce hybrids, genetic factors controlling traits related to growth and adaptation to climate change could be mapped. A super high density and complete genetic linkage map was constructed for black spruce using a three-generation outbred pedigree and that of black x red spruce hybrid using an interspecific BC1 pedigree. The black spruce map has 941 markers distributed over 12 linkage groups (Picea, n=12), and covers 1898 cM of the map length, with an average of 1 marker every about 2 cM. The black x red spruce hybrid map has 1216 markers distributed over 12 linkage groups, covering 1865 cM, with an average distance of 1.5 cM between adjacent markers. The estimated genome size of black spruce is about 1900cM. Candidate genes and QTLs were identified for growth, adaptation to elevated CO2 levels, water use efficiency and other ecophysiological adaptive traits using replicated clonal genetic tests under different abiotic stress conditions.

Management and conservation of forest genetic resources

Session Organizer: Judy Loo (Canadian Forest Service, Natural Resources Canada; email: jloo@nrcan.gc.ca).

This session was designed to report on, and further the work of IUFRO Task Force 4 (Management and Conservation of Forest Genetic Resources). The session organizer opened the session with a brief background and overview of the Task Force, which was established in 1998. The main undertaking of the Task Force was conducting a survey to assess the global state of research on forest tree genetic diversity. Survey results indicated significant gaps, particularly in understanding the economic and social value of forest genetic resources. Little is known generally about genetic resources of non-commercially important species.

Two speakers discussed different international initiatives for conservation and management of forest genetic resources. Jarkko Koskela (IPGRI, Rome) provided an overview of EUFORGEN activities and the role of regional collaboration in managing and conserving forest genetic resources in Europe. He pointed out that regional collaboration is important for purposes of reporting and such collaboration strengthens national efforts on forest genetic resources. EUFORGEN is currently moving into "Stage III", developing new research networks, and focusing on the linkages between managers, science and policy-makers. Bill Dvorak spoke of the role of CAMCORE in ex situ conservation of forest trees, briefly describing the organization's 25-year history of species conservation through seed collection and testing, often in countries where the species do not grow naturally. Most of the target species are native to Latin America and about 75% of the financial support comes from there as well. He described a situation where a very rare and endangered pine species native to Mexico has been cultivated in South Africa, and used this example to highlight the potential benefit available to countries of origin by returning conserved material back to its original location.

Judy Loo, the session organizer, described the mandate and gene conservation activities of the Forest Genetic Resources Working Group of the North American Forestry Commission. The Working Group consists of forest geneticists with different areas of expertise, from the three countries: Mexico, United States and Canada. The primary focus for the group, recently, has been on gene conservation of temperate, threatened or endangered forest tree species in Mexico. She outlined research carried out in endangered species of Mexican spruce, a piñon pine species and Douglas-fir. Tony Simons, of ICRAF, presented a very interesting perspective on conserving native tree species on farms, pointing out that 175 tree species are used on farms in western Kenya, for example. However, few species are available commercially for planting, so the opportunity to maintain this diversity of tree species, there and elsewhere, may be lost in the absence of a concerted effort to make quality material available for farmers' use.

Meeting the challenge of climate change

Tree rings as indicators of the impact of environmental changes on forest growth

Chairman and Rapporteur: Dr. Paolo Cherubini (WSL Swiss Federal Research Institute CH-8903 Birmensdorf, Switzerland; email: paolo.cherubini@wsl.ch).

A recent increase in tree-ring growth (Innes 1991) and net primary productivity (NPP) at northern high latitudes (Myneni et al. 1997; Zhou et al. 2003) has been observed. A clear explanation for such increases is still lacking and the causes still obscure. The respective roles of increasing nitrogen deposition, carbon dioxide concentrations and air temperature are difficult to disentangle. In Europe, since the work of Spiecker et al. 1996 showed such growth increases, there has been a great deal of work done on growth increases and new data are now available. In this session, we discussed new results recently achieved on the observed increase in growth trends throughout Europe (through tree rings and forest inventories).

Prof. Dr. Giuseppe Scarascia-Mugnozza (CNR Roma and Università della Tuscia, Viterbo, Italy) showed that increasing growth rates in beech and spruce forest chronosequences in Germany are clearly induced by human activities. Prof. Dr. Heinrich Spiecker (Institut für Waldwachstum, Universität Freiburg, Germany) presented the first results from a recent European project (Recognition), within which models are demonstrating that increased nitrogen deposition is the main

factor responsible for the observed increasing forest-growth trends. The use of a modelling approach to understand the effect of climate on cambial activity in Australian forests was illustrated by Mr. Matthew Brookhouse and Mr. Robert Waterworth (Australian National University, Canberra, Australia).

A lively discussion followed the three talks, given to an audience of approximately 40 participants. The discussion was mainly focused on the question of whether the observed increasing forest growth trends are mainly caused i) by increasing nitrogen deposition or ii) by increasing carbon dioxide concentrations. Some of the participants are convinced that the main driving force is nitrogen, whereas another group, maybe larger, of the participants emphasized the effects of elevated carbon dioxide concentrations. A definitive conclusion was not reached, but several critical points that need to be solved by new research efforts were detected, and some interesting ideas for future work arose.

Eleven posters were presented and shortly presented and discussed. Most of them showed the effect of climate on tree-ring growth, i.e. in Siberian forests (Olga Sidorova), in the Chinese loess plateau (Sheng Du, Satomi Koretsune), in old-growth Baldcypress in the southern United States (Margaret Devall), in Portoguese cork growth (Margarida Tome), in Scots pine and Norway spruce from northern Sweden (Tommy Morling), and in Brazilian rain forests (Patricia Povoa de Mattos, Mario Tomasello Fo, Paulo Botosso).

Global fire trends and climate change

Session Organizer: Bill de Groot (Canadian Forest Service, Canada; bill.degroot@nrcan.gc.ca).

Increasing global fire activity has been observed during the last 3-4 decades and many have attributed this to climate change. The purpose of this session was to present information on the current state of knowledge and recent research related to fire and climate change. In particular, four key presentation topics were identified for this session: global fire trends, climate change and fire activity, impacts of altered fire regimes on biodiversity, and fire and carbon.

Johann G. Goldammer (Freiburg University, Germany and Global Fire Monitoring Center) and Brian Stocks (Canadian Forest Service, retired) provided an excellent summary of recent fire activity trends, fire issues and management problems in 10 global regions. Several hundred million ha of vegetation burn annually around the globe, and the vast majority are not monitored or documented. Fire is a prominent disturbance factor in most biomes around the world, being ecologically essential is some global regions and unnatural (degrading) in other ecosystems. It is a cultural land management tool in many developing countries. There are also increasing vulnerabilities to wildland fire (worldwide), and climate change will exacerbate fire problems.

Mike Flannigan (Canadian Forest Service) presented an overview of climate change and wildfire, with particular emphasis on the circumpolar boreal forest region which burns 5-15 M ha annually. In general, the fire regime in this region is expected to be characterized by longer fire seasons, increased area burned, greater fire intensity, and more fire ignitions in the future. All of these fire regime changes provide increased potential for positive climate change feedbacks.

Neil Burrows (Western Australia Department of Conservation and Land Management) presented the inter-relationships between fire regime characteristics and biodiversity in Western Australia. This was described through a description of the impacts of fire parameters on key species through their vital attributes. Under climate change, there will be some winning species and some losing species, depending on their fire adaptive traits. However, large, intense fires are not good for biodiversity because it prevents the formation of a fine grain mosaic pattern on the landscape.

Bill de Groot (Canadian Forest Service) provided an overview of a new system to estimate annual carbon emissions from Canadian wildfires for UNFCCC and Kyoto reporting purposes. The system integrates daily hotspot and fire weather data, satellite mapping of fires, forest inventory, and dynamic forest carbon and fire effects models to estimate carbon emissions at 30 m to 1 km resolution based on fuel load, fuel type and burning (fire danger) conditions.

Several posters on fire danger from Malaysia, Turkey, Greece and Korea were also presented as part of this session. Several papers (oral and poster) from this session are being prepared for publication in the International Journal of Wildland Fire.

Rapporteur: Bill de Groot

Experimental manipulations of forest ecosystems: hints on global change

Session Organizers: Sophie Zechmeister-Boltenstern (email: sophie.zechmeister@bfw.gv.at) and Robert Jandl (email: robert.jandl@bfw.gv.at).

In an exciting introductory lecture, Peter Högberg (SLU, Sweden) demonstrated the direct importance of plant photosynthates for soil processes by showing results from large-scale forest girdling experiments in boreal forests. The drastic decline in soil activity after girdling supports the argument that autotrophic soil respiration has been underestimated so far, whereas rates of fine-root turnover may previously have been over-estimated.

Anders Lindroth (Lund University, Sweden) reported effects of management on carbon fluxes by showing results from a chronosequence study using eddy covariance measurements. His group observed that 30- and 60-year old stands had largest

net uptake rates of C, compared to clear-cut and 100-year old stands, where total ecosystem respiration was highest.

A review on oak forest responses to chronic precipitation change over one decade was given by Paul Hanson (Oak Ridge National Laboratory, USA). Unexpectedly, long-term annual leaf production for the dry treatment exceeded that of the wet and ambient treatment plots, which he attributed to excessive leaching of beneficial plant elements from the latter.

The lecture presented by Chris Weston (University of Melbourne, Australia) attracted a large audience who were keen to learn "What really limits the growth of the world's tallest flowering plant?" It turned out to be phosphorus and not nitrogen which limited the growth of mountain ash (Eucalyptus regnans) in south-eastern Australia.

Steven Schoenholtz (USDA Forest Service, USA) gave an instructive overview on the prerequisites for a timeless field experiment with examples. To endure, plots and treatments must be large enough to address multiple issues now and in the future, replication must be sufficient to handle "demonic intrusion", multiple disciplines should be involved in both planning and research, and commitment must be passed through generations.

The session was concluded by Andreas Schindlbacher (BFW, Austria) who presented a new measuring system for experimental soil warming effects on forest soil CO2 release and explained advantages and limitations of various experimental approaches.

Two interesting posters described results from boreal forests, one dealing with fires in Canada, another one with frost damage in Finland, where long-term warming trends had been observed during the last hundred years.

Rapporteur: Sophie Zechmeister-Boltenstern (Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Austria)

Climate change and tree resistance to insects and pathogens

Session Organizers: Francois Lieutier (Universite d'Orleans, France; email: francois.lieutier@univ-orleans.fr) and Michael R. Wagner (North Arizona University, USA; email: mike.wagner@nau.edu).

Climate change is operating through a number of environmental factors acting at different levels of intensity, and can thus affect biological organisms in various ways. As a result, between-organisms interactions and ecological equilibriums can be modified in a high diversity of directions. Regarding damage to forests caused by insects and pathogens, global change can act schematically in two main ways: directly by modifying the life cycle of the aggressors or indirectly by affecting tree resistance to those aggressors. Another session was focused on this second possibility. Synthetic analyses or particular examples were presented, giving an idea of the diversity of the effects. Attempts to discover general mechanisms were made. Five oral papers and five posters were presented.

In an introductory paper, P. Niemela (Univertity of Joensuu, Finland) gave an overview on the high diversity of environmental effects on tree resistance to insects and pathogens, often exhibiting conflicting patterns. Among insect herbivores as well as pathogens, the strength and direction of the effect depends on the type of environmental factor, tissue type, tree species studied and on the feeding guild of the herbivore and the pathogen. Factors explaining the high diversity of effects were discussed, and variation in responses could be interpreted as an adaptation to changing and unpredictable environments.

F. Lieutier (University of Orleans, France) then presented a review on the proven effects of environmental factors on conifer resistance to bark beetles. The considered factors included water stress, nutrient availability, defoliations, wind, lightning, fire, and pollution. Effects on tree susceptibility and resistance level were presented, in parallel to effects on tree resistance mechanisms themselves. General trends were presented, especially regarding dose effects of stresses for defoliation, fire and pollution. For water stress, the direction of effects depends on the stress intensity. Mechanisms are however still unknown.

The potential impacts of climate change on plantation pests and diseases in Southern Africa were presented by J. Roux (University of Pretoria, South Africa). Increased temperatures, by extending periods of drought, can decrease tree resistance, resulting in increased mortality due to infections and insect attacks. Examples are Pinus spp. attacked by Diplodia pinea and Sirex noctilio, and Eucalyptus plantations attacked by Phoracantha semipunctata and Botryosphaeria sp. Direct effect of temperature on pathogens can lead to extension of their areas, as for the Eucalyptus canker, Cryphonectria cubensis. Both types of effects must thus be considered in the future.

Factors associated with the susceptibility of elms (Ulmus spp) to the elm leaf beetle in Arizona were discussed by P.P. Bosu (Forestry Research Institute of Ghana, Northern Arizona University, USA). Thirty two elm species, cultivars or hybrids were evaluated for their susceptibility to defoliation by Pyrrhalta luteola in an experimental elm plantation established in Arizona, during 1999-2001. Analyses of leaf anatomical and nutritional traits indicated that trichome density as well as concentrations of iron, phosphorus, manganese and soluble nitrogen might be involved in elm resistance to elm leaf beetle defoliation.

The last oral paper concerned the impacts of climate fluctuations and climate changes on forest tree pathogens

in Europe and was presented by N. La Porta (University of Florence, Italy). Different scenarios with examples of effects of global change on tree health status and susceptibility to diseases were given for a diversity of tree species, with consideration of the frequency and intensity of stresses. In the most cases however, all contributing factors are still not well understood.

A poster by S. Lawson (Department of Primary Industries and Fisheries, Queensland, Australia) and collaborators discussed the problem of eucalypt resistance to stem borer attack in subtropical Australia, in relation with drought that dramatically increased in both frequency and duration during the recent years in northern New South Wales and south-eastern Queensland. Longicorn beetles and cossid wood moths successfully colonize trees at periods when trees are under greatest water stress, and the incidence and severity of their attacks have been observed to increase under these conditions, making them now one of the key pests of eucalypt plantations in this region. Future management options were discussed.

A. Bernhold and colleagues (Swedish University of Agricultural Sciences), in their poster, presented two experiments on regeneration of Pinus sylvestris after clear-felling of stands infected by Gremmeniella abietina. In middle-aged P. sylvestris stands, vitality and survival of G. abietina stayed high in slash on the ground up to 18 months after clear-felling. The infection rate of P. sylvestris seedlings was studied in another experiment with and without removal of infected slash.

Another poster by P. Hansson and coll. (Swedish University of Agricultural Sciences) dealt with climate indicators related to G. abietina outbreaks. Temperature and precipitation data from 1985–2000 were used to create indicators that correlate with large-scale disease occurrence of the fungus in Pinus sylvestris forests in Sweden. Five climate indicators were analysed. Various combinations between temperature and precipitation, occurring successively, were correlated with outbreaks. The results indicate that Scots pines in pure stands are more susceptible than Scots pines in mixed stands.

A. Horn and colleagues (University of Orleans and INRA, France) presented a poster on the role of temperature and host tree on the distribution range of the bark beetles Tomicus piniperda (palearctic) and Tomicus destruens (Mediterranean). Systematic samplings and molecular identification were performed, as well as assays on the developmental capacity of the species at different temperatures and on various host species. Parapatric distributions were found, with few sympatric populations on Pinus pinaster. Low temperatures limited the development of T. destruens, which could also develop on non-Mediterranean pines. The northwards extension of this tree killing species, as a result of increasing temperature, could thus be a threat for pine forests.

A poster on ecological assessment and sustainable management of cypress under climate change conditions in the Italian Alps was also presented by N. La Porta (University of Florence, Italy) and collaborators. Cypress canker causes severe damage in Italy, as well as in the Alps, and for long time prevented any plantation of this tree species for forestry and ornamental use. The main point is to study the potential of cypress cultivation at the Northern edge of its range, under conditions of continuous climatic change, which may favours the spread of this Mediterranean conifer.

Rapporteur: Francois Lieutier (University of Orleans, France).

Forest insect effects on forest productivity, management decisions, and carbon sequestration

Session Organizer: David A. MacLean (University of New Brunswick, Canada; email macleand@unb.ca).

Three Canadian- and one New Zealand-led papers in this session discussed the role of forest insect outbreaks on tree growth and mortality, forest management decisions, economic forecasts, and carbon dynamics in forests. A total of 9 posters presented a wide range of topics related to effects of herbivory, insect diversity, monitoring and management.

Rene Alfaro (Canadian Forest Service) described how the study of long term historical extent, intensity, and frequency of forest disturbances provides a baseline against which we can measure changes in current and future disturbance regimes. Alfaro and co-author's work on the spruce budworm, Choristoneura fumiferana, a native defoliating insect of balsam fir (Abies balsamea) and white spruce (Picea glauca), demonstrated its role as a major disturbance agent in the Canadian boreal forest. In a companion paper, David MacLean (University of New Brunswick, Canada) went on to describe how long-term spruce budworm defoliation and stand dynamics data have been used to develop a Decision Support System (DSS) to predict insect effects on forest management decisions. Such DSS can assist forest managers to predict insect outbreak effects, forecast forest growing stock and sustainable harvest levels, and optimize protection (biological insecticide use) programs. DSS for spruce budworm, mountain pine beetle (Dendroctonus ponderosae), and gypsy moth (Lymantria dispar) were compared. James Turner (New Zealand Forest Research Institute) took a broader view, of modeling the impact of exotic pests on the New Zealand forest sector and its major trading partners. The Global Forest Products model, which gives projections of production, consumption, and trade for 14 forest products, forest stock and area, and welfare for each of 180 countries, was used to assess the impact of exotic pests and mitigation measures. Allan Carroll (Canadian Forest Service) discussed the role of major insect outbreaks in forest carbon dynamics, using a current huge outbreak of mountain pine beetle in British Columbia as an example. This demonstrated the

broadening view of forest values that has occurred over recent years.

A sample of the interesting posters in the session included detection and control of teak defoliator infestation epicenters (V.V. Sudheendrakumar, India), development of management strategies for insects on African mahogany (E. Opuni-Frimpong, USA) and eucalypt plantations (A. Protasov, Israel), and the impacts of possum (A. Carnegie, Australia) and Sirex wood wasp (J. King, Australia) on Pinus radiata plantations.

Posters and presentations clearly demonstrated the magnitude and diversity of effects of insects on forests of four continents.

Rapporteur: David MacLean (University of New Brunswick, Canada).

Forests between air pollution and climate change

Session Organizer: Elena Paoletti (IPP-CNR, Italy; email: e.paoletti@ipp.cnr.it).

There is an increasing awareness of the importance of addressing the linkages between the traditional air pollutants and the greenhouse gases responsible of the ongoing climate change. This session discussed integrated effects of air pollution and climate change on forests, with 120 participants. Andrzej Bytnerowicz (Forest Service Riverside, CA, USA) updated the air pollution and climate change situation in the Northern Hemisphere, and recommended that addressing these problems simultaneously is an opportunity for capturing synergies and avoiding overlaps between two traditional research lines. Marco Ferretti (Linnaea Ambiente, Italy) resumed the programmes designed to monitor the effects of air pollution and climate change on forests in Europe and North America, and presented a perspective on effective large-scale monitoring for their interactive effects. Madeleine Günthardt-Goerg (WSL, Switzerland) showed macro and microscopic symptoms as reliable tools in stress diagnosis during forest monitoring, and addressed the present gaps in knowledge. Analysing these modifications can indicate the stress agent or at least its target, and the efficiency of the plant's response.

As the main force of climate change is the increasing atmospheric CO2 concentrations, several talks dealt with tree responses to pollutants in a CO2-enriched environment. David Karnosky (Michigan Technological University, MI, USA) examined the responses of three forest tree species grown for their 7-year life under the levels of CO2 and O3 predicted for the year 2050. Ozone at relatively low levels offsets the increases in productivity caused by elevated CO2; elevated CO2 generally decreases the negative aspects of O3; responses are highly variable by species and by clone resulting in changes in community composition; the long-term interactions of CO2 and O3 are not all predictable based on single-gas responses.

For a realistic assessment of carbon sequestration by forests, Robert Jandl (Federal Office and Research Center for Forests, Austria) recalled that natural site factors, including air pollutants, affect C sequestration potential. The example of nitrogen highlighted that C sequestration in forests depends on silviculture, external factors (air pollution) and chosen remedies (liming). Michael Tausz (University Melbourne, Australia; University Graz, Austria) discussed the global change factors affecting a flux-based critical level for ozone. The antioxidative defence system comes into play in both, defence against pollutant and protection from natural stress (e.g. drought). A flux concept weighted by defence capacity should therefore be tested. Giuseppe Scarascia Mugnozza, (University Tuscia, Italy) reviewed the effects of a FACE and nitrogen fertilization experiment on poplars, where the effects at elevated CO2 decreased over time due to competition, not to nitrogen limitation.

The poster presentations addressed: forest monitoring in the Italian Alps (Ambrosi, IASMA, Italy), deposition monitoring in Croatian forests (Vrbek, Forest Research Institute, Croatia), ozone levels and critical loads of nitrogen and acidic deposition in Switzerland (Waldner, WSL, Switzerland), and an analysis of climatic factors and nitrogen as cause of changes in European forest growth (Kahle, University Freiburg, Germany).

Peer-reviewed full papers from this session will be published in special issues of the journals Environmental Pollution and Environmental Monitoring and Assessment.

Rapporteur: Elena Paoletti (IPP-CNR, Italy).

Understanding linkages between climate and forest fire

Session organizer: David L. Peterson (USDA Forest Service, USA).

This session contained several topics relative to climate and fire and reflected the diversity of approaches currently being investigated in fire science around the world. The effects of weather on fuels are often quantified through fire danger indexes and assessments. Fire danger was addressed through empirical study of fuels in Turkey, as described by Kucuk et al. Sadlam et al. further developed this topic by focusing on the effects of specific meteorological parameters, such as relative humidity, on the calculation of fire danger. Finally, Durmaz et al. extended these studies in Turkey with a poster on how fire danger could increase in a warmer climate. In a related poster, Conese et al. quantified the relationship between meteorological conditions and fire occurrence in the Tuscany region, and area with Mediterranean climate

dominating the fire environment. Finally, Mickler and Bailey showed how fuel accumulation, in addition to weather as noted above, is related to fire hazard in the southeastern United States. This collection of studies covered a wide range of forest and fuel types in climates ranging from arid to humid, and demonstrated the potential for fire to occur, given both fuel conditions and short- and long-term meteorological conditions.

Rapporteur: David L Peterson (US Forest Service, USA).

Contributions of tree physiology to understanding the effects of climate change

Session Organizer: Robert Teskey (University of Georgia, USA; email: rteskey@uga.edu).

The effects of changes in the physical and chemical climate are likely to be first expressed at the physiological level and mediated through complex interactions over spatial and temporal scales. This session included presentations at the individual tree, stand, catchment and population scales and focused on effects of elevated atmospheric carbon dioxide (CO2), nitrogen (N) and ozone (O3) as well as the effects of global warming.

Using a process-level approach, Roger Gifford (CSIRO Plant Industry, Australia) constructed an argument using some numbers, assumptions and calculations to suggest that N deposition may keep up with the increased N demand resulting from the growth stimulation caused by elevated CO2. He emphasized the interrelatedness of the N and C cycles and the importance of understanding the linkages in order to predict plant response to these chemical changes.

Also at the individual plant scale, Bob Teskey further explored not only the direct chemical changes by anthropogenic activities but the projected effects of those changes on the physical climate, i.e. global warming. Recognizing that plants have the ability to acclimate to temperature he presented an argument that acclimation will likely not be sufficient to buffer the plants from impacts and those impacts will be far reaching and complicated by numerous interactions. His presentation highlighted our limited ability to predict long term effects from short term responses.

At the scale of stands, Ram Oren's (Duke University, USA) presentation demonstrated creative ways to develop a unifying understanding from our constrained experimental methods and research infrastructure. Dose–response technologies at the stand scale are limited and while the open exposure systems work, their expense restricts replication within forest types. As a result each FACE study has some limitations similar to a case study. Comparisons among sites have not presented a simple picture of tree and stand responses however he presents evidence that detailed examination within each FACE study can provide a mechanistic explanation of some of the apparent contradictory responses within and possibly among sites. He demonstrated that subtle difference in canopy structure (e.g. LAI, closure) can have a profound effect on the response to CO2 and/or N above and below ground.

At the catchment scale, Derek Eamus (University of Technology at Sydney, Australia) explored the critical issue of water use in response to elevated CO2 and the apparent "pan evaporation paradox". Again using a process-level approach, he presented a clear demonstration of the usefulness of assessing water use at the catchment level to infer plant responses over long time periods. Through numerous feedbacks he presented a working hypothesis that catchment water availability will likely return to equilibrium over time.

David Karnosky (Michigan Technological University, USA), in the final presentation of the session, highlighted the role of genetics in the response to elevated CO2 and O3. Through numerous examples he demonstrated the genetic control of response to stress and the implications of natural selection on the loss of genotypes over time and the genetic diversity in the future populations. Clear evidence of the genetic basis of O3 susceptibility and natural selection has been shown in the field and is suspected to be occurring after only 7 years of experimental exposure in the Wisconsin FACE study. He posed the question as to whether elevated CO2 is or will impose sufficient pressure on populations to affect the frequency of heritable traits. Therefore, not only may tree performance be affected by global change, the genetic diversity of the populations itself may be altered over time.

This session presented a solid summary of current knowledge with a critical evaluation of the available data and techniques. The session highlighted the point that the expected effects are often not observed as predicted due to numerous interacting factors which argues for a strong process-level approach to the experimental work and its interpretation. In addition, each speaker concluded with intriguing hypotheses and ideas for further thought and investigation. The session was well attended and judging from the questions and comments it was well received.

Rapporteur: Anna W. Schoettle (USDA Forest Service, Rocky Mountain Research Station, USA)

Impacts of drought and heat on forests

Session Organizer: Heinrich Spiecker (University of Freiburg, Germany; email: instww@uni-freiburg.de).

In his introductory talk, H. Spiecker gave an overview of the results of the 'Drought 2003' program, an initiative of French and German forest scientists focusing on the impact of the drought and heat of the summer 2003 on European forests. The jointly initiated program consisted of nine working

groups dealing with: climatology, forest monitoring, pests and diseases, water balance, tree physiology, forest growth, soil processes, biodiversity, socio-economic impacts, and forest management.

H.P. Kahle (Univ. of Freiburg, Germany) focused on the impacts of drought and heat on tree growth. Dendrometer data and retrospective growth data were analyzed to disentangle and quantify tree growth responses to drought stress at different temporal scales. Drought causes disturbances on biological, physical and chemical soil characteristics. Insights into the direct and indirect effects of soil processes on tree nutrition and water supply have been presented by K. von Wilpert (Forest Research Institute Freiburg, Germany). Socio-economic impacts of the drought and heat 2003 on the forest sector have been addressed by J.L. Peyron (Forest Economics ECOFOR, Paris France). The findings help to define the right strategies and policies for damage mitigation, risk management, and monitoring.

In a case study from northern Italy presented by P. Cherubini (Swiss Federal Research Institute Forest Snow and Landscape) it was shown that the 2003 drought can be considered as a lethal factor that lead to the death of trees which were already suffering for a long time period. Another study based on 13C isotopes by S. Koretsune (Univ. of Tokyo, Japan) in the loess plateau of China found that pine is more drought-resistant than locust. In the same region F. Yamamoto (Tottori Univ., Japan) conducted research into the drought tolerance of woody species based on pressure-volume analysis. In the poster by I. Drobyshev and K. Sonesson (Swedish Univ. of Agricultural Sciences) a number of risk factors negatively affecting growth of Quercus robur (L.) in southern Sweden were identified. Results of an investigation into the relationships between water stress and damage of oaks in the Italian Alps by applying a water-balance model were reported in the poster by E. Eccel (IASMA, Italy). Effects of soil moisture conditions on leaf photosynthetic properties in Pinus densiflora were studied by M. Naoko (Okayama Univ., Japan). No district differences in net photosynthetic rates were observed between different soil moisture conditions. E. Kupšinskienš (Univ. of Agriculture, Lithuania) found that drought has stronger effect on the condition of pine stands than ammonia pollution. M. Sarvaš and A. Tušeková (Forest Research Institute Zvolen, Slovakia) pointed out that drought is a key factor for successful artificial regeneration. Effects of drought stress on the stand structure of natural oak forests in the loess plateau of China were described by N. Yamanaka (Tottori Univ., Japan). T. Yoneda (Kagoshima Univ., Japan) studied the impacts of dry weather on a tropical rain forest in Sumatra.

Rapporteur: Hans-Peter Kahle (Institute for Forest Growth, University Freiburg, Germany).

Promoting development through improvements to the forest – wood and products chain

Promoting economic development through improvements to the forest – wood and products chain

Co-chairs: Howard Rosen (US Forest Service, USA) and Lauri Valsta (University of Helsinki, Finland).

'Tree-to-products wood chain of planted forests and regional development in the Tropics' (Dr. Mahabala Bhat, India. Dep. Div. Coordinator 5.0 IUFRO Forest Products

This paper discussed using wood and non-wood forest products to address poverty reduction, reviewed history of plantation forestry, and reviewed critical R& D needs. It concluded that expansion of third world trade is the key to international poverty reduction.

'Silvicultural management methods to meet end-product needs' (Dr. David Cown, New Zealand. Director of IUFRO Div. 5.0 Forest Products. This paper reviewed forestry development in New Zealand. New Zealand was intensively cut-over in last 500–1000 years with 85% of the New Zealand forest area being harvested. In the 1920s, the New Zealand Forest Service tested hundreds of potential tree species for plantations before selecting Pinus radiata as the premier plantation species. With harvest occurring over a > 25 yr rotation, management of juvenile wood is a critical need. NZ research has shown that with P. radiate, site and genetics are more important than silviculture.

'Marketing of forest products in a changing world' (Prof. Eric N. Hansen, USA and Prof. Heikki Juslin, Finland). This paper discussed market philosophies and defined drivers for forest product market development. It reviewed upcoming demands for sustainability, its needs for developing a customer orientation, and discussed the future of forest products markets.

'Simulation modeling of economic growth and forest stand improvements by selected harvesting and management options' (Professor Margarida Tomé, Portugal). As relationships and interactions between man and forests have become more complex, simulation management modeling systems have been developed to explain how variables interact and to help managers address complex land-use and product-demand requirements. This paper explained simulation management modeling systems and gave an example of their use.

'Forest economic benefits to communities' (Dr. Ewald Rametsteiner, Austria). This paper discussed development economics, economic growth research, innovation and

entrepreneurship, and policy needs to encourage such economic activity. It specifically addressed investment and human/societal capital, institutions and markets, and underdeveloped traps to sustainable livelihoods for people. It also stressed the need to teach people to understand technology, markets and potential, empower people to take entrepreneurial risk. Finally it discussed policy needs by government to remove barriers, build investment climate, empower people and in markets to remove barriers to growth, create learning environment, address failures in coordination.

Wood production in agroforestry and in short-rotation forestry systems – synergies for rural development

Session Organizer: Lars Christersson (Emeritus Professor, SLU, Sweden)

A few remarks and observations should be given to a broader audience. The President of IUFRO, Professor Risto Seppälä from Finland, opened the conference by declaring that forest scientists in many countries have not kept up with common developments. He also concluded that foresters no longer participate in the common debate. Many of us were startled of this statement but of course it is of great importance for the forest politics of a country that foresters participate in the public debate.

From the perspective of Short Rotation Forestry and Agroforestry.

The different effects of the increased green house effect and fears for the coming development were often discussed. Most people agree that temperature will increase in the future, but there were different opinions about how much. But then the opinions and ideas diverged. If the increased temperature at the same time means more or less precipitation, more or less cloudiness, higher or lower humidity, more or less heavy winds, more forest firers or less, more or less flooding cannot be predicted today. At the same time it was concluded that "climate change" would have such far-reaching effects and radical influences on almost all sectors of the society and human life that the term "climate change" ought to be replaced with "global change".

Suggestions concerning up-to-date priorities and further widening of the activities of IUFRO, particularly from an energy point of view, were discussed. So was the rapid change and in some cases the very frustrating development of the economy within the energy sector. As a matter of fact, the oil price rose from 60 to 67 US dollars per barrel during the Brisbane Conference.

It was noticed with some surprise that few foresters have realised the rapidity of the change taking place in the world in widening the use of forestry to embrace bioenergy in its different forms. It was almost only in the sessions of Short-Rotation Forestry and Agriculture, that this very rapidly developing trend was recognised. At our session, we stated that access to energy in different forms governs and controls the world, and we put the question at its edge and formulated the situation like this: Do the foresters (we) really understand the power they (we) have in their (our) hands? The fact that the average forester has hardly has noticed his/her possible role in bioenergy development confirms that Professor Seppälä's opening words are right! Lots of business opportunities are being lost by current attitudes that neglect the bioenergy business.

It was also amazing to hear some keynote speakers declare that now it is time to start to look at forestry for energy purposes. In some countries like Finland, Sweden, USA, Canada and Ireland, this has been done so since the mid 1970s. Wood has been used for cooking food and heating houses all over the world since the beginning of human life.

Many lectures dealt with the tropical rain forest and its future. It was surprising and a little astonishing to learn that results and experiences from Costa Rica show that clear cut and exploited areas after a while present a considerably higher biodiversity than the old rain forests. The most important action is to ensure that a complete plant community will be established as soon as possible to prevent erosion of all different kinds. Then a high biodiversity will develop by itself. In a speech it was also concluded that however badly we human beings treat nature, there will always be a new ecosystem. But this is a truth that perhaps demands some modifications

In a seminar on forest policy, among other things the organization of WWF (World Wide Fund for nature) and its activities was discussed. How representative is this organization, in whose interests are the priorities chosen, which scientific and emotional considerations are behind its standpoints and how democratic is its organization? These questions were put on the table but no answers were given. It was not clear whether anybody responsible from this organization was present. For personal privacy reasons, no participation list from the conference was available. On the other hand WWF participated with an informative showcase in the exhibition hall. It was suggested in the discussion that foresters should take part and also play a role in the work of WWF. This is particularly important now when WWF and the World Bank have renewed their Alliance for Forest Conservation and Sustainable Use for another five years.

Short Rotation Forestry Sessions

Two sessions of IUFRO's Short Rotation Forestry section (1.09.00) were carried out with excellent lectures by all the speakers. After every lecture, the chosen "opponent" started the debate with, in some cases, new and interesting angles of approach to the subject. All the manuscripts will be put together in a proceedings volume when the 'opponents' have reviewed them. A few manuscripts are already ready for publication. We are now looking for some scientific journals

to publish these manuscripts, even those from authors who unfortunately could not participate.

Rapporteur: Lars Christersson (Emeritus Professor, SLU, Sweden)

Surfacing and finishing

Session Organiser/rapporteur: Bernie Dawson (Ensis, Rotorua, New Zealand; email: Bernard.dawson@ensisjv.com).

In the keynote presentation for this session, Sam Williams (US Forest Products Lab, Madison, Wisconsin, USA), described in a very effective and compelling way how computers, sensors, microelectronics, and communication technologies have made it possible to automate the way materials are tested in the field. These technologies can yield detailed data that is critical for developing reliability-based service life prediction (SLP) models. Sealant test specimens were installed in specially designed apparatus that subjected the specimens to weather-induced deformation that caused specimen degradation. The information and weather were correlated to yield information on critical factors affecting the sealant degradation. The results showed a clear link between the sealant response during weathering and the weather conditions causing this response.

Martino Negri (Trees and Timber Institute, Italy) spoke about 3D roughness and wettability. The finishing process of wood depends upon many factors, such as the chemical and physical properties of products of coatings, the finishing process and the wood itself. His approach is focused on evaluation of physical and physical-chemical properties, performed using assessed and non-assessed measurements methods, carried out on the surface of wood obtained by standard and non-standard processes. Martino's approach to characterize surfaces using new technologies was innovative and very interesting.

Makoto Kiguchi (FFPRI, Tsukuba City, Japan) gave an excellent illustration presentation, which tied in many aspects of the weathering performance of wood-fibre plastics composite in a unifying manner. Discolouration (whitening) of WPC by weathering was caused by degradation of wood and plastic. Dark colour pigments as additives improved colour stability of WPC, however, chalking on the surfaces was still happened. Grafting of light stabilizers to wood-flours decreased discoloration of WPC.

Bernie Dawson (ensis, Rotorua, New Zealand) spoke on the improved photostability of chemically treated radiata pine surfaces. His paper reports a chemical treatment of the wood to stabilize the wood surface prior to varnishing. Radiata pine wood surfaces have been reacted with delignifying chemicals in a very controlled process in order to remove significant portion of the surface lignin without pulping the wood surface. The finished surface constituted a wood polymer coating with the properties of photostabilization, hydrophobicity, flexibility and external durability.

Sumire Kawamoto (FFPRI, Tsukuba City, Japan) dealt with the feasibility of using acoustic emission (AE) and acousto–ultrasonic (AU) techniques for detecting surface checking of exterior wood coatings. Acousto-ultrasonic (AU) techniques are suggested as a feasible method for finding areas having locally high moisture contents, thus being possible stress points to cause subsequent checking. On the basis of results in previous publications, a new method using AE techniques for detecting surface cracking of exterior wood coatings is suggested.

Only one of the poster presenters took the opportunity to present poster highlights. Allan Manolo gave a very lucid account of cashew nut shell liquid-based varnish: A Philippine experience. Cashew nut shell liquid (CNSL) is an important by-product of the cashew industry. The effect of different drying oils on properties of phenolic varnish from cashew nut shell liquid was evaluated.

Overall it was a well attended session with diverse and interesting topics which resulted in many interested questions being put to the presenters.

Cross-sectoral policy linkages in the forestry sector

Session Organizers: Yves C. Dubé (FAO, Italy; email: yves.dube@fao.org) and Franz Schmithüsen (Swiss Federal Institute of Technology, Switzerland; email: franz.schmithuesen@env.ethz.ch).

The objectives of the session were to review the state-of-the-art knowledge, report on some country examples and results of on-going research, and identify future actions. Five verbal and six poster presentations were prepared for this session.

The dominating role of cross-sectoral effects on forest cover were confirmed. This conclusion arose from a multi-year eight-country study of trade, macroeconomics, sectoral land-use structure, forest impacts as well as on the results from a decade of CIFOR research on the underlying causes of deforestation. However, it was cautioned that some partial effects can change switch from negative to positive according to the scenario context in which they occur, producing counter-intuitive results that are critical to informing policy and management.

Global trends and agreements are the main reasons why improved cross-sectoral policy planning is important for the forest sector. Increasing the capacity of public agencies to manage complex political networks through the use of

forestry accounts is a feasible goal. Forestry accounts can be a powerful tool for cross-sectoral policy analysis.

Experience and results of applying the FAO manual for environmental and economic accounting for forestry in the Jilin Province of China were reported. Findings showed that environmental services accounted for as much as two-thirds of the total forest value. Also, the problem of the data availability and the need for capacity building were stressed.

Noting that cross-sectoral linkages have always been implicit, different approaches used in the United States of America to assess forest resources and their related linkages were briefly reviewed, highlighting their respective strengths and weaknesses. It was concluded that natural resource accounting represented a promising framework to analyze cross-sectoral policy impacts despite the difficulty of finding the required data.

Preliminary results of a survey in Netherlands and Austria aiming at understanding sector definition and coordination were reported. They pointed to the importance of focusing on different actors' objectives and their coordination with a view to improving governance.

A brainstorming discussion followed verbal presentations where participants were asked to try to answer in small groups the following question: what are the actions needed to improve cross-sectoral policy planning in forestry? They identified these actions:

- To include cross-sectoral analysis in forestry curricula;
- To promote non-sector specific funding of public program;
- To identify actions for research;
- To identify actors and relations (e.g. problem definition);
- To link sector specific models as well as resource and discipline specific models;
- To define clearly what is the forestry sector and its functions;
- To encourage foresters to change their mentality and open up to other sectors.

Rapporteur: Margaret Shannon (SUNY Buffalo Law School and University of Freiburg, Germany).

The multiple benefits of small-scale forestry

Session Chairs: Dr John Herbohn, Dr Steve Harrison, Professor John Bliss

A standing-room only audience of perhaps 50 participated in this session, contributing thoughtful comments to the thought-provoking presentations, and testifying to the timeliness and salience of small-scale forestry.

Dr. John Herbohn kicked off the session with a review of long term, ongoing research involving several Australian colleagues, and focusing upon the motivations and management behavior of farm forest owners in Australia. His paper dealt especially with the non-financial motivations and their potential for enhancing environmental benefits for the public good.

Dr. Pentti Hytinen compared small- and large- scale forest industries in rural Finland with respect to the social responsibilities within which they operate. His model provided a solid framework for the discussion that followed.

Dr. Gun Lidestav presented a more theoretical model for understanding social dimensions of family forestry, seeing family forestry practice within the terms of a broad social contract and web of relationships.

Dr. John Bliss summarized results from a survey of IUFRO Small-scale Forestry Working Group attendees at the Spring meeting in Vilnius, Lithuania. The survey explored participants' perspectives on the roles, challenges, and strategies for sustaining family forests in their respective countries.

The session closed with a wide-ranging and lively discussion among participants, exchanging of business cards, and rekindling of old acquaintances. The Small-scale Forestry Working Group is definitely alive, productive, and growing. The success of the journal, Small-scale Forest Economics, Management, and Policy, an out-growth of the working group, is further evidence of the relevance of this field to the issues of the day.

The role of the International Energy Agency in creating a carbohydrate-based economy: bioenergy, biofuels, and bioproducts

Session Organizer: Jack Saddler (University of British Columbia, Canada, email: jack.saddler@ubc.ca).

This session was designed to examine the role that forest biomass will play in future energy, fuels, and materials production, and to highlight the role that the International Energy Agency Bioenergy Program plays in this area. As such, we invited participation from a number of IEA Tasks.

Jack Saddler opened the session and presented an overview of some of Task 39's ongoing program, focusing on the technical progress in bioconversion of lignocellulosics to ethanol, as well as policy and biodiesel opportunities. Some examples

of policy decisions designed to support increased ethanol production and use were discussed, including the Brazilian experience of the 1980s and 1990s, as well as current Canadian initiatives for supporting commercial ethanol production. The talk also provided a review of major existing pilot facilities for lignocellulosic bioconversion, either in existence or currently under construction. Finally, ongoing research to reduce the high costs associated with the enzymatic hydrolysis step was described.

Steve Schuck provided the audience with an overview of bioenergy development in Australia. He described the drivers and key issues for bioenergy, focusing on the Australia's recently released Energy White Paper, its Mandatory Renewable Energy Target, and other Federal and State Government policies and programs supporting renewable energy and bioenergy. It was shown that aspects of bioenergy have been contentious in Australia, and the attitudes of some environmental organizations and electricity retailers were described. Bioenergy development is being fostered in Australia through Bioenergy Australia, a group of 40+ government and industry organizations. Several examples of Australian bioenergy projects existing or under development were provided, as well as an indication of likely future opportunities and directions for the bioenergy industry and for the forestry industry.

Annette Cowie, Subtask Leader for IEA Bioenergy Task 38 (Greenhouse Gas Balances of Biomass and Bioenergy Systems) discussed the role of bioenergy in the mitigation of greenhouse gas (GHG) emissions. Task 38 has developed computer models and case studies for the assessment of GHG balances of bioenergy systems compared with fossil energy systems. A major objective is to aid decision-makers in selecting the most effective options to limit emissions or enhance removals of greenhouse gases. Task 38 has focused much of its efforts in clarifying the option of biomass sinks within the relevant provisions of the Kyoto Protocol.

Jim Richardson, Task Leader for IEA Bioenergy Task 31 (Biomass Production for Energy from Sustainable Forestry), reviewed the availability of forest biomass for bioenergy, biofuels, and biomaterials. Throughout most of the developing world, forest biomass is harvested for energy, for cooking, heat and other daily needs. Increasingly in the western industrialized world also, interest is focused on the forest as a feedstock for bioenergy, a sustainable, carbon-neutral alternative to fossil energy. To be truly sustainable, the harvest of biomass for energy must consider nutrient cycling, carbon sequestration, stand productivity and soil and water conservation, as well as cost-efficient forest operations.

Theo Verwijst, Task Leader for IEA Bioenergy Task 30 (Short Rotation Crops for Bioenergy Systems) expanded upon the theme opened by Jim Richardson, and provided an overview of the developments in short rotation crops (SRC) for bioenergy in Scandinavia. It describes the past and present drivers for SRC-development and identifies current trends that provide opportunities for Scandinavian forestry, agriculture and the bioenergy industry. A major question addressed in the paper is how the Scandinavian systems could be modified to function in different parts of Europe and elsewhere. Barriers to large-scale implementation in Scandinavia and their solutions are illustrated and compared to the situation outside Scandinavia.

Ritva Toivonen, Research Director at the Pellervo Economic Research Institute in Helsinki, closed the formal component of the session with a discussion of the growing share of bioenergy in the European Union. The target of the EU is to double the share of renewables (triple the use of bio-fuels) between 1995 and 2010, which indicates strongly growing demand for energy-wood. This would strongly accelerate international trade of wood-based bio-fuels, and the development would no doubt also have impacts on industrial round-wood markets. This may lead to changes demand/ supply balance of traditional forest industry products.

Overall, the session met its objective of raising the profile of IEA activities within the more traditional forest research community that IUFRO represents. Our session attracted crowds of between 50-90 people, a considerable success given the range of parallel sessions that were offered at the Congress. We would like to thank all of the presenters, as well as the audience, for their attendance at this session and for the range of insights that were provided.

Selected papers from this session will be published in full by the International Energy Agency Bioenergy Task 39, www.task39.org.

Rapporteur: Warren Mabee (University of British Columbia, Canada).

Utilization of plantation teak

Session Organizer: K. Mahabala Bhat (Kerala Forest Research Institute, India; email:kmbhat@kfri.org).

Although teak has a world-wide reputation as a high quality tropical hardwood, knowledge of the performance and behaviour of its wood products from planted trees/ forests, especially in short-rotation plantations of high input management and homesteads, is inadequate to provide recommendations for investments in tropical plantation programmes. The session was intended to appraise the myths and realities of wood quality, processing, and marketing of relatively fast grown teak, especially that grown outside forests in major teak producing countries.

A paper on timber quality of teak grown outside forests presented was presented by K.M. Bhat et al. (Kerala Forest Research Institute, India). According to the speaker, although yield was higher, the paler wood colour and lower decay resistance (to brown rot fungi) lowered the timber value of

trees grown in wet-site home gardens. However trees in drier homesteads produced a timber of more attractive wood figure with black streaks and a darker golden brown colour. Due to a lack of standard spacing, thinning and pruning regimes, the market value of home garden teak was lower due to greater number of timber defects, particularly bends and knots. In another interesting paper presented by Alexia Stokes et al (University of Bordeaux, France, Cirad Foret, France) on natural durability and colour characteristics of teak grown in Togo, the relationship between color parameters and durability was not sufficiently consistent to develop an accurate classification system. Sadhardjo Siswamartana et al (Perum Perhutani, Indonesia) examined the early performance of clonal teak and found that clone-site interactions were significant in influencing, tree height, diameter and stem form. Another paper by the same speaker with his associates, including authors from Germany, concluded that it is possible to use the embryos as a protoplast source for fusion, so that crossing could be made in vitro and with predictable results indicating good prospects of genetic engineering.

The posters from the Session dealt with interesting topics, including community-based teak forest management in Cepu Forest district in Indonesia (Sadhardjo Sm), colour improvement of sapwood by an oil-curing treatment (A Mohammed et al, Malaysia), gene flow in a teak clonal seed orchard (Iskandar Z. Siregar, Ulfah J. Siregar, Indonesia), and wood characteristics from clonal and multi-provenance trials (H. Bailleres et al, Cirad Foret, France).

Selected papers are proposed for publication in the J. Indian Academy of Wood Science in the year 2006.

Rapporteur: H. Bailleres (France).

Application of newly-developed technologies in mechanical wood processing: towards sustainable utilization of forest products in the 21st century

Session Organizer: Chiaki Tanaka (Kagoshima University, Japan; email: tanakach@agri.kagoshima-u.ac.jp).

Newly developed technologies in mechanical wood processing are being sought to progress the sustainable utilization of forest products in the 21st century. Presentations in this session examined sawn lumber, surface defects, human body-vibration, ablation on printed popular paper (PPC), and tool wear.

S.G. Hatton presented a paper on optical blade speeds for circular saws to achieve a high volume of sawn lumber. K. Murata studied a sawing method for medium-diameter Sugi (Cryptomeria japonica D.Don) logs by using the sawing pattern, considering the dynamic modulus of elasticity of logs by fundamental frequency of vibration induced by hitting in the longitudinal direction (Efr). He showed log Efr values may be one of the most effective parameters for log sorting.

J. Ratnasingam described the characterization of surface defects in rubber wood (Hevea brasiliensis) processing. He showed that the machine planning process of solid rubber wood was optimized when the machined surface had at least 25 cutter marks per inch. This not only resulted in acceptable surface roughness, but also significantly reduced the number of machining defects.

V. Goglia described transmission of vibration to framesaw operators. He showed that framesaw operators are exposed to vibration levels greater than those permitted in ISO 5349-1-2001 and ISO 2631-1-1986. It is presumed that the measured vibration acceleration level on the left handle will cause permanent damage in 10% of operators after five years of exposure.

N. Hattori presented a laser ablation method with pulsed Nd: YAG lasers to reuse printed PPC paper. R. Gazo reported a method for reduction in tool wear by cryogenic treatment, and by cooling tools with refrigerated air. In another poster, B. Ozarska described the use of microwave technology in the manufacture of bent wood components.

Rapporteur: Chiaki Tanaka (Kagoshima University, Japan).

Fire safety of wood structures

Session Organizer: Robert H. White (USDA Forest Service, Forest Products Laboratory, USA; email: rhwhite@fs.fed.us).

Fire safety of buildings is governed by building codes designated by individual countries. The first two papers, 'Fire Performance of Connections in Laminated Veneer Lumber', presented by Prof. Peter Moss (University of Canterbury, NZ) and 'Fire Performance of Composite Lumber Products', presented by Dr. Robert White (USDA Forest Service) discussed fire performance of engineered wood products. In both papers, charring rate of laminated veneer lumber (LVL) behaved similar to solid wood. Moss described performance of various connection systems, with metal connection systems having greater fire resistance than epoxy connections. Nailed connections had improved fire resistance when intumescent coating was applied. White compared fire performance of engineered wood systems with analytical procedures used by USA building codes. Empirical results were similar to analytical results for most types of engineered wood products. Oriented strand board had slightly higher HRR than lumber or LVL.

The 'Outlook for the Future Repair Methodology of Traditional Timber-frame Buildings in Japan', presented by

Ms. Yuko Osawa (Kogakuin University, Japan) discussed the problem between restrictive guidelines established by International Council on Monuments and Sites (ICOMOS) and type of wood available for rehabilation and repair of historic buildings. ICOMOS recommends utilization of 'same tree species, tree quality, and building techniques' for preservation of timber-frame buildings, such as Horyuji Temple. Acquiring 'same tree species, tree quality…' for use in replacing supporting structural members is very difficult. The recommendation is that foresters need to pay attention to growing large trees from plantations to meet this special need. Further recommendations include that ICOMOS may need to relax their standards on same tree species and quality.

The fourth paper, 'Development of Urban Wildland Interface Fire Standards for the California Building Codes' was not presented due to illness of Prof. Beall (University of California, USA). Robert White presented a summary from his knowledge. Dr. White indicated that Dr. Beall had not reviewed the presentation, therefore it represented Dr. White's perspective. The presentation discussed the latest protocols being developed in USA on evaluating ignitability of exterior building surfaces. New test procedures are being discussed in ASTM E5.

Dr. Yin Wang (Chemco, USA) discussed the evaluation of their fire retardant (Thermex-FR/FRX) to meet Australian Standard (AS) 3959 in a presentation on 'Developing Exterior Fire retardant Treated Wood in Compliance with AS 3959'. Both western red cedar and radiata pine, when treated with their fire retardant, could meet limited combustibility test. These species also need durability requirements. Dual treatment of CCA, CBA, or ACQ followed by drying and then treatment with Thermex-FR/FRX provided both fire and decay resistance. A poster, 'Fire retardant treated Western Red Cedar for the Japanese Market' was presented by H. Ieyama (Channel Original Co., Japan) and Yin Wang on how Chemco fire retardant western red cedar siding outperformed some of the most recognized non-combustible cladding material tested under Japanese standards.

Dr. Robert White (USDA Forest Service) presented poster on how homeowners can reduce likelihood that their landscaping will become involved in wildland urban interface fire. By using proper low flammability vegetation, homeowner can lower their risk.

Rapporteur: Susan L. LeVan-Green (USDA, Forest Service).

Using wood composites as a tool for sustainable forestry

Session chair: Jerry Winandy (USDA Forest Service, USA; email: jwinandy@wisc.edu).

Five oral presentations demonstrated on-going work in wood composites in five different global regions, explaining the availability and use of fibre resources beyond traditional sources. Ten poster presentations were also associated with this session.

'North American Perspectives on Using Wood-Based Structural Composite Products as Forest Management Tool to Improve Forest Health and Sustainability and to Reduce Forest Fuels and Exotic/Invasive Species'. Dr. Jerry Winandy described the status of fibre availability in North America, especially fibre from exotic/invasive species and from burned stands. Dr. Salim Hiziroglu described a specific utilization issue – low quality Eastern Red Cedar particleboard with suitable properties.

'Using Cedar Plantation Materials for Wood-Based Composites in Japan'. Dr. Shigehiko Suzuki described the use of Sugi-cedar plantation materials in a variety of wood products in Japan. Plantation Sugi is increasing rapidly and is now 57% of the growing stock in Japan. Large volumes are available on a sustained basis. Due to the small size and weak properties, a variety of research projects are underway to modify the properties to increase its usability.

'European Experience with Wood and Natural Fibre Composites'. Dr. Marius Barbu summarized the production of composites in Europe and discussed the future with respect to supply and demand of wood products in the world. Wood supply will increasingly be a constraint, with competition with power generation. An increase in the utilization of recycled wood is needed.

'Wood Composite Made of Populus Plantation Material in China'. Kelin Ye described the development in China of a significant volume of plantation poplar fibre. Rapidly rising demand for wood products, combined with a reduced supply of traditional wood sources due to environmental concerns has led to an increased reliance on plantation poplar as a fibre source in China. In the past fifteen (15) years, composites production in China has increased by a factor of 17x. Plantation poplar continued to be developed to meet this growing need.

'Advances for Utilization Whole Tree for Composites'. Dr. Jeremy Warnes gave the New Zealand perspective on utilizing residues from Radiata Pine. Emphasis was put on research to develop two(2) new products that use residuals: barkboard (where bark is chemically modified to act as the binder) wood fibre-reinforced plastic composites, where wood is used for reinforcement.

A complete Proceedings of all papers and posters presented in Session #090 is currently being edited and will soon be published.

The organizers of IUFRO XXII Session #090 (Div 5.05 composites) intend to publish the 5 oral papers and about 5 additional papers from some of our 10 poster presentations as a USDA General Technical Report. That report will be published by the US Forest Products Laboratory in Madison WI and will available as a downloadable PDF via internet off

the FPL webpage (www.fpl.fs.fed.us) in about 12 weeks from now (~Dec 05 if I get all papers prior to Sept 15, 2005). The format will be similar to this attached document which was the Proceedings of another similar workshop with multiple technical papers. (http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr149.pdf).

Rapporteurs: Robert W. Wellwood, Alberta Research Council, Canada; email: wellwood@arc.ab.ca) and Jerrold E. Winandy (United States Department of Agriculture, Forest Service, USA; email: jwinandy@fs.fed.us).

Links between supply chain management and value recovery

Session Organizer: Kevin Boston (Oregon State University, USA; email: kevin.boston@oregonstate.edu).

Foresters spend decades creating potential value in standing trees through silvicultural operations, and there has been a recent emphasis on value recovery. This session reviewed three causes of value loss that include losses due poor marketing decisions, poor operational planning and from poor control of operational practices.

The presentation by D'Amours, Frayret, D'Amours (FOR@C Research Consortium and CENTOR, Université Laval) described using demand analysis techniques and practices to synchronize the demand between high-value customers and suppliers. This improved synchronization allows for improved matching of supply to demand to lower inventory levels. Marshall (Forest Research New Zealand) described a system where once customer demand is known, a planning system is needed to assign cutting schedules to stands to best meet this demand. Value losses can occur by simply not assigning the correct cutting schedule to the correct stand. Marshall presents a new heuristic technique to solve the difficult forest-level bucking problem. Murphy (Oregon State University) described the operational losses from value recovery from poor felling, loading and storage practices with poor log making being the dominate cause of value loss that can account for nearly 50% of the total potential value produced from the stand. Murphy made the point in his presentation that it is easier to recover a dollar of value lost than to reduce costs by one dollar. It is hoped that through the ideas presented in these presentations that firms will be begin to focus on value recovery from the marketing, planning and operational environment.

Rapporteur: Kevin Boston (Department of Forest Engineering, Oregon State University, Corvallis, OR USA).

Current issues in forest products marketing and business management

Session Organizer: Richard Vlosk (Louisiana State University, USA, rvlosky@agcenter.lsu.edu).

These sessions dealt with current issues in forest products marketing and business management. Topics such as certification, strategic planning and the creation of value along the value chain were the most recurrent subjects demonstrating their relevance and actuality in the research domain.

Session 118:

Korhonen (University of Helsinki, Finland) explored new business models for forest products companies as a response to a highly competitive environment. The aim is differentiation through the development of value creation capabilities for both parts. This process showed to be very customer specific.

Grossmann and Schanz (University of Freiburg, Germany) discussed the environmental and economic effects of illegal logging and trade and presented the action plan being executed by the European Union. The plan features a more important role for corporate self-regulation and a higher emphasis on governance rule setting. The effectiveness of self-regulation is researched and recommendations are made to improve it. They concluded that: 1) Socio-historical and political national frame conditions are important for corporate self regulation, 2) Corporate codes of conduct addressing illegal logging fall back on existing certification schemes, and 3) Private sector initiatives are a necessary but not an independent part of governance processes.

Lefaix-Durand (Université Laval) examined the relationship dynamics between large US homebuilders and the forest products industry, namely suppliers and subcontractors. She also explored the expected changes in building techniques and material selection, along with the preferable channels of distribution and use of marketing functions and tools, such as IT. The results suggest a trend toward more cooperative and long-term relationships with suppliers, as well as shorter supply chains and an increasing use of IT as a means of value creation via inter-firm cooperation.

Knowles discussed measuring innovativeness in the forest products industry. A discussion of previously used measures was followed by an explanation of the scale developed for this study. This new measure is based on the propensity of firms to create and/or adopt new products, processes, and business systems. Although data collection is still in progress, initial reliability analysis indicates the scale has high internal reliability.

Session 166:

Smith (Virginia Tech, USA) examined consumer purchasing decisions for environmentally certified forest products (ECFP) in US home centers. They found that consumers associated ECFP to a higher quality of the product and hence price appeared to be somewhat inelastic.

Owari (Hokkaido University, Japan) proposes a conceptual framework for value creation in business relationships among customers and wood products suppliers, focusing the attention on the latter. The framework includes the intervening effects of two relationship variables, customer trust and commitment.

Bigsby and Ozanne (Lincoln University, New Zealand) looked at the degree of environmental concern among members of the Australian forest products industry value chain and those players with the capability to influence demand, such as architects and builders. Choices of building materials and perceptions of wood relative to alternative building materials, such as steel, plastic or concrete were also surveyed. Intermediate and final consumers generally believe that wood is more environmentally friendly than other building materials, although architects frequently avoid wood for environmental reasons. Consumers pay more attention to environmental issues when choosing wood-based materials as opposed to other materials. They found a high level of environmental awareness and familiarity with eco labels among intermediate and final customers, the former showing willingness to buy and stock certified wood products while the latter are expected to be willing to pay premiums for them. Interest in forest certification among the forest industry is higher among forest growers than primary processors. They report a need for adoption of an international certification system.

Gazo (Purdue University, USA) and Quesada (Institute of Technology of Costa Rica, Costa Rica) reviewed competitive strategies and financial performance of furniture manufacturers, both domestic (Costa Rica) and those exporting to the USA. A mix of low product costs, modern technology and innovativeness, access to raw materials, know-how, government support and favorable exchange rates (1998-2002) give a competitive edge to overseas competitors. The most critical financial factors when measuring company performance were liquidity, operating efficiency and capital turnover. The major differences were found for liquidity where the kitchen cabinet industry showed the highest liquidity as opposed to household and office furniture with similar and lower levels. Secondary research showed how the US furniture industry has suffered enormous competition from abroad, especially from China, resulting in hundreds of mill closures The researchers argued that US manufacturers are outsourcing or shifting their operations to Asia.

Hanninen et al discussed the transmission of demand shocks in the forestry-wood chain in Northern and Central Europe. Economic fluctuations in export markets are directly reflected to the exporters' roundwood markets roundwood price development is tied to cyclical developments in the lumber export markets, but behavioral differences can be detected between countries. Similarity of price transmission was found between Finland & Estonia and between Austria and the Czech Republic. Similarity could be explained by: 1) locational proximity, 2) the presence of the same large industrial wood buyers, and or 3) the use of quality classification of sawlogs in Austria/Czech Rep.

Forests and the livelihoods of rural people

Session Organizer : Mohammed Ellatifi (Forest Department, Casablanca, Morocco; email: mellatifi@yahoo.fr and m.ellatifi@mailcity.com).

Forest ecosystems play a tremendously important role in the livelihoods of local communities and, more particularly, rural people throughout the world. In this session, foresters and scientists from different countries presented their viewpoints and research findings, regarding the values of forest ecosystems' functions, and their importance in the livelihoods of rural people.

Sheona Schakleton (Rhodes University, South Africa), Bruce Campbell (Centre for International Forestry Research, Indonesia and Charles Darwin University, Australia) described the role played by NWFPs in reducing poverty and vulnerability of rural people in South Africa. For this purpose, they studied four locally-traded NWFPs, i.e. woodcrafts, reed mats, traditional brooms, and a beer made from the fruits of Sclerocarya birrea, in a South African semi-arid savanna area. Overall, the results of this investigation showed that NWFPs contributed, to a certain level, to enhancing livelihood security of rural poor communities who suffer from rising levels of unemployment and HIV/AIDS.

A particularly well presented paper was delivered by Atul (Palampur Agricultural University, Himachal Pradesh, India) about a Himalayan MADP Model for socio-economic sustainability and forest conservation.

In another paper, Minna Hares (University of Helsinki, Finland) described the value of the forest to upland people in northern Thailand. She concluded that the upland people consider the forest as vital for their livelihood, and tend to emphasize the importance of conservation and sustainable use of the forest, which provides them with NWFPS (firewood, construction wood, herbs, mushrooms and bamboo shoots), water, mild micro-climate, as well as with spiritual feelings.

In a poster, Juris Oslejs (Forestry Research Institute, Salaspils, Latvia) described an advancing communication between science, practice and capacity building, at the Latvian State Forestry Research Institute. The results of the study showed that, with a bilateral Latvia-Denmark project, significant progress has been made, during the last three years, in communication development between forestry research and practice, and in strengthening institutional capacity (more

particularly guidelines development for, and supervision of forestry research, data analysis, extension and training, circulation of information and research findings, web paging, etc.

In another poster, Aki Tarumi (Forestry and Forest Products Research Institute, Tsukuba, Ibaraki, Japan) tried to answer the question 'Who can shoulder forestry management in Japan?' Based on a survey in which a comparison was carried out between ancient and newly established enterprises, the results suggested four key elements in order to achieve sustainable management of forestry enterprises and NPOs, in terms of forestry employment, i.e.: forest policy, rate of man-made forests, forest age class, and situation of the regional economy.

Involving indigenous groups in forest science and forestry

Involving indigenous groups in forestry

Organizer: John L. Innes (Sustainable Forest Management Research Group, University of British Columbia, Canada; email: john.innes@ubc.ca).

There are major changes afoot in the ownership and management of natural resources around the world, especially in post-colonial states where indigenous peoples are pursuing models based on respect for their autonomy and authority in mutual jurisdictions. Suitable models need to address spirituality, the complexity of language, and indigenous perspectives on humans as a part of nature (with limited understanding) and scientists as moral beings.

From an indigenous perspective, the goal of incorporating traditional ecological knowledge (TEK) is to inform management practices directly. Successful involvement of indigenous groups in forestry will recognize that TEK is a broader knowledge construction process for secularizing and systematizing the diffusion of information about basic societal needs that is effectively grouped into 'disciplines' or histories, myth or legends. TEK therefore needs to be valued as an alternative way of looking at the world, rather than just a contribution to western science which will simply serve to strengthen existing institutional arrangements and power relationships.

A first step in moving from such objectives to implementation involves communities identifying their desired business partners and arrangements. A similar move from imposing scientific research agenda on indigenous communities to a focus on indigenous perspectives on research needs and priorities is also needed. Academic traditions need to be re-examined for reciprocity and negotiated fairness in intellectual exchange, including research protocols, publication processes and community participation in utilization of results. Research gaps exist, including: non-timber forest product (NTFP) values and systems for environmental income that respect TEK; a new definition of quality of life for comparing occidental and traditional ways of life; respect for other cultural expressions and values; knowledge interchange; and appropriate and multidisciplinary methodologies.

A majority of indigenous managed land tends to be located in isolated areas, where there is a limited infrastructure for resource development, and indigenous peoples are still generally underrepresented in forestry industry. Since TEK tends to be local, abstract, oral and belonging to a few people, global agreements that provide new visions can cause conflicts. Research challenges include the professional competency of researchers and forestry professionals working in indigenous communities; the capabilities of indigenous peoples, communities and governments to implement their community economic development objectives; and the ability to affect change in the status quo through research. Low levels of industry participation, a lack of peer group role models, cultural differences, employer biases, loss of non-wood industry TEK, and cultural and attitudinal differences pose barriers in the business environment.

New knowledge means new paradigms, and while globalization and increasing interaction with other cultures, authorities and traditions may change the believers, appropriate interactions with scientific knowledge can also polish TEK. Furthermore, just as technology has tradition, tradition has technology and management based on sound knowledge should be able to incorporate western science or TEK knowledge systems. Most importantly, context matters, and ties to the land must remain and be restored if we are to sustain relationships to the land and incorporate humans into our sense of place and understanding of ecosystem relations.

Questions raised during the discussion:

Are tradition-technology linkages feasible?

How far should scientists go to show that they respect nature?

Science is based on discovery: What does discovery mean to us?

The importance of place is also important to the concept of sustainability: What role this will play in bringing in science?

Does the line between the urban and the country aspect of living (indigenous or western) in itself face the biggest problem for continuing the drive to ensure traditional cultural activities are maintained?

How do foresters understand the oral process of transmitting indigenous traditional knowledge?

How can we use today's technical tools to go back and understand how people are searching for knowledge?

Are there some actual examples of the two-row wampum approach (Stevenson) working well in practice in Canada? How can you have two different streams, particularly in TEK in parallel, and come to some kind of harmony in the end?

Closing Statement (Dr. Innes):

The emphasis on indigenous communities and the great similarities in the research issues are problems of common interest that IUFRO can work with. Researchers are encouraged to raise these issues within IUFRO's new TEK Task Force, the new Working Group on Intercultural Communication, and through Division 6.

Rapporteur: S. Denise Allen (Sustainable Forest Management Research Group, University of British Columbia, Canada).

Indigenous peoples and commercial enterprises in forestry

Session Organizer: George Hoberg (Department of Forest Resources Management, University of British Columbia, Canada; email: george.hoberg@ubc.ca).

This session focused on the economic aspects of incorporating Indigenous peoples in commercial enterprises. Sample approaches to co-management of timber, non-timber forest products (NTFPs), community forests, and conservation and protection initiatives were drawn from Canada, India, Bolivia, Melanesia, Indonesia and Belize. The role of institutions, economic dependence vs. self-sufficiency, and the importance of participatory approaches in indigenous economies evolved as major themes.

The process of involving Indigenous peoples in forest science and forestry frequently results in visible changes to tribal lifestyles. Employing participatory approaches to forestry and land-use planning can help balance commercial and traditional requirements. When forestry is integrated with other forms of production in Indigenous economies and societies, it can help support a diversity of resources and management practices. Such dynamic, hybrid systems are better able to fulfill multiple needs and enable local communities to adapt to changing economic and political circumstances.

Commercial enterprise must consider the local institutions that provide legitimacy and governance structures in Indigenous communities. Institutional factors clearly matter for profitability; surprisingly, it appears that some basic economic factors don't (i.e., communities can enter into enterprises simply to learn about the forest sector and build capacity). In this context, effective institutional design will be localized and vary according to the primary objective of development. For new products such as NTFPs, where the situation is very fluid and dynamic, mapping industry structure and getting prices at each level is an important first step.

To better protect resources and provide for local populations, conservation initiatives must include economic development. Authority needs to mirror local political organizations, and these experiences suggest that enterprise and CED entities may need to be separated from traditional management structures. In rural villages, landowner enterprise competitiveness can be improved by pooling resources and efforts. Access to effective on-the-job training for managing user-friendly technology, and long-term advisory services from central marketing/training facilities and service providers are key.

Conflict is generally unavoidable. It can arise over: community values or objectives vs. product-based profit-making; traditional/livelihood vs. commercialized attitudes to work; individual families/people interested in business vs. the collective model; government owning the land vs. communities using it (give and take of power); and communities not wanting to be included in forest management, especially where political structures are changing. However, conflicts may also be good indicators, identifying that people who are being left out of resource management are speaking up.

The ties between resource use, poverty and power are strong. Where colonization and a lack of viable socio-economic alternatives to traditional shifting agriculture or illegal logging threaten the natural and cultural resources of Indigenous peoples, growth and development of capabilities, performance and markets are one path to economic self-sufficiency. With constraints on (collective) title, poor and marginalized rural groups often lose out. Careful management of external agencies/funding will help to avoid unrealistic expectations and dependence on external subsidies. Commercial business can also sustain more than just profitability, and often crosses the line into CED, where even relative economic failure may be offset with political success.

Questions raised during the discussion:

If we asked different questions, would we get more useful answers? How would objectives change development? What would an Aboriginal approach to economic development look like?

What are the institutional prerequisites for success when a FN and a private company join together in an economic enterprise?

Profitability is a kind of a dynamic thing that can change all the time: How do you measure if it is profitable or not?

If we just focus on profitability aren't we missing the boat?

What happens when indigenous communities want to set up on collectively owned land?

What kind of costs do communities look at in terms of forest certification (getting audits done, etc.)?

What kinds of gender divisions were associated with by-products of forestry?

Should you reroute funds to smaller but more successful aspects of projects?

What about the distribution of other benefits for poorer sections of the communities? Can we help the poorest of the poor or are we creating a new middle class?

What are some of the NTFPs? Some of these products are going through some growth in terms of their importance related to health: Is this another case where the poor don't benefit, there's another layer above that benefits?

How is the wildlife faring with respect to all the people going in and out of the forest for cultural purposes?

Refreshing to talk about profitability because it's the fundamental driver to a commercial enterprise, but the answers seem fundamentally obvious: What happened when you showed those results back to the people?

Is there any empirical study of fire frequency, woodcutting or not, before and after involvement of people? Criteria and Indicators for forest improvement as a result of involvement in decision-making on the forest?

What is the best way to deal with conflict or tribal conflicts? How do you get such communities to continue with the program?

What are the alternative models for NTFPs? A commercial business is one, but what are other business or enterprise models that might work?

Closing Statement (Hoberg):

This session was linking tradition and markets, highlighting some of the tensions between communities entering the markets through the forest. Generating a profit is one question, but the next question is how to distribute that profit in a fair way - which you can do as long as you have profit in the first place.

Rapporteur: Denise Allen (Sustainable Forest Management Research Group, University of British Columbia, Canada).

'Forestry' for Indigenous peoples: learning from experiences with forest industries

Session Organiser: Sue Feary (The Australian National University, Australia. sue.feary@anu.edu.au).

On a global scale, Indigenous participation in the forest industry is increasingly recognized as being beneficial for both sustainable management of the forest resource and for providing social, cultural and economic benefits to marginalized and dispossessed peoples. Using examples from Australia, Canada, New Zealand and India, speakers in this session demonstrated the diversity of ways in which Indigenous communities engage with forests and the forest industry. At the same time, they showed a remarkable commonality in the issues to be faced when the economic rationalism of an industry encounters a value system where forests are an integral part of identity and culture.

Stephen Wyatt wrestled with the complex issue of defining "Aboriginal Forestry" in the context of the First Nations of Canada, using sloganed t-shirts as innovative and useful props. He pointed out that the integrated approaches to public forest management in Canada today may be more compatible to First Nations' world views but many changes are still needed. Most First Nations want more control over resources on their traditional lands through effective participation in planning, impact assessment and certification and proper use of traditional knowledge. Aboriginal forestry should be a new form of forestry, based on Aboriginal values and rights, supported by western science and technology.

Jack Smyth's paper was also about First Nations in Canada, but he focused on the First Nations Forestry Program. This partnership between two federal departments and First Nations is aimed at building capacity and identifying economic development opportunities to increase First Nation's participation in the forest sector. He acknowledged the constraints to effective participation but was optimistic about a future that would see First Nations achieving greater economic independence.

Robert Miller's paper on Maori forestry began with some evocative images and stirring music from New Zealand, leaving no doubt as to the enduring nature of Indigenous culture in this country. Maori are a significant stakeholder within the forestry sector for both native and planted forests, owning 13% of pine plantations and nearly 50% of privately – owned native forests.. This is likely to increase as Maori rights from the 1840 Treaty of Waitangi are realised. Robert gave some examples of Maori forest management that incorporated both economic and non-economic values, similar to First Nations and Australia.

Hemant Gupta presented a very different scenario in his paper on Indigenous forest management practices in the Indian Himalayas. He described the importance of traditional systems of management by local Indigenous communities for sustainable harvesting of non-wood forest products. Analysis of these systems through case studies has revealed that they are grass roots expressions of true participatory resource management which builds social capital through respecting traditional systems of power and knowledge, thus reducing conflict and ensuring equitable distribution of resources. Many countries could learn from these Himalayan examples.

The Australian component of the session comprised two papers; a brief overview of Aboriginal involvement in forestry by Sue Feary and a paper by David Taylor and Mark Annandale, giving real insights into forestry operations on remote Aboriginal lands in north Queensland. Sue's

paper stressed the need for the industry to understand that Indigenous perspectives of forests are pluralistic and strongly influenced by historical factors. Not only are forests for deriving economic benefits, they contain places of immense spiritual significance and are part of a landscape where customary activities continue to be carried out.

The paper by David and Mark showed that how, with a bit of help from the government, Aboriginal communities have the ability to establish and run viable forestry based industries. Based on their first-hand practical experience in working with remote Aboriginal communities they stressed the importance of being realistic about what can be achieved, the value of participatory, bottom-up approaches that involve listening to people and, the need to keep technology at a level appropriate for the location.

The papers from this session are to be published in the 'Occasional Paper 'series of the School of Resources, Environment and Society, The Australian National University and will appear on the website http://sres.anu.edu.au

Increasing the value of forests through innovative products and technologies

Session Organizer: Hans Rudolf Heinimann (Swiss Federal Institute of Technology (ETH), Switzerland; e-mail: hans.heinimann@env.ethz.ch).

The session aimed at opening and widening participant's perceptions for the ways of thinking about value creation, to provide inspiring insights into related projects, and to work within a comprehensive framework of technology covering product, process and transaction technology. The session was organized around Schumpeter's concept of innovation: (1) taking a new idea or concept, (2) reducing it to practice, and (3) making it a commercial success.

Three speakers presented their views and experiences of new ideas and concepts. Chris Risbrudt (USDA Forest Products Laboratory, United States) shared his ideas on the future of forest product technology. A future technology roadmap consists of engineered biocomposites, biorefineries, bioenergy, and biotechnology of forest products, such as carbon nano-tubes. Coert Guldenhuys (Forestwood cc, South Africa) presented the commercialization of non-wood forest products in a small and medium enterprise context. Four key product areas were developed: (1) fruits for food (juices, jam), (2) fibers for craft, (3) plant components for traditional medicine, and (4) bark for traditional medicine. Special emphasis has to be given to the whole value chain from cultivation, harvesting, processing, distribution to marketing and after-sales services. Richard Vlosky (Louisiana Forest Products Development Center School of Renewable Natural Resources, USA) gave a presentation on the potential of e-business solutions in the forest sector. About 80% of the present e-business applications consist of business-to-business B2B transactions, in the forest sector mainly in the areas of raw material suppliers and logistic providers. e-business has the potential to improve order, order-fulfilling and billing processes along the whole value chain, covering inbound logistics, operations, outbound logistics, marketing and sales, and after-sales services. However, the forest sector is highly conservative. Compared to other industries there is still a big gap to be closed. Bar-coded supply chain and radiofrequency identification technologies RFID will be decisive components of future e-commerce applications.

Two speakers addressed the problems of how to reduce ideas to practice and how to make them a commercial success. José Joaquim Campos (Centro Agronómico Tropical de Investigación y Enseñanza CATIE, Costa Rica) spoke about the general role of innovation in forest management with a special emphasis on developing countries. He stated the fact that forestry is weak in innovation and posed the question of how to overcome this obstacle. He proposed several fields of actions on the policy level, such as (1) instruments to foster collaboration of actors along whole value chains , (2) re-designing the forest education system, and (3) financial incentives for creating markets for new products. He also stressed the fact that innovation always takes place locally, whereas product and factor markets are becoming more and more globally. The related problem has become known as the Glocallization problem. Stuart Whitten (CSIRO Sustainable Ecosystems Ecosystem Services Project, Australia) presented challenges and experiences of the 'markets for ecosystem services' project. The conversion of ecosystem services to private goods is going along with clearly defined property rights. Those have to be clearly defined, defensible und divestible. The project puts a focus on identifying and developing policies and the related institutional arrangement that will facilitate the creation of markets for ecosystem services, and that will provide incentives for agroforestry managers.

The presentations clearly demonstrated that reducing an idea to practice is a crucial part of innovation that is strongly related to development and design activities. Therefore, engineering sciences play a crucial role, not only in a traditional sense. Emerging engineering fields, such as business process engineering or financial engineering will be drivers to deploy new ideas and concepts in practice and to make it a commercial success.

Rapporteur: Hans Rudolf Heinimann (Swiss Federal Institute of Technology ETH, Zurich, Switzerland).

Utilizing small-diameter trees and solving forest resource problems

Session Chair: Victoria Herian (U.S. Forest Products Laboratory, Madison, Wisconsin, USA).

Throughout the world small-diameter trees present a resource problem. In Europe, the southern and western United States, and in some parts of Asia, managed plantations require thinning. In the western United States, millions of hectares of forestland have lost ecological integrity because of changes in vegetative structure and composition. Such stands are at significant risk from disease and insect attack and ultimately at risk for catastrophic wildfire. Reduced demand for pulp chips has limited traditional markets for these small-diameter trees. New technologies offer many opportunities for higher value uses of these materials.

Susan LeVan-Green (U.S. Forest Products Laboratory, USA) opened the session discussing opportunities and barriers to utilizing these small-diameter trees. Forest fires are the main incentive for thinning on federal lands. There is a need to revitalize the infrastructure, move some materials to high value markets first, then traditional uses and finally to use as residue. Transportation costs are the major barrier. Some new uses are 3-d pulp molded products, wood plastic components, wood fiber mats for erosion control and water filters, forest biorefineries, and urban wood waste cogeneration plants for energy production.

David Green (U.S. Forest Products Laboratory, USA) explained a mechanical grading system they developed for small diameter logs using modulus of elasticity determined in transverse vibration and the use of the logs in engineered round wood structures. This system is more reliable than traditional visual grading methods.

Erkki Verkasalo (Metla The Finnish Forest Research Institute, Finland) brought in the European perspective on utilizing thinnings. The primary aim was to add to potential sawlog supply and improve the competitive position in domestic round wood markets. They still need effective production lines dedicated to small logs and look to models being used in Canada and Sweden.

An interesting project was presented by Eva Haviarova (Purdue University, USA). She showed us how low-cost, durable furniture can be made from waste wood. She worked in Costa Rica and Jamaica concentrating on school furniture and light frame building kits. They use a simple round mortise and tenon joinery as the main means of assembly. This project demonstrated the ease and simplicity of construction and rapid rate of assembly.

Information from Canada came from Ian de la Roche (Forintek and Feric, Canada). He also said that transportation costs constitute 50-60% of the cost for utilizing and processing small trees in Canada. Canadians are using Optitek Sawing Simulator, software for assessing sawing strategies. They are using alternative methods such as auto-rotation systems, curve sawing to increase their recovery, and using smaller pieces and smaller diameter to manufacture engineered wood products.

Linking research, development and implementation

Session Organizers: Palle Madsen (KVL, Denmark; e-mail: pam@kvl.dk) and John Stanturf (USDA Forest Service, Athens, Georgia USA; e-mail: jstanturf@fs.fed.us).

The purpose of this session (and the related Session 164) was to highlight and demonstrate the importance of close and committed cooperation between scientists and practitioners in setting goals, creating research and development strategies to reach the goals, and finding ways to document, demonstrate and implement new findings into practical forest and landscape management. During the last 30 years, increased numbers of forestry researchers have caused an explosion in the scientific literature and a more complex knowledge base. Simultaneously, practitioners and stakeholders have less time to devote to acquiring new knowledge. Bridging the gap between research, policy makers, and stakeholders for improved implementation of important findings and policies is a major challenge in sustainable forestry.

In this session, research leaders from Asia, Europe, and the USA presented their viewpoints and strategies for improving the flow of information between researchers and users. N. E. Koch (Denmark) and K. Sagheb-Talebi (Iran) presented different perspectives from their countries and organizations. Koch pointed out that practitioners in Denmark sometimes were ahead of forestry research in developing new concepts and products, whereas Sagheb-Talebi demonstrated that the educational and knowledge level among farmers and forest owners in Iran were far behind forest research. The differences in the user communities for research results called for diverse methods of transferring information. In another case study, D.J. Robison (USA) recounted the development of the Hardwood Research Cooperative in North Carolina, a partnership between the university, forest industry, and public agencies. Robison warned against trying to be all things to every stakeholder and described the demise of the Hardwood Cooperative, which he attributed to the lack of a "marketable product" and the more profitable return on investment in pine research as carried out by other cooperatives.

Two important papers were presented by J. Stanturf (USA) and K. von Teuffel (Germany). Stanturf presented an investigation into how professional foresters obtain new technical information. Interestingly, managers tended to be conservative in their interests and it was more difficult to communicate issues such as climate change and biodiversity,

as compared to stand treatments and profits. Von Teuffel described a new internet-based system for transferring knowledge from 19 institutions concerning sustainable forest management in the forests of the Alpine Space countries in Europe. The task of communicating was difficult due to the complexity of multifunctional forest management, as well as the very different socioeconomic contexts of the countries involved. In a particularly interesting paper, B.R. Lockhart (USA) discussed the impact of the Data Quality Act of 2001 in the USA on public forestry research. He noted that public interest in the quality and accuracy of research has increased drastically, especially as more varied stakeholders now are dependent in various ways on the research. Relying on journal peer review alone as a quality measure is probably not sufficient in the future. Because stakeholders may now sue researchers on the basis of how research was conducted, research documentation becomes more and more important.

Selected papers from this session will be published in full in a special issue of *Journal of Sustainable Forestry.*

Rapporteur: Magnus Löf (SLU, Sweden; email: magnus.lof@ess.slu.se).

Innovation and entrepreneurship, rural development and forest sector competitiveness

Session Organizer: Ewald Rametsteiner (BOKU/IIASA, Austria).

The session drew around 60 participants, with the programme consisting of two overview presentations, two presentations selected from voluntary contributions and a discussion. The session started with a short introduction to the topic by the session chair, which highlighted increasing policy and research interest in the topic as well as the objectives of the session. These were: the provision of an overview on the state-of-knowledge on the topics covered, the identification of promising future research and the establishment of a global network of contacts of researchers interested in or working on the topic.

The first invited presentation, given by Prof. Eric Hansen, Oregon State University, USA, focused on 'Current State-of-Knowledge: Innovation Research in the Global Forest Sector'. Hansen outlined the rationale for the recent growth in interest in innovation as a topic. He then reviewed a range of research approaches to innovation and innovativeness and their application in forest sector. The presentation concluded with a list of future research needs.

The second invited presentation was given by Dr. Anssi Niskanen, University of Joensuu, Finland, on 'Forest Sector Entrepreneurship and Rural Development – An Overvew'. This presented a comparison of different country case studies on a framework outlining key factors for successfully supporting entrepreneurship through frame conditions.

Prof. Anders Luunan, University of Norway, presented a voluntary paper on 'Innovation in non-timber products and services in Norwegian forestry. Past experiences and future development'. Lunnan asserted that income from non-timber products and services are expected to grow in Norwegian forestry over the coming decades, which in turn will be an essential contribution to viable rural communities. Based on empirical data from Norway, he showed that formalized cooperation between forest owners is essential to create value from non-timber products and services, especially as the forest holdings are relatively small. The data showed that the forest owners' associations play an essential role in facilitating non-timber value-added activities. Lunnan concluded with some recommendations on how these associations could be more effective in promoting innovation in non-timber products and services.

Finally, Ms. Lyndall Bull, University of Melbourne, Australia, presented a voluntary paper on 'Wood products innovations: the effect of product, market and firm attributes on commercial success'. She studied a series of wood product innovations in Australasia and North America to determine what enabled some innovations to be successful while others failed. More specifically her work sought to understand the effects that the product, market and firm attributes have on the outcome for wood product innovations, using the concept of core competencies. The results inter alia show that products were typically developed based upon a resource push rather than market pull, which, however, is not the most successful approach to profitable innovation. The presentation illustrated that the presence of an appropriate technology governance structure and firm-wide learning culture will increase the likelihood that the product will achieve success.

After each of the presentations a few questions for clarifications were allowed. The presentations will be made available for download at the following websites: www.efi-innoforce.org, www.joensuu.fi/coste30.

The Session Chair furthermore reminded the audience that eight posters out of a total of more than 30 proposals were accepted and are exhibited at the IUFRO World Conference (Posters number 320-328). Authors of these posters that were present in the room were asked to give a short summary of the poster title and contents.

The discussion session focused on three topics: a) key gaps and challenges for future innovation and entrepreneurship research in the forest sector, b) promising topics for research, c) ways and means to improve exchange and networking amongst researchers working on or interested in the topic.

The discussion identified the following knowledge gaps and research needs:

- seed funding approaches and related best practice

- conditions for attracting innovations
- benchmarking of forest industry/sector with other industries/sectors
- diffusion of technologies (like US -> Scandinavia -> Australia)
- successful examples of R&D in creation value added in the markets
- comparison of different models of co-operation on innovation projects

The discussion furthermore identified the following possibilities for increasing networking:

- setting up an open and informal network, based on e-mailing list of participants present at the meeting (abbrev.: GLOB-INNO)
- using the informal network to inform the group about publications, projects, events or other news on innovation & entrepreneurship research individuals want to share
- initiating joint articles, whereby researchers willing to take the lead ask the network for contributions to a specific topic.

The session ended with a short summary of presentations and results by the session chair, who also thanked the participants for active participation in the discussion. After announcing that participants will be contacted by e-mail and thereby receive the contact information of the GLOB-INNO network. He concluded with a call to use the informal network of contacts for the benefit of all.

Remote sensing in forestry - recent developments of forest remote sensing

Session Organizer: Tomasz Zawila-Niedzwiecki (University of Applied Sciences, Germany. Email: tzawila@fh-eberswalde.de).

Technologies are advancing at an ever-increasing rate, and systems which only a few years ago were regarded as "blue sky" are now operational, widely available and cost effective. This is especially applicable to the forest sector in the area of resource and forest health assessment. In this technical session four speakers presented information on a wide range of remote sensing technologies, describing their individual applications, enhancements to their systems and results of recent use. The first three speakers detailed remote sensing technologies specifically being developed and used for forest inventories, while the final presentation described how lasers were being used aerially to pinpoint forest disorders and assess forest health.

David Evans (Mississippi State University, USA) chaired this session and was the first to present, giving an overview of his use of LiDAR, a relatively new remote sensing tool. This informative presentation outlined the dendrology of resource assessment covering manual stand measurement and mapping, aerial photography, satellite imagery through to high resolution digital imagery and LiDAR. David then described how LiDAR, which uses laser ranging from aerial platforms for high precision measurement, was being used for resource analysis such as tree/stand volume measurements, tree identification, terrain mapping, forest typing, habitat assessment and notably, the creation of a 'virtual' forest using graphic realism. Importantly it was shown that when a combination of technologies was used, e.g., draping high resolution imagery over LiDAR data, it not only overcame the deficiencies of individual systems, it realized the applicability of these systems for forest assessment.

Contrasting research detailing the use of a Compact Airborne Spectrographic Imager (CASI), a system which uses optical sensors rather than active sensors, as in LiDAR, was presented by Jusoff Kamaruzaman (Universiti Putra, Malaysia). Jusoff undertook a major trial of this system over 106,310 ha of logged over jungle within Sabah. The CASI instrument was mounted in a Cessna aircraft which flew strip transects over the jungle with data collected at 1 m hyper-spectral spatial resolution. All processing was undertaken in flight and by extracting 15 spectral signatures from the data, crown delineated images were obtained. This technology was successfully used to identify and map the dipterocarp forests, their species and distribution, estimated timber yields, harvest areas and volume per species. Jusoff concluded that this airborne inventory assessment system confirmed the same timber volumes as was obtained through ground surveys, and in the future CASI will be used for pre-inventory data collection.

The third presentation by Markus Holopainen (University of Helsinki, Finland) detailed the effectiveness of again combining remote sensing technologies to enhance accuracy and efficiency of forest inventories. Markus' research has concentrated on using laser scanner data and digital aerial photographs to produce a 3D image from sample plots. This image currently relies on a 3D tree height model, interpretation of digital images and need to apply radiometric corrections. This combination of technology has proved promising for measurement of individual trees, tree numbers and stand structure. Markus pointed out that this technology was currently expensive for whole of forest use but was feasible for operational use if applied to a sample plot system. The proposed future development of this technology was to use the 3D data in 2-phase sampling with stratification of the forest.

The final presentation was by Michael Ramsden (Department of Primary Industries & Fisheries, Queensland, Australia). This presentation broadly used the term "remote sensing" to describe a laser based system used to undertake forest health assessment, in particular for pests and diseases, as opposed to forest inventories. The system was operated from very low altitude and relied on Global Position System Laser offset

technology to accurately pinpoint forest disorders up to 500 m either side of a set transect. Positional data (waypoint) was combined with descriptive data on a palmtop, in a platform that was GIS compatible. Michael concluded that this laser technology was currently operational, effective and cost efficient, but stressed that satellite based remote sensing systems would ultimately become the universal tool re forest health assessment.

Rapporteur: Michael Ramsden (DPI, Queensland, Australia).

Understanding and managing wood quality to improve product value

Session Organizers: Dr. Simon Potter and Dr. Geoff Downes (Ensis, Australia; email: simon.potter@ensisjv.com).

This session examined the value of wood-based forest products and the techniques for measuring that value, not based simply on wood volume but on their intrinsic quality. Modern tools and technologies can now allow rapid assessment of wood properties, often at the standing tree level, that are directly related to product value. This greater understanding of product value should allow smarter pricing decisions to be made by both the forest owner and the purchaser of the stand. In addition, the knowledge of inherent wood properties will allow the buyers of the forest to better estimate the quality of products coming from that parcel of forest, and hence assist in forward planning for the utilization of wood resources. A speculative review of the present and future applications of such tools was presented by Rob Evans (Ensis, Australia), inventor of the world-renowned SilviScan instrument suite. In his presentation, Dr. Evans proposed that a new science of "xyloinformatics" should be established to develop models for understanding wood synthesis, structure and utility and to ensure that the increasing ease of data collection does not occur in the absence of fundamental understanding.

A practical example of the increasing ease of collecting data on wood formation was presented by Oliver Duenisch (University of Hamburg, Germany). The use of high resolution, 3-D laserscans of shoots, when combined with anatomical studies, can allow the dating of the wood formation process at a cellular level in unprecedented detail. Sven-Olaf Lundqvist (STFI, Sweden) continued this theme, outlining how his institute is producing software toolboxes that allow incorporation of fundamental wood properties to model "virtual fibres, wood and forests". These simulation tools will allow the development of optimal mill-specific solutions for resource utilization, modeling how the addition of pulpwood to a furnish would improve its optical properties, or how the addition of sawmill chips would improve its strength.

A real-world setting for these concepts and technologies was presented by Gabriel Rezende (Aracruz, Brazil). Currently supplying 31% of the world's eucalypt market pulp production, Aracruz manages over 400,000 ha. of forest and practices clonal propagation on a commercial scale. Dr. Rezende described how Aracruz's approach to tree improvement has evolved over the last few decades – in the 1980's the focus was on volume gain, but this was achieved at the expense of considerable variability in wood quality. From the 1990's onwards, the emphasis has changed to breeding for productivity, mill costs and product quality simultaneously. Breeding objectives have been directly aligned with business strategies. To monitor their progress, non-destructive wood quality evaluation tools are absolutely required and they are currently looking at acoustic techniques for standing tree assessments. Given the relatively high heritability of most wood quality traits, their future breeding objectives are to improve wood density, the number of fibres per gramme of paper and pentosans content (which together explain up to 80% of selected paper properties) with a view to producing fibres capable of both high bulk and tensile strength parameters. This forms one of the central planks of their "Fibre Platform Concept", combining tree improvement, forest management and product development to ensure the future success of Aracruz in the global marketplace.

Rapporteur: Simon Potter (Ensis, Australia).

Demonstrating sustainable forest management

National forest inventories to support sustainable forestry: research for linking practices to emerging challenges

Session organisers: Piermaria Corona (University of Tuscia, Italy; email: piermaria.corona@unitus.it) and Marco Marchetti (University of Molise, Italy; email: marchetti@mclink.it).

Effective sustainable management of forest resources requires a large amount of supporting information: what cannot be measured in an objective and unbiased way usually cannot be effectively managed. Traditionally, forest information has been collected through user-driven national forest inventories (NFIs). Although the NFIs have different histories in different countries, the usefulness of NFIs has been widely demonstrated; a contributing factor to this has been that the forest research community has been active in continuously developing and studying new methods and tools. However, the implementation of NFIs varies quite significantly between countries, especially since, during recent decades, the role of the NFIs has broadened and new variables for the assessments have been introduced. These new needs emerge both from the national level and from the international level – e.g., from agreements such as the Framework Convention on Climate Change and its Kyoto Protocol and the Convention on Biological Diversity. Reliable, harmonized information

is required and new technologies are emerging for the assessment. The need to review the state-of-the-art of NFIs and discuss recent advances is well recognized, also from the perspective of the Forest Resource Assessments carried out by FAO.

The objectives of the session were to provide participants with hands-on workshop exchanges and research experiences to foster continuous improvement of NFI practices and to generate openness to new requirements and research advancements to meet societal policy needs. The session was divided into two sub-sessions (014 and 169): the first concerned state-of-the-art reviews and two general case studies; the second was mainly devoted to specific issues related to national forest inventories.

During the first session, the need for new types of information from NFIs was demonstrated in many of the presentations. There are new important areas of concern, e.g., biodiversity monitoring, carbon pools, and issues related to land-use and tree occurrences also outside traditional forest areas. The new demands require new techniques, both to capture new types of data in the field (e.g., interviews), and for utilizing techniques such as remote sensing to improve the cost-efficiency of surveys or provide information with higher spatial resolution. It was stressed that in these developments there is a need to consider not only sampling efficiency aspects but also non-sampling errors that often tend to be more significant in the case of monitoring different non-wood goods and services.

During the second session different specific issues related to national forest inventories were presented, including a description of the new Italian NFI and outlines for plans for increased forest health monitoring in Australia and monitoring of carbon pool changes in Taiwan. These presentations again illustrated the new needs for data required from forests today compared to the situation only a couple of decades ago. The session was concluded by the presentation of a decision support tool for Irish forestry and the needs for data with higher spatial resolution than what is commonly obtained from NFIs as input to the system.

In conclusion, the presentations in the two sessions showed the continuous importance of NFIs to provide reliable data for forest policy decisions; and that information needs continue to expand, not only regarding topics to consider but also in regard to the spatial resolution of data. Many research challenges remain in order to design NFI systems that fully meet the new user requirements.

Selected papers from this session will be published in full in the European Journal of Forest Research.

Rapporteur: Goran Stahl (Swedish University of Agricultural Sciences, Sweden).

International research to monitor sustainable forest spatial patterns

Session Organizers: Christine Estreguil (European Commission DG-JRC; email: christine.estreguil@jrc.it) and Kurt Riitters (US Forest Service, USA; email: kriitters@fs.fed.us).

While protocols to assess spatial patterns from remote sensing have been developed by international conventions, there is an urgent need for research to improve their implementation and interpretation in large-area assessments. The purpose of this session was to review recent national and international assessments with a view to identifying common research needs and harmonizing future assessments.

Four papers relating forest spatial patterns to biodiversity assessments were presented. Two of the four papers described European experiences and two were related to the international Montréal Process. Peter Vogt (European Commission, DG-JRC) described an implementation of the MCPFE indicators from remote sensing and proposed a new model to classify forest spatial patterns. Grzegorz Mikusišski (Swedish University of Agricultural Sciences) reported results from two projects aimed at mapping landscape-level habitat suitability and testing spatial linkages with information at the species level.

Thomas Paul (Ensis New Zealand) summarized an implementation of the Montréal Process fragmentation indicator and highlighted research issues related to data quality and metrics as applied to time series of forest maps from remote sensing. Kurt Riitters (US Forest Service) reviewed results from an implementation of the Montréal Process fragmentation indicator and suggested the need for a better conceptual model of pattern-process in order to identify alternate metrics for future assessments.

Papers from this session will be published as a General Technical Report by the US Forest Service in 2006.

Rapporteur: Kurt Riitters (US Forest Service)

The certification of fast-grown plantation forests – issues, costs and benefits

Session Organizer: C.J. Goulding (Ensis Forests, New Zealand Forest Research Institute Limited; email: Chris.goulding@ensisjv.com).

Certification of forest products is a requirement for entry to many markets, the USA and Europe in particular. There are several certification standards world-wide. Particularly for the Forest Stewardship Council (FSC), certification of fast-

growing plantation forests is the subject of some debate. Short-rotation, extensive monocultures with clear-felling regimes are regarded less favourably than are uneven-aged, mixed species, 'natural' forests. To meet the standards, plantation forest managers must incur additional costs over and above those for purely economic management.

In Chile, the certification of environmental standards and practices for the sustainable management of industrial plantations has increased rapidly in the last five years. Gonzalo Paredes (University Austral of Chile, Chile; gparedes@uach.cl) described the current status in Chile and the factors and motivation behind the drive for certification. Certification compliance impacts on competitiveness of industrial plantations, while other issues include the role government forestry agencies and problems faced by small forest owners

Frederick Cubbage, Robert Abt (North Carolina State University, USA; fred_cubbage@ncsu.edu and bob_abt@ncsu.edu) and Jacek Siry (University of Georgia, USA; jsiry@forestry.uga.edu) described the situation in the 15 million ha of intensively managed pine plantations of the US South. They provided information on the current status of certification and analyzed objectives and performance measures of major certification programs. Costs and benefits (including environmental and social benefits) were evaluated. Forest certification was a means to ensure that plantation management demonstrated its economic, ecological and social acceptability, assisting landowners to practice responsible forestry.

In the past decade, sustainability of forests has been assessed through criteria and indicators for Sustainable Forest Management (SFM). Generally, evaluation has been conducted at national levels while in parallel, forest certification has been conducted at smaller, local scales such as management units. Jean-Michel Carnus (INRA, France; carnus@pierroton.inra.fr), Margarida Tome (ISA, Portugal; magatome@isa.utl.pt), and Christophe Orazio. (European Institute for Cultivated Forests, France; Christophe.orazio@iefc.net) suggested that SFM indicators will need to be evaluated at those local scales. Their paper proposed an integrated approach combining use of reference pilot zones; elaboration and evaluation of indicators; comparative testing of common protocols, and dissemination of information to stakeholders and the public.

Angus Carnegie, Christine Stone (NSW DPI, Australia; angusc@sf.nsw.gov.au and christines@sf.nsw.gov.au), and Simon Lawson (Department of Primary Industries and Fisheries, Queensland, Australia; simon.lawson@dpi.qld.gov.au) discussed cost-effective management of insect pests in relation to forest certification. The major pests of eucalypt plantations in sub-tropical New South Wales and Queensland are multivoltine and active for much of the year, due to the warm climate and short winters. Chemical control of an important native pest, Creiis lituratus, has proven difficult. The only insecticide currently registered for this pest is deemed 'unacceptable' for FSC certification and some being tested are 'marginally' acceptable. Suggestions included the targeted use of slow-release systemic insecticides and insect-based pheromones.

The papers will be published in full in a forthcoming issue of New Zealand Journal of Forestry Science.

Economics of sustainable forest management

Session organizers: Shashi Kant (Faculty of Forestry, University of Toronto, Canada) and Sen Wang (Natural Resources Canada).

The economic features of sustainable forest management (SFM) are quite different to that of sustained yield timber management, and therefore it will require different economic principles, theories, and model. The authors of four papers presented in the session discussed some of the issues related to economics of SFM: two authors focused on theoretical aspects while other two considered applied aspects.

Sen Wang (Natural Resources Canada) argued that SFM is characterized by a plurality of management objectives and approaches, and discussed the merits and limitations of different analytical approaches that attempt to address the issue of pluralism in the economics of SFM, mainly: (i) economic trade-offs, (ii) the search for compatibility among multiple values, and (iii) the notion of panarchy that accommodates extended rotations. Colin Price (University of Wales, UK) described the agreement of stakeholders as an essential pillar of SFM and invisibility of some stakeholders who are affected because present markets transmit signals of scarcity into their sphere of action. Local participatory decision – making tends to under-represent such market effects resulting into the new economic (pecuniary) externalities. Traditional cost–benefit analysis does not consider these pecuniary externalities, and therefore, SFM in one place may, by transferring timber demand elsewhere, decrease sustainability of forests at other places.

Stirn, L.Z. (University of Ljubljana, Slovenia) presented a discrete dynamic programming model to deal with multiple objectives, based on people's preferences for economic, social and ecological attributes, of SFM. The model is defined in terms of stages, states, decisions and multiple objectives; a multi-attribute utility approach is used to evaluate the forest management decisions; these decisions are presented to the public to determine their degree of acceptance of feasible forest management options, and weights for different options are decided based on peoples and managers response. J. R. R. Alavalapati (University of Florida, USA) discussed the issue of biodiversity conservation practices compatible with forest practices (BCCFP), and presented a study on environmental economic analysis of BCCFP on non-industrial private forests (NIPF) under Florida's comprehensive wildlife conservation plan. The author reported that not all policy

incentives stimulate the interest of NIPF landowners towards the adoption of BCCFP.

In addition to the presented papers, the session also included seven posters: (i) Soeren Schopfer, Andreas Huth, Reinhold Glauner. Financial analysis of a tropical forestry enterprise. A case study from Deramakot Reserve, Malaysia; (ii) Gilson Martins, Roberto Rochadell.: Interest and forest growth; (iii) Ulfah J Siregar, Asminah Rachmi, M. Yusram Massijaya, Nobuo Ishibashi. Economic analysis of sengon (Paraserianthes falcataria) community forest plantation, a fast growing species in East Java, Indonesia; (iv) Karel Pulkrab. Economic effectiveness of sustainable forest management; (v) Ichiro Fujikake. Forest owners' species choice for plantation in Japan; (vi) A. Maarit I. Kallio, Alexander Moiseyev, Birger Solberg. Economic impacts of increased forest biodiversity conservation in Europe; (vii) P.P. Bhojvaid and V. P. Singh. Medicinal Plants Based Agroforestry Models for Economic Development and Sustainable use of Biodiversity; and (viii) Kioyshi Yukutake,, Icihro Fujikake, and Kazuto Fukushima. Feasibility study of forestry management using demand/ supply model of timber in Japan.

Sustainable harvest planning and scheduling

Session Organizer: Róbert Marušák (Technical University in Zvolen, Slovakia; email: marusak@vsld.tuzvo.sk).

Significant developments in the areas of simulation and optimization techniques plus methods of sustainable harvest control have been achieved in the past decade. This session presented recent advances and a review of the state-of-the-art approaches, techniques and methods related to the harvest scheduling, forest regulation, forest planning.

John Nelson (University of British Columbia, Canada) described his experiences with managing interdisciplinary research teams tasked with developing decision support systems for sustainable forest management. The objective of the next interesting paper, Atsushi Yoshimoto (Tohoku University, Japan) was to evaluate carbon sequestration and thinning regimes within the optimization framework for forest stand management. He presented a dynamic programming model constructed to search for an optimal thinning regime and rotation age in the Kyushu region. This model incorporated the MSPATH (Multi-Stage Projection Alternative Technique) algorithm into a growth simulator derived from a stand density management diagram.

Róbert Marušák (Technical University in Zvolen, Slovakia) presented an application of linear programming in harvest scheduling in the shelterwood silvicultural system. He used two kinds of constraints (securing natural regeneration and fulfilling a specific regeneration period) to solve optimization problem. Fong – Long Feng (National Chung-Hsing University, China-Taipei) described a habitat suitable index technique as important tool for ecosystem management for evaluating wildlife habitat. He presented a model, which can be used to simulate forest-thinning scenarios, and the impacts of various forest management strategies on an avian community.

Damage analysis from timber harvesting in tropical forest under a sustainable management forest system in Western Amazon was described in a poster by Paulo de Souza (Federal University of Viçosa, Brasil). In another poster, Ann Merete Furuberg (Hedmark University College, Norway) described advantages and disadvantages with KONTUS – a developed principle of sustainable forest management. A poster by Anne-Katrin Visser (Virginia Polytechnic Institute and State University, USA) described virtual manufacturing has been used extensively for the planning and controlling of the production processes in industries

Presented papers from this session will be published in full in the Journal of Forest Science.

Rapporteur: Róbert Marušák, (Technical University in Zvolen, Slovakia).

Do we need new management paradigms to achieve sustainability in tropical forests?

Session Organizer: Robert Nasi (Center for International Forestry Research, Indonesia).

Tropical forests represent about 51% of the world's forest and the most biodiversity-rich terrestrial ecosystem on Earth. Yet they are undergoing unprecedented pressure as population and demand for new agricultural land, forest products and ecosystem services increase. At the same time, one cannot help but notice that forest management methods or prescriptions have only marginally evolved from the beginning of the industrialization in the 1960s. Powerful tools such as GIS and remote-sensing imagery are available and used, reduced impact logging guidelines are proposed almost everywhere in the tropical realm but the basic tenets of forest management have not really changed and are still largely based on European models 'exported' to the tropics in the 50s. These old management paradigms are now contested by various groups and for several reasons:

Existing management plans are based on unrealistic technical prescriptions that hinder their adoption or implementation by a large part of the operators in the tropics. The very idea of natural forest management as a way to achieve sustainability is strongly criticized by several actors proposing new alternatives such as conservation concessions, direct payment for environmental services, etc. At the same time the concepts of integrated natural resource management, ecosystem approach, and ecosystem management are gaining in strength.

The session was a contribution towards new management paradigms for tropical forests based on the experience of active research organizations in the field. We tried to bring elements to answer critiques of existing paradigms as well as propositions for new approaches and research directions. The various presentations challenged or revisited some aspects of "traditional" forest management. Gourlet-Fleury and Karsenty showed that applied scientific knowledge is insufficient to find enforceable sustainability criteria in tropical forest management; Hammond and Zagt explained how important it is to locally tailor management of tropical forest ecosystems while Hartshorn showed that neotropical forests can be sustainably managed and Meijaard et al. demonstrated that wildlife conservation is not necessarily incompatible with timber concessions in Borneo. Karsenty and Wunder argued about the pros and cons of new mechanisms and market-based instruments (like payment for environmental services) and their potential to replace traditional management tools for sustainability. Then Frost and Campbell proposed us some possible solutions and options offered by Integrated Natural Resource Management approaches.

So, the answer seems yes, we need new paradigms and new approaches for tropical forest management but these should not and will not replace existing ones that still have to be implemented in a large scale in tropical forests. New ones will fill specific niches and contexts or create new opportunities for old approaches but they need to be thoroughly tested in the real world.

Selected papers from this session, as well as additional contributions on the same issue will be published in full in a special feature of Ecology and Society.

Rapporteur: Robert Nasi

Evaluating new modes of governance for sustainable forestry

Session Organizers: Margaret A. Shannon (SUNY Buffalo Law School, USA; email: mshannon@buffalo.edu); Karl Hogl (BOKU Vienna, Austria; email: karl.hogl@boku.ac.at) and Heiner Schanz (IFP, Freiburg University, Germany; email: heiner.schanz@ifp.uni-freiburg.de).

The session began with two theoretical papers framing the questions of how policy evaluation is an integral part of the dynamics of governance institutions in the context of sustainable forestry. Margaret Shannon placed key concepts like governance, action, institution building, and dynamic learning, into a larger understanding of policy processes. Most importantly, governance institutions need be designed so that evaluation is the key to policy and organizational learning. Marielle van der Zouwen discussed research done at Wageningen University that contrasted a model of policy evaluation that simply asked how well means achieved desired ends (positivistic) versus one (constructivist) that recognized that goals are recognized through interaction. She discussed a model of policy evaluation that brought together the multiple perspectives inherent in social interaction and showed how this framework leads to a reflexive approach to policy evaluation.

Karl Hogl presented some first results from the EU - GoFOR project. GoFOR is using the key process elements of governance – public participation, inter-sectoral coordination, multi-level coordination, adaptive and iterative policy making, accountable expertise – to frame the research of specific cases across 10 European countries. The question of 'how are evaluation and monitoring conceptualized' is being analyzed by looking at the programmatic statements as well as the actual practices of the policy processes and policy actors in these cases. As actors are understood within contextual factors affecting them and actual outcomes are evaluated from both theory and programmatic statements, this project should provide some useful insights that will contribute to both theory and practical understanding for policy makers.

Gerard Buttoud followed by emphasizing the importance of integrating scientific discussion with policy makers through communication. He contrasted, as others did as well, the 'rationalist' and 'constructivist' models of policy and emphasized the role of dialogue between policy makers and scientists as essential to policy evaluation. Doris Capistrano continued the theme that governance and evaluation are messy processes. She gave a detailed paper chronicling the history of global forest governance and showing why multi-stakeholder approaches evolved out of necessity in addressing complex problems. However, she warned that a weak state can be further weakened by participatory processes when they are used to thwart effective, decisive government action.

Finally, Carol Grossman provided clear data from a recent research project contrasting how Boliva and Indonesia responded to the similar external pressures and undertook similar internal reforms but each responded very differently. In essence, local governance is more flexible and responsive than centrally driven policy processes when elections are the primary mode for changing policy. Her detailed data demonstrated her conclusions very clearly.

Our session was fortunate to have two excellent posters that explored cases of new governance, one in Southeast Asia and the other in British Columbia.

Attempts to measure sustainable forest management

Session Organizer: Dr. Meeta Biswal (Hirakud Wildlife Division, India; email: meeta_biswal@rediffmail.com).

The paper on 'Ecological villages towards a participative forest development, Valle Rey case study, Mérida state, Venezuela' by F.L. Sulbarán Guillén (Venezuela; Fanky_ sulbaran@yahoo.com) discussed the environmental effects of introducing the broad leaved trees adapted to the tropical montane rainforests to lowland ecosystems and the problems generating out of this.The Valle Rey area is located in the Río Mucujún basin, specifically on the right bank of the river. This zone is inhabited by families that use the land for productive agricultural and commercial activities such as crop farming, small-scale livestock farming, fish farming, tourism, and small food processing- and other industries. On account of this, the region has become a popular destination for local visitors as well as tourists. Conifer plantations have been established for conservation purposes (arboretum of the Reforestation National Company) in the area. As well, broadleaved trees that are adapted to a tropical-montane rainforest ecology have been introduced, initiating, unfortunately, a series of environmental problems that require immediate solution. Through the initiative of the local population, and technical and economic specialists, the village is attempting to assume an ecological focus, where Participative Forest Development (PFD) has a fundamental role. The PFD promotes rural family organization and participation in the process by means of an extension program. Also, different initiatives have led to the strengthening of integrated rural development, by recovering the Andean identities of local villages, and the ancestral knowledge that has been lost due to the transculturation process.

A paper on 'Quantification of species diversity: A criterion for sustainable forest management (a case study)' by Dr. Meeta Biswal, Divisional Forest Officer, Hirakud Wildlife Division assessed biodiversity indices and suggested that they can be used to measure changes in the biodiversity of an area over space and time. Thus biodiversity indices can be used as indicators for assessing the level of sustainable forest management in an area.

Ilaria Goio (IVALSA- CNR, Italy; ilaria.goio@ivalsa.cnr.it; ilaria.goio@libero.it) presented a paper on the 'Influence of FSC certification on the behaviour of stakeholders: The case study of the Magnifica Comunitá di Fiemme (Trento, Italy)'. In this paper, the author found that while the supply of timber was still important for the communities living on the mountain areas of the Southern Alpine multiple use forest, from a strictly economic point of view, other functions expressed by the forest were far more interesting. This was a consequence of not only the changes in the socio-economic scenario, but also because of the growing influence of human activity on ecosystems and an increased understanding of the role played by the forests itself. The role played by forest certification on relationships between the owners (prevalently public) of the forests and the stakeholders was analyzed by the authors in the Magnifica Comunità di Fiemme, a mountain intercommunity located in Fiemme Valley in the province of Trento (Italy), created more than 1000 years ago. The case study reported changes in behaviour and attitudes of local stakeholders after eight years of implementation of FSC certification and its influence on the forest management adopted.

The paper on 'Environmental benefits of mangrove forests: Perceptions of local people from the Bhitarkanika Conservation Area, India' by Ruchi Badola (Wildlife Institute of India, India; ruchi@wii.gov.in) examined the attitudes of local people towards mangrove forests and their perceptions regarding the services provided by these forests. The study involved 35 selected villages in the Bhitarkanika Conservation Area, along the eastern coast of India. The villagers felt that protection from storms and land erosion prevention were the primary functions of this ecosystem, followed by nutrient retention and export and fish production. The farmers in villages situated near mangrove forests felt that mangrove forests help in augmenting production of agricultural crops by enriching the surrounding soils, and this was reflected in the higher price of agricultural land in the vicinity of forests. Around 70% of the local people believed that biodiversity values, ground water recharge, and regional climate control were secondary functions. Provision of fuel wood and fodder, non-wood forest products, fish and shellfish were also considered important. Crop degradation and saline water intrusion were the main problems perceived by the residents. Better irrigation facilities (82.6%), restoration of mangroves (77%), maintenance (36.6%) and increase in the height of saline embankments (66.0%) would help in improving output of the local ecosystem. Most people (92%) were in favour of an integrated conservation and development program.

Selected papers from this session will be published in full in the Journal of Forestry Research sponsored by The Ecological Society of China and North East Forestry University.

Rapporteur: Dr. Meeta Biswal (Hirakud Wildlife Division, India; email: meeta_biswal@rediffmail.com).

Research demonstration: Evaluating sustainable forest management

Session Organizer: Gordon Hickey (Parks and Forests Division, Department of Sustainability and Environment, Victoria, Australia).

This Session explored a range of perspectives related to evaluating sustainable forest management in different jurisdictions.

The Session keynote speaker, Don Wijewardana, stated that criteria and indicators (C&I) provide important information that can reveal trends through time. This can then provide information to policy makers on what the potential issues are, and what may be required to improve performance. C&I can tell us what is wrong, what is right, what the gaps are, and how these might be interpreted in terms of decision-making. Claire Howell described the role that the Montreal C&I have had in a national context for monitoring and reporting on SFM in Australia. As in many jurisdictions, progress has been slow at the sub-national level, but things are beginning to progress. Improved sub-national reporting mechanisms will, ultimately, flow through to Australia's capacity to report. Gordon Hickey identified that despite relatively common SFM definitions and issues, there is currently an overload of different C&I standards that forest mangers need to navigate, particularly at the sub-national level. It is, therefore, important for the rationale behind the indicators to be clear to ensure that they are linked to what policy-makers need to know. Issues of scale also need to be addressed, most often through field-testing. Another important component is the existence of comprehensive data inventories. This will allow managers to determine what they already have and what it can be used for.

In this regard, John Turner described a range of issues related to future research on C&I. He noted that, in Australia, funding for forest-related research has been declining in real terms. Private companies require incentives to encourage research spending on individual indicators rather than relying solely on case studies. Ultimately, forest managers need indicators that tell them something about their forest management practices.

A number of outstanding issues were identified in this Session. These included: 1) slow and uneven progress on C&I, both nationally and internationally; 2) the fact that 65 countries don't yet belong to any C&I process; 3) lack of political commitment in many jurisdictions; 4) problems associated with agency co-ordination and implementation; 5) shortage of technical and resource capacity; and 6) inadequacy of data.

For further details, please refer to *The International Forestry Review* 7(5): 216-217.

Rapporteurs: Gordon M. Hickey and Kendra Dean

Sustaining forests: A duty for forestry and society?

Session Organizer: Max Krott (Georg-August University of Göttingen, Germany; email: mkrott@gwdg.de).

Climate change, illegal logging and invasive species are just a few issues which show the huge challenges that society as well as the state and science face in guaranteeing sustainable forests. The seminar discussed the options of science, society and state to contribute to solve the problems following an interdisciplinary approach.

Victor Teplyakov showed by the example of Russia whether and how forest management in partnership with civil society is possible in transition countries. The need for inputs from society is very high to support environmental and social tasks of forests. Nevertheless, the process of participation takes time and the mutual learning of representatives of the state and of the civil society has not yet developed much. Although the democratic traditions in Russia are not strongly developed, the forest sector is trying to incorporate public opinion into decision making.

The natural science dimension was brought into the discussion by Michael Wingfield and Robert Haack. By the example of biological invasions threatening world forest it became clear that the threats are much stronger than the slow and inefficient response of global markets and policy. The scientific evidence of the biological dangers by invasive species is strong, whereas the technical and political means to stop or control the invasive species are by no means sufficient. Science knows more than society and politics are able to take seriously.

The limits of the state were analyzed by Max Krott. The traditional national forest government approach gets into trouble with new threats for forests and with the international dimension of the problems. The new governance approach is able to find cross sectoral solutions and to coordinate joint international efforts. The challenge of governance instruments like certification, national forest programs or international conventions is to agree on a meaningful program and to organize resources for implementations. As long as implementations relay mainly on state sources, governance is not much more than an additional PR strategy of the state.

Richard Guldin asked the question whether science has a role in formulating public policy to sustain forests. He showed the rather disturbed connection between science and policy making. They are two worlds which do not merge much. But much can be done to increase the input of science into policy in the future. An improved science-policy interface is possible but needs a significant change in how science and policy look at each other.

The coordinator of the session Eva Hellström was able to link the diverse arguments of natural science, social science and practice, not in giving a final answer but to focus on factors which can be clarified by each partner in the future.

Rapporteur: Max Krott

Conditions for the transition to sustainable forestry

Session Organizers: David Bengston (US Forest Service, USA; email: dbengston@fs.fed.us), Youn Yeo-Chang (email: youn@snu.ac.kr) and Matti Palo (email: matti.palo@metla.fi).

Deforestation in the tropics has been a long-standing global ecological-economic issue. The transition from deforestation to sustainable forestry is a major global political goal. However, there have been few successes in moving toward sustainable forestry. This session examined conditions for the transition from deforestation to sustainable forestry.

In an opening paper, M. Palo described how deforestation occurs based on institutional economics and ecological economics theories. According to him, the practice of forestry is socialistic under state ownership of forests and stumpage is usually is under-priced, leading to a high opportunity cost for stakeholders to pursue sustainable forestry. Palo also introduced the methods of case studies and comparative analyses of cases as applied in a joint research project of multi-country comparative case study. Three related papers followed.

Youn Y-C presented a case study of successful transition toward sustainable forestry in Korea, in which he described the history of forestry evolution in Korea and the factors favoring the transition to sustainability. Factors include political factors such as government stability, economic factors like sustained economic growth, social factors such as social value geared to community commonwealth, and ecological factors such as inaccessible topography

Palo presented a case study (co-authored with E. Lehto) of successful transition to sustainable forestry in Finland. They described historical changes in forestry legislation including land tenure systems, forestry administration, and education. In particular, land reform, enclosure, border demarcation, and law enforcement created strong and clear property rights by 1900. This, along with growing foreign demand for forest products, supported increases in real stumpage prices and labor earnings from forestry. The opportunity cost of sustained yield forestry subsequently came down with help from productivity growth in agriculture. Stable government, increasing democratization, and non-corrupt conditions favored this transition. Finland was successful in developing forest clusters in the 20th century. Globalization of the Finnish forest industry and active international environmental NGOs have played a vital role in the recent transition to sustainable forest management (SFM).

Lee J. presented the fourth paper (co-authored with Youn Y-C) investigating the underlying factors for successful transition for sustainable forestry in six countries: Costa Rica, Finland, Japan, Germany, and Korea. They employed a Boolean algebra approach to identify necessary conditions for successful transition toward sustainable forestry based on the conditions of the six countries. They concluded that economic growth, stable government and effective policy are necessary conditions, and in order to facilitate the transition toward sustainable forestry governments should support the development of human resources, promote forest clusters, and establish competitive markets of forest goods and services through their policy.

Finally S. Dasgupta presented an assessment (co-authored with J.K. Rawat and R. Kumar) of the status of forest resources in India based on criteria and indicators of SFM. They employed criteria and indicators weighted by interactive consultations by a number of Indian experts in forestry. The approach was innovative. According to this assessment, forest resources in India are in a favorable condition from the perspective of sustainability.

Selected papers from this session will be published as a series of books in 2006, with consent of authors.

Rapporteur: Youn Yeo-Chang (Seoul National University, Korea).

The changing roles of stakeholders in sustainable forest management

Session Organiser: Dr. Meeta Biswal (Hirakud Wildlife Division, India; email: meeta_biswal@rediffmail.com).

Whether it was traditional forest management, where commercial forestry was given importance or whether it is sustainable forest management, where conservation and preservation have been a focus, a variety of stakeholders have existed and played a pivotal role in the way forests came to be managed across the world. The stakeholders include forest managers and policy makers in the government, indigenous communities, non- governmental organizations and researchers. With increasing awareness of the positive outcomes of sustainable forest management, stakeholders are now required to play a more responsive role, thereby managing forest resources on a sustainable basis. This envisages a clear demarcation of roles and responsibilities between the stakeholders, while working cooperatively. This paper ('Sustaining forests: Changes in roles of various stakeholders in sustainable forest management') by Dr. Meeta Biswal Hirakud Wildlife Division, India; (email: meeta_biswal@rediffmail.com) discussed the changes that

are required in the roles of various stakeholders in order to achieve sustainable forest management.

'Determining demand priorities of various stakeholders regarding forest goods and services in the context of sustainable forestry: A case study from Turkey' by A. Öztürk, (Kafkas University, Turkey; atak08@hotmail.com), and M.F. Türker (Karadeniz Technical University, Turkey; mft@ktu.edu.tr) included the social dimension in forest policies and management strategies. Forests supply many goods and services for individuals and groups. This imposes forest management decisions that should not to be made by foresters alone. The interaction between forestry and society is important and is an integral part of sustainable forest management. In Turkey, State Forest Enterprises are the main forest management units and these institutions manage forests according to timber-oriented goals prepared by foresters. These plans are highly technical and omit the social dimension and direct participation of relevant stakeholders.

The paper 'Engendering forestry: An empirical study on mainstreaming gender in forest conservation and sustainable livelihood' by Monica Singh (Oxfam, India; monikaxing@yahoo.com) focused on the outcome of 'gendering' management of forests and forestlands, wherein the processes become important for sustainable livelihood and conservation.. Gender mainstreaming in forest conservation, albeit researched and obligated into programs with mandatory women's participation, has remained an area requiring considerable progress. On the other hand, subsistence livelihoods through forests are mostly perceived to be related to women. This stereotyping of gender in forest management and livelihoods has been detrimental to women's involvement in the decision-making processes for forest conservation.

'How effective is community-based forest management as a model for managing former timber concessions: the case of the Lianga Bay Forest, Surigao Del Sur, Philippines' by Lucrecio L. Rebugio (University of the Philippines Los Banos, The Philippines; lucreb@laguna.net) looked at the applicability of community-based forest management (CBFM) as a model for managing large tracts of forests formerly covered by Timber License Agreements (TLA). The author suggested that long term security of tenure provides the motivation to CBFM participants and stakeholders to continue investing their time, energy, and resources in sustainable forest management. Moreover, the author reiterated that its effectiveness in managing, sustainably extensive areas of forests, depends on several organizational imperatives that ensure participatory decision-making and equitable benefit distribution within the federation.

A poster 'Examination of types and levels of public participation in forest resource management and planning in view of sustainability: Turkey' by Atakan Öztürk (Kafkas University, Turkey; atak08@hotmail.com) dealt with public participation in forest resource management and planning. Firstly, it explored the participation on a conceptual basis. Then, it examined the types of public participation, possible stakeholder groups, levels of involvement, and problems associated with the participatory process in resource management and planning in Turkish forestry.

A poster by Shaw Lin-Lo (National Chung Hsing University, Chinese Taipei; sllo@dragon.nchu.edu.tw) on 'Participation and empowerment mechanism of community forestry – An example from Taiwan' examined the process of constructing a mechanism of participation and empowerment for community forestry in Taiwan. As a result of over-utilization of the forests for timber, the Taiwan Forestry Bureau established a stewardship program with community residents for conservation and improvement of the economy of forestry-dependent regions. Through community empowerment, local people can receive more opportunity to improve their lives and keep the partnership with the government. By implementing the concept and enabling the community to make decisions regarding forestry issues that affect the people, the policy of empowerment was considered to be successful by the author.

In a poster on 'Paradigm shift of tumpangsari system towards local involvement in Madiun, East Java, Indonesia', the author, Yasuhiro Yokota (Japan International Research Center for Agricultural Sciences, Japan; yokotaya@affrc.go.jp), presented an initiative taken by Gadjah Mada University (UGM) to organize farmer groups for forest resource management (MPSDH: Masyarakat Pengelola Sumber Daya Hutan), to facilitate agreement among Forestry Enterprise, local government and local people. The process of selecting groups supported by Gadjah Mada University was democratic and effectively organized with the involvement of local people. Each group was encouraged to plant food crops or trees in the agricultural strip, to intercrop between planted trees and in the open spaces left after thinning the forest, and to share benefits from timber production. This organized local participation in teak forest management is a significant attempt to develop a new paradigm of participatory forest management in Indonesia.

Another interesting poster on 'Virtues of exclusive forest user rights for income generation in south-eastern Ethiopia' by J. Schmitt (Freiburg University, Germany; Bergulme@web.de) challenged the claim that sustainable forest management, combined with properly administered social assets, can bring people out of poverty, while maintaining the forest. In the Adaba-Dodola Forest Priority Area, in southeastern Ethiopia, the regional government granted exclusive forest-user rights to selected forest dweller associations. Five years after project establishment, the participants' household economy and the income potential of forest utilization were investigated in a socio-economic study. The results revealed that forest dwellers did not rely solely on forest production, but combine it with subsistence agriculture and livestock production. Furthermore, wealth inequity among forest dwellers created highly varying strategies of forest utilization. A gross margin analysis, however, proved that local forest products are highly competitive compared to available labor. Additionally, forest utilization had an essential income function during hardships.

To increase the potential of sustainable forest management, local knowledge can be augmented with silvicultural management techniques and improved timber processing capacities.

A poster on the 'Role of local communities and some elements of sustainable forest management in Korea' by Joong Myung Kim (Korea Forest Research Institute, Korea; KFRI, jmkim99@foa.go.kr) surveyed the various values assigned to forests and the opinions of people in generating new forms of partnership for forest management which is one of the critical factors in implementing sustainable forest management, particularly in developing a set of criteria and indicators based on forest values perceived in the local community.

I. Gutiérrez-Montes (Iowa State University, USA; igutie@iastate.edu) presented a poster on 'Evolution of a participatory research project towards a community natural resource management process in the Chimalapas (Oaxaca, Mexico)'. In this paper, the author analyzed resiliency and response of community capitals in two communities with different levels of organization and negotiation capacities to the integrative assessment of forest fire risk affected by community capitals. The results suggest that the occurrence of severe fires caused an imbalance among the community capitals, driven by changes in social-environmental relations. Increased pressures from external interests (i.e., protected area establishment, researchers) threatened control by local communities over their natural resources. This process provided a critical basis for empowering local communities to negotiate management of their natural resources and fire prevention and control programs.

A poster on 'Environmental management proposal to recover the Albarregas Metropolitan Park in the new millennium, Libertador and Campo Elías municipalities, Mérida State, Venezuela' by F.L.Sulbarán Guillén (Venezuela; Fanky_sulbaran@yahoo.com) dealt with the need for managerial and administrative measures in Albarregas Metropolitan Park in Mérida State, Venezuela, by means of an environmental management project for Libertador and Campo Elías municipalities. Conservation improvement of this natural heritage site would enrich the landscape in urban areas. In this research, participation in the process by all of the social actors (public and private institutions, universities, and community inhabitants) was considered to be important, since all of them are responsible for environmental conservation.

An interesting poster on 'The effectiveness of community-based forest management towards forest land security and community welfare: case study of Perum Perhutani area, Indonesia' by Lies Bahunta, (Perum Perhutani, Indonesia; lbahunta@hotmail.com; tek14@indo.net.id) examined the reasons for heavy losses suffered by Perhutani, a State owned Forestry Enterprise and suggested a CBFM Model which is effective in enhancing land security, people awareness, and community welfare by developing a participative action plan. This plan helped in developing an increased sense of tenure and the plantation program performed as well as desired by the corporate entity.

Selected papers from this session will be published in full in the Journal of Forestry Research sponsored by The Ecological Society of China and North East Forestry University.

Rapporteur : Dr. Meeta Biswal (Hirakud Wildlife Division, India; email: meeta_biswal@rediffmail.com).

Boreal zone forests in the balance – regional and global factors in boreal forest management

Session Organizers: Susan G. Conard (USDA Forest Service, Arlington, Virginia, USA; email: sconard@fs.fed.us), Sune Linder (Swedish University of Agricultural Sciences, Alnarp, Sweden), Pierre Bernier (Canadian Forest Service, Natural Resources Canada, Quebec), Olga Krankina (Oregon State University, Corvallis, Oregon, USA).

Victor Teplyakov (IUCN-The World Conservation Union, Moscow, Russia) set the global context for the importance of the boreal forest. Critical challenges in managing boreal forests include illegal logging, issues of forest tenure and law, impacts of climate change, supporting the livelihood and cultural history of local peoples, and overcoming the low level of international recognition of the global importance of these forests.

The perspectives, needs, and knowledge of aboriginal peoples in boreal zone countries are often not adequately considered in forest planning and management. Marc Stevenson (University of Alberta, Edmonton, Alberta, Canada) proposed an approach to sustainable forest management that integrates multiple economic, ecological and social values and effectively engages aboriginal peoples in forest planning and decision-making.

Susan Conard stressed that while extensive disturbances from wildfire, insect and disease, and harvesting affect tens of millions of hectares every year, their extent and severity vary greatly in time and space, in response to weather, climate, and human impacts. Disturbance in boreal forests can facilitate ecosystem transitions in changing environments and can have major impacts on forest health and dynamics.

Climate change may provide one of the greatest challenges to managing boreal forests, as the most rapid changes in temperature are predicted, and indeed are already occurring, in northern regions. Michael Flannigan (Canadian Forest Service, Ontario, Canada) described the profound effects that predicted climate changes are expected to have on boreal forests. These include direct impacts on forest composition,

as well as increased frequency and severity of natural disturbances.

Human impacts on the global carbon cycle are the main drivers of global climate change. Mike Apps (Canadian Forest Service, British Columbia, Canada) described these effects, including changes to vegetation distribution, ecosystem productivity and carbon stocks, and the release of carbon through fossil fuel combustion. Due to the extent of boreal forests, their complex disturbance regimes, and the expected rapid climate change in this zone, changes in these forests and their management can significantly alter the global carbon cycle and the earth's climate system.

The way wood products are managed also plays a key role in sustainable use of forests and mitigation of increasing atmospheric carbon. Timo Karjalainen (Finnish Forest Research Institute, Joensuu, Finland) described sustainable use of forests in Finland, Norway and Sweden. Increased use of wood for bioenergy production and for construction of apartment housing and public buildings is part of a strategy for decreasing reliance on fossil fuels and substituting wood for energy intensive building products such as steel and cement.

A major management challenge in the boreal zone is balancing mitigation with adaptation, while continuing to supply essential products and services from the forests. How do managers minimize negative disturbance impacts while fostering changes that will maintain forest health and viability and encourage net carbon storage as ecosystems are responding and adapting to rapid and unprecedented environmental change?

Poster presentations covered topics from the effects of harvesting and silvicultural treatments on water, insects, and birds; to impacts of fertilization; nitrogen cycling; and effects of environmental and climatic change. John Yarie (University of Alaska, Fairbanks, Alaska, USA) won the best poster award for Division 3 with a presentation on "Decomposition of coarse woody debris in the boreal forest of interior Alaska".

Emerging issues for sustainable forest management

Session Organizer: Robert Deal (USDA Forest Service, Pacific Northwest Research Station, USA; email: rdeal@fs.fed.us).

Sustainable forest management is a logical consequence of global environmental awareness and the long term concerns that foresters have with sustaining wood resources. Sustainable forestry needs to include global, national, regional and local aspects. This session included seven oral presentations and ten posters from researchers in Europe, North America, Central America, Australia and Asia on a suite of emerging issues related to sustainable forest management.

The session included two state of the art presentations and perspectives from North America and Europe. Chadwick Oliver (Yale University, USA) gave a particularly interesting paper on sustainable forestry at different scales ranging from local to international. Peter Freer-Smith (UK Research) discussed the sustainability of European forests using examples from a variety of recent research projects.

The session also included five short presentations from speakers representing Costa Rica, India, Finland and the USA. Glenn Galloway (CATIE, Costa Rica) gave an interesting paper on barriers to sustainable forestry in Central America using examples from Guatemala, Honduras and Nicaragua. Arvind Singh (Indira Gandhi National Forest Academy, India) discussed some of the criteria and indicators for sustainable forest management in India. Jari Hynynen (METLA, Finland) discussed a new model for multipurpose forest management and its applicability for forests in Finland. Ralph Alig (USDA Forest Service) summarized research on changes in land use and land values affecting sustainable forest management in the USA and other countries. Finally, David Damery (University of Massachusetts, USA) discussed opportunities and challenges for family forestry owners and forest cooperatives in Massachusetts, USA.

Posters associated with the sessions covered a wide set of topics and ranged from sustainable forest management in the tropics (R. A. Guzmán Gutiérrez, Centro Amazónico de Desarrollo Forestal, Bolivia) to European field research networks (Anders Marell, GIP EDOFOR, France) to the sustainable forest model in Europe (Paschalis-Jakubowicz, Warsaw Agricultural University, Poland). A particularly well presented poster was given by Alan Griffiths (Ministry of Agriculture and Forestry, New Zealand) that discussed different sustainable forest management projects in Nothofagus forests of New Zealand.

In summary, the sessions were very interesting and covered a wide range of topics on issues important for sustainable forest management throughout the world. Fourteen selected papers from this session and an associated session on integrating wood production within sustainable forest management will be published in a special issue in the *Journal of Sustainable Forestry* in 2006.

Rapporteur: Robert Deal, USDA Forest Service, Pacific Northwest Research Station

Changes in forest ecosystems and their implications on human health

Session co-Organizers: Edmond Dounias and Carol J.P. Colfer (emails: e.dounias@cgiar.org, c.colfer@cgiar.org)

The goal of this session was to investigate the relationship between the components of forest anthroposystems to assess the problems that simultaneously compromise the health of people and the sustainability of their ecosystem. The session was a unique occasion to identify challenges and to discuss potential solutions that combine ecosystem management and health sector interventions, in order to improve human health and well-being while maintaining a healthy ecosystem.

To achieve such an ambitious goal, presentations were limited to nine minutes and speakers were strongly encouraged to go straight to the point and focus on the few key messages to encourage debate. The fact that the speakers had shared the texts of their presentations beforehand enhanced the quality of the discussions.

The two first papers by Misa Kishi and Mark Wilson exposed evidence that declining biodiversity, especially in tropical forest ecosystems, affects human health. Wilson estimates that 50% of new and emerging diseases have some link to forest habitat, citing diseases such as Ebola hemorrhagic fever, lyme disease and cryptosporidiosis. Wilson and Kishi emphasized that critical analysis is needed to better assess emerging risks and opportunities to predict and prevent rising rates of environmentally related illness.

The next four presentations - firstly by Alain Froment and Edmond Dounias, secondly by Lisa Gollin and Patricia Shanley (supplemented by a poster by Tony Cunningham) - provided a historical perspective and data on the risks that forest-dependent people face in their changing environments. The four speakers also explored concrete pathways for bridging public health and forest conservation.

The last paper by Timothy Johns adopted a regional perspective, exploring new ways of increasing synergies between biodiversity conservation and human nutrition in developing countries.

In a synthesis, Tony Cunningham recapitulated the key issues of the presentations and cross-continental overview of potential solutions. He also exposed new research opportunities that may better integrate the elaboration of indicators, the identification of causal factors, and the implementation of concrete actions.

This synthesis gave way to a final open discussion of key recommendations on the type of research to implement in the future. In that perspective, Carol Colfer introduced her poster on new research approaches to be conducted using an 'adaptive collaborative management' approach developed at CIFOR.

Contacts are in progress with Unasylva (FAO) and Environmental Health Perspectives to publish the proceedings of the session as special issues. The latter journal would address the academic audience, while the former would target the policy makers.

Rapporteur: Edmond Dounias (CIFOR, Indonesia).

Natural and anthropogenic disturbances – rehabilitation of forests

Session Organizers: Reinhard Hüttl and Werner Gerwin (Brandenburg University of Technology at Cottbus, Germany; email: huettl@tu-cottbus.de, werner.gerwin@tu-cottbus.de).

Session chair: Wolfgang Schaaf (Brandenburg University of Technology Cottbus, Germany; email: schaaf@tu-cottbus.de).

Both natural and anthropogenic disturbances influence landscapes and their forests. Human-made disturbances have been particularly responsible for a considerable reduction of the world's forest cover within the last centuries. In order to restore the ecological benefits provided by the former forests it is important to understand successional processes that occur in natural forest ecosystems following natural disturbances. This session addressed this issue using presentations involving several different types of disturbances including fires which are important natural disturbances in forest systems. The session sought to explore how this knowledge can be used to develop sustainable reclamation techniques for ecosystems disturbed by anthropogenic influences, such as mining activities.

Dale W. Johnson (University of Nevada, USA) reviewed the effects of wildfire on soil chemistry and nutrient budgets in forest ecosystems and illustrated them with recent studies from Sierra Nevada Mountains, USA. Wildfire is an important natural disturbance with major effects on the long-term nutrient budgets of ecosystems. Yannis Raftoyannis and Ioannis Spanos (TEI Lamias/Forest Research Institute, Greece) presented an overview of studies designed to evaluate the effectiveness of post-fire rehabilitation treatments on ecosystem recovery.

The problem of restoring the original biodiversity to sites disturbed by mining was discussed by David Lamb (University of Queensland, Australia). He presented different rehabilitation measures which have been carried out at contrasting mines in tropical and sub-tropical localities. In addition Clive L. Bell (Australian Centre for Minerals Extension and Research (ACMER), Australia) gave an

overview on some innovative approaches used to re-establish native ecosystems after mining in Australia.

Wolfgang Schaaf (Brandenburg University of Technology at Cottbus, Germany) presented results from the Lusatian lignite mining district (Germany) where intensive field measurements, small-scale monolith sampling and soil column experiments have been carried out. The effects and the degree of soil heterogeneity was studied on different scales. Effects on water and element transport as well as element transformation and soil development had been investigated.

The oral presentations of the session were complemented by 12 posters. Nominated for best poster of the session was ´Simulation of forest development after open-cut mining using an agent-based model´ by Xiangfeng Su and J.A. Duggin (University of New England, Australia).

Selected papers from this session will be published in full in a special issue of Ecological Engineering.

Rapporteur: Wolfgang Schaaf (Brandenburg University of Technology at Cottbus, Germany).

Towards sustainable forestry – the living soil: soil biodiversity and ecosystem function

Session Organizer: Sue Grayston (Faculty of Forestry, University of British Columbia, Vancouver, Canada; email: sue.grayston@ubc.ca).

Soil organisms play a vital role in nutrient cycling, tree productivity and maintenance of forest ecosystem function. However, we know woefully little about these organisms, their identity or function. This is largely attributable to the methodological challenges of studying soil organisms, most of which are microscopic and cannot be cultured to allow investigation. There have been huge advances made in the last decade in the development of new techniques, molecular and biochemical, to allow identification and study of these organisms. As a result there is now an explosion of new knowledge in this field, which was highlighted in the talks and posters from this session.

Matthieu Chauvat (University of Giessen, Germany) presented a paper reviewing the diversity of soil fauna and their importance in soil functioning. Dan Durall (University of British Columbia – Okanagan, Canada) described the diversity and functioning of ectomycorrhizal fungi in forests. John Cairney (University of Western Sydney, Australia) described some novel molecular methods to assess the effect of prescribed burning on soil fungal communities in Eucalypt forests in Australia. Cindy Prescott (University of British Columbia, Canada) discussed whether rates of litter decomposition tell us anything we really need to know about nutrient cycling in forest ecosystems. Sue Grayston (University of British Columbia, Canada) described a novel multi-disciplinary project being conducted in British Columbia to determine whether green tree retention is a suitable management option for maintaining a healthy soil after harvesting. Gregor Yeates (Landcare Research, Palmerston North, New Zealand) reviewed what is known about the diversity of soil nematodes and their importance in nutrient cycling processes in forest soils.

An excellent multi-disciplinary European study on soil biodiversity and nutrient turnover in different forest types in Central Europe was described in a poster by Sophie Zechmeister-Boltenstern (Forest Research Centre, Vienna, Austria). This poster was nominated by the session chairs (Sue Grayston and Cindy Prescott) for an award and it was given the IUFRO Division 8 best poster award for the meeting.

In another excellent poster, Miho Matsushita (Kagoshima University, Japan) compared the structure and function of soil microbial communities in Sugi plantations and semi-natural broad-leaved forests with different land use histories.

Another interesting study, presented in poster form, by Tekahiko Ochimaru (University of Tokyo, Japan) described changes in the fungal flora of evergreen broad-leaved forests as a result of urbanization.

Selected papers from this session will be published in full in a special issue of the Canadian Journal of Forest Research, anticipated publication date of fall 2006.

Rapporteur: Sue Grayston (University of British Columbia, Canada).

Social and cultural values of forests – benefit for today's society

Session Organizer: Elisabeth Johann (Co-ordinator, IUFRO 6.07.00; email: elis.johann@utanet.at).

Since the UNCED conference in Rio de Janeiro in 1992, environmental sustainability has become a global paradigm, but the criteria which now underpin nature conservation and sustainable forest management are incompatible with the conservation of cultural landscapes. This proposition was persuasively argued by Mauro Agnoletti (University of Florence, and Vice-President of the European Environmental History Society). Using case studies from Tuscany and Catalonia, it was shown that the rules of environmental sustainability can make cultural landscapes unsustainable. As forest has replaced pasture and cultivated fields in these landscapes, they have become at once more natural and less diverse culturally. Entire landscapes should be considered as cultural landscapes, and forests treated as a result of the long-term interplay of environmental, social and economic factors.

The role of history in landscape development is central to this approach.

In Australia, UNCED led to the adoption in 1995 of a National Forest Policy Statement as the basis for sustainable forest management. Sue Feary (Australian National University) explained that the NFPS recognised the interests of Aboriginal Australians in the forests in two ways: by providing jobs for them in forests, and by protecting their cultural heritage. Although the emphasis has been on the latter, oral history has shown that employment in forests has been important for Aborigines during European times. Aboriginal use of the forests in pre-European times is well demonstrated by the wealth of cultural sites which have been found within them.

Steven Anderson (President, Forest History Society, USA) explored the common roots of European and American forestry. A divergence occurred from the late nineteenth century as the European model was adapted to American conditions. Anderson contends that under the requirements of sustainable forest management a reconvergence is now occurring. This is reflected in a recent agreement between the US Forest Service and the French Ministry of Agriculture for cooperation in professional exchange and training.

The three main papers were followed by brief poster presentations on various topics. In the Philippines, changes in the ratio of forested land area to population (the 'land:man ecological ratio') has been employed in the quantification of the ecological impact of forestry projects, although the formula could be improved by incorporating cultural values (Minda Odsey, ERDS, DENR-CAR, Baguio City, Philippines). The historical reconstruction of organizational culture and its development is being used to understand the gender separation that persists in German forestry (Siegfried Lewark, University of Freiburg). Harvesting of runoff and the selection of appropriate species have permitted the successful reafforestation of arid land in Israel (Zvika Avni, KKL Forest Department, Israel). A framework of social and economic criteria and indicators has been developed to support sustainable forest management in Taiwan (You-Jei Huang, National Chung Hsing University). Andrew Heaver (University of Edinburgh, Scotland) discussed the social and cultural values of the boab tree (Adansonia gregorii) in north-western Western Australia.

Rapporteur: Brett Stubbs (President, Australian Forest History Society Inc.).

Alien pests threatening biodiversity of forest ecosystems

Session Organizers: Naoto Kamata (Kanazawa University, Japan; email: kamatan@kenroku.kanazawa-u.ac.jp) and Kurt W. Gottschalk (USDA Forest Service, USA; email: kgottschalk@fs.fed.us).

The aim of this session was to cover the state-of-the-art on invasive pest impacts to biodiversity of forest ecosystems. The session thus started with two general review presentations about forest pest invasions and biodiversity of forest ecosystems. Andrew Liebhold (USDA Forest Service, USA) summarized the influence of alien pest species in forest succession. Nod Kay (NZFRI, NZ) discussed the role of biodiversity in explaining patterns of establishment and host range expansion. Three presentations then followed, covering invasive pests of different taxa. Fumio Yamada (FFPRI, Japan) described the impacts of invasive mongoose on native animals in Amami-Island, Japan and provided a good example of an island ecosystem vulnerable to invasive species. Anna Schoettle (USDA Forest Service, USA) discussed the long term consequences of the alien disease, white pine blister, on ecosystem biodiversity and sustainability in North America. Glenn Stewart (Lincoln University, NZ) described vertebrate invasions and their effects on biodiversity of New Zealand forests. He demonstrated that native vegetation had been severely impacted by introduced mammals, but the degree to which natural processes are being impaired was highly variable.

In a particularly interesting paper, Kazuyoshi Futai and Takeshi Taniguchi (Kyoto University, Japan) showed that the introduction of pine wilt disease to Japan lead to a disturbance of mycorrhizal relationships, thereby inhibiting pine regeneration. There were three additional papers that discussed the current situation of invasions by pinewood nematode in Taiwan, Portugal and Okinawa, Japan.

Two other papers described recent work on risk assessment and management of an Asian long-horned beetle (Anoplophora glabripennis) in the USA and Canada. Several other papers reported on the current status of invasive pests on eucalypts. Additonal topics of poster papers were as follows: an invasive seed chalcid Megastigmus rafni on firs stands in Europe, the Japanese oak wilt caused by an ascomycetous fungus Raffaelea quercivora carried by an ambrosia beetle Platypus quercivorus, genetic structure of a Ips duplicatus populations from Europe and Asia, Phytophthora cinnamomi as a threat a threat to north temperate pine forest, western gall rust (Peridermium harknessii syn. Endocronartium harknessii) as a serious threat to exotic Pinus radiata forests in New Zealand, and a phytoplasma disease causing degeneration of Toona ciliata in India.

Selected papers from this session will be published in full in a forthcoming volume of the Journal of Forest Research.

Rapporteur: Naoto Kamata (Kanazawa University, Japan)

Impact of exotic invasive plant species on forest ecosystems

Session Organizer: Dr. Ravinder Kohli (Panjab University, Chandigarh, India; email: rkkohli45@yahoo.com).

Invasive plant species are altering the diversity, structure, and function of forest ecosystems world wide. In this session, researchers from the tropical and temperate regions of the world presented their findings through both overview/ synthesis papers and specific case studies. Julie Denslow (U.S. Forest Service) opened the session with an overview of invasive plants in tropical forests. Alien species generally comprise a smaller portion of tropical flora than temperate flora. However, tropical islands are notable exceptions. Several hypotheses such as high pest loads, species diversity, functional diversity and high competitive pressure that predict low invasibility of tropical mainland ecosystems were also discussed.

A specific case study involving three invasive plants and their role in altering the understory vegetation of the subtropical Shivalik Himalayas was the focus of a paper by Ravinder Kohli (Panjab University, India). The three invasives, Ageratum, Pathenium and Lantana have drastically reduced the diversity, richness and evenness of understory vegetation in these forests. In addition to the interspecific competition from Lantana and other invasive species, interference competition via allelopathy may also play a role of displacing native plants in infested areas. He explained this point using a case study in which phenolic compounds from Lantana decreased shoot and root growth of Achyranthus asper and Albizia lebbeck.

The world's worst weed of the natural systems, Imperata cylindrica, was the focus of two separate papers. Greg MacDonalds (University of Florida) described the integrated pest management strategy used in combating Imperata in the southeastern United States. He emphasized the role of revegetation which seemed to prevent reinfestations. The ecological impacts of Imperata on southeastern forest ecosystems were the focus of an overview paper by Shibu Jose (University of Florida). Research done over the past five years has shown that Imperata could reduce plantation productivity by 70-100%. It could also displace native vegetation, reduce understory species diversity, alter fire regimes, and change soil physical and chemical properties.

The role of herbicides in removing exotic grasses and restoring grasslands in the eastern United States was discussed by Tom Barnes (University of Kentucky). Specific protocols used in controlling both warm season and cool season exotic grasses from the Midwestern, Southeastern and Great Lakes region were presented in greater depth. Particular attention was given to the timing and rates of various herbicides that have been proven to be successful.

In addition to the oral presentations, several interesting posters were also presented in this session. Management tools for assessing stem tissue viability and tracing herbicide damage in invasive woody vines and shrubs was the focus of a poster by Mark Fuchs (University of Dayton). Coert Geldenhyus (University of Stellenbosch) posed the question, "Are invasive species a problem or facilitation in forest rehabilitation?" in his poster. The allelopathic effect of Lantana was investigated by using bioassays in Mohammed Husain's (Chittagong University) poster. Another interesting poster was by Ravinder Kohli who examined the impacts of Salix alba on the understory vegetation of temperate Himalayas. Keiji Sakamoto (Okayama University) addressed the invasive characteristics and stand dynamics of abandoned bamboo forests in western Japan. Constance Stubbs (University of Maine) presented interesting results on invasive plants' effects on pollinator bees and fruit set of understory native plants. Economic analysis of invasive species was the topic of Tumaneng Diete (Queensland Dept. of Natural Resources and Mines). John Volin (Florida Atlantic University) presented an example of developing optimal management strategies for the invasive vine, Lygodium microphyllum. Brian Ward presented herbicide gel as a user-friendly technology for controlling invasive species in his poster. Overall, the papers and posters represented a cross section of the current research efforts in the field of invasive plants.

R. Kohli and S. Jose are pursuing options to publish a book based on selected papers from this session.

Rapporteur: Shibu Jose (University of Florida, USA)

Forests in the Global Balance – Changing Paradigms

Session Organizer: Gerardo Mery (Coordinator of IUFRO's Special Project on World Forests, Society and Environment (IUFRO-WFSE); email: gerardo.mery@metla.fi).

The IUFRO's Special Project on World Forests, Society and Environment (IUFRO-WFSE) has developed a critical review of the on-going changes in the global paradigms in the interface between forests, society and the environment. The session presented the research results of an extensive global network of more than 150 researchers, who have developed critical and innovative analyses of the globally on-going changes in paradigms related to forests and their repercussions on the society and the environment.

The session started with seven short oral presentations on themes studied by the researchers of the project and finalised with an open discussion. The presentations were:

- Brief introduction to IUFRO-WFSE project by Gerardo Mery, Coordinator of IUFRO-WFSE, from the Finnish Forest Research Institute (METLA)
- A review of the key issues in the changing global paradigms operating on the interface between forests, society and the environment, by Dr. Markku Kanninen, from the Center for International Forest Research (CIFOR).
- An analysis of paradigm changes in the governance of forest resources, introduced by Gerardo Mery on behalf of the authors of this paper.
- Paradigm changes in livelihoods and poverty alleviation of rural inhabitants, mainly those who live in forested areas, by Heidi Vanhanen, from METLA.
- Paradigm changes in environmental services provided by forest ecosystems, by Dr. José J. Campos, from the Tropical Agricultural Research and Higher Education Center (CATIE).
- Paradigm changes in planted forests and plantations and their diversifying functions, by Dr. Martti Varmola, from METLA.
- What are the implications of these on-going changes for policy decisions – both in forests, social, economic and environmental policies by Dr. Rene Alfaro, from the Canadian Forest Service (CFS).

The oral presentations were followed by a vivid open discussion, chaired by Dr. Markku Kanninen. Many interested questions and observations were presented and discussed by the numerous participants in the session.

The original papers introduced in the session have been published in the book Forests in the Global Balance – Changing Paradigms, 2005, Mery, G., Alfaro, R., Kanninen, M., and Lobovikov, M. (eds.). IUFRO World Series Volume 17, Helsinki, 318 p. The book was launched in this session.

Rapporteur: Heidi Vanhanen, the Finnish Forest Research Institute (METLA); email: heidi.vanhanen@metla.fi).

Forest landscapes for locals and tourists

Session Organizer: Tuija Sievänen (Finnish Forest Research Institute, METLA, Finland; email: tuija.sievanen@metla.fi).

The session, which covered presentations of three continents, dealt with several important questions in recreation and ecotourism. Presentations from Japan and Denmark showed the necessity of national inventories over a long-term period to rise the political presence and to adapt to new or changing demands.

The paper of T. Ito (University of Tsukuba. Japan) gave an interesting overview of how a change in demographics might influence the recreational patterns in the future – such as the demand for more diverse trail planning and management. In addition to a brief overview of the history of national outdoor recreation surveys in Denmark, Frank S. Jensen (Danish Centre for Forest, Landscape and Planning, Denmark), presented a European research network (COST action E33 'Forest Recreation and Tourism'). Preliminary data obtained in the network shows a group of countries with a strong tradition in the field of outdoor recreation research, while for another group of countries is just in its beginning in this field.

Dutch scientists demonstrated promising methods in collecting and analysing data – for example the use of GIS and GPS. One use is to predict visitor behaviour. This methodology can reduce the data-collection effort at the sites. Sjerp de Vries (Alterra, Green World Research, The Netherlands) gave an overview of the development of a national model, aiming at predicting the number of recreational visits to natural areas based on readily available data, like size and attractiveness of available destinations, as well as the distance from the visitor's home. Peter A.M. Visschedijk (Alterra, Green World Research, The Netherlands) presented a joint research project between the UK, France and The Netherlands, focusing on the relation between recreational use and the conservation of habitats. Data collection involved GPS tracking and the use of models, simulating recreational use and wildlife population dynamics. The models can help optimising the balance between recreation and ecology, and assist in management decisions, as well as communication with stakeholders.

Presentations from Austria, Sweden and Brazil highlighted the challenge to protect characteristic landscapes. In the case of Austria, Ulrike Pröbstl (BOKU - University of Natural Resources and Applied Life Sciences, Austria), focused on the recent dynamics of forested areas across Europe and its effects on the suitability for tourism. This included the recreational demand on the landscape in terms of structure, composition, diversity, and how these relate to the changing motives for visiting forests. Peter Fredman (European Tourism Research Institute, Sweden) showed the importance of pre- and after-surveys in relation to the establishment of a new national park in Sweden (Fulufjället).The purpose of the study was to monitor short-term changes in tourism as a consequence of the national park designation in 2002. Results from the study show a significant change in visitor numbers, characteristics, use patterns and economic impact, e.g. increased the number of visitors by almost 40%. Finally, Teresa C. Magro (Universidade de São Paulo, Brasil) showed an interesting approach of collaboration between researchers and daily managers regarding the development of recreational impact indicators. An important lesson was that some indicators, which were useful for scientists, don't work for local managers.

Rapporteurs: Frank S. Jensen (Danish Centre for Forest, Landscape and Planning, Denmark) and Ulrike Pröbstl (BOKU – University of Natural Resources and Applied Life Sciences, Austria).

Forest policy research – new methodological and empirical developments in the last decade and priorities for the future

Session Organizer: Birger Solberg (Norwegian University of Life Sciences, Department of Ecology and Natural Resource Management, Norway; email: birger.solberg@umb.no).

A lot of forest policy research has been done during the last decade. The purpose of this session was to try to get an overview of the most important developments the last decade with emphasize on methodological aspects and empirical results. Margaret Shannon (SUNY at Buffalo Law School, USA), K. Norman Johnson (Oregon State Univerity, USA) and Benjamin Cashore (Yale University) described the development in North America, emphasizing the long-term developments in relation to national demand for public services and public participation.

Jacek P. Siry (University of Georgia, USA), David Newman (University of Georgia, USA) and Fredrick Cubbage (North Carolina State University, USA) presented a global overview of the forest ownership structure and how that could influence forest production, management and protection.

Birger Solberg (Norwegian University of Life Sciences, Norway) and Ilpo Tikkanen (European Forest Institute, Finland) discussed new developments in forest policy research in Europe, and concluded that although much new work had been done, it was still in most cases a long way to go before the research results could be of particular use in practical policy decision making.

Reidar Persson (Swedish University of Agricultural Sciences, Sweden) and Elisabeth Corell (Swedish Institute of International Affairs, Sweden) discussed options for the future international forest policy, with special emphasize on the challenges associated with the UN Forum on Forests (UNFF). David Kaimowitz (CIFOR, Indonesia) discussed forest policy research in developing countries, and emphasized, among other things, the need to get improved funding for researchers in developing countries.

It is anticipated that selected papers from this session will be published in the Journal of Forest Policy and Economics.

Rapporteur: Birger Solberg

Setting conservation targets in managed forest landscapes: theory and practice

Session Organizers: Marc-André Villard (Université de Moncton, Canada. email: mvillarm@umoncton.ca) and Pierre Drapeau (Université du Québec à Montréal, Canada. email: drapeau.pierre@uqam.ca).

This technical session went very well. Except for David Lindenmayer, all speakers were there and had plenty of high-quality material to present. Andrew Bennett (Deakin University, Australia) presented extensive analyses on the response of birds and mammals to the proportion of native forest in 10 x 10 km agro-forested landscapes of southeastern Australia. He distinguished several types of responses (flat, linear, curvilinear, step-threshold) and discussed implications. Claude Gascon (from Conservation International) emphasized the establishment of networks of reserves prior to extensive habitat alteration and (to some degree) land conversion in many tropical areas of the world. He used amphibians as a focal taxon to conduct a gap analysis. Jean-Michel Roberge presented his work on the use of resident birds as potential umbrella species for which conservation targets can be set for the maintenance of forest biodiversity in the Baltic forest region. Pierre Drapeau presented analyses of forest birds response to extensive clearcutting in the boreal forest of eastern Canada and derived habitat configuration thresholds from empirical analyses of forest species responses to distance from source habitat. Marc-André Villard emphasized novel statistical approaches to the detection of thresholds in forest birds that are sensitive to habitat alterations induced by harvesting at both stand and landscape scales in the hemiboreal region of eastern Canada.

A panel discussion was organized to replace Dr Lindenmayer's presentation. Three questions were provided to the audience for discussion. They were:

1. Can we integrate biodiversity conservation into forest management without setting targets?
2. How should we consider such targets? -Rules of thumb? -Mean values with a specified «acceptable» deviation? -Ecoregion-specific objectives to be used as part of an adaptive management strategy?
3. What are the respective roles of researchers and managers in the development of meaningful conservation targets?

The audience participated actively in this discussion with the speakers and showed great interest in the work presented. Judging by the quality of interventions, we felt a great demand for this type of 'pragmatic' approach to conservation in the context of forestry On Question 1, it was mentioned that species diversity and functional diversity conservation goals cannot be set solely through protected areas but within managed areas. Given that human development cannot be stopped, we

must tackle the issue of biodiversity maintenance with a 'Can we do better?' attitude. Scientific knowledge should help us in this regard. On question 2, setting quantitative conservation targets was considered to be essential for assessing through monitoring how well we are doing in terms of biodiversity maintenance in managed systems. Hence, we need more than rules of thumb and science-based knowledge on organisms' response to habitat alteration should provide useful science-based knowledge. Quantitative targets could thus be useful to provide a sounder basis for conservation and management. However, the question of seeking generalizations with the threshold issue was raised by the audience given that many talks emphasized various thresholds for various taxonomic groups. It was also mentioned that we should be cautious with these thresholds. They should not be used as minimal conservation targets but rather as insights about ecological limits and precautions needed to prevent breakdowns in managed systems. Hence, once these habitat thresholds are reached it may be too late for many species that became threatened at lower levels of habitat alteration. On Question 3, it was felt that the role of researchers is to provide the best possible science to managers and decision-makers, who will in turn apply their findings to address conservation issues.

A joint submission of our papers as a book-length publication is presently under discussion with Cambridge University Press. These papers will represent the backbone of the proposed book. Additional contributors will be invited to broaden the scope, both in terms of target setting approaches and taxa/forest ecosystem types.

Rapporteurs: Pierre Drapeau (Université du Québec à Montréal) and Marc-André Villard (Université de Moncton).

Sustainable management of high value timber species of the Meliaceae: a global perspective

Session Organizer: Sheila Ward (Mahogany for the Future, Inc., USA; email: seward@caribe.net).

Members of the family Meliaceae include tropical trees that are some of the finest cabinet woods in the world. The sustainable management of high value species in this family faces similar issues in the eastern and western hemispheres. The purpose of this session was to draw together a global perspective on such topics as the shoot borer Hypsipyla spp., natural forest management, and conservation and use of genetic resources.

Aspects of management for Swietenia macrophylla were addressed by Laura Snook (CIFOR) and Frank Wadsworth (USDA FS IITF). Snook reviewed strategies for improving regeneration and survival of enrichment plantings in Yucatan forests. Establishment and survival of mahogany regeneration was favored on clearings of 5000 m2 produced by machinery or burning, which impeded resprouting by trees of other species, but seedlings did not survive under the forest canopy. Wadsworth's findings indicated that the heartwood proportion of a trunk increases with age, which suggests using a longer rotation before harvest for maximizing profitability.

Genetic resources in the New World Meliaceae were presented by Andrew Lowe (University of Queensland, Australia), Carlos Navarro (CATIE, Costa Rica), and Amanda de la Torre (Universidad Nacional Agraria, Peru). Lowe reported on recent surveys of neutral genetic variation in Swietenia macrophylla and Cedrela odorata, which showed significant structuring of variation at both local and regional spatial scales that could be negatively impacted by extraction and habitat fragmentation. Navarro covered the results from progeny trials for these species in Costa Rica and in Mexico, which have yielded encouraging heritabilities for height growth, and relatively low genetic components for shoot borer attack. Torres investigated patterns of variation in AFLP markers in Peruvian populations of Cedrela odorata in different habitats and with different logging histories.

Results from Old World species were presented by Manon Griffiths (Department of Primary Industries and Fisheries, Australia), Atul (CSK Himachal Pradesh Agricultural University, India), and Bernard Mallet for Chevalier et al (Cirad-Forêt, France). Griffiths reviewed problems with the shoot borer Hypsipyla robusta in Southeast Asia and Australia and trials of Toona and Chuckrasia spp., where genetic differences were found among seed sources in damage from attack, and improved performance in mixed species plantings. Atun assessed genetic variation among Himalayan populations of Toona ciliata. Chevalier et al investigated the impact of logging on genetic variation and mating systems in Entandophragma cylindricum using microsatellite markers, which indicated a decrease in pollination distance after logging.

During the discussion, we agreed to that it was invaluable to compare notes across geographic regions, and that we need to meet again in the near future for more interchange of ideas. Selected papers from this session will be published in Forest Ecology and Management.

Rapporteur: Sheila Ward

Environmental concerns of forest product utilization

Session Organizer: K. Mahabala Bhat (Kerala Forest Research Institute, India; email:kmbhat@kfri.org).

There is a growing global concern that utilization of forest resources should be within the permissible limits of the ecological health of the forest. The session deliberated on the feasibility of implementation of codes of practices by timber producers and industrial processors and whether promoting trade is in line with the norms of sustainable forest management. Dennis P. Dykstra (Pacific Northwest Research Station, USDA Forest Service, USA) presented data to argue that in tropical forests excessive logging residues cause environmental hazards such as forest fires; a short term goal of increasing the recovery rate to around 60% can be achieved by adopting improved harvesting practices such as those promoted through the FAO Model Code of Forest Harvesting Practice. Patrick B. Durst et al. (FAO, Thailand), while presenting the challenges in developing countries, concluded that implementation of codes of forestry practices, stepwise approaches to certification, and group certification for small holders will offer some promising opportunities for increased demand of certified products in Asia.

Kathryn Harrison (University of British Columbia, Canada), in an unique presentation attempted to fill the gap between the abundant theorizing that has taken place concerning the "race to the bottom" and the scant empirical evidence, through examination of environmental regulation of the pulp and paper industry and argued that it is the international dissemination of research via transnational networks of environmentalists and bureaucrats that has exerted upward pressure and that it is the environmental groups that generated consumer demand for "chlorine-free" paper, which in turn created market pressure for improved environmental performance around the world. Shuirong Wu (Chinese Academy of Forestry, P.R. China) examined the issue of economic compensation for environmental benefits arising from forest watershed resources using the Faustmann-Hartman forest resource model and felt that the effect of transaction costs on the benefits of stakeholders is considered acceptable within the range of 10–50% of the environmental benefits of forest resources.

The posters presented convincing data on the scope for : utilization of barks of industrial tree plantation species (Jennifer P. Tamayo, Maxima E. Flavier, Philippines), recycling solid residues from the paper pulp-mill by quantitative assessment of plant-nutrient recovery and heavy-metal contamination (by Caroline Rothpfeffer, Erik Karltun), recovery of wood as environmental strategy (by Arno Frühwald. Germany),

Negotiations are underway to publish the selected papers of this session in UNASYLVA after meeting the journal's norms of publication.

Building synergies between institutions and conventions dealing with non-wood forest products

Session Organizer: Jim Chamberlain (USDA - Forest, USA).

Co-chairs: Paul Vantomme and Madhav Karki

There are many challenges involved in using non-timber forest products (NTFPs) for development. In this session, speakers focused on selected constraints and opportunities for using NTFPs for biodiversity conservation and improvement of rural livelihoods. Paul Vantomme (International Tropical Timber Organisation, Japan) gave an overview of general challenges, including lack of standardized terminology and the wide range of products and actors involved. He emphasized that NTFP-based development is relevant to a large number of sectors, not just forestry, and that the general challenges made it difficult to provide strong institutional support to NTFP-based development. He invited all participants to the Research Group 5.11 business meeting to discuss the way ahead for NTFP-based development, including the establishment of an IUFRO Task Force on NTFPs and a Global Alliance to advance NTFPs.

Madhav Karki (International Centre for Integrated Mountain Development, Nepal) focused on the medicinal plant sub-group in South Asia. He emphasised the need for integrated and innovative approaches to increase economic returns to harvesters; particular attention was paid to the possibilities of developing vertically integrated business platforms building on community-based enterprises. R.B.S. Rawat (Watershed Management Directorate, Uttaranchal, India) focused on medicinal plants in India. He provided an overview of recent institutional support by the Government of India to develop the medicinal plants sub-sector. Particular attention was paid to the economic potential of cultivation. He ended with showing a short film on medicinal plant cultivation, trade and utilisation in India. P.P. Bhojvaid (India Habitat Centre) focused on problems related to NTFP-based development in India. The need to develop NTFP specific inventories and management techniques was emphasised.

Ian Hunter (International Network for Bamboo and Rattan) highlighted experiences from bamboo and rattan based development interventions. He emphasised the importance of focusing work on a sub-set of issues and products: INBAR worked mainly with skill transfer and capacity building for small-scale farmers and enterprises, and, within bamboos, focused entirely on cultivated species. He stressed the importance of supporting activities focusing on products with an established market (demand-pull) rather than attempting to develop new products without a proven demand (supply-push).

Rapporteur: Carsten Smith Olsen

Ozone exposures and effects on forest vegetation: A global overview

Session organizer: M. Schaub (WSL, Switzerland).

Tropospheric ozone has been suggested as one of the main air pollutants threatening forest health in heavily polluted parts of Europe, the United States of America, Asia, and Latin America. Current levels of O3 have been shown to cause damage to forest vegetation while climate models predict a global increase of O3 concentrations. In the session, scientists from Asia, Latin America, the USA and Europe provided the state-of-the-art knowledge on the global threat by O3 to forest health and stressed the importance to initiate an improvement in the use of international synergies.

An historical overview of the research carried out in North America (including Mexico) in relation to ozone effects in Forest Ecosystems was presented by D. Karnosky, A. Bytnerowicz and M. de Bauer. Presentations pointed out the importance of considering the interactions of air pollution as such with climate change and atmospheric nitrogen deposition.

The inclusion by the UNECE CLRTAP Convention of possible different risk assessment methods for tropospheric ozone lead to the development of models to estimate ozone deposition to forest canopies/stands by employing the flux-based approach, as well as to the exploration of other approaches (i.e. Maximum Permissible Ozone Concentration). L. Emerson pointed out that the estimation of fluxes for risk assessment requires accurate modelling of the deposition on forested areas to ensure appropriate mass balance calculations of ozone in chemical transformation models. Furthermore, recently efforts have been undertaken to simplify these rather complex canopy/stand model schemes to enable their regional/global scale incorporation within photo-oxidant models. In this respect, several presentations form European scientists pointed out that most of the actual research in Europe is currently focussing on the establishment of a new critical level for ozone.

Several presentations within the poster session highlighted that in several regions of the world, monitoring programs are taking place at different levels of intensity with ozone being one of the most relevant pollutants (for example efforts on Long Term Ecosystem sites in North America, ICP-Forest in Europe, as well as networks in Asia). In such programs, passive sampling techniques and the use of passive bio-indicators in combination with other measurements (i.e. growth, N-deposition, etc.) are considered to be necessary and valuable tools which may be further developed based on the information collected within the respective networks (i.e. visible ozone symptom surveys for forest and natural vegetation).

New simplified protocols and further research investigating plant responses to ozone under realistic field conditions (i.e. stomatal conductance and the use of fluorescence) are necessary in the near future. Also, other pollutants such as H2O2 (e.g.,. in Japan) were presented as being potentially responsible for an impact on forest health in synergy with ozone.

However, so far no comprehensive holistic approach has been suggested to deal with other issues in combination such as climate change or N-deposition and other factors which contribute to the present and future health status of forest ecosystems. Therefore, it was acknowledged that multidisciplinary and integrated approaches are needed in which ozone plays an important role, although it is not the only player. Furthermore, the importance of large-scale monitoring networks was stressed – they are needed to collect relevant information within existing frameworks for integrated multidisciplinary studies.

Reporter: M.J. Sanz, Fundación CEAM, Spain

Remote sensing in forestry - modern technology supporting sustainable forest management

Session Chair: David Evans (USA).

Modern technology in the form of remote sensing systems can support sustainable forest management in a number of ways. For example, this session included presentations that used mostly high resolution (aerial) and medium spatial resolution sensors (Landsat) to extract spectral data as input into predictive models for applications in forest inventory and for detecting forest change and monitoring forest composition and stand structure components.

Medium-resolution satellite imagery is well-suited for detecting and monitoring forest and land cover changes. Deforestation and land use changes are recognized as a national problem in many tropical countries, yet the link between government policies and other factors that induce these changes are not well understood. In the lead off presentation, M.N. Suratman (Universiti Teknologi MARA, Mayaysia) employed Landsat Thematic Mapper (TM) imagery and land cover/use change detection methods to examine the linkages in change of rubber plantation area to socio-economic and policy related driving forces in Malaysia.

In another paper addressing change detection, S.A. Sader (University of Maine, USA) reported that simple vegetation indices derived from Landsat TM can detect even light forest disturbances but omission and commission errors in detecting changes in coniferous and broadleaf stands increase with longer image acquisition gaps (1-5 years). The lesser known normalized difference moisture index performed at least as well as the tasseled cap wetness index. Also coarse resolution

MODIS satellite images (250 m) can detect larger disturbed forest patches (>50 ha) with good accuracy (90%) but smaller patches had increasingly higher errors.

Forest inventory is one of the earliest research topics of remote sensing using aerial photography in forestry dating back to the 1930s. In a paper continuing a long line of practical research in remote sensing and forest inventory, C.L. Brack (Australian National University, Australia) examined methods to improve the precision of forest volume estimates using satellite or aerial imagery and empirical modeling approaches in Tasmania, SE Queensland, Australia. He reported unbiased estimates of volume in ad hoc selection of stands and improvements in precision of total volume estimates of one-half the length of confidence limits were achieved.

In an interesting paper integrating ground inventory data with satellite remote sensing, O. Hagner (Swedish University of Agricultural Science, Sweden) developed a spectral index using Landsat imagery and a neural network method for quantifying stem density of coniferous and broadleaf species in Sweden's boreal forest. The index was based on 20,000 forest inventory plots linked to spectral data in six reflective bands and supplemented with stand age and site quality data. The spectral index is being tested as a method to select candidate stands for pre-commercial thinning.

In another paper on a forest inventory topic and employing a modeling approach, P. Surovy used data from high resolution aerial imagery as input into a tree growth model for Cork Oak in southern Portugal. Vegetation indices computed from the imagery helped distinguish between open and dense forests with minimal cost and labor involved. The 'tree top detection' and the 'temporal matching' techniques were presented and compared for their efficiency as input in models to estimate and predict cork production.

Rapporteur: Steve Sader (University of Maine, USA)

Silviculture and management of rare, threatened and endangered tree species

Session Organizer: Margaret Devall (USDA Forest Service, USA; email: mdevall@fs.fed.us).

The survival and persistence of rare, threatened and endangered tree species around the world is in doubt. There is a lack of information on silviculture and management of these species, and conservation of their genetic resources is necessary and important. This session brought together scientists from various parts of the world who are interested in this subject and who have information to share. There were seven interesting presentations in the session: five papers and two posters.

A paper on silviculture of rare, threatened and endangered tree and shrub species in the U.S. was presented by Margaret Devall. Future predicted climate change could have severe effects on growth, reproduction and survival of these species. Although much silvicultural information is available for common tree species, information for many rare species is extremely scarce or lacking.

Trees and shrubs at risk in Canada were discussed by Judy Loo (Natural Resources, Canada) et al. Although Canada has low biodiversity compared to some other parts of the world, 200 trees and shrubs in Canada are in need of gene conservation. Initiatives have been undertaken for several of the species, and recovery plans are mandated for endangered species. Threats are likely to increase in the future, so proactive work should be initiated now.

Douglas Jacobs (Purdue University, USA) et al. presented progress in a breeding program to produce a blight resistant form of American chestnut (Castanea dentata). Nearly every American chestnut tree was killed by an introduced blight, and now a hybid (~94% American chestnut) with resistant Chinese chestnut (Castanea mollissima) should be available for reintroduction within the next decade.

A study of maturation and chemical composition of pondberry (Lindera melissifolia) seeds by Kristina Connor (USDA Forest Service, USA) et al. was presented by Ted Leininger (USDA Forest Service, USA). Pondberry is an endangered shrub that grows in the southeastern United States, and these are the first data about the early physiology and biochemistry of the fruits as they mature.

Jan Svejgaard Jensen (Forest and Landscape, Denmark) discussed saving rare forest tree species in Denmark. Danish landscape has been under constant human influence. The most severe threats are fragmentation and inbreeding, and abundant introduction of exotic provenances and species. A wide array of instruments has been applied to conserve and promote rare species, including an 'in situ' gene conservation strategy, breeding seedling orchards, promotion of domestic species, and a few rare species in 'ex situ' programs.

The tree ring response of Pinus eldrecchii to climate and anthropogenic activity in the National Park of Pollino (Basilicata, Southern Italy) were discussed in a poster by Luigi Todaro (Università degli Studi della Basilicata) et al., presented by Paolo Cherubini (Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland). The authors concluded that at this site tree rings reflected land-use changes rather than climate changes.

A study of Juniperus procera in the Asir Mountains of Saudi Arabia and possible causes of crown dieback were described in a poster presented by Ken Yoshikawa (Okayama University, Japan) and F.Yamamoto (Tottori University, Japan). The authors concluded that the dieback may be due to environmental stress.

Papers from the session will be submitted for a joint special issue of Biological Conservation, which will be shared with presenters from the session: Managing forest landscape mosaics for production and conservation.

Mangrove forests and the protection of coastal areas

Session Organizer: Bradley B. Walters (Mount Allison University, Canada; email: bwalters@mta.ca).

The Asian Tsunami of 2004 raised worldwide awareness of the importance of coastal mangrove forests for protection against the impacts of ocean waves. Yet, among the many values of mangroves, their role as wave and storm buffers is little understood. The purpose of this session was to convene a diverse panel of experts to explore ecological, economic and policy dimensions of mangrove management for coastal protection in an era of changing climate and accelerating coastal development.

Following a brief introduction to the session, Dr. Brad Walters of Canada considered the emerging sub-field of environmental security and explored ways in which mangrove forests can be viewed as contributing to human security. Mangroves provide diverse resources that contribute to livelihood security for thousands of coastal communities, but conflict among competing mangrove users is also common and likely growing as population pressures increase along many coastlines. Mangroves are also known by coastal residents to be important for reducing storm-related impacts, and preliminary findings from studies of post- tsunami affected areas suggest they may have reduced the damage inflicted in some areas, but not in others.

Picking up on this latter point, Dr. Ariel Lugo from the Institute for Tropical Forestry in Puerto Rico examined the state of scientific knowledge about mangroves and ocean waves and made the general observation that the topic has been little studied. In general, we know that mangroves will not thrive in environments subject regularly to high wave and current energies. In this respect, the role of mangroves as storm buffers is limited or non-existent in many sites where such a role would be most appreciated. But where found, mangrove forests can dissipate the energy and impact of waves. Human settlements and infrastructure are thus at greater risk of damage when they build into mangrove areas and eliminate shoreline forests.

Dr. Norman Duke from the University of Queensland, Australia, followed with a presentation on how climate change is likely to impact mangroves and other coastal habitats. He noted that relatively small changes in ocean temperature and rainfall can have large effects on the distribution, composition and structure of mangroves. In some cases, changes in these variables and associated habitat changes can come surprisingly quickly.

The session then shifted to papers with a more applied focus. First, Angus McEwin of Australia provided an introduction and overview of the Principles for a Code of Conduct for Sustainable Management of Mangrove Ecosystems, an initiative currently under development by the The World Bank and partners. This was followed by a presentation from Alastair Sarre of the International Tropical Timber Organization. The ITTO was shown to have supported a variety of initiatives involving mangrove management and conservation. The final 20-25 minutes of the session was devoted to a lively, interactive discussion involving members of the audience and presenters.

Both presenters and audience members displayed considerable satisfaction with the session, in terms of both the caliber of presentations and the stimulating quality of the discussion following. In fact, several explicitly stated their appreciation of the relatively longer time provided for and provocative facilitation of the post-presentation discussion. In this respect, it might be desirable for organizers of future IUFRO meetings to emphasize the value of providing adequate time and effective facilitation for generating vigorous, post-presentation discussions.

Rapporteur: Brad Walters

Forests, trees and human health and wellbeing (B). Effects on people and the environment

Session Organizer: Kjell Nilsson (Forest & Landscape Denmark; email: kjni@kvl.dk).

Nature has a positive effect on people's mental and physical health. This is the result of the first systematic study on the relationship between nature and health in Denmark. The study, a questionnaire sent to 2000 persons (filled out by 61 %) between 18 and 80 years old, was carried out by Karsten B. Hansen (Forest & Landscape Denmark). The most positive correlations were between experienced levels of stress and distance to a green area, number of visits to green areas, and having your own garden.

Giovanni Sanesi (University of Bari) presented two major studies carried out in the Italian cities of Rome and Bari. Urban forestry and environmental psychology were combined in a framework illustrating how the presence of green areas within settlements affects the inhabitants' perception of urban environmental quality, as well as the psychological health of the citizens. The two studies showed how people's expectations are for functional green areas that can provide services for a wide range of age categories and needs.

Therapeutic effects of forests are becoming a considerable concern for rehabilitation and therapy. Sounds from winds and streams are important in this connection. Yozo Yamada (Nagoya University) has studied frequencies of sound from different types of forests and tested the effect of sounds with the same frequencies on university students. Based on the results one recreational forest has been estimated from its

soundscape, and the layout of walks and facilities has been planned for the benefits of people's health and wellbeing.

In another Japanese project John Gathright (Nagoya University) has studied the therapeutic effects of tree climbing. He compared the effects of climbing a living tree in a forest to climbing a concrete tower of the same hight in the same forest. A group of 11 inexperienced tree climbers were taught rope-climbing techniques and asked to perform the same climbs on a tree and a tower. Tests were conducted before, under and after each climb. The psychological tests revealed that compared to tower climbing, tree climbing produced greater vitality and reduced tension, confusion and fatigue. Also the results of the physiological tests indicate that the body is more relaxed after tree climbing.

It is well known that trees and forests, as a result of their large leaf area and the turbulent air movements that they create, take up more pollution from the atmosphere than shorter vegetation or other land uses. They also have an ability to take up gaseous pollutants and particles. Finally, Peter Freer-Smith (Forest Research, UK) presented the progress in the development of an integrated model of how urban and peri-urban trees can improve air quality, and on which to base policy advice and recommendations for planners and local authorities.

Rapporteur: Kjell Nilsson (Forest & Landscape Denmark)

Realizing the environmental benefits of forests

Session Organizers: Niels Elers Koch (Danish Centre for Forest, Landscape and Planning, Denmark; email: nek@kvl.dk) and Klaus von Gadow (University of Goettingen, Germany; email: kgadow@gwdg.de).

The first presentation of this sub-plenary was given by L. Sennerby Forsse (Formas, Sweden) and J.-M.Carnus (INRA, France) with the focus on forests, water and biodiversity. The presentation addressed the question of how forest management strategies may influence i) quantity and quality of water ii) biodiversity conservation, and iii) living conditions for people. A major problem addressed was how to balance forest production while maintaining water and biodiversity. Another issue raised, was the relation between forest and poverty reduction, where promotion of non-wood products was highlighted. Three case studies (Denmark, China and France) were used to illustrate the different problems.

After water and biodiversity the view was raised to a global scale, as H.-F. Essmann (University of Freiburg, Germany) and P. Vantomme, (ITTO, Japan) in their presentation gave a general overview of the main features of economic globalization. Stressing, that until now, the most evident feature of the globalization process has been the intensive interweaving of the financial centres in world-wide operating markets. In this process, the links to national economies, particularly within the forestry sector, are declining rapidly, and the largest enterprises (namely the multinationals) are operating exclusively on a global scale. As a conclusion of the presentation, an overview of the operative systems of the NGO's in this context was given.

U. Pröbstl (BOKU – University of Natural Resources and Applied Life Sciences, Austria) then asked the question: 'Forests in balance?' and discussed whether the predominantly European concept of multiple use forestry - which is integrating economic interests with those of recreation and conservation in the same areas – is now being questioned. It was emphasized that research can offer a multitude of answers and solutions to these questions. However, it seems that the tradition of multiple use of European forests is being scrutinized for several reasons. It will therefore depend on science, the application of forest management and society at large to maintain the multi-functionality of the forest vis-à-vis short-term and short-sighted changes and re-structuring. As a kind of overall conclusion the need for education in multifunctional forestry and landscape management was raised.

The last presentation, by C.C. Konijnendijk (woodSCAPE consult, Denmark) and B. Jellesmark Thorsen (Danish Centre for Forest, Landscape and Planning, Denmark), took up the interface between the forest and the city, and the discussion relating to the fact that many environmental and social services provided by urban and peri-urban forests are difficult to assess and quantify, for example, in monetary terms. To illustrate the problems, three examples of tools for assessing the multiple benefits of urban woodland was given: i) mapping of social meanings and values of urban forests in Helsinki, Finland; ii) hedonic pricing study of peri-urban afforestation in Denmark; and iii) combination of various assessment tools to assess the multiple values of a woodland park near Kuala Lumpur, Malaysia. It was concluded that these and other assessments show that the services provided by urban forests can be considerable – and there is a need to develop assessment approaches that can strengthen the policy–science interface by acting as decision-support tools.

Rapporteur: Frank S. Jensen (Danish Centre for Forest, Landscape and Planning, Denmark).

The role of forests in carbon sequestration – considerations for the carbon market

Session Organizer: Robert Jandl (Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Austria; email: robert.jandl@bfw.gv.at).

Brent Sohngen (IIASA Laxenburg) gave an overview on incentives to participate in the C market based on today's prices and presented the results of simulation studies. A prerequisite for the inclusion of forest ecosystems in the global C market is knowledge of the C stocks in the ecosystem. Pekka Kauppi (Univ Helsinki, Finland) showed that even in recent publications, the global forest biomass is still overestimated. Under such conditions, an estimate of the C sink is elusive. On the regional scale, the natural system is spatially and temporally variable. Often, simulation models are employed to estimate regional C dynamics. The presentation of Robert Luxmoore (ORNL, USA) modelled the main C pools, i.e. biomass and soil C, over a moisture gradient of site conditions in the SE United States. Aleksi Lehtonen (METLA, Finland) presented simulated values of the aboveground biomass of forest stands in Finland and was able to amend his results with an uncertainty analysis. The largest and least volatile C stock of forests, the soil, was the topic of a presentation by Mats Olsson (SLU, Sweden). Sweden is in the favorable or still unique position of having access to a replicated nation-wide forest soil survey. A more detailed analysis was presented by Jürgen Bauhus (University of Göttingen, Germany), who concentrated on the assessment of the fine roots of a forest. This compartment belongs to the hidden part of the ecosystems that contributes substantially to C turnover. Mario Tomazello (Univ Sao Paolo, Brazil) presented fascinating picture material on the C stored in tree rings of selected tree species.

The oral presentations were supported by numerous posters, that presented case studies. In the poster session an overview was given forest ecosystems in many climatic zones of the world.

Rapporteur: Robert Jandl (Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Austria).

Decisions with long-term effects - How to deal with uncertainty?

Session Organizers: Peter Deegen (Dresden University of Technology, Germany; email: deegen@forst.tu-dresden.de) and Axel Roeder (Forest Research Institute Rheinland-Pfalz, Germany; email: axel.roeder@wald-rlp.de).

Sustainable forest management aims to include all essential information. Forest investments beyond short-rotation plantations are characterized amongst others by uncertainty and fuzziness due to long rotations. Long rotations are typical for investments in Central Europe where rotations of more than 80 years are common. Uncertainty means that the probability of occurrence of an event is not known, whereas fuzziness describes the qualitative outcome. In fact, the description of the outcome is important for sustainable forest management. The vagueness of all outcomes has been described as a 'surprise' by Axel Roeder. In his opinion, further analysis is useful to classify these information deficits as risk, uncertainty and ignorance. From the perspectives rendered by some methods that are generally used to overcome the lack of information on future developments, it becomes clear that information deficits especially in the class 'ignorance' (e.g., information on future markets) may not be bridged by any standard method.

Many different approaches that include surprise in management decisions were introduced. Axel Roeder elaborated further that sensitivity analyses, scenario analysis, and flexibility are appropriate approaches to include surprise in management decisions. Flexibility is characterized by the existence of multiple management options and by the lack of long-term commitments. Flexibility means the availability of degrees of freedom in making decisions in a changing environment. A heuristic decision tool was proposed and illustrated to make the criterion 'flexibility' operational. As a result, the following flexibility criteria were identified: keeping the increment potential (e.g., stable stands, no damage to site conditions) and the stock high, provide for a broad scope of potential products and finally ensuring the liquidity of the enterprise.

Frank Setzer described the lack of knowledge of an outcome (mentioned as ignorance by Axel Roeder) with the fuzzy-set-theory. The fuzzy-set-theory has been used as a model for many forest investment decisions by several authors to include qualitative outcomes in such investment calculations. According to the fuzzy-set-theory it is possible to transform qualitative outcomes (e.g., 'high cash flows') in mathematical expressions for further surveys. In this way it is feasible to recognize qualitative information in management decisions. Frank Setzer had used this approach to extend the classical Faustmann-model. His studies showed that the

lack of knowledge for an outcome effect new decision rules sometimes. For example, if the interest rate is fuzzy many financially optimal rotations are possible.

Markku Penttinnen presented an interesting study on forest owners' investment strategies under uncertain growth or stumpage prices. It has been shown that the Capital Asset Pricing Model suggests a very low competitiveness of forest assets.

In another presentation, Piotr Paschalis-Jakubowicz stressed the global changes in forestry and particularly the consequences they have for long-term decision making. He introduced a preliminary analysis of the future development of forest resource utilization on a world scale and evaluated the significance of different factors concerning the forest environment, as well as the technological, economic, social, demographic and institutional solutions.

Rapporteur: Frank Setzer (Federal Research Centre for Forestry and Forest Products Hamburg, Germany; email: f.setzer@holz.uni-hamburg.de).

Forestry for urban development – Urban forestry as a tool for industrializing countries

Session Organisers: Cecil C. Konijnendijk (woodSCAPE consult Denmark; email: cecil@woodscape-consult.com) and Abdul Rahim Nik (FRIM, Malaysia; email: rahimnik@frim.gov.my).

Oudara Souvannavong of FAO's Forestry Department demonstrated how sound tree and forest management in and around cities can benefit developing countries, especially when associated with good governance, enabling politics, participatory approaches and capacity building of the stakeholders. FAO's promotion of urban forestry as a contributor to achieving the Millennium Goals was introduced. David Nowak (USDA Forest Service, Northeastern Research Station, USA) then focused on the policy-science interface in urban forestry. Urban forestry research in the United States is detailing urban forest structure and its effect on environmental quality. This research is leading to new tools and policies that can be used to improve environmental quality in cities across the world.

In one of four regional perspectives, Zhiyong Li (Chinese Academy of Forestry) showed through the example of China that urban forestry has an important role to play in a rapidly urbanizing and developing society, as long as appropriate policies, legislation and research are implemented. Western and industrializing countries can gain from sharing experiences, as illustrated by Abdul Rahim Nik (FRIM, Malaysia), who presented a twinning programme between Malaysia and Denmark. Janis Donis (SILAVA, Latvia) presented status and needs of urban forestry in Eastern European countries, where urban sprawl is threatening city greenbelts. Fabio Salbitano (University of Florence, Italy) showed how recent networking efforts had raised the profile of urban forestry in parts of Latin America. Awareness had grown that green spaces can be important tools in combating the major environmental and socio-economic problems Latin-American cities face.

Several posters dealt with how urban forests are affected by adverse urban growing conditions. Abiotic and biotic stresses, such as draught (Markus Holopainen et al., University of Helsinki, Finland) and diseases (Michael Ramsden et al., Department of Primary Industries and Fisheries, Queensland, Australia) cause major problems to managers. Moreover, urban trees are heavily dependent on soil conditions (Olga Makarova, Moscow State Forestry University, Russia). Urban stresses make it difficult to preserve natural woodland vegetation, as shown by Jun Nemoto of the Wakayama University, Japan. Comprehensive assessment of urban forest resources and of social demands and values are needed, as shown by Vilem Podrazky (Czech University of Agriculture Prague, Czech Republic) and his co-authors.

Successful, multifunctional urban forestry calls for city-wide strategies. Much can be learnt from examples such as that of the Malaysian city of Putrajaya (Sreetheran Maruthaveeran et al., FRIM, Malaysia) and urban greening efforts in Metro Manila, Philippines (Armando Palijon, UPLB College of Forestry and Natural Resources et al.). Urban forestry planning should be carefully designed to allow for stakeholder involvement (Irjä Löfström et al., Finnish Forest Research Institute), so that local preferences, values and knowledge (Kaneez Hasna, University of Oxford, UK) is an integral part of decision making.

Selected papers from this session will be published in full in Urban Forestry & Urban Greening (www.elsevier.de/ufug).

Rapporteur: Cecil Konijnendijk (woodSCAPE consult)

An overview of national forest greenhouse gas accounting systems: progress and scientific challenges

Session Organizers: Werner Kurz and Kevin Percy (Canadian Forest Service, Natural Resources Canada; email: wkurz@nrcan.gc.ca).

The United Nations Framework Convention on Climate Change requires that countries report on greenhouse gas (GHG) emissions and carbon (C) stock changes from land-use change and forestry activities. The Kyoto Protocol established further detailed reporting requirements for participating developed countries. Bernhard Schlamadinger (Joanneum Research) described the Intergovernmental Panel on Climate Change Good Practice Guidance (GPG) that

aims to ensure countries provide transparent, accurate and complete estimates that comply with the reporting rules. Four speakers then described the systems their countries are developing.

Although Australia is not part of the Protocol, Gary Richards (Australian Greenhouse Gas Office) described its National Carbon Accounting System (NCAS) that covers all land-based forest and agriculture activities (http://www.greenhouse.gov.au/ncas/). It uses a large number of spatial data layers (at 25 m resolution) showing forest cover change, management, climate and soil data. Process modelling is used to simulate C and nitrogen cycles. Land managers can use the NCAS Toolbox to identify C impacts of their practices.

The Canadian National Forest Carbon Monitoring, Accounting and Reporting System was reported by Kurz (http://carbon.cfs.nrcan.gc.ca/). Key components are Canada's new National Forest Inventory now being implemented, land-use change detection methods, and the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) which simulates the forest C budget. An operational-scale version of the model is available and will allow forest managers to estimate forest carbon stock changes resulting from the activities.

Matsuo Matsumoto (Forestry and Forest Products Research Institute, Japan) noted that key components of the Japanese system are spatially-detailed information in millions of forest registers and a forest inventory begun in 1999. For land-use change, remote sensing combined with sampling will be used. Existing Japan-specific factors supplemented by additional research will be used to derive biomass C stock changes and work is needed to address dead organic matter and soil C stock changes.

The Swedish system, as described by Göran Ståhl (Swedish University of Agricultural Sciences), will rely on the large number of National Forest Inventory permanent sample plots with changes in C stock estimated through repeated measurements (on a 5 or 10 year cycle depending on the variable), complemented by modelling. Deforestation will require additional remotely sensed data.

In the final presentation, prepared in conjunction with session participants as well as Michael Gytarsky (Institute of Global Climate and Ecology, Russian Federation) and Peter Stephens (Ministry for the Environment, New Zealand), Kurz provided synthesis observations on the approaches of the countries and the challenges they identified. UNFCCC and particularly the Kyoto Protocol have created requirements for detailed reporting with high spatial resolution by activity, C pool and GHG gas, and the countries have all taken somewhat different approaches. No country has been able to rely solely on its existing forest inventory system and all will use remotely sensed information. Land-use change presents a particular challenge because it is difficult to detect small changes and to relate observed land-cover changes to land-use changes. Systems for estimating dead organic matter and soil C stock changes require the most effort and suffer from data shortages. Development of the systems presents challenges in maintaining long-term funding support, and meeting documentation and validation requirements. Scientific challenges include the level of reporting detail required, lack of data on soil carbon and its response to human activities, and estimating uncertainties associated with large complex GHG inventory systems. Increased international cooperation will help to address some of the challenges.

Rapporteur: Tony Lemprière (Canadian Forest Service, Natural Resources Canada)

Improving the functional benefits and ecological services from forest rehabilitation

Session organizers: David Lamb, Alex Mosseler and Thomas Crow

The focus of this session was to explore how reforestation programs might be managed to generate outcomes in addition to more traditional targets such as sawlogs or pulpwood. There is increased interest in using timber plantations to restore or maintain biodiversity in managed landscapes. John Kanowski and Carla Catterall (Griffith University, Australia) reviewed a variety of plantation designs and silvicultural options that might foster increased levels of biodiversity in reforested areas. They pointed out that the context in which a plantation is located is crucially important and that the extent of biodiversity that develops as a consequence of reforestation can be influenced by off-site factors as much as on-site factors. They also reviewed some of the trade-offs that must be made when managing for production and biodiversity. A poster by B Villa-Castillo (University of New England, Australia) complemented this presentation by describing how biodiversity was being fostered in an old eucalypt monoculture by creating canopy gaps.

The hydrological consequence of reforestation is also a topic receiving a good deal of attention in both scientific and management circles. Albert van Dijk (CSIRO, Australia) and Sampurno Bruijnzeel (Vrije University, Netherlands) discussed the disparity between scientific understanding and public perceptions about the affect of reforestation on water flows. Their paper reviewed some of our current knowledge and described how reforestation changes water yields, seasonal flows and stormflows. They also discussed the scope for reforestation to improve infiltration and hence the extent to which this might counter increased water losses through evapotranspiration. They also briefly reviewed some of the new software becoming available to model some of these processes.

Biodiversity maintenance and hydrological changes are both good examples of where one should examine reforestation from a landscape perspective rather than a site-level perspective. Eugenie Euskirchen (University of Alaska, USA) described

work done on biodiversity maintenance in the USA from a landscape ecology point of view.

Finally, Jeff Sayer (World Wide Fund for Nature, Switzerland) reviewed a series of reforestation program in several countries to explore the trade-offs required to satisfy the requirements of the many stakeholders usually involved when reforestation occurs. There is increasing acceptance that there is often a variety of stakeholders with an interest in the management of many natural forests and Jeff argued the same is true of plantation schemes. Developing multi-function plantations usually requires measures at scales larger than the plantation management unit to manage these trade-offs..

A vigorous discussion followed the presentations. This dealt with each of the presentations but mostly dealt with the issue of how to make trade-offs.

Rapporteur: David Lamb

Stem and shoot fungal pathogens and parasitic plants: the values of biological diversity

Session Organizer: Dr. Simon Francis Shamoun (Natural Resources Canada, Canadian Forest Service, Pacific Forestry Center, 506 West Burnside Road, Victoria, BC V8Z 1M5 Canada; email: SShamoun@nrcan.gc.ca).

Although parasites (including fungi and parasitic plants) had previously been considered as nuisances or serious pests, they are now recognized as often becoming important agents of ecological change They affect and respond to forest biodiversity, dynamics, and productivity. Their significance from diverse perspectives includes both deleterious and beneficial consequences. As parasites, they damage the host organism, but their interactions with and effects on host species, community composition and ecosystem function are complex and controversial. The most appropriate divisional IUFRO working units for addressing the topic were 7.02.11 and 7.02.02. The mutual research interests among the scientists of these working units has triggered demand for an international meeting to evaluate the values of biological diversity in relation to forest parasites dynamics. The overall aim of the sessions was to encourage the cooperation and exchange of information among the scientists and other interested agencies.

In the verbal session (# 076), six papers were presented. Dr. David Watson discussed the influence of mistletoe on diversity, patterns, mechanisms, and consequences. He concluded that longer-term monitoring will reveal the interplay between mistletoe density and species richness with time, suggesting optimal mistletoe densities that maximize biodiversity over the longer term. Dr. Gerhard Glatzel presented a paper on mistletoe ecophysiology: diverse host-parasite interactions and effects. His concluding remarks were that some mistletoes are generalists, many are host specific. By reducing their host's vigor, as well as by specific dispersal patterns, mistletoes may directly affect forest community composition. Thus, even though mistletoes are often seen as pests, they are integral and indispensable components of many forest ecosystems. Dr. Nick Reid highlighted the impact and management of mistletoes in planted forests and wooded pastures. He summarized research and development of biological control approach for management of dwarf mistletoes (Arceuthobium spp.) in Canadian conifer forests, as well as, the impact and management of Australia's farm eucalypts which are often attacked and killed by mistletoes (Amyema spp) in grazed landscapes where tree decline is a major form of land degradation. Dr. Mike Ostry addressed the area of fungi and diseases: natural components of healthy forests. He stressed that native fungi and diseases, dead and dying trees and the many complex ecological interactions among them provide many valuable benefits that ultimately contribute positively to sustainable, healthy forest ecosystems. Ms. Giuliana Deflorio examined through histological and histochemical analyses whether the inoculum potential affect the disease severity in a range of tree species. She concluded that Douglas-fir was more susceptible to brown rot, whereas beech and sycamore wood were more susceptible to white rots. Oak was the most resistant tree species to decay. Dr. Dusan Jurc discussed the area of how the stress induced dieback of Austrian pine in Slovenia and a suggestion for a new category of tree diseases: Compound Disease. He concluded that in periods of strong drought, facultative parasitic fungi may invade the weakened bark tissues of branches of the Austrian pine and cause their dieback. The fungus Sphaeropsis sapinea was the dominant cause of branch mortality, but the following fungi may also be involved in branch dieback: Sydowia polyspora (isolated as Hormonema dematioides), Cenangium ferruginosum, Truncatella hartigii, Phomopsis occulta, and Alternaria alternata. Most of these fungi occur as endophytes in healthy bark. The disease is characterized by a variety of involved fungi and with common disease syndrome. For such diseases, he proposed the term "Compound Disease".

In the poster session (# 165), eleven posters were displayed and discussed with the authors by large number of scientists and other IUFRO attendees. These included the following posters: 1) Quambalaria pitereka on spotted gum plantations in Queensland and northern New South Wales, Australia, by G.S. Pegg et al.; 2) Modelling the effect of Fusarium circinatum spore concentration, wound type and environment on disease development, by A. Hammerbacher et al.; 3) Barrier zone formation in E. nitens after wounding and inoculation: a microscopic study, by G. Deflorio & C. Mohammed; 4) Histological study on barrier zone formation after wounding and inoculation with six wood decay fungi, by G. Deflorio and F.W.M.R. Schwarze ; 5) Influence of wound location on disease spread in Eucalyptus nitens and E. globules, by G. Deflorio et al.; 6) Rhizoctonia fungi associated with diseased seeds of European beech (Fagus sylvatica) in forests of the

Italian Alps, by N. La Porta & A. Hietala; 7) The phenology of Caliciopsis arceuthobii, an ascomycete pathogen of spring flowering dwarf mistletoes, by T. Ramsfield et al.; 8) Loranthaceaous mistletoes in young eucalypt plantations in northern New South Wales, Australia, by A. Carnegie & H. Bi; 9) Genetic and cultural characteristics of Cenangium ferruginosum, depending on three different host pine species in Korea, by S.K. Lee et al.; 10) Studies on growth characteristics and optimum solid medium for Antrodia cinnamomea culture, by S.-H Lee et al. ; and 11) New canker gall of five-needle pines newly found in Japan, by T. Yamada et al.

All the verbal and poster papers from these two sessions (076 & 165) will be published in full in a special issue of Forest Ecology and Management.

Rapporteur: Dr. Simon Francis Shamoun (Natural Resources Canada, Canadian Forest Service, Pacific forestry Center, Victoria, BC, Canada).

Protection forests: recognizing and maintaining the forest influence with regards to hydrogeomorphic processes

Session Organizer: Dave Wilford (British Columbia Forest Service, Canada; email: dave.wilford@gems3.gov.bc.ca).

This session highlighted the importance of forests in reducing hydrogeomorphic hazards (debris flows, debris floods, floods, rockfalls and snow avalanches). It brought scientists of hydrology and geomorphology together with research foresters. It is intended that exchanging perspectives and experiences between these groups will facilitate the science and management of protection forests.

Matt Sakals (University of British Columbia, Canada) introduced protection forests and their history. His main topic was how forests influence hydrogeomorphic processes by retaining and containing material through initiation, transport and deposition. Managing forests to maintain this influence in mountainous areas was the focus of Peter Brang's (Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland) presentation.

Gordon Grant (USDA Forest Service, USA) questioned whether forest harvesting causes floods, noting the lack of scientific evidence. Gordon differentiated hydrologic and geomorphic flooding and the interplay of the two process realms was revisited by following speakers. Roy Sidle (Disaster Prevention Research Institute, Japan) focused on the concept of hydrogeomorphic stormflow generation in headwaters at the site-level. Gebhard Schuler (Rearch Institute for Forest Ecology and Forestry Rheinland-Pfalz Schloss, Germany) outlined his work in preventing flood generation at the site-level, particularly disconnecting hydrologic and sediment pathways. The biology of riparian forests was recognized; Dave Wilford (British Columbia Forest Service, Canada) expanded this with a poster of hydrogeomorphic roles of riparian forests. Hydrogeomorphic hazards are strongly affected by climate and Sangjum Im's (Seoul National University, Republic of Korea) poster assessed climate influence on watershed response.

Regarding the transport and deposition of hydrogeomorphic events, a collection of work was presented on rockfall hazards. Alexia Stokes (Laboratoire du Rhéologie du Bois de Bordeaux, France) identified that tree species provide different resistances to rockfall. Luuk Dorren (Cemagref Grenoble, France) highlighted the Congress theme as he discussed tradition and technology in protection forests, tradition from the long-term hazard recognition and technology from GIS and digital media recording simulated rockfalls. Walter Schönenberger (Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland) presented a poster that spanned rockfall, snow avalanche and management indicating that windthrow debris provides protection while regenerating trees establish. A poster by Matthias Kalberer (Swiss Federal Institute for Snow and Avalanche Research Davos, Switzerland) displayed individual tree strength testing and silvicultural approaches for rockfall areas.

Silviculture in protection forests represented another theme within the session. Kevin O'Hara (University of California – Berkeley, USA) described how foresters emulate natural disturbance regimes to produce multi-aged forest stands for different objectives. Masami Shiba (Kyoto University, Japan) presented his GIS-based work to minimize the cost of managing protection forests by integrating with production forest management. Since protection forests are intended to permanent, the long-term perspective on forest dynamics and their protective effect was presented by André Wehrli (Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland). Finally, to evaluate management options in protection forests subjected to disturbances, Peter Brang's poster on the Markov chain model provided valuable insights.

Papers from this session will be published early in 2006 in a special issue of Forest, Snow and Landscape Research.

Rapporteur: Matt Sakals (Sustainable Forest Management Research Group, University of British Columbia, Canada; email: msakals@interchg.ubc.ca).

Net environmental benefits of plantation forests in degraded agricultural landscapes

Session Organizer: Phil Polglase (Ensis, Australia; email: philip.polglase@ensisjv.com).

The key note address by Graham Harris approached the topic from the point of view of 'What happens when you take the trees out of the landscape?' He compared introduced grasses versus native vegetation and described the ecosystem properties that emerged. For example, complex native vegetation systems tend to have maximum rates of evapotranspiration and thus have a significant impact on the hydrological balance and the flow of materials in catchments. The complexity of interactions between trees, energy budgets, and cycles of carbon and nutrients makes modelling landscape processes extremely difficult. The task of putting trees back into the landscape is far more complex than taking them out, especially if other factors such as social dynamics and profit motives are taken into account.

The presentation by Mark Adams was constructed around projects in Africa funded by ICRAF that firmly integrate people into natural resources management systems. The need to relieve poverty highlights the importance of organisations in driving change and also the need for tree-based enterprises to be centred around individuals and villages. Phil Polglase outlined the need to better predict the impacts of new forests on ecosystems processes to drive public and private investment. Current research to help build knowledge of interactions among varying levels of tree cover, water yield and biodiversity were outlined. Like the other speakers, he concluded that large-scale landscape change would be unlikely without appropriate community engagement.

Comments during discussion time highlighted the following issues:

1 A need to recognize the role of natural regeneration of forests on cleared/degraded sites; with Africa providing good examples of where this has been successful (by removing grazing pressure).

2. Are there differences between genera (eg pines and eucalypts) in water use? There was general agreement that this was not the case, but that there may be large differences within genera (such as in the eucalypts) depending on suitability of a species to grow in a site.

3. Is the time taken to recover from a problem (eg reverse salinity) the same as the time taken to cause it? One opinion was that the time scales were about the same, another was that recovery took much longer.

Rapporteur: Chris Weston (The University of Melbourne, Australia).

Carbon balances in planted forests established in agricultural landscapes

Session Organizers: Trevor Booth and John Raison (Ensis [a joint venture of Australia's CSIRO and New Zealand's SCION], Australia; email: Trevor.Booth@ensisjv.com).

Establishment of tree plantings in former agricultural lands has been seen as a potential means to increase net sequestration of carbon in the terrestrial biosphere. However, as this session highlighted, there are still many issues yet to be resolved regarding estimating net benefits of afforestation. Miko Kirschbaum (CSIRO, Australia) stimulated much debate when he outlined that although there are obvious environmental benefits of afforestation, there are also negative effects. These include reduced uptake of CO2 from the oceans as a result of increased sequestration of carbon in forests, and increased absorption of sunlight (decreased albedo) leading to further global warming. In his talk, Miko concluded that afforestation has net benefits if used for bioenergy, thereby offsetting greenhouse gas emissions from fossil fuels.

Both Tony O'Hara (Australian Forestry Management, a wholly owned subsidiary of the Rothschild Australia Group) and Daniel Murdiyarso (Center for International Forestry Research, Indonesia) gave overviews of some potential issues arising under specific carbon accounting schemes. Tony discussed the NSW Greenhouse Gas Abatement Scheme and challenges of maintaining rigour in accounting, verification, compliance and monitoring while simplifying systems and reducing compliance costs for participating companies and organisations. Daniel spoke about the Clean Development Mechanism (CDM) under the Kyoto Protocol, with some examples of small-scale projects in Indonesia. He indicated that it was paramount to the success of this scheme that methodologies for estimating baseline carbon storage and monitoring increased sequestration of carbon be cost-effective to avoid high transaction costs. Keryn Paul (Ensis: a joint venture of Australia's CSIRO and New Zealand's SCION) then gave an overview of eight carbon accounting models being developed around the world, describing where these models are being developed and what processes they each simulate.

Four posters were also presented for this session. Jyrki Hytönen's (Finnish Forest Research Institute) poster outlined a study of development of carbon pools in a chronosequence of sites afforested with three different species, showing that sequestration of carbon increases time since afforestation and that effects of tree species are significant both in biomass and litter production. Päivi Mäkiranta (Finnish Forest Research Institute) outlined a study on the effects of afforestation on peat soils in Finland showing that peat respiration was dependent upon the peat thickness, tree species and age, and soil preperation. Vilšm Podrazsky (Czech University of Agriculture, Czech Republic) presented a study of restoration

of forest soil following afforestation of four different tree species in the Czech highlands, showing a restoration of surface soil humus and soil chemistry. Naresh Thevathasan's (University of Guelph, Canada) poster gave a summary of the potential for carbon sequestration in Canada by afforestation as well as plantations established at lower and higher tree densities, such as in agroforestry and short-rotation bio-energy enterprises, respectively.

Rapporteur: Keryn Paul (Ensis: a joint venture of Australia's CSIRO and New Zealand's SCION).

Forests and people: Valuation of the forest ecosystems' outputs

Session Organizer: Mohammed Ellatifi (Forest Department, Casablanca, Morocco; email: mellatifi@yahoo.fr and m.ellatifi@mailcity.com).

Forest ecosystems provide goods and benefits of paramount importance for the well-being of human communities, as well as for the preservation of the fauna and flora on earth. In this session, foresters and scientists from different countries presented their viewpoints and research findings regarding the values of forest ecosystems.

Emmi Lehtonen, Jari Kuuluvainen and Pouta E. Rekola (University of Helsinki, Finland), and Chuanzhong Li (University of Uppsala, Sweden) described the use of the contingent valuation method in a survey of forest conservation in southern Finland, and concluded that the uncertainty expressed by respondents may result both from cognitive difficulties of the choice task and pure preference uncertainty, which leads to a higher mean WTP, compared to conventional method.

In a state-of-art presentation, Mohammed Ellatifi (Forest Department, Morocco) presented the different techniques for valuing forest benefits provided by forest ecosystems. In a first step, he presented the concept of the forest Total Economic Value (TEV), and its components: use values (direct use value, indirect value, option value), and non-use values (existence value and bequest value), underlining the difference between financial value and economic value. In a second step, Mohammed Ellatifi gave a detailed description of the various methods for valuing forest benefits, putting emphasis on the methods to estimate the value of non-market environmental costs and benefits in monetary terms, so that they can be compared directly with the value of marketed commodities. In this endeavour, five broad groups of valuing techniques were described, (1) market price valuation, (2) surrogate market valuation (travel-cost method, hedonic pricing, substitute goods approaches), (3) production function approaches (to estimate the indirect use value of forests' ecological functions, through the valuation of their impacts on economic production), (4) stated preference approaches (contingent valuation method, contingent ranking, choice experiments, participatory methods , and (5) cost-based approaches (replacement cost methods, preventive expenditure methods, opportunity cost methods). At the end of his presentation, he gave a list of selected most recent publications in which these valuation methods were developed and used by eminent foresters and forest economists.

In other papers, Tapan K. Nath and M. Inoue (University of Tokyo, Japan), and S. Chakma (University of Chittagong, Bangladesh) developed some thoughts on rural livelihood and policy issues, regarding the prevailing shifting cultivation in the Chittagong hill tracts, in Bangladesh. They compared past and actual shifting cultivation, and showed that the returns from shifting cultivation were almost equal to input values when opportunity costs of family and exchanged labour were excluded. Mustafa Fehmi Turker and I. Durusoy (Karadeniz Technical University, Trabzon, Turkey), A. Osturk (Kafkas University, Turkey) and M. Pak (Kahramanmaras Stutcu Imam University, Turkey) presented the impact of negative externalities on the total economic value of Turkish forests, in the context of sustainable forestry. They came to the conclusion that negative externalities, such as erosion and forest fires – estimated by the replacement cost method - have a negative impact on the forest TEV which they reduced by 12%, and put in jeopardy the implementation of sustainable forest management of the Turkish forests.

In a poster, Gun Ledislav (Swedish University of Agricultural Sciences, Sweden) and Anna Springfors (FAO, Rome, Italy) described the gender structure in forest organizations, and in forest ownership, along with the gender peception of forests. They concluded that women were often under-represented in management and decision-making, and that there is a lack of gender awareness which constrains the sustainable use and management of forest ecosystems throughout the world. In other posters, Tessie Tumaneng-Diete (Department of Natural Resources and Mines, Brisbane, QLD, Australia) presented a case of community consensus regarding the values of forest ecosystems, in Australia. Punam (Palampur Agricultural University, Himashal Pradesh, India) described, in a case-study, the role of women in tea-based agroforestry systems in the Himalayas. The case study showed that about 43% of women had no basic knowledge on agroforestry systems, and near 70% felt a lack of technical guidance in their work. Nevertheless, 68% of respondent women had an important role in the decision-making of the family.

The role of forests in carbon sequestration – accounting for ecosystem dynamics

Session Organizer: Robert Jandl (Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Austria; email: robert.jandl@bfw.gv.at).

The carbon storage in forest ecosystems can mitigate climate change. For stakeholders relying on the C accumulation capacity of trees, it is important to understand how C can be retained in ecosystems and what impact ecosystem disturbances can have. Werner Kurz (NRCAN, Canada) presented the modelling tool that is used in the Canadian forest sector. The role of fire was explained by Dale Johnson (University of Nevada, USA). In the latter presentation the all important vinculation between C and N was discussed. Special emphasis was given to the biogeochemical soil processes. – modelling exercises require an assumption on the NPP:GPP ratio. Ivan Janssens (Univ Antwerp, Belgium) demonstrated that the ratio is not at all a constant and specific assessments are required, depending on the climatic zone and type of forest ecosystem. The soil C stocks turn over slowly. Nevertheless, due to the large size of the pool, these small changes are important. Erik Karltun (SLU, Sweden) showed the potential error sources, based on his experience with the Swedish Forest Soil Survey. A mechanistic approach for the assessment of the carrying capacity of C for two model ecosystems, a plantation and a close-to-nature forests, was presented by Regina Wollmann (ETHZ, Switzerland).

The oral presentations were supported by numerous posters, that presented case studies. In the poster session an overview was given for studies of local to regional relevance and about specific details in forest ecosystem dynamics, that have a big impact on the estimation of C fluxes.

Rapporteur: Robert Jandl (Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Austria)

Environmental goods, institutions and markets

Session Organizers: Shashi Kant (Faculty of Forestry, University of Toronto) and Sen Wang (Canadian Forest Service, Natural Resources Canada).

Session Chair: Sen Wang (Natural Resources Canada).

Forests provide timber and a host of non-timber products and environmental and ecosystem services. The environmental aspects of forest management involve a spectrum of institutional arrangements and markets. The four presentations of this technical session discussed some of the important issues in the general topical area.

Naskali argued that institutional changes are required for implementing sustainable forest management. In particular, the new property rights must be such that they aim at attaining desired future conditions in terms of environmentally sound ecosystems rather than outputs such as timber volumes or wildlife numbers. Vedeld et al. highlighted the importance of forest environmental income for rural residents. Analysis of 54 case studies shows that, on average, forest environmental income represents some 22% to rural household income.

In attempt to answer the question 'Do certified tropical logs fetch a market premium?' Kottert employed quantitative evidence from Sabah, Malaysia to show that those species in high market demand, especially high-quality hardwood species, indeed were valued significantly higher. Finally, Penttinen examined the sensitivity of optimal harvesting with stochastic stumpage prices and timber growth, demonstrating that modellers need to give considerations to various market factors as well as institutional variables.

M.C. Diaw was previously scheduled to present a paper entitled 'Global commons' and environmental markets: forests, fisheries, and the virtual trading of property rights'. Unfortunately, due to visa problems, the author was unable to attend the Congress and, as a result, the presentation was withdrawn from the program.

In addition to the presented papers, the session also included three posters: (i) Economic analysis of carbon sequestration at the stand and forest levels, by Pohjola et al.; (ii) Cost efficiency of measures to increase the amount of coarse woody debris in managed Norway spruce forests, by Ranius et al.; and (iii) Comparative investments in forest plantations in the Americas: Implications for wood trade and forest management sustainability, by J. Siry. It is worth mentioning that the poster by Pohjola et al. won one of the Best Poster Awards of the Congress. Selected papers from the session will be formally peer-reviewed and, when accepted, will be included in a special issue of the journal Forest Policy and Economics entitled 'Economics of Environmental Products and Multiple Functions of Forests'.

Advancing the role of communication, education and capacity building in the future of forestry

Session Organizer: John Innes (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada; email: john.innes@ubc.ca).

The role of education, either initial or continuing, for the future of forestry was the main theme discussed in this session. The need for increased transparency and congruency between what is required of graduates that are entering the work force and the need for continuing education to keep current practitioners up to date on the issues facing today's and tomorrow's forestry were all presented.

The presenters suggested that reforms in the current educational paradigms prevalent in forestry are required to address concerns of educators, students and practitioners. There is a need to offer a wide range of courses that provide students with the necessary skills that are relevant to today's forestry paradigms and to the future's paradigms. Curricula that offer courses traditionally found outside of the field of forestry are required. Communication and people skills are needed to ensure that practitioners can communicate with the societies that have charged them with managing their forests in a sustainable manner. There is also a need for problem-based learning mixed with practical application and acquirement of relevant skills.

The need to involve students and practitioners in the reform of forest education was identified as an important component. Working with students in curriculum reform can provide valuable insight into what is required and in the success of any change. Forest education must be made to appeal to the younger generation and must continue to do so, particularly as these students become practitioners. Forest education must be dynamic in order to reflect the current and future paradigms of the practice of forestry. Collaboration between institutions of higher learning and industries of practical application must evolve together to provide attractive and comprehensive programs that will improve the ability and capacity for future practitioners to continually make the must informed decisions. Decisions based on science and knowledge.

Session Rapporteur: Craig R. Nitschke (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada)

Horizontal communication: combining traditional expressions in communication strategies

Session Organizer: Ajith Chandran (Executive Director, Development Interlinks International, India; email: achandran.dii@gmail.com).

Communication in forestry, specifically between varied stakeholders is a challenge to practitioners and academics. Designing communication strategies without hierarchal inhibitions that enable learning between diverse stakeholders seemingly goes a long way towards the acceptance of the message and meaningful discussions. In this session the speakers explored experiences from tribal India, New Zealand based forest research and technology organization and forest-based industries in England. The experiences spanned a range of activities involving multi stakeholder participation.

The innovative experiences of 'people-to-people education' under the broad spectrum of 'horizontal communication' in Joint Forest Management programmes from the western Indian region were analysed. Ajith Chandran (Development Interlinks International, India) described the various steps that were developed to foster closer interaction between communities and the Forest Department. This further led to developing strategies for village development. Simple and replicable steps were highlighted for horizontal communication. The number and effectiveness of Joint Forest Management villages had a direct and positive correlation to the use of horizontal communication strategies.

In a very interesting presentation on 'Public dialogue: bringing community perspectives into sustainable forest management in New Zealand', E.R. Lisa Langer described how there is growing shift from a 'deficit model' to a move towards 'consultation'. The experience of ensis, from a traditional one-way consultation to two-way dialogues, was shared. Different dialogue techniques such as scenerio workshops; consensus conferences and future panels were described. The importance of two-way communication process in discussions and anticipatory dialogues for contingency response planning were other areas that were highlighted.

Mardi MacGregor, Project Manager, England Forest Industries Partnership (EFIP) illustrated a novel approach being tried in United Kingdom. Her presentation 'Public Private Partnerships: a successful method for facilitating communication and increasing business competitiveness in England' demonstrated the importance of partnerships as a successful mode of communication. EFIP has been established to develop the competitiveness of England's forest industries and their capacity to contribute to the delivery of the England Forestry Strategy. Each stakeholder is as important as any other, and it is crucial to the venture that each partner recognizes this. Working together, learning from each other

and setting priorities for action form the bedrock of the partnership.

The questions revolved around communication with different groups, modes of communication, gender differences, use of Internet and web-based techniques, and accountability. It emerged that there were issues in dealing with different groups and more so with groups within communities, for example men and women. Different strategies are required for dealing with such differences. A successful example of this was demonstrated in one presentation. In the case of partnerships for business, another method, namely the Internet, is still under development. Overall, a broad picture of the importance of charting Horizontal Communication strategies for specific goals and their impact on the outcome came to light strongly.

Rapporteur: Monika Singh (Adviser, Development Interlinks International, India; email: msingh.dii@gmail.com).

Technology and tradition at the desktop: effective use of global forest information resources

Session Chairs: Carol Green (Natural Sciences Library, University of Washington, USA) and Roger Mills (Oxford University Library Services, University of Oxford, UK).

Our first speaker, Ms. Margaret Sraku-Lartey from the Forestry Research Institute of Ghana, spoke on 'Enhancing access to forestry information in Africa to ensure sustainable forest management'. She gave an overview of forest information needs in Africa and of the efforts to improve not only the access to forest-related information but the training of information workers, using the GFIS – Africa program as an example. Many challenges to information access remain, including developing the technical infrastructure, providing further training, and financing both of these efforts.

The second presentation, 'Information resources for forest researchers and managers: strengths, weaknesses, threats and opportunities', by Dr. Alan G. Brown (Honorary Research Fellow, CSIRO Forestry and Forest Products) and Mr. John Turnbull gave the users' viewpoint regarding forest information needs. They described many of the technological advancements that are now available to the information user including powerful search engines and databases, but are concerned that these resources are primarily available only in developed countries. They stressed the need for better coverage of literature from developing countries, more open access archiving, and use of partnerships and collaborative research to encourage the ability of managers to use relevant information.

Dr. Su See Lee, from the Forest Research Institute Malaysia (FRIM) gave a paper co-authored by Mr. Mohd. Zaki, M.I., on 'Accessing and sharing research information in the Asean region: Malaysia's perspective' describing the situation in the ASEAN region regarding forest-related information. Electronic access, budgets and collections vary significantly across the region, 'researchers in Singapore, Malaysia, Brunei and Thailand have excellent to reasonably good access, but other countries have very little'. Personal contacts and networks are sometimes the only means of exchanging information.

Four additional presentations rounded out the session. Dr. Alois Kempf (WSL, Swiss Federal Institute for Forest, Snow and Landscape Research) analyzed the forestry coverage of some major indexing services including CAB Abstracts, and ISI Web of Science. Mr. Roger Mills (Bio- and Environmental Sciences Librarian and Oxford Forest Information Service Manager) reviewed the history and challenges of archiving and preserving forest information in a variety of formats. Ms. Cynthia Miner (Communications and Applications Director, USDA Forest Service, Pacific Northwest Research Station) presented a paper by Ms. Julie Blankenburg (Librarian, USDA Forest Service, Forest Products Laboratory) describing the development of Treesearch, an online full-text database of USDA Forest Service publications. To end the session Ms. Gillian Petrokofsky (CAB International) and co-author Mr. Nick Pasiecznik (Agroforestry Enterprises) looked at research trends in the forestry literature from 1939 to 2005 discovering that the literature reflects the move away from timber production research into other aspects of forestry which do not necessarily match the resource needs of mankind, but which mirror other perceived international priorities.

In addition to the papers presented, the session included three posters: 'The International Directory of Forest Information Services, its use and value' by Ms. Carol Green describing an online directory that is a project of IUFRO 6.03.00; 'The Global Forest Decimal Classification update project' by Ms. Barbara Holder (Librarian, Forintek Canada Corp) describing the effort to update the forestry classification system; and '100 years of forestry information from Oxford' by Mr. Roger Mills, giving the history of the forestry libraries at Oxford University.

The session was felt to be quite successful. We were pleased by the attendance and received anecdotal feedback that the papers were interesting and relevant to the Congress themes. We hope to publish these papers in early 2006 in conjunction with papers from a further conference to be held in December 2006 at Oxford University.

Communicating forest science: from theory to practice

Session Organizer: Daniela Kleinschmit (University of Göttingen, Germany).

The first presentation, given by Alejandra Real and Mi Sun Park, 'Present views of science communication – not necessarily a one way street' gave an overview of the theoretical state-of-the-art of science communication. The presentation built the framework of the session and allowed participants unfamiliar with this approach to structure the following presentations. The presentation was peppered with the results of empirical studies of global media analysis.

The next three presentations dealt mainly with concrete experiences of science communication. This part of the session started with the presentation of Michael Hailu and Greg Clough 'Forests, Science and People: Bringing them together through the media'. First they spoke about the general necessity of communication with the media. The second part of their presentation said more about thepractice of media contacts and its success within CIFOR. The main message of the presentation was that contact with the media has to be very professional, friendly and helpful.

The third presentation changed from a poster presentation to an oral presentation: Guy K.M. Smith on 'Policy case studies to characterise effective communications'. Examples of different field studies showed the success of participatory processes. The presentation focused on different publics and these could be integrated through communication.

Finally Cindy Miner presented several results from her experiences of science communication. The main part of her presentation 'Communications: The key to adoption of forest science concepts, knowledge and technology' described the feedback from public to science.

The presentations were followed by an inspiring discussion, which emphasized the necessity of science communication and of a platform where science communicators can exchange ideas and experiences.

Rapporteur: Dr. Daniela (Krumland) Kleinschmit (Institute of Forest Policy, University of Göttingen, Germany).

Science, stakeholders and sustainable forestry: Canadian forestry partnerships

Session Organizer: Christopher Lee (Natural Resources Canada; email: clee@nrcan.gc.ca).

This session, under the sub-theme Demonstrating sustainable forest management, described the Canadian Model Forest partnership program, sponsored by the Canadian Forest Service (CFS). The session demonstrated how this program provides the forum for scientists and diverse groups of stakeholders to engage in participatory decision making around Sustainable Forest Management, helping to identify stakeholder priorities and then using science to inform the debate and improve decision-making.

Brian Wilson (Director of Programs, CFS, Natural Resources Canada) provided an overall description of the Canadian Model Forest Program along with several examples of the projects being undertaken across Canada.

Dr. David MacLean (President of the Fundy Model Forest and Dean of the Faculty of Forestry and Environment at the University of New Brunswick) described his involvement in the Model Forest Program and ways the Fundy Model Forest works with universities to engage students, scientists and stakeholders, both nationally and internationally. He talked about a Canada-European Union project he is involved with that is linking several Canadian and European universities, faculty and students.

Dr. Fred Pollett, a consultant for the International Model Forest Network Secretariat, outlined the work of the International Model Forest Network in engaging scientists with stakeholders in both developed and developing countries. He described some of the history of the Canadian program and links between it and International programs.

Dr. Werner Kurz, a Research Scientist with the CFS, Natural Resources Canada, provided his perspective as a scientist engaged in Model Forest Program activities. He talked about the Carbon Budget Model project and his ability to successfully develop and test the model using several Model Forests as pilot sites. Dr. Kurz described how he has been able to engage stakeholders, develop this new Carbon Budget Modeling tool and have it applied by stakeholders to better understand both the tool and how their forest management decisions will affect the release and sequestration of carbon.

Reg Parsons, Newfound land and Labrador Aboriginal Liaison Officer for the CFS described a Special Project Area of the Canadian Model Forest Network, the Innu of Labrador project. Reg talked about how Model Forest Program support has been able to result in much greater participation in a vast area of northern Canada to address aboriginal involvement in many forestry and general management issues.

Dan Adamson, the General Manager of the McGregor Model Forest described the management of a Model Forest in an area that has challenges related to engaging university researchers, First Nations, governments and forest industry in the partnership he manages. All these challenges are over-shadowed by an infestation of mountain pine beetle that is affecting millions of hectares of forest in the McGregor Model Forest area and well beyond.

A discussion session followed and dealt with how the Model Forest Program works, why partners become and stay involved and how the Model Forest concept might be applied in other parts of the world.

Information technology and the forest sector

Session Organizers: Lauri Hetemäki (Finnish Forest Research Institute; email: lauri.hetemaki@metla.fi) and Sten Nilsson (International Institute for Applied Systems Analysis; email: nilsson@iiasa.ac.at).

This session presented the work of the IUFRO Task Force on the Information Technology and the Forest Sector, which published its final report at the Brisbane congress (see below). The report looks at the challenges and opportunities for the global forest sector of the 'digital revolution'. In the report, 27 researchers from Europe and North America assess how ICT has affected the forest sector so far, and is likely to do so in the future.

Four papers from the report were presented in the session: Ewald Rametsteiner (IIASA) discussed the role of ICT in international governance; Lauri Hetemäki presented ICT impacts to communication paper markets; Richard Vlosky (Louisiana State Univ.) discussed ICT and paperboard and packing industry and Lauri Hetemäki concluded the session with the overall summary and implications of the report.

According to the report, ICT enhances the movement of production and consumption of forest products from North to South, thereby intensifying the ongoing restructuring of the global forest sector. In a number of OECD countries, ICT development has started to have negative impacts on newsprint consumption and to some office paper grades as well. The existing market outlook studies need to be updated in order to take into account the ICT impacts, and therefore to provide more realistic projections for the future.

ICT also helps to increase the productivity and viability of the forest sector. For example, e-commerce, greater utilization of modern ICT in logistics and marketing, new products combining ICT and wood fibers, such as radio frequency identification (RFID) tags, can provide more efficient and new opportunities for the industry.

The report concludes that the global forest sector is not fully prepared for the impacts of ICT. New ICT-led strategies, restructuring, and prioritizing are urgently needed especially in the traditional forestry countries of North America, Scandinavia, Japan, and Central and Western Europe. This requires a change in the mindset in the forest sector in these regions, in order for them to remain viable in the face of the challenges brought by ICT development. A better environment for new innovative forest sector strategies and businesses could also be created and nurtured by national policies. Governments should enhance R&D in new technologies and their applications and support investments in more-risky, innovatory, long-term projects.

The papers from this session are published in full in:

Hetemäki, L. & Nilsson, S. (eds.) Information Technology and the Forest Sector, IUFRO World Series, vol. 18, Vienna, August 2005, 236 p. www.iiasa.ac.at/Research/FOR/iufro/iufro_WS18.pdf

Rapporteur: Lauri Hetemäki (Finnish Forest Research Institute).

Crossing borders: International perspectives on interdisciplinary research

Session Organizer: Craig R. Nitschke (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada; email: nitschke@interchg.ubc.ca).

Forestry is increasingly about meeting the needs of people. This is resulting in a need to synthesize a broad range of information or develop tools to address both social and natural science problems. Forests are not centralized systems, but rather, co-evolutionary systems requiring tools that can account for dynamics, both socially and ecologically. As a result, there is an overwhelming diversity of methodologies being used in forest research. There is also a wide range of perspectives on what constitutes interdisciplinary research. The nature of the issues currently being faced by forest researchers has promoted the integration of methodologies from various disciplines in order to better address issues of complexity. As stated by John Innes, 'the reductionist approach to research is a problem because of the complexity of today's problems'.

The role of interdisciplinarity in forest education and research collaboration was discussed and was the focus of most questioning. The blending of disciplines in forest research was apparent in all papers and posters presented as part of this Session. The diversity of presentations shows that researchers are thinking 'outside the box' in order to answer their questions, however, there is no discernible pattern to the approaches being used. There were many similarities between the issues being faced by research initiatives from different regions, however, the methodologies varied. This was reflected in the papers on forest education and research collaboration. Education and collaboration were identified as the key areas for interdisciplinary training and research; however, institutions can not do this simply. The use of interdisciplinarity in forest education and research must be disciplined. There needs to be structure to guide the use of interdisciplinary research.

The questions that have driven researchers to break away from traditional forest research in order to deal with the social, economic and ecological complexity of the current sustainable management paradigm needs to be grounded and disciplined. There is also a need for cross-disciplinary research, but

when, where and if we need to use it must be thought through beforehand. In the context of forest education and research collaboration, the need for increased use of social sciences was advocated, as was the need for the development of practical skills, social skills and an understanding of theory. Practitioners must be able to integrate broad knowledge with practical skills.

Because sustainable forest management reflects human and societal needs, the triangulation of understanding, need, and perception are required. When sets of values overlap with each other, there is a need to understand the underlying social constructs and perceptions driving the process. Failure to understand the perceived impacts of management decisions means that they may not be construed as being sustainable at the social level. Communication and understanding at both the social and ecological levels thus becomes an important determinant of sustainability. For this reason, many of the presenters advocated the importance of transdisciplinarity in forest research because it combines science with local knowledge.

Interest in interdisciplinary research is growing as the need to address broader questions grows. This is placing pressure on the capacity of forest education, communication and practice to provide the skills required for conducting disciplined interdisciplinary research. Further pressure is also being placed on the capacity of professional practitioners to respond to changes in management paradigms. Communication and collaboration between affected parties is thus important, as is the need to build capacity for integrating disciplines and policy. Forest researchers should not be looking towards interdisciplinarity as the only answer. They must keep this form of research complimentary to disciplinary approaches.

For further detail please see *The International Forestry Review* 7 (5), No. 28: 346-350 and *The Forestry Chronicle* 81 (3): 321-408.

Session Rapporteurs: Craig R. Nitschke and Gordon M. Hickey (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada).

Effective teaching with technology in higher forest education: foundations for success

Session Organizers: Sandra Schinnerl (University of British Columbia, Canada; email: sandra.schinnerl@ubc.ca) and Siegfried Lewark (University of Freibrug, Germany; email: siegfried.lewark@fobawi.uni-freiburg.de).

The session opened with Dr. Gary Poole from the University of British Columbia explaining that before incorporating learning technologies within programs or courses one needs to ask what are you trying to achieve? For some it may be that technology is seen as a tool to enhance learning or improve access, a way of generating resources or for some other objective. By creating a decision making framework that allowed instructors to understand that certain forms of technology that are incorporated into classroom or distance teaching can help support the objectives one is trying to achieve as well as support a pedagogical approach to teaching. Both of these must be considered before you invest time and energy in effectively using technology in a teaching environment.

Inclosing, Dr. Poole stressed the importance of looking at the incorporation of new technologies in teaching as a scholarly effort and that there are opportunities to publish and share findings with other people interested in understanding or improving the teaching and learning that goes on in their own classrooms or within a unit or department. This form of research is a valued contribution to a growing body of knowledge on technology use within higher education institutions.

Examples of best practice in forest education and the use of technology highlighted the efforts of several colleagues within the forest education community. Dirk Laengin from the University of Stellenbosch in South Africa spoke of the online learning efforts taking place at his institution to create access opportunities for students and the challenges involved in the implementation of such a program. Cris Brack from the Australia National University shared the outcomes of satisfaction and performance surveys of students who participated in a course that had a high degree of technology use incorporated into it in order to increase the support they felt they were receving from the instructor during their learning. His results suggested that the use of technology did in fact improve the students' perceptions of higher engagement on the part of the lecturer. Finally, Liisa Tahvanainen spoke of the unique features of the Joint Masters Program offered through the SILVA Network including the Virtual Exam where online examinations and self testing took place remotely to students participating in the program.

There was a clear demonstration that there are some innovative educational programs being offered using various levels and forms of technology within forest education institutions and hopefully there will be some future opportunity to support and share these experiences with those involved in teaching within forest education institutions.

Presentations from this session will be made available on the International Partnership for Forest Education website as well as the IUFRO unit 6.15.00 group website.

Rapporteur: Sandra Schinnerl (Faculty of Forestry, University of British Columbia, Canada).

Capacity building as an objective of international development projects: case studies from ACIAR's Asia-Pacific Forestry Program

Session Organiser: Dr Russell Haines (ACIAR, Canberra, Australia; email: haines@aciar.gov.au).

The Australian Centre for International Agricultural Research (ACIAR) is part of the Australian development assistance program. It was established in recognition of the rare position Australia holds amongst industrialised countries, of having the range of climates—cool and warm temperate, subtropical and tropical—typical of the developing world, combined with an exceptionally strong capacity in agricultural research and development. It assists and encourages Australian scientists and institutions to use their skills to develop solutions to agricultural problems in developing countries.

In this session, Russell Haines, ACIAR's Forestry Program Manager, outlined the role of the Program in capacity building in the Asia-Pacific region, describing areas of interest, country partnerships, strategies and training programs. He emphasized ACIAR's multidimensional approach to capacity building with a focus on impact through livelihood enhancement, sustainable development and highly applied research.

In the first of four Case Study presentations, Sanjana Lal (Forestry, Fiji) described a recently-completed project in Fiji, Vanuatu, Samoa and Tonga which saw the introduction of formalized forest health surveillance systems to the region and the establishment of active Forest Health units in each participating country. She explained how such systems were essential to meet World Trade Organisation certification requirements for the timber trade. A particularly important outcome from the project is the increased understanding and cooperation on forest health issues between forestry, agriculture, quarantine, industry and community farmers in the countries.

Nalish Sam of the Papua New Guinea Forest Research Institute gave an overview of the many positive impacts of two ACIAR projects –species domestication and science communication – on capacity at the Institute. He particularly emphasised the benefits of the training, both formal and informal, provided in these projects. This had built staff skills and confidence and was manifested in the formation of a core management team and the development of a strategic plan for PNGFRI.

There have been five ACIAR-funded forestry projects conducted in China in the last 20 years which resulted in the introduction of a wide range of Australian tree species and greatly increased productivity of eucalypt plantations in that country. Daping Xu of the Chinese Research Institute of Tropical Forestry provided some impressive statistics on the impacts of these projects – for example, MAI of eucalypt plantations increased from 5 to 20 m3/ha/annum and rotation period reduced from 10-15 years to 4-8 years. Of great interest was the project on managing eucalypt plantations to avoid resource depletion and environmental detriment.

The final presentation by Daniel Mendham (Ensis) on behalf of K.V. Sankaran, India concerned a collaborative project by Kerala Forest Research Institute and CSIRO (Ensis) to increase the productivity of eucalypt plantations in India and Australia. He outlined how productivity can be increased by 20% (on good sites) to 260% (depauperate sites) using a combination of weeding, slash retention and legume intercropping. Capacity building has involved scientific staff, industry and farmers.

Summaries of these various projects are available from ACIAR on its website or at the above address.

Rapporteur: Ross Wylie (Department of Primary Industries & Fisheries, Brisbane, Australia)

Interactions between science and practice

Session Organizer: John Innes (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada; email: john.innes@ubc.ca).

After the initial call for proposals for technical sessions, the demonstration of the value of research to forestry professionals or to the public appeared as a thematic gap in the congress. This was one of the sessions aimed at bridging such gap by gathering insights from various researchers and policy makers.

Arne Skaugset (USA) presented his experience of managing a large collaborative project involving a large private forestland owner and Oregon State University. This multidisciplinary project was designed to integrate a number of studies and ultimately identify an appropriate 'watershed management' strategy that goes beyond 'best management practices'. The

implications for timber production, employment, revenues and fishery protection contributed to the dedication of resources by industry who expects in return the development and communication of watershed management practices and also expects that these results be communicated to policy makers.

Andrea Tuttle (USA), a former policy maker and now at the University of California – Berkeley introduced how California state forest carbon protocol was developed based on research related to climate change and to the policy implications for potential future markets such as carbon credits. California Climate Action Registry (CCAR) is a proactive initiative that was designed to provide a clear accounting system and help managers or developers assess the potentials of carbon sequestration alternatives. The decision to develop forestland, to harvest it or to use it for carbon sequestration can be a complex one; the CCAR government initiative has helped clarify some of the outcomes associated with those decisions and has provided such a valuable tool as to generate interest in other USA states.

Ann Merete Furuberg (Norway) is a researcher who is also involved in policy making and is a forest owner. Sharing her experience, she presented a framework to achieve better cooperation and interaction between science, practice and policy making. This framework is mainly based on the establishment of partnerships between the different actors. Furuberg established that a successful partnership requires both the availability of resources (financial or otherwise) and a good integration/communication among the partners. Norway has moved towards applying such framework to research initiatives and encourages the establishment of contract-binding partnerships. With different examples, Furuberg promoted partnerships as an efficient approach to linking research, policy and societal needs despite the risks to 'neutral research'. Merete Larsmon presented a partnership between the association Women in Forestry and local communities which aims at promoting gender equity.

Gordon Bradley (USA) presented some results from his research on understanding the aesthetics of various harvest methods depending on which stakeholders are interrogated. This is particularly important in the context of SFM and the Sustainable Forestry Initiative certification scheme which comprises managing for visual quality as one of its objectives. There exist differences in the perception of harvest practices depending on the professional expertise and training of the survey respondent, on the level of trust in the land owners, and on the time elapsed since harvest. Two other significant findings were that education does raise the acceptance level for some practices and that foresters are aware of their higher acceptance level than other stakeholders and adapt their decisions accordingly. Lastly, Bradley presented ENVISION, a software aimed at determining the threshold of timber removal beyond which quality is really impacted which was identified between 20 to 30 %. His results were compounded in a management guidebook that presents mitigation techniques using the size, shape, edge and distribution of harvested areas.

Craig Nitschke from the University of Bristish Columbia (Canada) presented his research and collaboration with the forest industry in the context of designing forest management strategies that can maintain biodiversity in the face of climate change. One premise of this research is to evaluate the appropriateness of TRIAD zoning where reserves, extensive and intensive management zones are delineated. Nitschke's research question was to identify the appropriate location for reserve zones when it is known that climate change will modify fire regimes. Some areas currently appropriate for reserve location may later be subject to higher risks of fire damage. Using a metamodeling framework that combines a number of already existing and tested models, Nitschke showed that climate change decreases fire intervals and increases mean fire size and maximum fire size regardless of the climate change model used. Fire risk modeling was used to identify biodiversity refugia where fire probability is likely to remain low. This research elicited a high interest from industry because of their commitment to biodiversity conservation while maintaining more economic services.

In the past decades, forestry has suffered a substantial loss of social licence. To regain such social licence, it is necessary that NGO's, government, Industry, consumer or other stakeholders organizations and researchers establish partnerships. This will help increase mutual acceptance and understanding between forest stakeholders and favor synergetic collaboration. In addition such partnership will also improve proactive decision making and thus contribute to SFM.

Rapporteur: Anne-Hélène Mathey (Sustainable Forest Management Research Laboratory, University of British Columbia, Canada).

Linking science and practice through the Landcare Approach

Session Organizers: Charles Willcocks (Australia; email: charles.willcocks@affa.gov.au), Adela Backiel (US Department of Agriculture, USA; email: adela.backiel@usda.gov), Ruth McWilliams (USDA Forest Service, USA; email: rmcwilliams@fs.fed.us).

The Landcare approach for community based natural resource management began in Australia and focuses on local action by communities to deliver the triple bottom line of economic, environmental, social and economic improvement through land and water management. The Landcare movement has now expanded to other counties and is growing. Adela Backiel began the session with a short introduction to the Landcare concept and introduced the theme of how the Landcare

approach can be used to integrate research and community based natural resource management.

Ross Dalton gave a brief overview of the Australian Landcare experience and described the Landcare structure including over 4000 community groups which are organized along regional catchments and work on natural resource management. Landcare also helps promote partnerships among government, industry, and local groups. In Australia regional issues important to local groups include salinity, biodiversity, and ground water levels.

Ian Rankin, Mel Brown and Phil Dyson presented their experience as members of the

Northern United Forestry Group a Landcare group in Victoria, Australia. Their excellent case study showed how research can be integrated into community based land use management. They described several projects including working with forestry farms of native tree species, and monitoring the impact of vegetation on ground salinity. These projects have improved their land management and also provided data that can be used in other areas.

Dennis Garrity gave an overview of the efforts to establish an International Landcare and the activities of Landcare in other countries particularly in Africa and the Philippines. The goal of International Landcare is to act as a supportive network and for NGO's and community and farmer based organizations

David Penman gave an overview of the Landcare research approach in New Zealand describing their focus on outcome oriented research. He also presented a case study that brought together community groups, scientists, and artists to put together an exhibit that explains the importance of water catchment management.

Ariel Lugo described work by the USDA Forest Service in the tropics to integrate research with community based activities. In Puerto Rico work is being done with local communities to achieve special zoning for conservation in order to address the impact of land cover change on watershed functions. Engaging local governments and creating good visual data with GIS are important components of these activities.

An informative discussion period followed these talks and included discussion of the value of integrating research with community based natural resource management groups. The issue of funding was also discussed and a number of comments pointed out that working with results oriented community groups can achieve a lot with limited funding. Payments for ecosystem services were also discussed as a potentially valuable tool for Landcare groups. Many participants also discussed the value of Landcare for engaging diverse members of the community in natural resource management issues.

Rapporteur: Evan Notman (USDA Forest Service, USA)

Dissemination of forest restoration and regeneration knowledge into management

Session Organizers: Palle Madsen (KVL, Denmark; e-mail: pam@kvl.dk) and John Stanturf (USDA Forest Service, Athens, Georgia USA; e-mail: jstanturf@fs.fed.us).

Efficient dissemination of forest restoration and regeneration knowledge from research into management is important for sustainable forestry. In this session (and the related Session 055), researchers from Asia, Australia, Europe and North America presented diverse viewpoints on forest restoration and regeneration research and dissemination. In total, six oral presentations were given and seven posters presented. P. Madsen (Denmark) set the tone for the session, stating that traditionally, researchers carry out research and publish their major findings in international scientific journals that many stakeholders never read. Better and more direct communication is needed, together with structured collaboration between research and practice. Madsen described the Danish Regeneration Commission as a good example of involving practitioners in setting the direction of research from the beginning. The Commission was initiated following a major windstorm in 1999 that caused severe damage to large areas of especially Norway spruce stands. The work has involved researchers and managers from various professional groups and has produced recommendations for new research and lower-cost regeneration methods.

M. Löf (Sweden) presented the new research program on sustainable management in hardwood forests, including the dissemination strategy towards forest owners and companies. A specific problem addressed was the varying levels of interest among stakeholders; whereas some public stakeholders were very interested in the research results, some private stakeholders were mostly uninterested. In a particularly interesting paper, E. S. Gardiner (USA) described a major demonstration and research experimental site in Mississippi, USA. During the past 15 years, an 800 hectare area was developed for research and demonstration purposes on various aspects of bottomland hardwood ecosystem restoration. The site has served as a good platform for cooperation between landowners, policy makers, researchers and managers, demonstrating not only current methods but providing comparisons to innovative techniques at operational scale.

Three case studies on regeneration or forest restoration from Romania, Finland and Australia were presented. N.-V. Nicolescu (Romania) described the difficulties that arose in beech silviculture and regeneration following the fall of communism in 1989. M. Hyppönen (Finland) talked about natural regeneration of pine, which is recommended on certain sites in Finland. However, due to lack of time for forest owners and managers, the regeneration result varies greatly. M. G. Neyland (Australia) presented a very interesting technique for retaining both species and structural elements using

understorey islands during forest operations. Four posters presented various regeneration challenges. M. Hyppönen (Finland) presented a model for natural regeneration of pine. D. K. Lee (South Korea) described how logging and forest fire caused soil degradation and difficulties for natural regeneration in Mongolia. M.G. Neyland (Australia) presented results on natural regeneration following variable retention harvesting. D. J. Robison (USA) described individual tree release and enrichment planting of oaks.

Selected papers from this session will be published in the *Journal of Sustainable Forestry.*

Rapporteur: Magnus Löf (SLU, Sweden; e-mail: magnus.lof@ess.slu.se).

Delegates network during the Welcome Reception

The speaker preparation room

Closing Ceremony

Closing Ceremony Program

Saturday 13 August 2005

Great Hall, Brisbane Convention & Exhibition Centre

MC – Stephen Walker, Queensland Department of Primary Industries, Forestry

Thank you, Dr Gary Bacon, Chair, Congress Organising Committee

Visual Presentation (Video of Congress Highlights)

Presentation of Best Poster Awards by Dr Howard Rosen (chair Best Poster Awards Committee). Citations read by Dr Karel Vancura.

International Council Decisions, Professor Risto Seppälä, IUFRO President

Host of the 2010 Congress – Korean Forest Research Institute

Honorary Membership presented to Professor Jeffery Burley, Immediate Past President, Heinrich Schmutzenhofer, former Executive Secretary, Les Whitmore, former Vice-President Administration.

New Board

Congress resolutions, Dr Peter Mayer, IUFRO Executive Secretary

President Elect Presentation, Professor Don Lee, IUFRO President Elect

2010 Congress Presentation, Traditional Korean dance troupe and address by Dr Seung-Jin Suh, Director General, Korea Forest Research Institute

Indigenous Farewell - Message Stick Presentation by Mr Geoff Binge, indigenous member of COC

Official Close, Professor Risto Seppälä, IUFRO President (includes lowering of IUFRO flag and handing over to 2010 Congress representative)

Delegates move to the Gala Farewell event.

Address by Dr Gary Bacon, Chair Congress Organising Committee

Greetings Colleagues All

On closing day we first recognise the traditional custodians of this land.

The holding of the 22nd IUFRO World Congress, the inaugural "Downunder" Congress, here in Brisbane has involved the participation of inclusive teams.

No enterprise of this magnitude, long in the gestation can be effected without the substantial and sustained input by a number of supporters.

First I acknowledge the Congress Organising team members, and in turn their respective collaborators, for their splendid efforts over the five year planning horizon.

Our professional congress organiser, OzAccom Conference Services, has been an essential component of this team throughout the entire bid – plan – do continuum.

We acknowledge the many local Departmental staff and volunteers highly visible in their distinctive vests and broad smiles who have given generously of their time to ensure the smooth running of both in-situ and field based activities.

We acknowledge the workaholic chair of the Scientific Committee and his core supporters for the effort in securing and abstracting near 1,500 presentations.

We acknowledge the IUFRO senior management team, lead by a creditable President, and the IUFRO Secretariat for the professional partnering, guidance and encouragement extended over the whole establishment period.

We again acknowledge the sponsors of the Scientist Assistance Program, the SPDC Training Programs, the Exhibition Booths, the tours and of the Congress proper.

These are the foundations on which the Congress planning and execution have been based.

However, it has been the whole hearted, passionate involvement of you the 2,100 participants from 90 countries in the whole matrix of Congress activities – professional, social, cultural – that has injected life into this event.

You have all taken up my opening day invitation to become involved in your Congress.

The organising team thank you all for your support.

Now colleagues, sit back, take in the fragrance of the eucalypts and enjoy a brief retrospective of the week that we have experienced together.

Presentation of Best Poster Awards

Dr Howard Rosen (Division 5 and Chair, Best Poster Award Selection Committee) made the following presentations;

Division 1: Poster #669: "Long-term effects of forest fertilization on ground vegetation in the northern Black Forest, Germany"

Carl Höcke, Freiburg University, Germany

Division 2: Poster #18: "Overcoming biological barriers to hybrid seed production in Eucalyptus"

Tasmien Horsley, Terry Stanger, Sappi Forests Research; S. Johnson, University of KwaZulu-Natal, South Africa

Division 3: Poster #473: "Decomposition of coarse woody debris in the boreal forest of interior Alaska"

John Yarie, University of Alaska, Fairbanks, Alaska, USA

Divisions 4 & 6: Poster #682: "Economic analysis of carbon sequestration on stand level"

Johanna Pohjola, Finnish Forest Research Institute; L. Valsta, J. Mononen, University of Helsinki, Finland

Division 5: Poster #16: "Evaluation of five reforestation species for manufacture of oriented strand board"

Nigel Lim, Y. K. Pek, Sarawak Forestry Corporation, Malaysia

Division 5: Poster #799: "Improvement of the acoustic properties of Sitka spruce with chemical treatment"

Chih-Lung Cho, S.-Y. Wu, S.-U. Yeh, National Ilan University, China-Taipei

Division 7: Poster #836: "Managing intensively grown, irrigated hybrid poplars based on clonal susceptibility to Poplar/Willow borer Cryptorhynchus lapathi (Curculionidae)"

Eugene Hannon, N.T. Kittelson, J. J. Brown, Washington State University, USA

Division 8: Poster #521: "Soil biodiversity and nutrient turnover in different forest types of Central Europe"

Sophie Zechmeister-Boltenstern, M. Pfeffer; Forest Research Centre; A.Bruckner, University of Life Sciences; W. Foissner, University of Salzburg; E. Hackl, A. Sessitsch, Austrian Research Centres; N. Milasowszky, W. Waitzbauer, University of Vienna, Austria

Task Force – The Role of Forests in Carbon Cycles, Sequestration and Storage: Poster #210: "Spring phenology of Norway spruce (*Picea abies* (L.) Karst.) at ambient and elevated [CO2] and temperature"

Michelle Slaney, Swedish University of Agricultural Sciences, Sweden; J. Medhurst, CRC/CSIRO Forestry, Australia; S. Linder, Swedish University of Agricultural Sciences, Sweden; G. Wallin, Goteborg University, Sweden

Presentation of Honorary Membership

The President presentated Honorary Membership of IUFRO to three outstanding supporters of the Union,

Jeffery Burley, Immediate Past President

Heinrich Schmutzenhofer, former Executive Secretary

Les Whitmore, former Vice-President Administration.

Address by Professor Don Koo Lee, IUFRO President elect

Professor Risto Seppala, President of the IUFRO, Prof. Jeff Burley, Immediate Past President of the IUFRO, IUFRO International Council members, Enlarged Board members, Dr. Hosny El-Lakany, Assistant Director General of FAO, Dr. Gary Bacon, Chair of the COC, Distinguished participants, Friends, Ladies and Gentlemen: Good afternoon! We have come to the end of a very fruitful XXII IUFRO World Congress being held in the beautiful city of Brisbane in the Smart State of Queensland, Australia.

It is my great privilege to deliver a short message at this very significant event. As next IUFRO President, I would like to express my deepest appreciation to the IUFRO Board members as well as to the International Council members for their trust and support in me as IUFRO President for the next five years. Serving IUFRO as President is a privilege and a great honor for me. At the same time I am fully aware of the challenges that are to be met in this prestigious function.

IUFRO, as you all are aware of, is a unique non-governmental organization with 113 years of history. One of its most important characteristics is the independent networking for global science cooperation for the benefit of forests and people. It is due to your efforts that IUFRO is so special and at the same time successful – as IUFRO's President elect I would already now express my deep appreciation for your commitment.

We all share a common research interest for forests and trees. However, we have a variety of approaches and research interests connected to that. We are also facing various problems such as poverty issues and environmental degradation which includes water and air pollution, desertification, forest fire, illegal logging, unemployment, unbalanced jobs or work opportunities in terms of gender. There are even more severe issues we are confronted with such as war, terrorism, tsunami, landslides, and floods. While IUFRO will not be able to solve all of these problems we can strive towards providing scientifically sound information for tackling them.

Ladies and Gentlemen, IUFRO family!

The 21st Century is known for having a knowledge-based society with unlimited competition. However, more than two-thirds of the people, particularly in developing countries have not benefited from the richness of information and knowledge existing worldwide. Nevertheless, IUFRO is striving to bridge this information gap and provide access to forest-related information through the Global Forest Information Service, GFIS.

Please allow me in this context to draw your attention to the important partnership between developing and developed countries as well as scientists and policy makers, which can be established and strengthened through the IUFRO network. In addition, collaboration and partnership with FAO, CIFOR, ITTO, CATIE, IUCN, WWF, IFSA, World Bank and many other organizations are an important aspect of IUFRO's networking activities.

Ladies and gentlemen, Family of the IUFRO!

This Century is called the "Speedy Era". We live in an era of paradigm change in the way people view, understand, and value the natural world. In this Century, technology advances much faster than scientific knowledge. The importance of adaptation to the changing environment has been mentioned already by Charles Darwin. He concluded in his book "The Origin of Species" that only species being adapted well to the changing environment could survive continuously from generation to generation, not depending upon its strength or talent. If species survival depends upon its strength or power, why have dinosaurs disappeared? We cannot stop change, but we can aim at finding adequate responses to change or even be an active part of change. If the letter "G" in the word CHANGE is replaced by the letter "C", then it becomes CHANCE.

My personal plans for the coming 5 years, are to work towards expanding the membership base of IUFRO, harnessing IUFRO's strengths, alleviating its weaknesses and to increase the partnership with other organizations as well as providing scientific information to policy and decision makers and stakeholders. The IUFRO Strategy 2006-2010 will provide a very important guidance in this respect.

Ladies and gentlemen, Family of the IUFRO!

I would like to assure you that I am highly committed to meeting the obligations and challenges I will face in the next five years. But I am very fortunate to have excellent persons

to work with me in the future to meet these challenges: They are the IUFRO Vice-Presidents elect, Prof. Niels Koch and Prof. John Innes, as well as the competent IUFRO Secretariat led by Dr. Peter Mayer as well as a series of excellent officeholders including Enlarged Board members and Task Force Coordinators.

During the period 2006 – 2010, I am going to implement the 5 I's: those are Inform, Involve, Ignite, Invite and Influence:

1) I am going to *inform* you about latest news.
2) I am going to *involve* you in activities related to IUFRO.
3) I am going to *ignite* your interest to join in the activities provided by IUFRO.
4) I am going to *invite* you all to meetings.
5) I am going to work toward increasing IUFRO's *influence* by providing scientific information to various bodies and organizations.

Young scientists and young foresters!

Please be ambitious to succeed what you are doing now and what you are going to do. Please be proactive to global issues such as climate change, forestry issues, diversity, sustainable development, etc. You are our hope of the IUFRO in this Century. It is one of my goals to support your endeavors through the networking possibilities of IUFRO.

Ladies and Gentlemen, IUFRO family!

Before I close my message, I would like to express my sincere appreciation to Prof. Risto Seppälä, IUFRO President for his tireless dedication and effort to the development of IUFRO, his remarkable accomplishments of various activities done under his great leadership during the last 5 years. May I ask you to join me in applauding him for his excellent job done? My special thanks are also given to Dr. Gary Bacon, COC Chair including all his staff as well as Dr. John Innes, Chair of the CSC and all of the contributors for this great success of the 22nd IUFRO World Congress.

In concluding let me remind ourselves that IUFRO is all of us. It is not only mine but also yours. I therefore look forward to your continued support to this marvelous organization.

Thank you so much for your attention and support. God bless you all.

Presentation of the new IUFRO Board 2006-2010

The President welcomed and introduced the new Board elect to this plenary session of delegates.

President
Don Koo Lee, Korea

VP Science
Niels Elers Koch, Denmark

VP Policy
John Innes, Canada

Immediate Past President
Risto Seppälä, Finland

Executive Director
Peter Mayer, Austria

Finance Officer
Clark S. Binkley, United States

Coordinator Division 1
Björn Hånell, Sweden

Coordinator Division 2
Bailian Li, USA

Coordinator Division 3
Hans R. Heinimann, Switzerland

Coordinator Division 4
Margarida Tome, Portugal

Coordinator Division 5
Cathy T. Wang, China

Coordinator Division 6
Perry Brown, USA

Coordinator Division 7
Mike Wingfield, South Africa

Coordinator Division 8
Alexander Mosseler, Canada

General Board Members
Vitor Höflich, Brazil
Mohammed Ellatifi, Morocco
Roberto Ipinza, Chile
Su See Lee, Malaysia
Tohru Nakashizuka, Japan
Piotr Paschalis-Jakubowicz, Poland
Liu B. Shirong, China
Heinrich Spiecker, Germany
Victor K. Teplyakov, Russia

Address by Dr Seung-Jin SUH, Director General, Korea Forest Research Institute as the Host Country of 2010 IUFRO Congress

Your Excellencies,
Distinguished Member of the Council and Board,
All Delegates of IUFRO, Colleagues and Friends,
Ladies and Gentlemen,

Today I have an honour and great privilege on behalf of Korean Government and Korean people to welcome forest researchers from all over the world to the 23rd IUFRO World Congress in 2010 in Seoul.

Korea has a variety of forest types from warm-temperate to alpine forests, and distinctive four seasons which afford beautiful scenery. Korea has a long history of its people living in close relationship with forests. Wise management of forest has been the most important agenda of every dynasty through 5 thousand-year history. In the management of these forests, we face challenges similar to those faced internationally and highlighted at this Congress.

Korea has a strong commitment to use forest resources in a sustainable way based on the scientific knowledge for the benefit of current and future generations. We fully understand that forest research lead us to the resolution of the challenges that we are facing today. We have been a strong supporter of the IUFRO by recognition of its objective as we have committed.

Dear Australian Colleague,

Indeed you have organized the most excellent and successful Congress. You also give us a very high standard to match with Seoul in 2010. I would like to deliver my most sincere congratulation to you on behalf of the delegates.

Ladies and gentlemen,

We are very pleased to show our hospitality to all of you in 2010 in Seoul, and to return the hospitality given to us here in Brisbane. We also look forward to linking with the broader international IUFRO community in organizing the 23rd IUFRO Congress, and to carrying the IUFRO flag for the next five years. In particular, we look forward to seeing all of you in Seoul in 2010.

I thank you very much.

Korean Performers

Closing Address by Professor Risto Seppälä, President IUFRO

Dear colleagues,
Ladies and gentlemen

I see that many people in this room are looking at their watches. Yes, I know that I am between you and the Farewell Gala Event. Therefore, I try to follow an old speaker's instruction. It has three parts. First, stand up so that everybody can see you. Second, speak up so that everybody can hear you. And finally: step down quickly so everybody will like you. I want you to like me.

All good things must come to an end, and the 22nd IUFRO World Congress has now come to an end. Although many of us have had long busy days and are looking forward to getting back home, I am sure that we all feel sadness at leaving this lovely city of Brisbane and the old and new friends we have met here.

In my opening speech on Monday I said that I save my final thanks to this last day of the Congress when we have seen how this event has been handled. It would not have been premature at all to thank many people already on Monday as the Congress arrangements have been truly exemplary. But even more important than smoothly running technical arrangements is the atmosphere that has surrounded us during the week. This Aussie spirit has been created by the friendly and smiling faces and relaxed attitude of our Australian hosts. The ongoing week will remain in our memories as an incredibly enjoyable experience.

It is not possible in this short speech to thank all individuals and organizations that have contributed to the success of this Congress. On behalf of all participants I will therefore thank collectively the Queensland State, the Australian Federal Government Agencies and numerous corporate sponsors for the financial and material support. However, our special thanks at this farewell moment go to Gary Bacon and his Congress Organizing Committee as well as all people who have worked with them during this week and in preparing the Congress. They have done a marvellous job.

I would like to put on record our special gratitude to John Innes and the Congress Scientific Committee for creating an excellent Congress programme. Finally, I wish to thank the IUFRO Secretariat for carrying out the huge range of activities related to the IUFRO structure.

Now I invite you all here to show our appreciation in the usual way by giving resounding applause.

I wish you all safe onward journeys. See you in Seoul in five years time. I declare the 22nd IUFRO World Congress closed.

IUFRO Flag handover

Let the Gala begin

Scientist Assistance Program

The Scientist Assistance Program (SAP) is designed to offer delegates from developing countries financial assistance to participate in the IUFRO world Congress. In selecting applicants to receive financial assistance, the selection committee gave preference to young scientists who had a good recent record of scientific achievement, were active members of the IUFRO Units, and were contributing to the Congress by presenting a paper/poster or making a critical input to its organisation. Female scientists received special consideration for support.

Applicants were ranked on scores according to the following published criteria:

Gender	Female	30
	Male	10
Age	45 and below	30
	46 – 57 years	10
Achievements since Kuala Lumpur 2000 Congress	Journal Paper published	20
	Conference paper or other publication	10
	No publication	0
IUFRO Congress 2005 Paper Accepted	Voluntary paper or poster	30
	No Paper	0
IUFRO Activity	Officeholder	20
	Active in a IUFRO Unit	10
	Employed with an IUFRO Member Organisation	5
	None of the above	0

We thank the following donor organisation for providing financial support to the Scientist Assistance Program:

- Swiss Agency for Development & Cooperation (SDC)
- Belgian Minister of Development Cooperation
- Ministry of Foreign Affairs of Finland
- AusAID
- IUFRO (SAP)

Successful recipients of SAP received financial assistance to fund travel expenses, accommodation, per diem and complimentary registration to attend the Congress.

A total of 324 applications were received, of which a total of 62 delegates were offered full funding and 3 delegates offered partial funding to attend the 2005 Congress in Brisbane. An additional 20 SAP applicants were offered complimentary registrations to assist with minimising costs associated with attending this event. The delegates supported through SAP represented 35 countries. Over 60% of SAPers were women.

Tours

In-Congress Tours

On Thursday 11th August, approximately 1400 delegates enjoyed a sunny day out in south east Queensland, when 34 separate tours made their way from the Brisbane Convention and Exhibition Centre to various forestry related sites.

Delegates had pre-selected their tour of choice from a matrix provided at the Registration desk during the first three days of Congress.

The tour deployment system worked like clock work, with the adjoining great halls in the Centre converted overnight into a gigantic bus depot to allow for up to 7 coaches to depart every 15 minutes. The only minor issue was one coach that decided to make its way to the first tour site without any passengers!

The tours contained a variety of themes, including plantation production, forest conservation and recreation, research and industry so there was something to suit every taste. Those tours including a forest recreation component proved to be immensely popular with many international delegates keen to experience some of the natural forest types in and around Brisbane and to come up close and personal with the local wildlife.

The majority of tours visited approximately 3 different sites throughout the 7-9 hour day. The tours travelled as far south as Beaudesert, west to Yarraman and north to Imbil.

The tours were met with tremendous enthusiasm and support from local forest-based organisations and interest groups, with the following spread of tour sites across various organisations:

Organisation	Number of sites
Department Primary Industries and Fisheries	16
Environment Protection Agency including Queensland Parks and Wildlife Service	11
City Councils (including Brisbane, Redlands and Sunshine Coast)	15
Industry	12
Private	5
University	3
Total	**62**

Tour highlights

- DPI Forestry's clonal pine plantations and plantation nursery at Beerburrum
- The Indigenous Officer's presentation at Boondall Wetlands
- Wildlife spotting on numerous tours
- Ferry trip up the Pumicestone Passage (spotting dugongs and dolphins)
- Guided tours around Mt Coot-tha gardens and Mary Cairncross Park
- Recycled timber products at Kennedy's Timbers
- Experiencing the natural forests in and around Brisbane

Personnel assisting with the tour day included 34 tour guides, 10 IUFRO volunteers located at various sites, plus around 100 site speakers. DPI Forestry also had emergency support located at strategic locations across south-east Queensland throughout the day (thankfully not required).

ICT Bus

Post-Congress Tours

General Travel Australia Ltd. was appointed as the commercial tour operator. The general objective was to showcase research and forest management in each locality and provide for visits to a mix of technical and tourist highlights to meet the interests of a diverse variety of forest science interests and non-scientific accompanying persons.

Eleven tours were developed and presented for initial advertisement in the Congress Information Package. Contacts were enlisted in each locality to scope itineraries for technical activities and other local highlights. General Travel assessed accommodation and transport arrangements and provided indicative costings.

1. Far North Queensland (7 days)
2. Papua New Guinea
3. South East Queensland
   - 4 day option
   - 6 day option
4. Northern New South Wales (6 days)
5. Southern New South Wales / Australian Capital Territory (6 days)
6. Tasmania (6 day tour)
7. Victorian West Coast and Green Triangle South Australia (7 days)
8. Western Australia (7 days)
9. New Zealand (7 days)
10. New Caledonia (7 days)

Based on expressions of interest registered through the Congress web-site, eight tours were offered in the registration package. Western Australia, South East Queensland and NSW tours were dropped due to lower levels of interest. The 'Land of Contrasts' tour was included. This was a standard General Travel tour product with no technical content taking in the Barrier Reef, Uluru and Sydney. Firm itineraries and costings were established for registration.

All post-congress tour registrations and payments were handled independently through General Travel Australia's website. A nominal minimum number of 15 participants was set to ensure that each tour would be commercially viable and to justify the time investment for local technical support and a guide. Registrations were reviewed in early May 2005. Based on registrations, it was decided not to proceed with the Papua New Guinea and Victorian tours. Numbers were below the initial minimum for Tasmania and New Caledonia but a decision was made to proceed with these were after discussion with General Travel and local contacts.

Five tours proceeded with 126 participants (see table below). Numbers on tours were limited to one bus load for logistical and comfort reasons. The tour to Tropical North Queensland filled rapidly, with many more delegates interested than could be accommodated. Some delegates took up places on another tour. About 30 participants registered for tours in the last two months before the Congress, with a few registering during the week of the Congress. Due to the lower participation on the New Caledonia tour, a more limited technical program was offered than originally planned. Participants were still very satisfied with the arrangements on this tour.

Location	Participants
Tropical North Queensland	45
Tasmania	17
New Zealand	33
New Caledonia	9
Land of Contrasts	22

General Comments

There was very positive feedback from participants and hosts for each tour. Participants enjoyed a wide variety of experiences and there were no apparent logistical problems. The success of the tours was due to no small measure to the commitment and talents of the local leaders and guides.

Specific details for each location

Tropical North Queensland

Duration: 6 days

Tour Leader: Mr Errol Wiles

Local organiser: Mr Geoff Dickenson, Queensland Department of Primary Industries

Participants: 45

Activities:

This tour, to one of the most diverse and beautiful parts of Australia, included Aboriginal culture, the Skyrail rainforest cableway, Daintree National Park and the beautiful Atherton Tablelands. Technical aspects included coastal and upland rainforest research, conservation and rehabilitation, management of native conifer, exotic conifer, eucalypt and mixed rainforest plantations and Tolga Woodworks - a locally owned business producing high-quality furniture and craft products from Australian native timbers.

Tasmania

Tour Leader: Mr Ken Felton, retired forester

Local organiser: Mr John Hickey, Forestry Tasmania

Participants: from 11 countries

Activities:

Tour started in Hobart at the southern tip of the island and ended in Launceston in the north. Highlights included the Tahune Forest "Air Walk through some of the world's tallest hardwood forest, value adding to regrowth eucalypt forests and the Warra Long Term Ecological Research site, the historic penal settlement at Port Arthur, spectacular Freycinet National Park, the Cradle Mountain National Park World Heritage Area and Cataract Gorge in the heart of Launceston. Technical content included plantation and native forest management and forest processing facilities.

New Zealand

Tour Leader: Mr Jeff Tombleson

Local organiser: Dr Mike Menzies

Participants: 33 people

Activities:

The tour provided participants with an overview of both indigenous and exotic forests in New Zealand, with visits based in the central North Island. Participants visited Pureora Forest, a magnificent indigenous forest dominated by one thousand-year-old podocarp trees. They also visited Kaingaroa Forest, New Zealand's largest radiata pine plantation (170,000 ha), and Tarawera and Kinleith Forests to see exotic forestry operations. Other forestry visits included Gill & Geoff Brann's award-winning agroforestry property, Kinleith pulp mill, and also received an overview of Scion (Forest Research) by CEO, Dr Tom Richardson. Social events included lunch at a local winery, Waitomo caves, and tourist activities around Rotorua. A highlight was the Te Puia geothermal geysers, boiling mud pools and steam vents and a traditional Maori hangi dinner and concert.

New Caledonia

Tour Leader: Agence Arc-en-Ciel

Local organiser: Jaques Tassin, Thierry Menneson, IAC

Participants: 9

Activities:

Ecological studies, dry forest restoration, deer damage evaluation and native fauna. Soil conservation, limonite waste dumps, preservation of sites of high biodiversity, rehabilitation of "maquis" vegetation on mining sites and a visit to 'Pine Island'.

Trade Exhibition

Following the distribution of an Invitation to Exhibit brochure some 47 exhibitors presented in 67 booths at the trade exhibition held within Exhibition Hall 1, BCEC for the first three days of the Congress. The Welcome Reception and all lunches, morning and afternoon teas were held in the hall, maximising networking opportunities.

The following trade exhibitors participated at the Congress.

Altmann & Cherny; Australia Post; Australian Government Department of Agriculture, Fisheries and Forestry; Ben Meadows Company; CABI Publishing; CIFOR; CRC-Forestry; CRC Wood Innovations/Bushfire CRC; Decagon Devices Inc.; Department of Sustainability and Environment; DPI Forestry; Elsevier; Ensis; ESRI; European Forest Institute (EFI); Faculty of Forest Sciences, SLU; Forest Products Commission; Forestry Bureau COA; Forestry Tasmania

and Private Forests Tasmania; Forestry South Australia; Forests NSW; Haglof Sweden AB; ICT International Pty Ltd; Institute of Forest Ecosystem Research, Ltd.; Integrated Tree Cropping Ltd; International Centre for Research in Agroforestry; International Network For Bamboo & Rattan (INBAR); International Tropical Timber Organization; Joint Venture Agroforestry Program C/- RIRDC; Korea Forest Research Institute; Metla / Finnish Society Of Forest Science; National Association Of Forest Industries (NAFI); Natural Resources Canada; Nordic Forest Research Cooperation Committee (SNS); Paragon Furniture; Prospectors Earth Sciences; Department of Primary Industries and Fisheries; Regent Instruments Inc.; Relaskop Technik; Springer / DA; The University of British Columbia; Timber Queensland; University of Melbourne; USDA Forest Service; Weyerhaeuser Company; World Agroforestry Centre; WWF International.

Press and Publicity

Situational analysis and background

To ensure that media and communications were given priority during the XXII IUFRO World Congress, a dedicated Senior Media Officer was committed to the project March 2005 through August 2005.

This was the first time an IUFRO World Congress had been held in the Southern Hemisphere and although this in itself created newsworthiness, it also highlighted some communications challenges.

Forestry is not high on the Australia's media's agenda. In Queensland there is one daily metropolitan newspaper distributed throughout the State, four television channels and one key public radio provider, limiting the local opportunities to publish news.

In a bid to maximise media opportunities a comprehensive media strategy was prepared.

Media Passes

In consultation with the IUFRO Secretariat a number of key international media were approached to attend Congress. Complimentary media registration was available for 10 full-time media. Seven registrations were provided with media from Australia, France, Indonesia, Germany and Argentina in attendance.

A dedicated media room was established which included two computers with internet access, a photocopier and fax machine. Media Packs were a useful reference for journalists, as well as the book of congress abstracts, of which many media requested a copy.

Proactive Media Relations

A range of tactics were employed to gain media coverage including targeted media releases and the establishment of ongoing relationships with journalists. More than 26 media releases and 15 media alerts were distributed in the lead up to, and during the congress week. A number of feature articles were written and successfully pitched to trade/industry publications.

Media Coverage Achieved

In Australia, the COC are aware of more than 30 articles about the IUFRO World Congress printed. Industry/trade magazines ran significant feature articles in the lead up to and during the world congress – which ensured key messages were received by the desired target audience.

The key interest for journalists was keynote speakers. Regional and local suburban newspapers were especially interested in pre-congress training and in-congress tours.

The Wollemi Pine tree-planting ceremony, pre-congress training and congress tours were of interest to television stations, with three television stories during the congress.

Radio was also a strong ambassador, with support from Australia's national broadcaster, the ABC. There were seven significant key radio interviews during the congress period, including interviews with keynote speakers and the President of IUFRO. Interviews were aired locally and nationally on leading programs including the ABC's Bush Telegraph.

The Senior Media Officer was responsible for coordinating international media and distribution of these media releases occurred via email. It is difficult to capture information about the international penetration however the COC has collected numerous media articles and news-alerts from countries including Argentina, Canada, France, Germany, Indonesia, New Zealand, Russia and USA. Significant coverage was also achieved with online international media and forestry e-newsletters.

Daily Newsletter

The daily newsletter, *Congress News*, was a very successful communications initiative which received strong feedback from delegates.

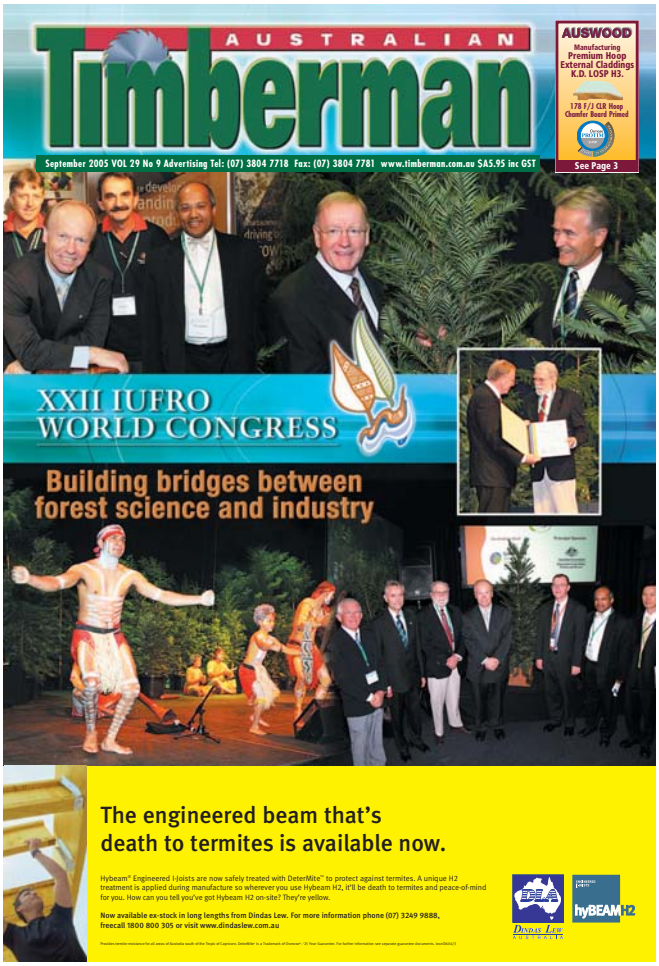
The four-page, full-colour newsletter included profiles on keynote speakers, articles and photos of events from the previous day and stories from key congress sponsors. Delegates responded positively to the publication, and took ownership by submitting their own news items, announcements and photos. The graphic design and overnight printing of the newsletter was outsourced.

Photography

A photographer was present most days of the IUFRO Congress. The photos were used in the daily newsletter and in the closing ceremony 'congress highlights' presentation. Photos were also accessed by local and international journalists for their own publications. A CD of congress photos was collated and has been presented to IUFRO.

Crisis and issues management

A crisis and issues management strategy was prepared in the lead up to the congress. Fortunately no implementation strategies were called for.



Congress Facilities

The Brisbane Convention & Exhibition Centre (BCEC) located in South Brisbane and adjacent to the Southbank Parklands was selected as the Congress venue to accommodate 2000 delegate plenaries, permit up to 20 concurrent sessions, and maximum interaction and networking opportunities under the one roof. Professional Conference Organisers (OzAccom Conference Services) were appointed and in addition a Technical Director to manage all the audiovisual requirements of the Congress. A dedicated speaker preparation room was setup. Internet facilities were provided free of charge to delegates to access the internet and the Eforum thereby allowing delegates the opportunity to provide real time comments on sessions, poster presentations and IUFRO strategy document. Over 150 volunteers from Government agencies, students IFSS and members of the Institute of Foresters of Australia participated as Volunteers during the Congress week and greatly contributed to the hospitality shown to all delegates.

Special Events

Tree Planting Ceremony Program

Sunday 7 August 2005

Rainforest Green, Southbank Parklands

MC – Stephen Walker, Queensland Departmentt of Primary Industries, Forestry

Welcome by Professor Risto Seppälä, IUFRO President

Entertainment by Yuggera Aboriginal Dance Troupe (children performers)

Presentation by student representatives from Aboriginal and Torres Strait Islander Independent School on "What trees mean to us"

Planting of Trees by IUFRO President, the IUFRO Vice-Presidents, Chair CSC, Chairman Southbank Corporation - jointly planted with students

Address by Mr Jim Varghese, Director-General, Department of Primary Industries & Fisheries

Unveiling of *Wollemia nobilis* (Wollemi Pine) as a gift to the people of Brisbane

Presentation by student representatives from the Aboriginal and Torres Strait Islander Independent School

What Trees Mean to Me

Trees mean a lot to me. My ancestors used trees for many reasons. We used tress for tools to help us gather food. We used trees for shelter; we used trees for weapons and for food and medicine. We used trees to help us cook and keep us warm. We also used trees for building transport like canoes.

Today we still need trees for some of the same reasons. Without trees we would not be able to build houses, schools or shops.

Without trees we would not be able to build houses, schools or shops, without trees we would not have been able to build boats to transport people and resources. We need trees for such things as paper and fuel. And many of the most important medicines of the world come from trees. If it was not for trees we may no have life saving medicines. Without trees we might not have known about such delicious foods as nuts and fruits. We would also miss out on things such as keeping warm from the wood fireplace in our lounge rooms.

Not only are trees important for providing us with food and shelter, they also make our environment look better.

Imagine no trees in the park to sit under and have lunch or to climb.

Imagine no trees in your yard to build a swing from. Things would look very bare and boring and there would be no birds or other animals around. You would not be able to hear birds singing.

Besides being beautiful and providing homes for animals, trees also help our environment. Trees help to clean the air that we breathe by fighting green house gas emissions and protecting the ozone layer. Trees also help soil erosion around riverbanks.

Without trees our creeks and rivers would be more polluted by soil erosion.

Most people do not realise the importance trees have in our lives. We take them for granted.

To me trees mean a lot

Trees mean we have shelter, comfort, warmth, medicine, and food.

Without trees we would have a very sad, unhealthy, boring world

Thank you.

I have written a poem about trees.

T – T is for trees and the tools and shelter my ancestors were able to use.

R – R is for the rivers and banks that trees support so that soil erosion does not happen.

E – E is for the environment, that trees help to keep healthy and clean.

E – E is for emissions, green house gas emissions that trees help to fight.

S – S is for saving, we must all do our best to save the trees so that we can keep our environment clean and so that our native animals can continue to survive.

TREES, trees mean we keep our world green and clean!

Thank you.

Address by Mr Jim Varghese, Director General, Queensland Department of Primary Industries and Fisheries.

Professor Risto Seppälä, President of IUFRO

Members of the IUFRO International Council and Board

Malcom Snow, CEO Southbank Corporation

Invited guests

I would like to acknowledge the traditional custodians of the land on which this ceremony is taking place today.

Today, to mark the start of the International Union of Forest Research Organizations World Congress in Brisbane, we will give the people of this city one of the most precious botanical gifts.

This gift is the Wollemi Pine – a species thought to have been extinct since the Jurassic era – 200 million years ago when dinosaurs roamed the Earth. Then a decade ago a bushwalker made the amazing discovery of a small number of Wollemi Pine in a deep gorge in the remote Wollemi National Park north-west of Sydney. Once this incredible discovery was made steps were taken to ensure that the Wollemi Pine was brought back from the brink of extinction. To ensure the tree's survival, Sydney's Royal Botanical Gardens and Domain Trust decided the tree needed to be conserved through propagation.

To do this, they looked to the Queensland Department of Primary Industries and Fisheries' commercial forestry organisation, DPI Forestry. DPI Forestry has more than 80 years' research expertise in propagating the Wollemi Pine's cousin – the successful commercial Araucaria tree species.

For six years our scientists, together with other Australian and international collaborators, have worked on propagating Australia's Wollemi Pine for worldwide distribution and the species' survival.

DPI Forestry and Brisbane's Birkdale Nursery have formed a joint-venture company Wollemi Australia which will market the Wollemi Pines around the world.

Ladies and gentlemen, it is thanks to innovative research and development - part of Queensland's Smart State focus - that the Wollemi Pine has survived, and is planted safely at South Bank Parklands alive and thriving today.

We heard here today the students from the Aboriginal and Torres Straight Islander Independent School answer the question - what do trees means to them?

I believe this tree - the Wollemi Pine – is a powerful example of this State's 'innovation' and 'smart science'.

Already it has put Queensland's scientists and researchers on the world stage, with the Wollemi Pine stealing the show at Japan's recent Pacific Flora and World Expo, the Chelsea International Flower Show and at Kew Gardens in London.

So it is fitting that we unveil this tree to welcome the world's best forestry scientists, processors and growers to Brisbane for the 22nd IUFRO World Congress, of which the Department of Primary Industries and Fisheries is the Australian host.

As Professor Seppälä outlined earlier, the IUFRO Congress provides a once-every-five-year opportunity for people to meet and share the latest in research and learning about global scientific innovations in forestry.

This is the first time an IUFRO Congress has been held in the Southern Hemisphere, and during the next week the innovative and exciting work of our Queensland's leading forestry scientists and researchers will again be on the world stage. Not only for our State's achievements in saving the Wollemi Pine, but also for the myriad of innovative work that we are undertaking in a range of forestry research every day.

Innovative forest science and research is critical for the sustainable management of Australia's diverse forest ecosystems and the State of Queensland and this department is committed to growing on this firm foundation of forestry research and development.

There's no doubt that the one of these scientific innovations - the successful survival of the Wollemi Pine has captured the hearts and minds of people around the world, not only scientists.

Our Queensland researchers and scientists are making giant 'dinosaur-sized' leaps and bounds every day, and the community not only need to *know* about the great

work that's happening, but they also want to share in these achievements.

Until the Wollemi Pine is commercially available from October this year, this will be the only Wollemi Pine available for public viewing in Queensland, and South Bank Parklands is the place to see it.

Ladies and gentlemen, it is with great pleasure I unveil this Wollemi Pine today for the people of Queensland.

Russell Haines initiator of the Australian bid, Gary Bacon Chair Congress Organising Committee and John Innes Chair Congress Scientific Committee

Native Tree Stamps

A set of 5 x 50cents Australian native tree stamps were issued by Australia Post on 8 August 2005 to coincide with the opening of the 22nd IUFRO World Congress. A range of philatelic items based on the new definitive series, including a special cancellation/franking depicting the Congress logo were available immediately after the opening ceremony from the Australia Post booth in the adjacent Exhibition Hall.

The stamps feature iconic Australian trees found in different habitats in different parts of the country.

Snow gum (*Eucalyptus pauciflora*)

The snow gum grows in the highest and coldest parts of southern Australia, along the tablelands in New South Wales, in the Snowy Mountains, through Victoria to Tasmania. Generally a small to medium sized spreading tree, the Snow Gum usually has a crooked trunk and spreading crown with distinctive beautiful smooth green, grey and cream bark. The bark changes to the vibrant colours of red, green, pink and orange when wet with rain or snow. The leaves are glossy, thick and waxy. The Snow Gum, although called "*pauciflora*" meaning few flowers, in fact flowers quite profusely and frequently with white blooms from October to January. A very long-lived species, it is also very slow growing. It can withstand snow and ice but is able to grow in diverse areas and is easily cultivated from seed. It can be used for windbreaks, shade, fence posts, fuel, honey and its leaf oil for medicinal purposes.

Wollemi Pine (*Wollemia nobilis*)

One of the world's oldest and rarest tree species, the Wollemi Pine was known only from fossil relatives until discovered in the Blue Mountains near Sydney in 1994. Dubbed "the botanical find of the century", akin to finding a living dinosaur, extensive research is now underway in order to conserve this ancient species. Less than 100 mature trees exist in the wild. Wollemi Pines are members of the ancient Araucariaceae family, that also includes Hoop, Kauri and Monkey Puzzle pines. These are trees of the southern hemisphere. Ancient pollen samples show that relatives of these araucarians dominated the forests of the southern hemisphere for more than 100 million years. Dramatic changes to the world's climate about 2 million years ago led to their demise. Wollemi Pine is being propagated for commercial release in 2005. Royalties from the sale of the trees will go to the Royal Botanic Gardens Sydney to fund conservation efforts.

Boab (*Adansonia gregorii*)

The Australian Boab is indigenous to the Kimberley region of northern Western Australia, where its distinctive shape has become symbolic of the region. Related to the Baobab tree of Africa, it is a large spreading deciduous tree up to 15 metres high with branches that radiate from the top of the trunk and deeply divided bright green glossy leaves. The barrel shaped trunk, with its smooth grey-brown bark, can grow to 20 metres in circumference. The tree flowers with large fragrant white blooms just before the wet season. The fruit are small to large melon-like spongy gourds containing many kidney-shaped seeds. Aboriginal people carve Boab "nuts" as decorative ornaments and have traditionally used parts of the tree for food, medicine, water supply, fibre, glue and shelter.

Karri (*Eucalyptus diversicolor*)

In the south-west of Western Australia fine forests of towering gum trees, known by their Aboriginal name Karri trees, once dominated the area. Many of the forests were cleared for farms but significant karri forests remain in conservation and forest reserves. The great trees became the building materials for cities and the timber was exported for construction and mining purposes. The botanical name, Eucalyptus diversicolor, refers to the contrast in leaf colour. With delicately marbled trunks, the graceful karris can grow to enormous heights,

up 75 metres, the tallest trees in Western Australia. It is also one of the most important timbers - red, hard, heavy, tough and moderately durable, it is used for general construction, shipbuilding, flooring, telegraph poles.

Moreton Bay Fig (*Ficus macrophylla*)

The Moreton Bay Fig is best-known as a massive tree native to the rainforests of coastal NSW and southern Queensland. It frequently starts life as a strangling vine, if the seed is deposited (often by birds) on the trunk or branches of another tree and germinates there; its roots spread down the trunk of the host tree which will eventually be strangled, the fig then replacing it as a tree in the forest. Moreton Bay Fig grows into a magnificent tree with thick glossy leaves, aromatic red-brown figs,massive buttresses at the foot of its trunk and huge spreading roots. The Moreton Bay Figs have been cultivated extensively in public parks and gardens around the country, where they are valued for their beauty and their extensive shade. The buttresses serve as wonderful playgrounds for children. They form an important food tree for flying foxes and birds. Many of these old giants have achieved iconic status.

IUFRO Stamps First Day Cover

Making the Most of Congress

This very first session of the Congress took place at the Brisbane Convention & Exhibition Centre on Sunday 7 August, 2005, and was aimed at first-timer delegates providing them guidance on how to make the most of the scientific sessions of the Congress, the time in between the sessions, and other congress events. Information was also given on the facilities available at the Congress Centre and "best practices" of exchanging information, making contacts with fellow researchers, and building partnership for research projects through involvement in IUFRO activities. Over 200 participants joined this one-hour session and listened to the various presentations.

After the welcome addresses by Professor Risto Seppälä, IUFRO President, and Dr. Gary Bacon, Chairman of the Congress Organising Committee, Professor John Innes presented the scientific program of the Congress. He explained the purpose of the various sessions and emphasised the importance of other events such as lunch-time speakers, poster sessions and the trade exhibition. Lisa Eastley, the Event Manager of the Congress, introduced the audience to the facilities of the Brisbane Convention & Exhibition Centre. With the help of maps showing the various floors of the congress building key locations such as information desks, the IUFRO booth, the session rooms, the corridors for poster presentations, meeting points and areas for ad-hoc meetings, the information village and other facilities were highlighted. A brief guide on best practices for congress participation was presented by Dr. Michael Kleine, IUFRO-SPDC Coordinator. The guide summarised experiences from previous congresses, particularly on how to maximise the benefits from sessions, how to get in contact with other researchers and how to explore opportunities for cooperation and joint projects. Before Dr. Eric Teissier du Cros, IUFRO Vice-President, closed the session, the speakers answered questions from the audience. The detailed programme of the session is provided below.

Overall, the participants viewed this introductory session as very useful and informative and recommended including this session also in the programme of the next Congress.

Making the Most of Congress Program

Sunday 7 August 2005

Great Hall, Brisbane Convention & Exhibition Centre

Moderator – Dr Michael Kleine, IUFRO SPDC Coordinator

Welcome address by Professor Risto Seppälä, IUFRO President

Welcome address by Dr Gary Bacon, Chair Congress Organising Committee

Scientific Program by Professor John Innes, Chair Congress Scientific Committee

- Structure and objectives of scientific sessions
- Types of sessions eg as plenary, sub-plenary, technical, business meetings
- Other events eg lunch-time speakers, posters, trade exhibition, In congress tours, etc

Congress Facilities Overview by Lisa Eastley, OzAccom Conference Services

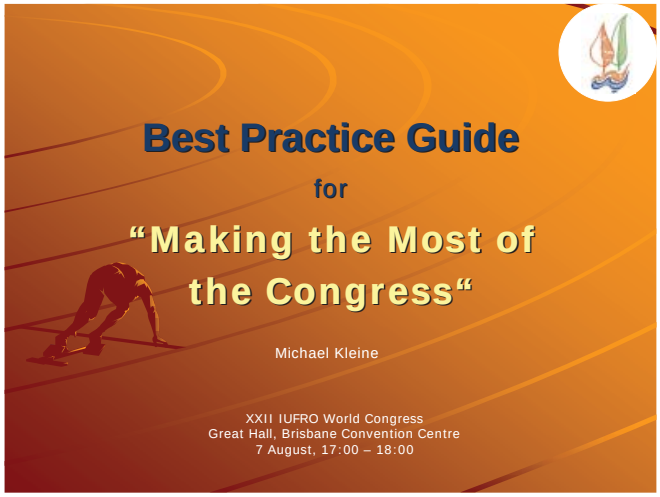
- Congress Centre
- Trade Exhibition
- Areas for gatherings and ad-hoc meetings
- Electronic communication
- Daily Newsletter
- Other Important Information

Delegate's Guide by Dr Michael Kleine, IUFRO SPDC Coordinator

- Organising your individual daily program
- Making yourself known to others
- Getting in contact with fellow researchers
- Exploring possibilities for future cooperation and networking (IUFRO Divisions, Working Parties etc.)
- Pick relevant information

Q&A session

Closing remarks by Dr Eric Teissier du Cros, IUFRO Vice-President (Science)



IUFRO Host Scientific Awardee Presentations

Dr Gary Bacon chaired this lunchtime session on Friday 12 August 2005 at which the two Australian recipients of the inaugural IUFRO Host Scientific Award, Dr E K Sadanandan Nambiar and Dr D Garth Nikles made presentations. Some 135 delegates attended. Dr D Ian Bevege provided the vote of thanks.

Address by Chair - Dr Gary Bacon

Colleagues all

Welcome to this special lunch-time session wherein we will be addressed by two renowned Australian forest scientists.

The IUFRO World Congress Host Scientific Award honours outstanding scientists from the Congress host country who have in the estimation of their peers best elevated the profile of forest science and research accomplishments.

The recipients of this prestigious, inaugural Award, presented by the Australian Minister for Forestry at the opening ceremony last Monday, are regarded as the pre-eminent forest scientists of contemporary times from Australia.

It is my good fortune to chair today's presentation. I have personally known the two awardees over two decades of professional association and take particular delight in their accomplishments. Furthermore the initiative for this award came from the Brisbane Congress organising team of which I am proud to be a member.

Dr D Garth Nikles

In a career in Queensland now spanning over a fulsome *Araucaria cunninghamii* rotation Garth Nikles has established an enviable reputation for his contribution to the international literature relating to forest genetics, tree breeding and reproductive biology, especially of the native hoop pine, the introduced Southern and Caribbean pines, their hybrids and the local native eucalypts.

His passion for professional pursuits and in the mentoring of young scientists is legendary as is his impact on the productivity of large areas of forest plantations in Australia and elsewhere in the tropics.

Garth co-founded the first IUFRO working party focussed completely on the tropics and was awarded an IUFRO Distinguished Services Award in 1996.

Garth will address us on the topic,

Improvement of forest tree plantations using a knowledge of biology and genetic variation – the 60 year Queensland experience.

Dr E K Sadanandan Nambiar

Sadanandan Nambiar is a Chief Research Scientist and Science Director of CSIRO with an outstanding track record of conducting and disseminating multi-disciplinary research on sustainable management of pine and eucalypt plantation forests particularly in stress prone landscapes.

During his distinguished career he has built enduring partnerships with forest industry and land management agencies and contributed to public debates and policy development on forestry.

He is committed to international collaborative research supporting sustainable forestry in developing countries in the tropics. He is a passionate advocate of the potential of man made forests, agroforests and woodlands as land use systems which can foster both economic prosperity and environmental benefits to society.

Sadanandan will address us on the topic,

Forest, People and Poverty Reduction – Are we making a difference?

Host Scientific Award recipients Dr Garth Nikles and Dr Sadanandan Nambiar photographed with Mr Ian Bevege and Dr Gary Bacon

EVOLUTION OF TREE IMPROVEMENT IN QUEENSLAND – 1

1920s – deliberate choice of diverse natural-stand sources & superior individual seed trees for plantations of hoop pine (*Araucaria cunninghamii)*

1930s – provenance trials of hoop pine established
– research-based choice of *Pinus* species made
– plantations started with chosen, N Florida sources

1939 – 'population improvement' began with two *Pinus* species (slash & loblolly pines - Haley 1957)

Presentation by Dr Garth Nikles

IMPROVEMENT OF FOREST TREE PLANTATIONS USING A KNOWLEDGE OF BIOLOGY AND GENETIC VARIATION — THE 60 -YEAR QUEENSLAND EXPERIENCE

D. Garth Nikles, 12 August 2005

Queensland Government
Department of Primary Industries and Fisheries

EVOLUTION OF TREE IMPROVEMENT IN QUEENSLAND – 2

1940s – open-, control- & self-pollinated progeny tests of slash & loblolly pines were planted, but work was retarded by WW2 until the late '40s

1950s – third-generation slash pine planted 1955 (200 ha)
– intensive within-species breeding began
– studies of inter-specific hybridisation began

1960s onwards
– incremental sophistication was incorporated so that leading-edge programs are now in place with species & hybrids within 3 genera of native & introduced pines & certain hardwoods

ACKNOWLEDGEMENTS

Tribute is paid to EHF Swain, VA Grenning and AR Trist, successive, early leaders of State forestry in Queensland, for their vision and drive. They established a culture of research-based forest management and inspired many staff.

As well, many Directors, Managers, Research Foresters; numerous collaborators including Biometricians, Wood Technologists, Entomologists, Pathologists, Soil Scientists, Librarians; our Technicians, Overseers, Skilled Labourers and Administrators have made important contributions to the 60-year plus program overviewed here.

I thank Dr Susan House for editorial assistance with an earlier, large document from which some of the present material is derived. I am pleased to thank Marcia Tommerup for scanning old photographs in the Forestry collection, and Dr Kerrie Catchpoole for fine tuning the format of this presentation.

The support of my family, and the influences of my teachers, have been fundamental to any contribution I am privileged to be making to forest tree improvement.

BRIEF OVERVIEW OF HOOP PINE BREEDING - 1

1930s - Provenance research began

1940s - Initial studies of biology & some breeding undertaken

1950s - Intensive tree improvement began

1960s - The first clonal seed orchard was established
- The first, large , control-pollinated progeny trial was planted
- All seed-orchard-candidate trees screened for wood properties

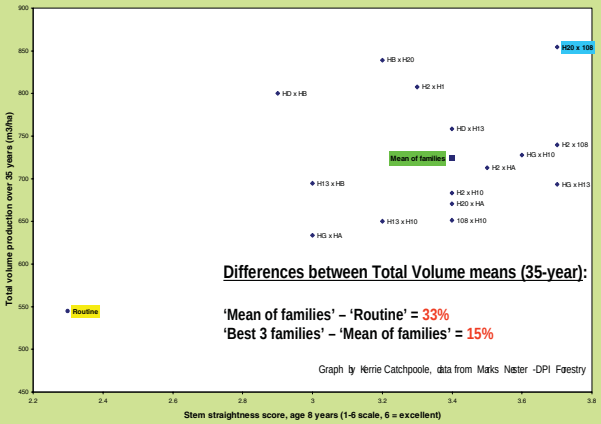
A second-generation "plus tree" of hoop pine aged 38 years in a control-pollinated progeny trial planted near Imbil in south-east Queensland.

Photo by J. Brawner.

THE COMPLEX BIOLOGY OF HOOP PINE GAVE RESEARCH CHALLENGES & OPPORTUNITIES

- Seedling trees do not produce pollen until > 20 y old
- Crops of seed with high viability occur at intervals of 2-10 y
- The fixed bud systems result in orthropy & plagiotropy:
  - Hence grafts from lateral shoots give trees with branch habit
  - How to obtain grafts with orthotropic habit was not discovered until 1959
  - A need to establish grafts of both types in clonal seed orchards (CSOs) was not realised until the late 1960s
- The multiplication rate in vegetative propagation is low due to strong apical dominance, though 'rootability' of cuttings is high

EFFECT OF SELECTION & CONTROLLED BREEDING OF HOOP PINE



A CLONAL SEED ORCHARD (CSO) OF HOOP PINE

THE COMPLEX BIOLOGY OF HOOP PINE GAVE RESEARCH CHALLENGES & OPPORTUNITIES

- Seedling trees do not produce pollen until > 20 y old
- Crops of seed with high viability occur at intervals of 2-10 y
- The fixed bud systems result in orthropy & plagiotropy:
  - Hence grafts from lateral shoots give trees with branch habit
  - How to obtain grafts with orthotropic habit was not discovered until 1959
  - A need to establish grafts of both types in clonal seed orchards (CSOs) was not realised until the late 1960s
- The multiplication rate in vegetative propagation is low due to strong apical dominance, though 'rootability' of cuttings is high

BRIEF OVERVIEW OF HOOP PINE BREEDING - 2

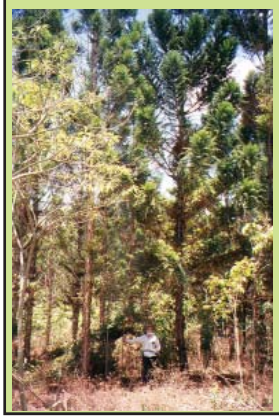
1970s - Clonal seed orchards (CSOs) at Taromeo & comprehensive provenance trials established

1980s -Taromeo CSOs produced large crops of highly-viable seed. Three new breeding populations & CSOs established. Self sufficiency in CSO seed achieved

1990s - An improvement strategy documented & acted on. New tests of wide-provenance hybrids established

2000s - Transition to operational 'family forestry' began. Funding breeding ceased, but propagation R & D continues

PROVENANCES
Left: S Qld Right: PNG (Age 9 y)



PROVENANCE HYBRIDS
S Qld x PNG (Age 9 y)

CURRENT STATUS OF THE HOOP PINE INDUSTRY

- Plantations are State owned with a stabilised area of 45,000 ha
- Harvesting yields 400,000 cubic metres of logs per year, much more than was ever taken from natural stands in a year
- Re-establishment and all management, which is sustainable, is by the DPI Forestry
- All plantings made since 1984/85 are from orchard seed and are higher yielding, as has been illustrated here
- The species' genetic resources are well conserved (Dieters et al. 2002)

THE EFFECT OF INTENSIVE SELECTION & CROSSING IN SLASH PINE
Left: 'land race' of the 1950s Right: good 2 nd-generation family

EXOTIC PINES (*Pinus* species)

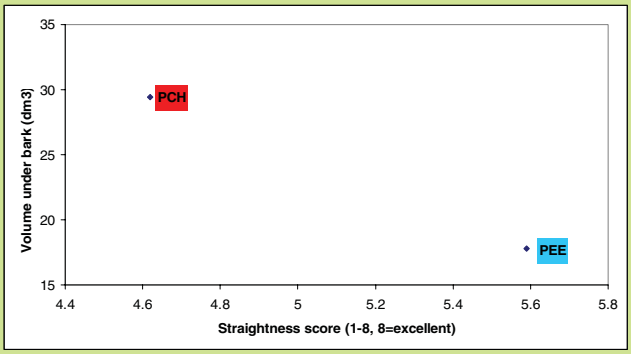
BY THE 1930s, RESULTS OF TRIALS SHOWED SPECIES – SITE MATCHING IN SE QUEENSLAND TO BE AS FOLLOWS:

- *P. elliottii* (PEE) & *P. taeda*: spp matched to soils in coastal lowlands
- *P. elliottii* & *P. radiata*: spp matched to soils in cold, dry 'high-lands'
- *P. patula:* deep, red loams in cold, dry midlands

LATER, OTHER SPECIES WERE INTRODUCED, e.g. *P. caribaea* var. *hondurensis* (PCH), AND THEIR NICHES DETERMINED

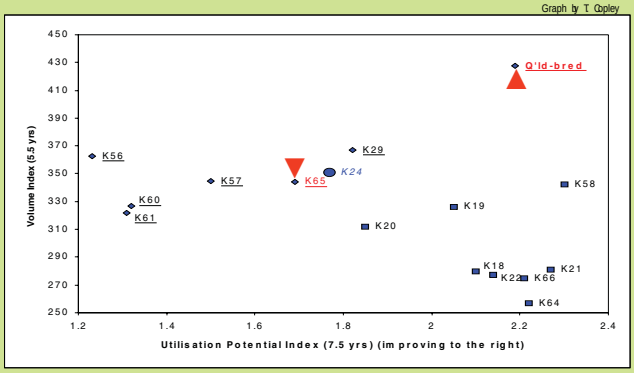
THE GREAT POTENTIAL OF HONDURAS CARIBBEAN PINE (PCH) WAS EVIDENT BY THE MID-1950s

Graph by Kerrie Catchpoole ex data of M. Powell



PCH – SEED SOURCE VARIATION, e.g. growth & tree quality of natural provenances *versus* Queensland-bred PCH of the 1970s (▲) that was derived from a natural-stand base (▼)

Graph by T Copley



TESTS OF *Pinus* HYBRIDS & DEVELOPMENT OF ONE

1950s – Inter-specific hybridisation began on a 'try it & see' basis
– First PEE x PCH crossing done in 1955, tests planted 1958

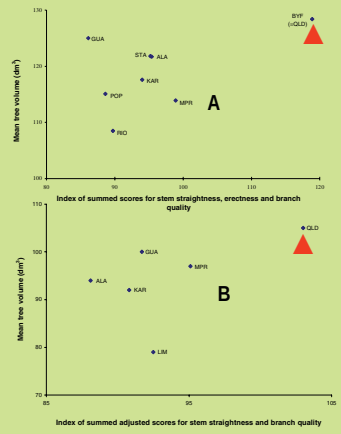
1960s – Work on PEE x PCH hybrids (the most promising) escalated
– Planted tests of PEE x PTAE F_2 hybrids (inbred & outbred)

1970s – First CSO estab. with PEE x PCH F_1 clones to produce F_2 seed

1980s – Second PEE x PCH F_2 CSO, & first F_1 clone tests established
– On-going production & testing of large numbers of families
– First operational plantings of F_1 & F_2 hybrids

1990s – F_1 clone tests assessed & operational planting of best clones

2000s – Selected hybrid clones deployed totally on all suitable sites
– 'Synthetic' hybrid breeding strategy documented & applied



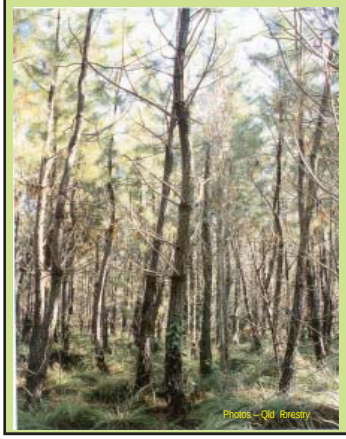
Growth & tree quality of Queensland-bred PCH (▲) in two series of international, multi-country trials of the 1970s (A) & 1980s (B).

From Nikles 1996.

An outcrossed F_2 hybrid family from selected F_1 hybrid parents & selected PEE & PTAE grand-parents.

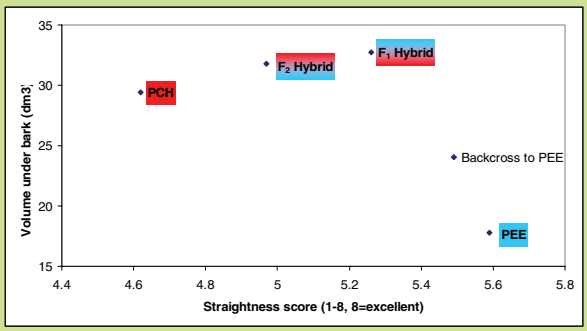
Planted in SE Queensland in 1965, age 34 yrs.

EFFECT OF BREEDING PCH IN QUEENSLAND



RELATIVITIES OF 6-YEAR VOLUME AND STRAIGHTNESS OF PEE, PCH, & THEIR F_1 & F_2 HYBRIDS

Graph by Kerrie Catchpoole ex data of M. Powell



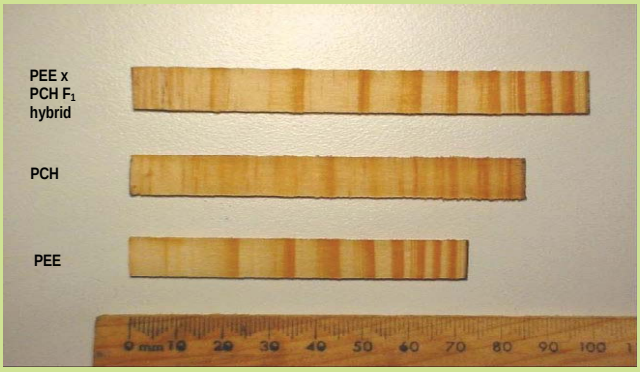
COMBINING WITHIN-SP (PEE, PCH) BREEDING + HYBRID BREEDING + CLONE TESTING + MASS PRODUCING THE BEST HYBRID CLONES GIVES HIGHER PLANTATION PROFITABILITY & SUSTAINABILITY

'Qld land race' PEE of the 1950s | Qld PEE x PCH F_1 clone of mid 1990s | Wild-quality PCH base of 1950-60s

L: *Ct* x *Ccv* F_1 HYBRIDS R (FOREGROUND): PURE *Ccv*

WOOD SAMPLES FROM HYBRID AND PARENTAL TREES AGED 13 YEARS.

Sample prep. & photo by D. Kain.



PLANTATIONS IN QUEENSLAND – by 1945 versus Dec. 2004

Species group	Area 1945 (ha)	Area 1945 (%)	Area 2004 (ha)	Area 2004 (%)	Comments
Native pines	8,004	75.2	45,000	20.9	Nearly all hoop pine ‡
Exotic pines	2,640	24.8	134,000	62.4	Pine hybrids: 20.5% ‡‡
Hardwoods	Small		34,000	15.8	Private sector: 12.6%
Miscell-aneous	Small		2,000	0.9	
Totals	**10,650**	**100.0**	**215,000**	**100.0**	

‡ % of native pines fell from 75% to 21% over the period.
‡‡ % of pine hybrids increasing at expense of slash pine.

RANGES OF THE *Corymbia* SPECIES BEING HYBRIDISED

(*C. torelliana* - ***Ct***)

C. citriodora subsp *citriodora* (***Ccc***)

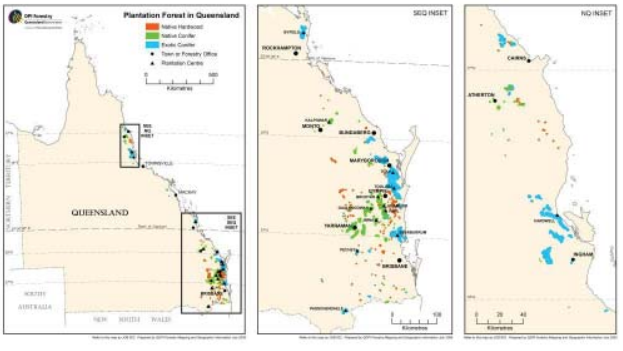
C. citriodora subsp *variegata* (***Ccv***)

C. henryi (***Ch***)

C. maculata (***Cm***)

All are good commercial species

REGIONAL DISTRIBUTION OF STATE-OWNED PLANTATIONS BY SPECIES GROUPS – HARDWOODS ■, CONIFERS (NATIVE ■, EXOTIC ■)



1. SO, WHAT HAVE WE IN QUEENSLAND DONE & LEARNT?

- *We've made a contribution in Forestry – locally, nationally & internationally*
- *Our efforts have consolidated Tree Improvement as an essential part of wise forest management in Queensland, & helped achieve this elsewhere*
- *We've learnt that you must:*
  - *–know your species group – its biology, adaptability, genetic variation, crossabilities, the literature*
  - *–emphasise assembling & developing appropriate staff – at all levels*
  - *–document a strategy & implementation plans that are fairly simple, flexible & revised periodically; & report progress to the beneficiaries*
  - *–assemble a wealth of genetic resource, characterise it & use it effectively*
  - *–realise that you can get started by relying on well-known procedures*
  - *–seek collaboration & cooperation; & be willing to change*

Acknowledgements for ideas

- **CIFOR Scientists and Publications**
- **Reports: FAO, World Bank, APAFRI**
- **Papers by Prof. Matti Palo**
- ***End of poverty* - Jeffrey Sachs**
- ***Development as Freedom* -Amaratya Sen**
- ***Banker to the poor*- Muhammad Yunus**
- ***India unbound* – Gurcharan Das**

2. WHAT HAS ACCOUNTED FOR THE LONG HISTORY OF SUCCESSES?

- First & foremost is the long-term commitment of people, funding & other resources that was made to Tree Improvement. (In my opinion, some signs of a failure of commitment, if not banished, could jeopardise sustainability of success)
- The vision & persistence of a succession of good leaders
- A culture of research-based forest management, and
- Integration of Operations & Research for a long period

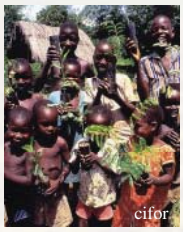
Depth of poverty

More than eight million people die each year, because they are too poor to stay alive.

That is 20,000 people every day

As they go, should another eight million follow the trail of deprivation and death?

Forests, people and poverty reduction: Are we making a difference?



Sadanandan Nambiar

CSIRO

What is Poverty?

Poverty is a pronounced deprivation of well-being related to lack of material income or consumption, low levels of education and health, vulnerability and exposure to risk, and voicelessness and powerlessness

(World Bank 2001)

Income:

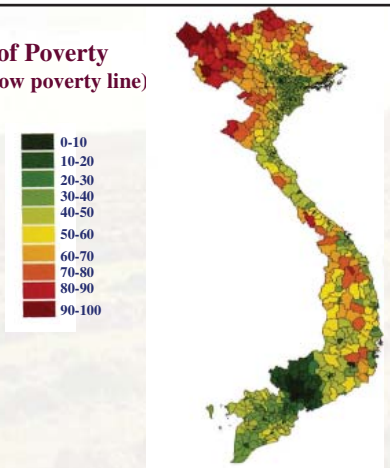
Extreme poor : less than $1 per day

Poor : 1-2 $ per day

Incidence of Poverty
(% of people below poverty line)

Poverty is often regional and local

So also the solutions



(Sunderlin and Thu Ba 2005)

Poverty: a narrow definition for today

Poverty is a state of deprived survival when people have little or no assured income or support, for today and tomorrow, to buy their most basic needs

Poverty can be reduced in absolute numbers

Poor people - India	(millions)
1993 – 1994	317
1999 – 2000	259
Less	58
China – 1978-98	> 200
Recent data: China	400 million
India	>70 million

(Economist July 05)

What can forestry do?

One out of four of the world's poor, about 1.6 billion, depend directly or indirectly on forests for livelihood

Poverty reduction is not be a zero-sum game

Poverty reduction has rippling positive effects upward

As one strata of the society steps on to the first step of the ladder of economic development, the group ahead of them may climb one step more

The most difficult step to economic development is the first step on the ladder

Forests and poor people - linkages

- Forests are *poverty traps*
- Forest products provide *safety nets* and reduce vulnerability
- Riches of forests, products and environmental services, can help to *alleviate* poverty and improve the *wellbeing* of people

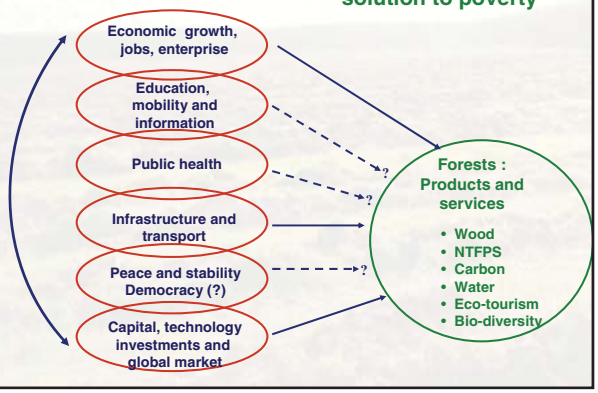
Journey to economic growth and poverty reduction

- China – cultural revolution to modern market economy since 1978-80
- India – state controlled economy to new economy model since 1990-91
- Vietnam – communism to *doi moi* reform in 1986
- Uganda – failed dictatorship to civil government and entrepreneurship since 1990s

Increasing number of forest dependent people cannot be lifted out of poverty based on a declining forest resource

	Tropical Forest loss (million ha per year)
1980	11
2000	14
Current	14-15
By 2020 (estimates)	Asia - 29 - 44 % Africa - 50 %

Paths to Poverty reduction: Fundamentals



Native forest logging sector: poverty links

- Native forest logging and deforestation has created wealth, not for the forest dependant poor
- Corruption undermines social justice and the opportunity for poverty reduction; illegal logging is big business
- Value of wood at stump is too low (deals, no competition!)
- "Papuans get 1$/m^3 for cutting- 240 $/m^3 in Singapore"

Forest resource for poverty reduction

- Native forests timber
- Non-timber forest products (NTFPs)
- Environmental services
- Wood from plantations and farms
- Jobs around forestry business
- Fuel wood
- Non-forest timber products (NFTPs)

Native forest logging

- Value adding and wealth creation mostly off-shore
- Inadequate vertical integration for local benefits
- Certification has not advanced sustainable forest management in poor tropical countries

Non timber forest products (NTFPs)

- Poor forest dependant people rely heavily on non-timber forest products for survival
- Diverse estimates show that NTFPs provide 30-70% of the income in many poor households
- But 30% of 1-2 dollars, even if received every day, cannot lift people to the first step on the ladder
- NTFPs represent a very wide range – products and services

Health care for poverty reduction

- Complete "dependence" on "natural medicine" and "healers" do not lead to a way out of poverty and death
- This dependence is a measure of the tragedy; they have no access to basic (primary) health care
- Can traditional healers and natural products save victims of malaria and AIDS in Africa?

Non-timber forest products

Medicinal plants and health

"Natural products (many from forests) are the only source of medicine for 75-90% of people in developing countries"

(Dubois, FAO 2003)

Tanzania had "almost 60,000 traditional healers" only "600 western trained" doctors around 1990s *(Weenen et al 1990)*

Non- timber forest products

Products and processing

Some constraints

- Productivity fluctuation
- Quality, grading
- Seasonality and access
- Low volume and low value
- Uneven demand and storage
- Sustainability – over harvesting

Medicinal plants used by "healers" in Tanzania

Disease / Ailment	Number of plant species
Chronic malaria	3 – 10
Dysentry / Diarrhoea	4 – 9
Women complications	18 – 24
Infertility / Internal	9 – 11
Syphillis / Veneral disease	7 – 8
Love affairs / Aprodises etc.	8 – 10
Bewitchment	1 – 2

(Augustine and Gillah, 2005)

Most products are sold by the poor to the poor who have little purchasing power. This can not grow the economy. So poverty persists.

Some products have high values beyond the forests and for "exports". How can the poor share the benefits of value adding?

Environmental services and tourism

Assumption:

We can make the markets to work for the forest dependant poor so that they can cash in on all the good things that the nature provide to us

Can we really do this?



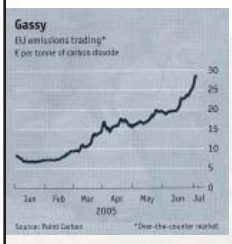
Value adding to short rotation plantations-
Simple technologies and modest investments

Eucalypts

Silviculture	Sawlogs (%) Total	Sawlogs (%) High value	Pulp wood
Poor	10-15	0	40
Improved	64	58	14

(Washusen CSIRO/ensis)

Carbon trade (CDM) for the poor?



- **Complex international politics and trade**
- **Kyoto Vs Asia-Pacific CDC?**
- **Multi- layer processes and middle investors**
- **Volatile markets and drivers**
- **CDM- limited scope for forestry**
- **High transactional costs**
- **No entrepreneurship and empowerment to the poor**

High value timber from small farms

Acacia logs for furniture in Vietnam:
US $ 45-60 per m³ at the mill

Teak and mahogany planting in Indonesian village; high value timber from poor, rocky soil

Farmers with enterprise and initiatives can get better returns

Plantation forests based options

- **More and more future wood will come from the expanding plantation sector**
- **About 54-60% of plantations in poor countries are failures. This should be improved to drive growth and improve environment**
- **Industry partnerships with people are expanding; out grower schemes in Brazil, Indonesia, India, South Africa**
- **Value adding with simple technologies and low capital**
- **Scope for individual initiatives, enterprise and high direct local return**



Melaluca plantations in acid soil – farm forests in Mekong

- **Food and wood from 5 ha land**
- **Forestry share- 45% of the income**
- **Timber poles in seven years; 80% of the market value for the farmer**

China's sloping land conversion program is another example

Jobs in forestry business

- Forestry provides more than 10 million 'real' jobs in developing countries, and 30 to 50 million 'informal' jobs in the wood industry
- This has impacts on regional income
- Forest workers are among the lowest paid; poor business drives exploitation
- Much needs to be done to improve wages and conditions

Lessons from agriculture

- Increase in agricultural production has substantial impacts on poverty reduction in India
- For every 1% increase in agricultural productivity, poverty (less than 1$ a day) reduces by:
  0.62-1.3% - a major impact

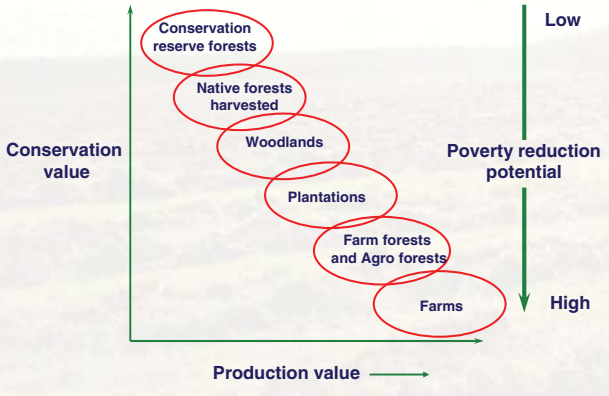
(Gustafson 2003; Thirtle et al. 2001)

Conclusions

Millions of people are isolated in poverty in the forested rural areas

- They are disconnected with the rest of the national economic development and social reforms in progress
- For millions, the only way out of poverty is to walk away from forests
- They are not responsible for "*caring for our forests*"
- Their heavy *dependence* on forests should not be equated as a way to find *solutions.* We are churning the same jungle
- The impacts of two decades of "*pro-poor*" strategies and research on sustained poverty reduction are not visible (Romantic notions, rhetoric, frame-works and acronyms!)

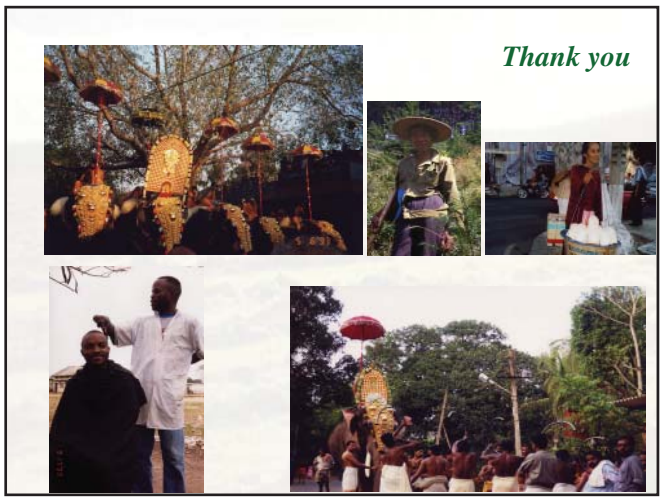
Forests - natural resources continuum



Forest dependent poor must be connected to other key fundamentals of growth and reform

- Timber and non-timber based solutions offer modest help
- The roles of the environmental services are doubtful *Gramene bank (Bangladesh)* may be a better model
- Timber growing and local value adding industries have more chances for success than other options on the table
- Donor driven international research lack balance; cycles of *policies, frame-works, quick-fixes and agendas*
- Little attention is given to sustained productivity and management of the very diverse ecosystems and products

  This ignores the lessons from the uses of other natural resources which have reduced poverty



Economic development in Vietnam regional variation

	North	South
Population (million)	10	5
Exports – 2003 ($ per person)	50	785
FDI – 2001-03 ($ per person)	60	570
New jobs per '000 person		
2000 – 02	7	41
2003	3	12

(UNDP, Economist 2005)

Who are the forest dependant people?

- People living in the forest or at the boundary- include tribal communities and hunter-gatherers
- Indigenous and migrant communities
- Small entrepreneurs – producers, merchants
- Farmers with diverse land ownerships
- Forest and agricultural labourers – varied skills
- Workers for native and plantation forest industry
- Threatened and displaced people in war-torn regions

Poverty can be reduced in a relatively short time

Some countries in SE Asia have removed poverty during the last two decades

Address by Dr D Ian Bevege

I feel greatly honoured to have this opportunity to thank our distinguished awardees on your behalf for presenting an overview of their work and perspectives on forestry research.

Garth and Sadanandan are more than close colleagues; they are good friends, our working relationships going back to the 1960s. Their research interests and specialties are close to my own in forest soils and nutrition in the case of Sadanandan and genotype/environment interactions with Garth and we have collaborated in these areas in the past while I was working in the Queensland Forestry Department and through the Working Groups of the Standing Committee of the Australian Forestry Council.

I am proud to have been associated in some small ways with their achievements and attainment of their vision: Garth with the establishment of what is arguably the most advanced forest tree breeding programme now bearing economic fruit for Queensland, and Sadanandan with his well and passionately articulated perspectives on sustainable forest productivity. Their vision and achievement has been duly recognised this week by IUFRO in these inaugural Host Scientific Awards.

To me, both Garth and Sadanandan epitomise what is most effective in forest researchers – a problem oriented strategic approach, a long term view while keeping a close eye on the ball with regard to outcomes, and being strong advocates for adoption of research findings into forest management:

- Garth developed improved genotypes of Pinus and Araucaria now used in routine plantations in Queensland and is now working with eucalypts
- Sadanandan has improved the management of forest plantation soils in both tropical and temperate regions for the sustainability of ecosystem productivity, not just for increased wood production.

I would like to thank Garth and Sadanandan for their contribution to global forestry and more immediately for their presentations today that have demonstrated to us so well their skills as scientists and communicators – they are excellent role models for our promising young forest scientists who I hope will take up the challenge of emulating their scholarship and achievements for the betterment of the world's forests and the people – all of us – who are dependent on them.

Thank you Garth and Sadanandan, thank you Gary, thank you IUFRO colleagues.

Wallenberg Prize Awardee Presentations

The Marcus Wallenberg Prize Selection Committee (MWPSC) organized a satellite meeting at lunchtime on Tuesday 9 August under the title "Rewarding forestry and forest products research; the Marcus Wallenberg Prize". This was attended by approximately 150 Congress participants. The chairman of the MWPSC, Jeff Burley introduced the background, objectives and procedures of the Prize.

Two previous Prize-winners from Australia (Dr Robert Leicester and Dr Robert Evans) gave well illustrated talks about the excitement of their research and the impact of the Prize on their career and subject development. Both mentioned the role of the Prize in gaining wider recognition for their subjects and, in the case of Rob Evans, gaining further honours in Australia. His work (the development of the Silviscan apparatus and software for wood quality assessment) has stimulated the development of an improved version of the system installed in Sweden, the potential for another in North America, and a wide demand for its analytical services by a range of wood producers and users, particularly silviculturists and geneticists.

Professor Robert Johnston, a member of the MWPSC discussed issues for the future of research, its role in industry and society, and its recognition. He stressed the changing policies of governments and commercial companies that now encourage research funding by producers and markets. Common recent reductions in R&D funding emphasize the value of the MWP in continuing encouragement for research. "Researchers must promote their successes; if we do not who will? We need your help in nominations – the research community needs you!"

All four speakers were available for discussions for the rest of the day. Based on these subsequent discussions, it appeared that a number of candidates will be nominated in the near future while Directors of IUFRO Member Organizations will seek other potential nominees.

President's Discussion

"Research to Cope with Global Change"

On the occasion of the XXII IUFRO World Congress in Brisbane, Australia, the President of the International Union of Forest Research Organizations (IUFRO), Professor Risto Seppälä, invited a panel of distinguished persons representing forest research and the private sector to offer their views on how research can cope with global change. The President's Discussion took place on Wednesday, 10 August 2005. It was chaired by Professor Seppälä. The panel of speakers included Dr. José J. Campos A. (CATIE), Dr. Joseph R. Cobbinah (Ghana), Mr. Thorry Gunnersen (Australia), Dr. Peter Mayer (IUFRO), Dr. Razak Mohd. Abd. Ali (Malaysia), and Prof. Lisa Sennerby Forsse (Sweden). The rapporteur was Alexander Buck (IUFRO Deputy Executive Secretary).

1. Welcome and opening

Professor Seppälä welcomed the participants to the President's Discussion and highlighted its theme "Research to Cope with Global Change". He pointed out three main objectives of the session, namely to (i) exchange information about developments in forest research in different regions; (ii) identify common problems and challenges of forest research and education institutions; and (iii) discuss approaches for effectively solving these problems and responding to emerging challenges. He informed the participants about the structure of the session, i.e. presentations followed by a discussion.

2. Presentations

Global Situation and Trends in Forest Related Research

Dr. Peter Mayer (IUFRO Executive Secretary) outlined the global situation and trends in forest-related research. He communicated that the presentation had been prepared on basis of the results of a questionnaire that had been sent to IUFRO officeholders and members. Replies had been received from 172 respondents covering all IUFRO Divisions. The answers received indicated that research priorities have shifted over the past ten years from more technical towards environmental issues. For the future, an increasing focus on social issues could be expected. The analysis of replies to the questionnaire had also revealed that there was no common trend regarding the financing and infrastructure of forest research. About half of the responding members had faced a decrease in infrastructure, and about one quarter had been merged with other organizations, notably those addressing natural resources and environmental management. At the same time, about one third of the respondents had reported increases in research infrastructure. As regards financing trends, a decrease in national public funding had taken place in many countries. In contrast, the funds of about one third of respondents had increased, mainly in Asia. Regardless of these contrasting developments, a majority of respondents had identified national public funds as the main funding

source also in the future. Furthermore, Mr. Mayer reported that agroforestry, biotechnology and social sciences would increasingly come into play as partners for forest research. He concluded his presentation by stating that more than two thirds of all respondents had attached high to medium importance to IUFRO for science collaboration. He noted that this was an encouraging signal for IUFRO.

Research to Cope with Global Changes: Issues, Challenges and Opportunities for Africa

Dr. Joseph R. Cobbinah (Director General, Forestry Research Institute of Ghana) addressed issues, challenges and opportunities for forest research in Africa. He underlined that poverty continued to be one of the world's biggest moral challenges, with an estimated 51% of population in Africa living in abject poverty. At the same time, the forest resources contributed directly to the livelihood of about 90% of the people in Tropical Africa through providing life supporting goods, income, employment and environmental services. Hence, the accelerated deforestation in Africa had profound effects on the livelihood of the rural poor. In this context, Dr. Cobbinah stressed that forests research could play an important role in reducing poverty by developing technologies, processes and policy innovations that ensure the sustained provision of forest goods and services. Yet, this role was restricted by the weak capacity and low funding levels of forest research institutions in Africa. For example, less than 10 African countries had institutions dedicated to forest research. Challenges for forest research included (i) access to information, equipment and workshops; (ii) human resources and skills development; (iii) the research strategy; and (iv) challenges with respect to values, including ethics, accountability and commitment. Dr. Cobbinah emphasized the important role of IUFRO in facilitating access to information and the development of skills. More than that, IUFRO should facilitate the mobilization of global intellectual resources and funding by advocating for the establishment of a special partnership fund for research in Africa. Such a partnership could help overcome government failure that would often be rooted in low economic performance and corruption. Dr. Cobbinah concluded in stating that Africa needed what he referred to as a "Grand Coalition of Scientists".

Forestry Research to Cope with Global Changes – The South East Asian Scenario

Dr. Mohd. Abd. Ali Razak (Director General, Forest Research Institute Malaysia) highlighted challenges and trends for forest research in Southeast Asia, including the involvement of the private sector in forest research. He noted that fundraising was an increasingly important aspect of forest research also in the South East Asian countries. For example, funding for forest research in Malaysia had increased in biodiversity research, biotechnology research, and the use of proper plants and medicines, but not in more traditional forest research areas. Therefore, in order to position itself in the future, and to attract the private sector and obtain complimenting funds, forest research needed to build strong partnerships with stakeholders and the private sector also in South East Asia. Furthermore, there was a need for forest research to sell itself more effectively and to highlight and market the capabilities of the respective institutes to clients and potential donors. Also, forest research institutes should be able to source funding for research by putting together, in a timely manner, research proposals that are relevant to the needs of clients and attractive to donor agencies and that create benefit to them and the nation. He noted that the Forest Research Institute Malaysia could serve as a case for successful association with the private sector in forestry research and development. Mechanisms put in place by FRIM for effective association with the private sector in forest research and development included a regular dialogue with the private sector, collaborative research, consultancy and technical services, royalties received from licensing and technology, adoption schemes with the private sector, and an industrial attachment scheme. Overall, the experiences gained by FRIM underlined that close collaboration and networking with the private sector was the way to obtain complimenting funds to sustain research in the research institutes.

Forest Research Issues in the Nordic Countries

Professor Lisa Sennerby Forsse (Secretary General, Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning - Formas) addressed forest research issues in the Nordic countries. She noted that the forest based sector played a key role in a sustainable society in the Nordic Countries. Key challenges for forest research in the Nordic Countries included climate change, the increasing demand and competition for raw material, the achievement of an economic and environmental balance in the utilization of forests, and attracting young talents to the sector. Meeting these challenges also required international science cooperation. Therefore, various cooperative activities had been initiated in the Nordic countries. For example, the Nordic Forestry Research Cooperation had been established with the purpose to finance collaborative forest research and networking, and to advice the Nordic Council of Ministers. Scientists and research institutions also cooperate in the context of bilateral programmes and as part of the broader European Cooperation. Professor Sennerby Forsse noted that forest research in Nordic Countries benefited from comparatively high levels of funding, with Sweden topping the list in Europe followed by Finland. Available forest research funding focused on: sustainable timber production; multiple use forestry; biodiversity and climate change; industrial research in pulp and paper; and wood based products. Overall, Prof. Sennerby Forsse described forest research as a corner stone for future competitive, knowledge-based activities in the Nordic Countries that foster the extended use of renewable forest resources.

Forest Research Issues in Latin America

Dr. José J. Campos A. (Head, Department of Natural Resources and Environment, Tropical Agricultural Research and Education Center – CATIE) highlighted forest research

issues in Latin America. He communicated that forest research in this region was characterized by an increased number of forest academic and research organizations, including some not typical "forestry" institutions and non-governmental organizations, and by a reduced availability of financial resources either locally, nationally or internationally. For example, the intensity of agricultural research investments since the 1980s had increased in developed countries, but had decreased in Latin America and the Caribbean. Also the values on the role of forests and forestry had changed, with an increased emphasis on environmental and conservation issues. Dr. Campos outlined three emerging challenges for forest research in Latin America. The first challenge was to increase the communication with stakeholders and their participation in the research process. As a second challenge, forest research needed to retain relevance and contribute to poverty reduction, environmental conservation and policy dialogue, and to national development programmes and strategies. And thirdly, forest science had to deal with complexity and uncertainty through holistic, long-term approaches. In order to meet these challenges, the forest research community needed to put stronger emphasis on landscape-scale management and adopt interdisciplinary approaches, such as the ecosystem approach and the livelihoods approach. Dr. Campos also underlined the importance of learning systems and adaptive management, and remarked that the impact of research had to be evaluated through effective mechanisms that go beyond publications only. Concerning the experiences of CATIE, Dr. Campos pointed out that restructuring had been key to achieving further integration, critical mass and positioning. He also underlined the importance of fundraising strategies and endowments. At the same time, IUFRO and the global research community would have important roles in raising awareness, organizing workshops and trainings, and in pursuing activities that strengthen the science-policy interface.

Australian Approaches to Industry Partnerships in Forest Industries Research

Mr. Thorry Gunnersen (CEO, Gunnersen Timbermark Pty Ltd; Chair, Forest and Wood Products Research and Development Cooperation) highlighted Australian approaches to industry partnership in forest industries research. He outlined the effects of globalization on research and development (R&D), such as an increased accessibility of sources of research, information and technology; an increased pressure for international competitiveness; a declining core investment in public R&D, and less emphasis on long-term patient investment, but more contestable and project funding, as well as an increasing shift in funding from theoretical to applied research. Mr. Gunnersen also observed an increasing commercialization of R&D, as was e.g. reflected in a stronger focus on protectable intellectual property. He noted that research providers in Australia had responded to these challenges through a number of joint ventures and mergers, such as the merger of CSIRO and Scion. In addition, several effective models had evolved for cooperation between R&D and the private sector. In Australia, Research and Development Corporations (RDCs) have been established as statutory authorities or industry owned companies that chose to fund R&D on a long-term basis by means of a levy on a unit of production and matching government funding. As another model, Cooperative Research Centres (CRCs) constituted long term contractual arrangements between research providers and the industry with the purpose of designing and implementing agreed research programmes. In New Zealand, Research Consortia have been formed as industry-led, collaborative ventures to fund and manage R&D. Altogether, these models had also helped to overcome potential conflicts between public and private sector interests in forest research in a creative manner.

3. Discussion

In the discussion, several speakers referred to the situation and trends in forest research financing and capacity. It was noted that a more in-depth analysis may be needed of the trends in forest research funding in many countries. In this context, it was stated that experiences gained in New Zealand and Australia had indicated that an effect on funding could be achieved through the structured involvement of the private sector, such as industry advisory groups and Cooperative Research Centers.

Particular reference was made in the discussion to the lack of forest science capacity in many developing countries. This would also be reflected in the limited participation of especially African scientists in the IUFRO World Congress. It was noted that the number of scientists from African countries should be increased in future Congresses, inter alia, by making better use of regional networks and organizations for communicating participation and sponsorship opportunities.

Finally, also the need to intensify research and the dialogue with stakeholders on forest ethics was pointed out in the discussion. It was stated that the principle of sustainable forest management provided a good foundation for global forest ethics and that there would be good opportunities for forestry to be among the outstanding sectors ethically and morally. Therefore, forest ethics should find its place also in the global network of IUFRO.

In closing the meeting, Professor Seppälä thanked the speakers and the participants for their contributions which had covered a wide range of topics that were crucial for research to cope with global change. He noted that the President's Discussion had also provided important guidance for the work of IUFRO in the future.

Directors' Forum

Directors and heads of forest research and education organizations met on Wednesday, 10 August 2005 on the occasion of the XXII IUFRO World Congress in Brisbane, Australia, to discuss common challenges and problems and

to deliberate the future cooperation of forest research and education organizations. The Directors' Forum was the first of its kind with a global scope. It was hosted jointly by IUFRO, CSIRO and the Congress Organizing Committee. The Forum was chaired by Dr. Colin Dyer (Institute of Commercial Forestry Research, South Africa) and Alexander Buck (IUFRO Deputy Executive Secretary) served as rapporteur.

1. Welcome and opening

Dr. Gary Bacon (Chair, Congress Organizing Committee), also on behalf of Professor Risto Seppälä (IUFRO President) and Dr. Rick Ede (Chief, CSIRO Forestry and Forest Products), warmly welcomed the directors and heads of forest research and education organizations.

Dr. Colin Dyer, the Chair of the Forum, outlined the objectives of the meeting to (i) discuss common challenges and problems of forest research and education organizations, and how they can be overcome, (ii) and to consider existing and possible future approaches for intensified, interdisciplinary cooperation and the development of joint activities. He informed the participants that five speakers had been invited to give presentations, and that their presentations would be followed by an open discussion with the panelists.

2. Presentations

First International Meeting of Heads of European National Forest Research Institutes

Dr. Harald Mauser (Head, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape) described challenges for national forest research institutes (NFRIs) in Europe, as well as recent activities to strengthen their collaboration in the region. He emphasized that NFRIs would have a unique role in combining applied forest research, knowledge transfer and forest monitoring. At the same time, changes in the funding environment of NFRIs in Europe, such as the decrease in public funding and the increasing importance of European Union frameworks for research and development, would require stronger trans-boundary cooperation and new approaches to measuring and demonstrating more clearly the performance of NFRIs. Dr. Mauser informed about several successful collaborative activities that had been initiated in Europe as a follow-up to the first international Meeting of Heads of European NFRIs (July 2004, Vienna/Austria). These include the preparation of a joint Vision Paper „Future Forest Research Strategy in Europe", the participation in the planning of the 7th European Framework, and the establishment of a European Technology Platform Forest-based Sector.

Future of Tropical Forests, Old and New: Linking Science, Markets, and People

The presentation of Dr. David Kaimowitz (Director General, Center for International Forestry Research) focused on the future of tropical forests and the need to link science, markets and people. Dr. Kaimowitz noted that there were significant disparities in the amount of research on different types of forests in the tropical landscape. For example, there was substantive research available on large compact primary forests as well as on fast-growing plantations, but only limited research on secondary forests and deforested areas. Also, the support of different forest users varied considerable, according to Dr. Kaimowitz, with strong research support from industrial user groups, but limited support from the informal sector. As a result, many crucial land uses, actors and issues, such as the poverty dimensions of forest use, would continue to get only limited attention. Against the background of rapid changes in forest policy and global markets, such as the dramatic rise in Chinese forest product imports or the dramatic rise on Brazilian beef and soybean exports, the debate would therefore remain poorly informed. Dr. Kaimowitz pointed out that in particular developing country governments only had few sources of solid objective advice to help them address these transformations. He concluded that the consequences of these developments would be serious, with major implications for the tropical landscapes and the people living there.

Emerging Themes for Natural Resources Research and Sustainability in the United States

Dr. Ann M. Bartuska (Deputy Chief, USDA Forest Service) highlighted emerging themes for natural resources research and sustainability in the United States. Against the background of increasing rates of environmental change, and the growing expectations for solutions resulting in changes on the ground, the USDA Forest Service had identified drivers for forest science in the 15-20 years ahead. These included: rehabilitation and recovery; managing with disturbances; capturing value from forests; linking land use and water; social dynamics and forest use; urban natural resource stewardship; and globalization. Dr. Bartuska emphasized that adequate research and development capacities and skills would be key for effectively addressing these and other emerging issues. She particularly underlined the need to enhance the recruitment of scientists to sustain the scientists' base as an asset. Similar, it would be important to embrace all fundamental disciplines including new ones, and to rejuvenate public-private-partnership in research. A comprehensive approach to monitoring, the communication of forest science, and the implementation of adaptive management would be other essential components of a vision for forest science, according to Dr. Bartuska.

ENSIS – Joining Forces for National Benefit

Dr. Rick Ede (Chief, CSIRO Forestry and Forest Products) presented ENSIS as a successful example of how the forces of two national forest research organizations had been joined for national benefit. He noted that the forest sector and forest research were under stress from globalization, and that organic growth had become increasingly difficult in the research and development landscape of Australia and New Zealand. At the same time, Scion (previously New Zealand Forest Research Institute) and CSIRO had been facing the same set of issues in

the sector, such as an increasing share of non-traditional forest owners (investment funds, etc.), a diverse mix of production species, strong mandates from the government to extend the plantation base, and tangible opportunities for environmental services. Therefore, growth by partnership had been regarded as the best choice. As a consequence, Scion and CSIRO had been merged into one fully integrated forestry and allied industries science delivery organizations as of 1 July 2005. This new organization, ENSIS, would be well positioned to effectively respond to the changing strategic environment for forestry research and to meet the challenge of maintaining scientific depth and breadth also in the next decades.

Forestry, Biological Resource Management and OECD

Professor James Lynch (Chief Executive, Forest Research, Great Britain) underlined the need for integrated approaches to land management and the utilization of land resources. He presented the OECD Co-operative Research Programme "Biological Resource Management for Sustainable Agricultural Systems" as an activity supporting such integrated approaches. Professor Lynch noted that the programme put considerable emphasis on forestry in two of its three main research themes for the period 2005-2009. Theme 1 "The Natural Resource Challenge" emphasised the contribution of forestry activities to the efficient use of natural resources in support of a continued food production and quality of life for humans, domestic animals and wildlife. Theme 2 "Sustainability in Practice" aimed to target the maintenance of resources and biodiversity within a productive agricultural system by linking research to adopting sustainable practices. Also in this programme area, forestry had an important role to play, according to Professor Lynch. He concluded that forest research had a lot to offer in terms of natural resource management and sustainability research, and encouraged strong participation in the OCED programme.

3. Discussion

In the discussion it was noted that advising policy and land-use decision makers would be an increasingly important role of forest research and education organizations. In this context, the challenge of balancing the long-term research with the more immediate information requirements of policy makers and of ensuring the quality of research were pointed out. Often, national forest research organizations were in charge of maintaining forest monitoring systems and carrying out long-term studies. It was considered a major strength of these organizations to be able to build on these activities. The information derived from forest monitoring systems could, for example, help meeting reporting requirements of countries to international forest-related conventions.

The need to sustain the base of well-qualified scientists was identified as another challenge for forest research and education organizations. It was stated that, in order to attract good people and maintain a high standard of scientific quality, forest science should be put in the context of science globally and should open its doors to scientists of other disciplines. The participants also identified the need to better integrate the social science community into forest science and to enhance the contribution of forest research to interdisciplinary research. For example, the challenges resulting from projected changes in semi-arid and tropical landscapes and forests would require scientific approaches that integrate research related to forests, agriculture, conservation and social sciences. More specifically, it was remarked that international policy research should be strengthened, also within IUFRO. The role of international organizations such as FAO and OECD in influencing decision makers and administrators by using and disseminating forest-related scientific knowledge was underlined.

More differentiated views were expressed in the discussion concerning the role of public-private-partnerships. While the potential of public-private-partnership for attracting investment in forest research was acknowledged, it was also pointed out that potential conflicts of interest and external pressures should be duly considered.

In his concluding remarks, Dr. Dyer stated that the discussion had clearly indicated that the world was changing and that forest science would be confronted with the difficulty of balancing the requirements and interests of stakeholders with scientific quality. The discussion had also demonstrated the huge opportunity for IUFRO to make a difference in the future as a forum to share best practice at the international level, especially also between developed and developing countries. As a consequence, he suggested establishing the Directors' Forum on a more permanent basis.

Pre-Congress Training

A pre-congress training event comprising four different courses took place at the Gympie Conference Centre north of Brisbane from 2-5 August 2005. The courses broadly focussed on knowledge and skills that are required by forest scientists to manage information and interact with other forest stakeholders such as forest-dependent rural communities, forest managers, policy-makers and the society at large.

Course Programme

The use of information and communication technology tools in forest research

This course aimed at providing an introduction to important Internet based forest information resources and search tools and their relevance to forest research. Special emphasis was given to hands on skills in carrying out basic and advanced operations using forest information systems/services and forestry compendia. A mix of presentations and practical exercises was included within each topic. Participants had access to their own computers with internet access, essential for a course of this kind. Emphasis was laid on the use of resources freely available on the internet (e.g. Global Forest

Information Service (GFIS), FAO iMark training module on Management of Electronic Documents etc), but subscription databases and priced software were also described to indicate the advantages or otherwise of using them (e.g. CABI Forestry Compendium). Participants were encouraged to discuss the usefulness of particular resource types in their own working lives.

International forest related initiatives and agreements and their implementation in the context of national forest programs – Linking research and science with practice

In this course participants learned about major developments and issues concerning global environment and forest-related initiatives and their relevance to national forest programmes. The course was intended to enhance the understanding of these global processes and their implications and opportunities for member countries. Particular emphasis was placed on key elements of scientific knowledge and effective ways of interaction between science and practice that are necessary to successfully meet national and international policy requirements and to enhance national forest programme processes. Besides the implementation of international forest-related processes in the national context, innovative financing mechanisms for sustainable forest management such as payment for environmental services and environmental fiscal reform were discussed. Substantial time was spent on ways and means of bridging the interface between science and policy. Topics dealt with included involvement of forest scientists in national forest programmes through the provision of scientific knowledge and mutual learning with other forest stakeholders; contribution of science to policy making and approaches to influence policy agenda at various levels; and understanding about the ways that forest research results have influenced the development and implementation of policies to protect, manage, and utilize forest resources.

Communicating forest research – Making science work for policy and management

Although different approaches to public affairs and technology sharing are applied across the world, proper ways of communicating research results to people who need them is a challenge common to all involved in public relation activities. Communicating properly involves matching information needs with supply and transforming research results into tailor-made information - information that the target group understands and is interested in. Against this background this course aimed to familiarise forest scientists with the concepts of basic communication and public relation tools and their practical application in forestry. The methods and tools discussed included media communication; communication model, tools and planning; popular writing; presentation skills; corporate communication; proposal writing; interpersonal and intercultural communication and overall communication strategies. The participants appreciated the interactive approach practised in the course with role plays and hands-on exercises. The content presented was largely based on the IUFRO-SPDC manuals on PR for forest science and preparing and writing research proposals.

Sustainable forest management criteria and indicators – Their enhancement through science

Over the past decade, Criteria and Indicators (C&I) have emerged as an important tool in forestry around the world in defining, assessing and monitoring progress towards sustainable forest management. Despite these achievements, experiences with C&I application particularly in developing countries have shown that there is the need to further develop forest management standards through improved formulation, assessment, interpretation and validation of C&I. Thus far, the scientific community has been very supportive towards the idea of promoting improved social and environmental standards in forestry. With the further expansion of sustainable forest management systems in the developing world, forest scientists in these countries need to play a greater role in C&I development, auditing and certification processes. Against this background this course aimed at updating participants on local and regional C&I processes across the world; linking international C&I processes with forest certification; demonstrating the application of C&I systems in evaluating forest management, monitoring and reporting; and explaining opportunities and processes of enhancing C&I through science input.

Participants

More than one hundred scientists from developing countries expressed their interest to join the pre-congress training. As IUFRO-SPDC covered the costs for the courses only, each participant had to arrange her/his own support package for the trip to Brisbane and congress participation. About one-third of the participants were successful in obtaining support through the official Congress Scientist Assistance Programme, one-third benefited from donors responding positively to IUFRO-SPDC's request for in-kind contributions, while the rest made their own arrangements. Out of fifty-one participants who have been accepted for final registration forty-four made it to the training venue. Seven scientists registered in the courses could not obtain their Australian visas on time or fell ill, thus were unable to participate. The following nineteen countries of Africa, Asia, Latin America and Eastern Europe were represented in the courses:

Argentina (1 participant); Bangladesh (1); Cambodia (3); China (1); DPR Korea (4); Ghana (3); India (5); Indonesia (3); Kenya (1); Malaysia (6); Nepal (1); Philippines (5); Republic of Korea (1); Slovakia (2); Sri Lanka (1); Surinam (1); Thailand (1); Venezuela (2); Vietnam (2).

Contributors and donors

In total, fifteen organisations and forestry expert institutions assisted in this training event through cash and in-kind contributions. The Ministry of Foreign Affairs of Finland, the USDA Forest Service and the Food and Agriculture Organisation of the United Nations supported the training event with funding while in-kind contributions were provided by the University of Oxford Library Services, the Washington University, CAB International, the Finnish Forest Research Institute, GTZ Germany, the Finnish Forest Association, the International Students' Association, Tropenbos International, the USDA Forest Service, the International Foundation for Science, the Centre for International Forestry Research, the Southern Cross University and the Government of Queensland through the Department of Primary Industries and Fisheries. The in-kind support included the provision of the training venue (Gympie Training and Conference Centre), preparation of programme and course material, provision of expertise and course facilitators, and assistance in course implementation and local logistics. IUFRO gratefully acknowledges the contributions and assistance provided for this training event.

Reactions from participants

The participants showed keen interest in the programme and activities and rated all courses as very useful and relevant.

- '…was amazed to see how much information is out there and I didn't know!';
- 'very informative and useful';
- 'it not only gave me new ideas but I was able to make new friends and future collaborators'.

Many participants felt that the four-day courses were too short to sufficiently explore the various topics and have more detailed discussions. In order to further foster cooperation and have joint learning experiences it was also suggested to include a one-day field trip in any future training course. Participants clearly benefitted from interaction with members of the different courses and enjoyed sharing learning experiences; the total number of 50 participants in the whole training event seems an ideal number for the groups to 'gel'.

More information about the courses (course content, results of discussions, list of participants etc.) can be found on the IUFRO-SPDC website at: http://www.iufro.org/science/special/spdc/projects-activities/.

IUFRO Honours and Awards

Honorary Membership

Honorary Membership was conferred upon three present and former officeholders:

- Jeffery Burley, Immediate Past President
- Heinrich Schmutzenhofer, former Executive Secretary
- Les Whitmore, former Vice-President Administration

Host Scientific Awardees

- E.K. Sadanandan Nambiar
- D. Garth Nikles

Scientific Achievement Awardees

- Joseph Buongiorno
- Shashi Kant
- David Karnosky
- Victor Lieffers
- P K Ramachandran Nair
- Dave Peterson
- Rémy Petit
- John Spence
- John Turner
- S Y (Tony) Zhang

Distinguished Service Awardees

- Gary Bacon, Chair of the Congress Organizing Committee
- John Innes, Chair of the Congress Scientific Committee
- Keith Rennolls, Deputy 4.03.00 – Informatics, modelling and statistics
- Eric Teissier du Cros, IUFRO Vice-President Science

Outstanding Doctoral Research Awardees

- John G. Bellow
- Eugénie S. Euskirchen
- Christian Gamborg
- Kyu-Suk Kang
- Pablo García
- Sofía Sánchez Orois
- Bernard Slippers

Student Awardees for Excellence In Forest Science

- Katja Eisbrenner
- Carlos A. Ruiz-Garvia

Best Poster Awardees

Division 1: Poster #669: "Long-term effects of forest fertilization on ground vegetation in the northern Black Forest, Germany"

Carl Höcke, Freiburg University, Germany

Division 2: Poster #18: "Overcoming biological barriers to hybrid seed production in Eucalyptus" Tasmien Horsley, Terry Stanger, Sappi Forests Research; S. Johnson, University of KwaZulu-Natal, South Africa

Division 3: Poster #473: "Decomposition of coarse woody debris in the boreal forest of interior Alaska"

John Yarie, University of Alaska, Fairbanks, Alaska, USA

Divisions 4 & 6: Poster #682: "Economic analysis of carbon sequestration on stand level"

Johanna Pohjola, Finnish Forest Research Institute; L. Valsta, J. Mononen, University of Helsinki, Finland

Division 5: Poster #16: "Evaluation of five reforestation species for manufacture of oriented strand board"

Nigel Lim, Y. K. Pek, Sarawak Forestry Corporation, Malaysia

Poster #799: "Improvement of the acoustic properties of Sitka spruce with chemical treatment"

Chih-Lung Cho, S.-Y. Wu, S.-U. Yeh, National Ilan University, China-Taipei

Division 7: Poster #836: "Managing intensively grown, irrigated hybrid poplars based on clonal susceptibility to Poplar/Willow borer Cryptorhynchus lapathi (Curculionidae)"

Eugene Hannon, N.T. Kittelson, J. J. Brown, Washington State University, USA

Division 8: Poster #521: "Soil biodiversity and nutrient turnover in different forest types of Central Europe"

Sophie Zechmeister-Boltenstern, M. Pfeffer; Forest Research Centre; A. Bruckner, University of Life Sciences; W. Foissner, University of Salzburg; E. Hackl, A. Sessitsch, Austrian Research Centres; N. Milasowszky, W. Waitzbauer, University of Vienna, Austria

Task Force – The Role of Forests in Carbon Cycles, Sequestration and Storage:

Poster #210: "Spring phenology of Norway spruce (*Picea abies* (L.) Karst.) at ambient and elevated [CO2] and temperature"

Michelle Slaney, Swedish University of Agricultural Sciences, Sweden; J. Medhurst, CRC/CSIRO Forestry, Australia; S. Linder, Swedish University of Agricultural Sciences, Sweden; G. Wallin, Goteborg University, Sweden

Best Poster Awardees

Best Poster Award

IUFRO International Council

The IUFRO International Council (IC) met twice on the occasion of the XXII IUFRO World Congress in Brisbane, on 9 and 12 August 2005. Being the most authoritative statutory body of IUFRO, the IC discussed the future strategic orientation of IUFRO and took decisions of key importance for the next Board period. Both IC meetings were chaired by the IUFRO President and Chair of the IC, Mr. Risto Seppälä.

1. Reports on the Board period 2001-2005

The IUFRO President, Vice-Presidents Science and Policy, and the Executive Secretary reported on the main developments and achievements of IUFRO in the Board period 2001-2005. As reflected in these reports, most goals set by the Board in the Strategic Action Plan for 2002-2005 had been achieved. In summer 2004, an independent Review of IUFRO had been carried out in order to assess IUFRO's current structure and activities, to identify challenges and opportunities, and to provide guidance on how to adjust and position IUFRO in the future. The report of the Review panel had provided an important basis for the development of the draft IUFRO Strategy 2006-2010 (see also item 5 below).

2. Election of President and Vice-Presidents and members of the Board

One of the key items on the IC agenda was the election of the President, Vice-Presidents and members of the Board for the period 2006-2010. The IC elected the following personalities who will play a key role in shaping the further development of IUFRO in the next five years: The new President of IUFRO will be Professor Don K. Lee (Republic of Korea). He will be assisted by Dr. John Innes (Canada) as Vice-President Policy and Dr. Niels Elers Koch (Denmark) as Vice-President Science. Björn Hånell, Bailian Li, Hans R. Heinimann, Margarida Tomé, Cathy Wang, Perry Brown, Mike Wingfield and Alex Mosseler will serve IUFRO as Division Coordinators for the period 2006-2010. Furthermore, the IC elected Mohammed Ellatifi, Vitor Hoeflich, Roberto Ipinza, Su See Lee, Shirong Liu, Tohru Nakashizuka, Piotr Paschalis- Jakubowicz, Heinrich Spiecker and Victor K. Teplyakov as General Members.

3. Congress Resolutions

At their first meeting on 9 August, the members of the IC presented comments on a draft Resolution that had been prepared by a special Congress Resolutions Committee. It was noted that the messages contained in the text should be directed more clearly to the two main target groups, namely IUFRO itself, and decision-makers. Taking into account these comments, the original text was amended and split into two Resolutions which were then presented to the IC at its second meeting on 12 August. At this meeting, the IC approved both, Resolution 1 "Promoting Global Cooperation in Forest Related Research" and Resolution 2 "Promoting Science for Decision-Making".

4. Venue of the IUFRO Congress 2010

The next IUFRO World Congress after the Brisbane Congress will take place in the year 2010. In this context, another key item for the IC was to vote on the host country of this Congress. The IC noted that bids to host the Congress had been received from Brazil, Russia, South Africa, and the Republic of Korea. Following the evaluation of these bids against the IUFRO criteria for selection, South Africa and the Republic of Korea had been invited to give a presentation during the Board meeting in Seoul, Korea, in October 2004. The Board had then discussed both bids and had recommended the Republic of Korea as host of the IUFRO Congress 2010. The IC followed this recommendation of the Board and voted to invite the Republic of Korea, Seoul, to host the next IUFRO Congress in October 2010.

5. Future policy and orientation of IUFRO

As a central outcome of its work, the IUFRO Review Panel had recommended to develop a general strategic plan for IUFRO. As a consequence, a draft IUFRO strategy 2006-2010 had been prepared. Given its crucial role in advising the President and the Board on major issues, the IC was invited to discuss this draft IUFRO strategy so that it could be finalized and adopted by the IUFRO Board at its next meeting in May 2006. In the discussion, the importance of providing an even better home for IUFRO's members and of promoting the development of capacities of scientists and research institutions was underlined. Furthermore, the need to further strengthen the science-policy interface and to enhance the dissemination of scientific information to decision makers and stakeholders was emphasized. A more active role of the IC in facilitating such interaction and/or in assessing or approving state-of-knowledge reports was discussed.

6. Other items

In recognition of their outstanding contributions to IUFRO, the IC approved the nominations of Jeffery Burley, Heinrich Schmutzenhofer and Les Whitmore as Honorary Members of IUFRO. With a view to the next Congress, the IC discussed how the current system of IUFRO Awards could be revised in order to increase its attractiveness and reduce existing administrative and financial burdens.

Report of the President Professor Risto Seppälä to the International Council for the period 2001 - 2005

The IUFRO President has reported annually to the International Council and to Member Organizations on the activities of the Union. This report covers the whole period 2001-2005 and should be considered not only a report of the President, but rather a collective report of the IUFRO Senior Officers (President, Vice-Presidents, Immediate Past President and Executive Secretary).

In its first meeting in March 2001 the IUFRO Board 2001-2005 agreed on Vision and Mission statements for the Union. They are as follows:

IUFRO's Vision

Science-based sustainable management of the world's forest resources for economic, environmental and social benefits.

IUFRO's Mission

To promote the coordination of and international cooperation in scientific studies embracing the whole field of research related to forests and trees.

Strategic Action Plan

In order to achieve its mission and to expand it into a comprehensive and robust strategy with clearly identified goals a Strategic Action Plan for 2002-2005 was accepted by the Board in June 2002. This report is based mainly on the goals, actions and issues listed in the Plan.

Membership and Members

The scope of forest science has expanded, and many new organizations and individuals have stepped into the field of forest research. This means that there is a substantial potential to expand IUFRO's membership. For example, in the 2000 IUFRO World Congress almost half of the participants came from organizations that were not members of IUFRO. According to a COST study made by the European Forest Institute, in Western Europe alone, there are more than a thousand institutions dealing with forest-related research. Out of these, less than 200 are IUFRO members. In the other parts of the world the situation is likely to be similar. Therefore, the Board accepted a goal to expand the IUFRO membership base to reflect the broadened scope of forest research and to increase the number of members.

In 1995 we had 539 main member organizations, in 2000 the number was 512, and in 2005, at the writing of this report, we had 502 main members. This means that we have not reached our goal to increase the number of members and consequently, stronger and more effective actions are needed. On the other hand, the total membership has not decreased substantially despite the global trend of forest research organizations losing ground to non-forest institutions. However, it is worrying that some long-time members have withdrawn their membership due to financial reasons.

There are some specific issues connected with expanding IUFRO's membership. One of them is that many forest scientists are not working in traditional forest research organizations. It is not easy to identify these individuals and organizations, and it is difficult to get the organizations to join IUFRO, especially if they do not see a clear benefit in doing so because of only one or few interested scientists. Therefore, IUFRO should perhaps give more emphasis to individual membership. In this case a lower fee for Associated Members is needed.

Membership Fees

IUFRO is very dependent on membership fees: 50 per cent of the Secretariat's operational budget is covered by these fees. Although our membership fees are modest compared with many other international organizations they have obviously been too high for some members, especially for those in developing countries and countries in transition. On the other hand, many members in rich countries are able to pay higher subscriptions for the services and benefits IUFRO provides. Consequently, in 2003 IUFRO changed the membership fee structure in order to introduce social fairness and to take into consideration the financial ability of members to pay the fee. The subscription was increased for members in high-income countries and decreased for those in low-income countries. The new fee structure was well received by the member institutions.

The Board set also a goal to decrease financial dependence on membership fees by finding new additional income sources. This goal has been reached only partially. See Finances for details.

International Council

According to the IUFRO Statutes, the International Council (IC) is responsible for advising the President and the Board on major issues concerning IUFRO's policy and strategy. The IC normally meets only during the World Congress. Ballot voting by post or e-mail has been used between physical meetings. The President has written to the IC once or twice a year. It has been felt that the IC is not very active. Therefore, the Board set a goal to activate it and requested the Management Committee to develop respective means in the new IUFRO Strategy 2006-2010. It is hoped that the IC in its meeting in Brisbane can discuss ways to increase its activity.

Board

The IUFRO Board meets only once a year but has increasingly used e-mail voting in making decisions and Internet in communication. The activity level of the Board members, especially that of the General Members varies considerably. It has been felt that Board meetings have not focused sufficiently on policy and strategic issues.

When the Board accepted the Strategic Action Plan for 2002-2005 it set a goal to improve the efficiency of the Board meetings and give more emphasis to strategy and policy issues. The Board also wanted to have the Secretariat host country representative on the Board. Furthermore, it hoped that the next (2006-2010) Board would be more representative of the general IUFRO membership.

During the current term the Board meetings have gradually become more efficient and time has increasingly been devoted to strategic issues but improvements are still needed. In 2003 the Statutes were changed so that the host country

of the IUFRO Secretariat and Headquarters (Austria) now has a representative on the Board. As for the composition of the Board 2006-2010, the geographical balance has slightly improved but the gender balance is still very poor, and there are very few young people.

Since 1995 the Management Committee (MC), consisting of eight members of the Board has met once every year between the Board meetings. In addition to the meetings, many MC members have communicated almost daily by e-mail and phone. In all, the MC has taken a fairly strong role in acting on behalf of the Board. The problem is that, like many other Board members, the MC members are working on a voluntary basis and are busy in their non-IUFRO duties and thus have difficulties in finding time and finance for the MC activities, especially for meetings. This emphasizes the importance of an improved electronic communication and conferencing.

President, Vice-Presidents and Immediate Past President

The President has the overall responsibility for the Union and he/she is supported by two Vice-Presidents. The President chairs the IUFRO Congress, International Council, Board and Management Committee, and between their meetings he makes any necessary decisions with the agreement of these other organs. In addition, the President serves IUFRO in an ambassadorial capacity and provides intellectual leadership to the Union. He represents the Union in international policy fora and other external relations. A problem in carrying out all these activities is that the President works for IUFRO in a voluntary capacity and has also other activities and duties. During the ongoing period especially IUFRO's increasing involvement in international processes has created additional pressure on the time of the President.

In order to free the President more for strategic thinking and greater representation of the Union externally the Board set a goal to strengthen the Secretariat so that it would be able to take care of all managerial responsibilities. This, together with the reorganization of the Secretariat, has indeed decreased the President's workload connected with internal activities. However, in the future it can be difficult to find for the post competent and suitable candidates who are able to devote enough time to IUFRO. It can also be questioned whether the five-year period is too long for one person.

The two Vice-Presidents (Science: Eric Teissier du Cros, Policy: Don Koo Lee) have supported the President in leading and representing IUFRO. Since 1996 the Vice-Presidents have had Deputies from among the members of the Board. The Deputies have also been Management Committee members. The Board set a goal to develop continuously the mandates of the Vice-Presidents, and the division of labour between them, the President and the Executive Secretary. See the reports of the Vice-Presidents for their activities.

The Statutes do not give any special assignment to the Immediate Past President (currently Jeffery Burley) except that she/he is a member of the Board and Management Committee. He has also been acting as Chair of the Nominating Committee. The Board set a goal to have a more active role for the Past President especially as an advisor to the President and the Board. This goal has been reached reasonably well. However, it can be asked whether the Past President should be a member of the Board only for the two or three first years after his period as President, especially because he has normally been a member of the Board at least for one five-year period before becoming the President and will thus serve in the Board for 15 or more years. On the other hand, long-term memory is also needed in the Board and its Committees.

Secretariat

In the beginning of the current period the IUFRO Secretariat was suffering from a lack of resources and from unsatisfactory working conditions. Bookkeeping and other financial activities were physically separated from the Secretariat. Relations between the Secretariat and the host organization, Austrian Federal Office and Research Centre for Forests (BFW), were rather formal and distant.

Based on these facts, the Board set goals to have a stronger and more visible Secretariat as IUFRO's executive management unit as well as to improve its facilities so that the Secretariat could better serve the Union. In addition, the Board wanted to locate financial management at the Secretariat, create better relationships with BFW, and finally, select the next Executive Secretary based on an international search to secure transparency and guarantee that the best possible candidate will be chosen.

Negotiations with the Austrian government led to a new contract, signed in September 2003. This contract considerably widened the scope of contributions granted to IUFRO by the Republic of Austria by supporting more staff for the Secretariat and providing larger, newly renovated office space in Mariabrunn where the idea to establish IUFRO was born in 1890. When the Secretariat moved to the new premises also the financial management activities were transferred from Switzerland to Vienna.

Relations between the IUFRO Headquarters and the Research Centre (BFW) have entered a new era. However, there is still room for improvement.

The period 2001-2005 was marked by one more significant change at the IUFRO Secretariat. In November 2003 Heinrich Schmutzenhofer retired after 16 years as Secretary and lately as Executive Secretary, and Peter Mayer commenced his career as IUFRO's Executive Secretary after passing through an international selection process.

It can be concluded that the goals set for the Secretariat have materialized almost completely. Lack of resources is still a problem but the main reason for this is that the IUFRO activities have increased so much in recent years that not even the improved resources have matched the growing needs. The new and increasing activities have been connected both with participation in international processes and with needs to better serve members and the whole forest research community.

In 2000 the name of the Secretary was changed to Executive Secretary to reflect the changes that had taken place in his duties. As of 2006 the name will be Executive Director to match with the title of similar posts in other international organizations. This change of title will make it easier for the incumbent to represent the Union in international meetings and thus decrease the workload of the President.

Since 2003 the Austrian Government has provided IUFRO with a Deputy Executive Secretary. The current incumbent, Alexander Buck, has had an important role in compiling science-based policy reports for UNFF meetings and other policy processes.

Additional information about the activities of the Secretariat can be found in the Report of the Executive Secretary.

Divisions, Research Groups and Working Parties

According to its Statutes, IUFRO's field of scientific activity is spread over a number of Divisions, Research Groups and Working Parties. The current discipline-based Divisional system has existed since 1971. This structure, inherited from the past, may not always be the best for the complex and rapidly evolving world. This has been partly answered by adding Task Forces, Programmes and Projects to the IUFRO Structure. However, Divisions and their Units are still the absolute core of IUFRO's scientific activities.

One of the main issues connected with the IUFRO Units is that they differ markedly in their level of activity. Consequently, the Board set a goal either to activate non-active Units or to terminate them when activation efforts do not succeed. Another goal was to create more collaboration and synergy between Divisions e.g. by creating joint Research Groups.

The evaluation of the IUFRO Units is an ongoing process. In some Divisions it has led to reactivation and even complete restructuring, and also to termination of Units. In general, the process has, however, proven to be rather difficult. It has also been laborious to increase collaboration between Divisions.

Task Forces

Since 1987 IUFRO has had Task Forces to strengthen its expertise in specific areas and to contribute to international processes and other international activities. Task Forces have a limited duration, normally from one IUFRO Congress to the next. In all, twelve Task Forces have been established, with nine existing in 2005.

The Board asked the Management Committee to develop new Task Forces as required. During the current term three new Task Forces (Carbon Sequestration, Forest Biotechnology, and Information Technology and Forest Sector) were established.

The Board requested Task Forces to produce State-of-Knowledge Reports for the 2005 Congress. All Task Forces will not be able to do this. Low level of activity has indeed been a problem in some Task Forces, mainly because the Coordinator has not been active.

There have been concerns that the Task Forces can diminish the importance of the Divisions and their Units. It has also been expressed that by having too many Task Forces IUFRO might be placing too great an emphasis on short-term challenges at the expense of long-term scientific work. Sometimes it has proven to be difficult to terminate Task Forces although they are meant only for a limited period. In general, it can, however, be said that Task Forces have been an efficient way to react to emerging problem-oriented interdisciplinary issues. Several Task Forces have produced excellent results both scientifically and by contributing to policy processes.

Additional information on Task Forces can be found from the Reports of the Vice-Presidents.

Programmes and Projects

Special Programmes are long-term activities that are aimed at improving networking, research capacities and information exchange. Special Projects are limited-term activities with specific objectives. Unlike other IUFRO Units that are based only on voluntary contributions, Programmes and Projects have paid personnel. Normally the Coordinators are based at the IUFRO Headquarters thus increasing its activities and visibility.

In 2001-2005 IUFRO has had two Programmes and two Projects. The oldest of these, the Special Programme for Developing Countries (SPDC) was established already in 1983. The Terminology Project (SilvaVoc) was established in 1996. In 2001 the IUFRO Board established a new Programme – the Global Forest Information Service (GFIS) - that had been a Task Force since 1998, and a new Project - World Forest, Society and Environment (WFSE) - that had earlier been a non-IUFRO project. Since 2004 GFIS has been a CPF (Collaborative Partnership on Forests) Joint Initiative and consequently, the GFIS Programme was converted to a GFIS Management Unit leaving SPDC the only IUFRO Programme.

Programmes and Projects have been fighting with financial problems, and the future of SPDC and Terminology is at stake. The income of the Programmes and Projects must be based on

external sources as IUFRO cannot fund these activities from its own budget. It is envisaged that one way to solve the current problems is to create more synergy between Programmes and Projects and possibly organize them and some other policy-related activities under a common umbrella.

Additional information on Programmes and Projects can be found from the report of the Executive Secretary.

Chapters

Chapters comprise groups of Members in a geographic region seeking closer collaboration within the IUFRO framework. In some cases, also members in individual countries have established informal IUFRO chapters or associations but normally chapters cover several countries.

Because the status of Chapters and the position of groups that call themselves IUFRO Chapter have been unclear the Board requested the development of a clearly defined concept for Chapters and the signing of agreements with Chapters. Terms of Reference for Chapters were accepted in 2002 and the first Memorandum of Understanding was signed in 2003.

It has been considered important that Chapters do not compete with IUFRO but rather increase IUFRO-related activities in their respective regions.

More information on Chapters can be found from the report of the Vice-President Policy.

Publications

A goal was set to streamline IUFRO's publications and go more towards electronic publishing. As a response to this, the IUFRO Occasional Paper series will be published only in electronic form starting in 2005, and it will be expanded to include short contributions on timely "hot" topics. The IUFRO Research Series and the IUFRO World Series will continue unchanged.

Four IUFRO Research Series books, nine IUFRO World Series books and three Occasional Papers were published in 2001-2005.

There have been problems in obtaining appropriate contributions to the IUFRO Research Series. Further, the sales of these publications have not been satisfactory. It has been felt that greater flexibility for publishing less expensive paper and electronic versions should be considered.

Additional information on publishing activities can be found from the report of the Executive Secretary.

Image, Public Relations and Communication

Organizations are paying increasing attention to their "corporate image". Usually this concept is connected with a logo or the visual image of the organization but it means much more: it is the overall impression that the organization gives to the outside world. Consequently, the IUFRO Board decided to prepare a Public Relations strategy and improve IUFRO's image and visibility. Based on this, a new modern IUFRO logo was accepted and a new flyer and flag were prepared in 2002. The IUFRO News and the Annual Reports have a new design, and the Annual Reports are now meant also for our stakeholders whilst the earlier reports were mainly for internal use.

In 2001 the Secretariat began to publish the bimonthly electronic E-notes. In 2005 this and the printed IUFRO News, that had been published already for more than 30 years, were merged into an electronic IUFRO News.

In 2004 the IUFRO web-site was restructured to make it more user-friendly and to reflect benefits from IUFRO membership. Accordingly, it now contains a Member Zone and a non-Member Zone.

IUFRO still lacks a strategy for Communication and Public Relations. There is also a clear need to hire a PR and media expert to the Secretariat. So far, IUFRO's budget has not allowed this plan to materialize.

Additional information on communication activities can be found in the report of the Executive Secretary.

Finances

In the period 2000-2002 IUFRO had an annual operating deficit, i.e. the annual income was insufficient to cover expenses. In 2003 the Secretariat budget was in balance again based on different measures initiated in 2001 and 2002. The main reasons for reaching the balance were savings in some cost items (e.g. mailing) but above all, increases in income. The most important factor was the increase in support from the Austrian Government. In addition, the new membership fee structure produces slightly more income than the old one, and finally, invoicing is now more efficient after moving the financial management to the Secretariat. More funding is, however, needed in order to respond to the new challenges arising e.g. from the participation in international processes and to improve public relation and media activities.

The budget of the IUFRO Secretariat is now in balance but this is not the case with all Programmes and Projects that are based on external funding and should pay overhead charges to the Secretariat for services they receive. More detailed information can be found from the report of the Executive Secretary.

In 2001-2005 several governments and their agencies provided considerable financial support to IUFRO's activities, both to the Secretariat and to Programmes and Projects. In 2005, many activities connected with the Brisbane Congress have been financed by different sponsors. In 2001-2005 the main contributions to IUFRO came from Australia, Austria, Canada, Denmark, the European Union, Finland, Germany, Japan, the Republic of Korea and USA.

The Board set in 2002 a goal to prepare a comprehensive fund-raising strategy. This strategy has not yet been developed.

Meetings

By the end of the period 2001-2005 IUFRO's Units will have arranged altogether 336 meetings in 62 countries. These figures are more or less the same as during the previous period. Most of the meetings are organized by Research Groups and Working Parties but also Divisional, Inter-Divisional, Task Force and Regional Meetings have been held to adopt a more interdisciplinary approach to forest science. The most important meeting is, of course, the IUFRO Congress, but at the time of the writing this report, the XXII Congress is still ahead.

IUFRO and its scientists also participated actively in meetings arranged by other organizations. The most important non-IUFRO meeting was the World Forestry Congress (WFC) in 2003. The Board set a goal to have an active IUFRO involvement both in the planning and participation of the WFC. In addition to contributions to the design of the WFC programme and reviewing papers, many IUFRO officeholders and members of the Board were among the invited speakers, and 15 side events were organized by different IUFRO Units. It can be said that the goal set by the Board was reached very well.

IUFRO has been active in FAO's COFO (Committee on Forestry) meetings by arranging side events and contributing to discussions. The IUFRO representatives have also participated in FAO's regional meetings.

International Processes

The Board set a goal to continue and further strengthen IUFRO's participation in international processes. A clear milestone was reached in 2003 when IUFRO became the 14th and so far, the last member of the Collaborative Partnership on Forests (CPF). IUFRO has been very active in the UNFF meetings e.g. by arranging side events and drafting different reports, such as a UN Secretary General's Report.

The problem in IUFRO's participation in international processes compared with other CPF members is that our Union is mainly a voluntary organization, and therefore, it is difficult to find IUFRO representatives to attend meetings regularly because IUFRO cannot pay the costs of participation.

Collaboration with Other Organizations

In order to attain its Mission to promote the coordination of and international cooperation in forest research, IUFRO has to work in close collaboration with other international and national organizations. Contracts and agreements with most important partners ease collaboration. During 2001-2005 IUFRO signed Agreements or Memoranda of Understanding (MOU) with the Austrian Government, APAFRI, CIFOR, ETFRN, IFSA, IUCN (currently in preparation), Korea Forest Research Institute, NEAFF, UNU and WWF. Collaboration with all these organizations as well as those with which IUFRO has old ties has clearly intensified during the current period.

IUFRO is an Associated Member of ICSU (International Council of Scientific Unions). Full membership has been applied for, and the decision will be made at the ICSU General Assembly in October 2005. It is hoped that the IC members can support IUFRO's application by approaching ICSU members (usually national science organizations) in their home countries.

Student Participation

After the 2000 IUFRO World Congress, several comments were received that students should be more involved in IUFRO. As a response to these requests, a MOU was signed with the International Forest Student Association (IFSA) in 2003. Based on this, an IFSA representative has attended the IUFRO Board meetings since 2004 as an observer and IUFRO has e.g. helped the participation of the student community in the UNFF meetings. In 2002 the Board approved a Student Award, and two first recipients will receive their Awards during the Brisbane Congress.

IUFRO Review and a New IUFRO Strategy

IUFRO was reviewed in 1987 and 1999. According to the Strategic Action Plan, the Board initiated in 2003 a further review that was carried out in summer 2004. The report of the Review Panel was presented to the IUFRO Board in October 2004 by the Panel chair, Dr. Jag Maini.

The Review Panel considered it essential for IUFRO to expand the sphere of influence of the Union by increasing activities related to policy and human well-being. In this context, the Panel recommended developing strategies for communication, expanded scope, as well as streamlined structure and funding. The report can be obtained from the IUFRO Headquarters by writing to office@iufro.org.

Following the recommendation of the Review Panel the IUFRO Board decided to prepare a new IUFRO strategy. The International Council is invited to discuss the draft of this IUFRO Strategy 2006-2010 and advise the Board on the future directions of the Union in its meetings in Brisbane. The intention is also to make the draft available to every attendee

at the Brisbane Congress in order to mobilize Congress participants and obtain feedback from them.

IUFRO's Role as the Global Network for Forest Science Co-operation

Many forest-related scientific issues have left the confines of traditional forest research institutions and consequently, there is a danger that IUFRO with its traditional structure and membership may become marginalized and we may no more be able to respond to the challenges of the evolving world.

IUFRO's primary niche and mission is to provide physical and virtual platforms where scientists can meet. Although this fostering of international scientific collaboration is the raison d'être of IUFRO, the Union has in recent years become more and more involved also in international forest-related processes.

Despite the increasing visibility of IUFRO in international fora and the greater emphasis placed on problem-oriented Task Forces and Programmes there is no doubt that our core activities are still connected with our eight discipline-oriented Divisions and their Research Groups and Working Parties. These Units form IUFRO's scientific base without which our participation in political processes would not be possible. However, if we are not able to translate our scientific information to the knowledge and know-how of policy makers and other clients our research findings and our scientific fora will be of little value. It is really vital to the research community that research results are used in decision-making and forest management at all levels. IUFRO can work toward this goal by strengthening its role as the global focal point of science-based information and expertise related to forests. This also gives the justification to say that IUFRO is "the" global network for forest science co-operation.

Report of the Executive Secretary Dr Peter Mayer to the International Council for the period 2001 - 2005

This report gives complementary information to the reports of the IUFRO President and the IUFRO Vice-Presidents and the financial aspects for the IUFRO Secretariat and the IUFRO Programmes and Projects over the last five years.

1. IUFRO membership status and development 2001- June 2005

IUFRO currently has 659 members (incl. 115 Sub- und 42 Sub-submembers). This is a decrease of 52 members compared to 2001 which can partly be explained by the introduction of a new membership fee structure in 2003. However, this change was in general well received and lead to an increase of fees for IUFRO (more details see chapter 5 of this report). Moreover, IUFRO had an increase of associate members from 52 to 82 during the last five years.

IUFRO membership 2001-2005

	Members (incl. Sub- and Sub-submembers)	New members	Associate members	New associate members
2001	711	12	52	9
2002	691	24	66	14
2003	649	7	69	5
2004	648	12	77	7
2005	659	11	82	5

Members in regions (2005)

	Members (incl. Sub- and Sub-submembers)	Associate members
Europe	170	29
Eastern European Transition Countries	61	4
Africa	51	11
Latin America & Caribbean	61	7
USA & Canada	148	15
Asia	125	9
Western Pacific	43	7
Total	**659**	**82**

2. IUFRO Meetings

The following table gives an overview of the meetings of the IUFRO Divisions, Research Groups, Working Parties and Task Forces. In addition, each of the IUFRO Programmes and Projects convened several meetings and courses each year.

Meetings	2001	2002	2003	2004	- 6/ 2005	Total
Division 1	8	10	14	12	4	48
Division 2	8	8	9	10	1	36
Division 3	10	6	11	5	5	37
Division 4	11	14	12	17	5	59
Division 5	8	5	8	4	8	33
Division 6	18	9	10	12	11	60
Division 7	7	6	7	9	6	35
Division 8	7	6	13	7	5	38
Task Forces	3	5	9	2	-	19
Total	**80**	**69**	**93**	**78**	**45**	**365**

3. IUFRO Publications, Communication and PR

As outlined in the report of the IUFRO President, the main changes in IUFRO's communication and publication strategy have been the relaunch of the IUFRO website www.iufro.org, the start of a regular electronic IUFRO newsletter and the publishing of the IUFRO Occasional Papers in electronic form. These improved communication tools facilitate and support the collaboration of scientists within the IUFRO network. At the same time they have also increased the visibility of scientific results of IUFRO units for other scientists, but also for a wider community of people interested in forests and forestry.

In the period 2001 – 2005 the IUFRO HQ published the following books and newsletters:

Books and brochures

15 IUFRO News (2001-2004)

8 Noticias de IUFRO

5 Annual Reports

1 Honours and Awards Booklet

1 IUFRO Statutes and Internal Regulations

2 IUFRO information folders

IUFRO World Series

World Series Vol. 9-ch
Terminology of Forest Management Planning - in traditional and simplified Chinese

World Series Vol. 9-fr
Terminologie de l'aménagement forestier, Termes et définition en français – in French

World Series Vol. 12
Modelización del Crecimiento y la Evolución de Bosques

World Series Vol. 13
Medición y Monitoreo de la Captura de Carbono en Ecosistemas Forestales - available in electronic form only!

World Series Vol. 14
Forestry Serving Urbanised Societies

World Series Vol. 15
Meeting the Challenge: Silvicultural Research in a Changing World

World Series Vol. 16
La Contribución del Derecho Forestal – Ambiental al Desarrollo Sustentable en América Latina

World Series Vol. 17
Forests in the Global Balance – Changing Paradigms

World Series Vol. 18
Information Technology and the Forest Sector

Occasional Papers

Occasional Paper No. 14
Forest Terminology: Living Expert Knowledge - How to Get Society to Understand Forest Terminology, Proceedings of the 6.03.02/SilvaVoc Group session at the IUFRO World Congress 2000 and Selected Contributions on Terminology

Occasional Paper No. 15
Science and Technology – Building the Future of the World's Forests. Contributions to the Third Session of the United Nations Forum on Forests in Geneva, Switzerland, 26 May - 6 June 2003

IUFRO Research Series (published by CAB International in association with IUFRO)

Research Series, No. 7
Criteria and Indicators for Sustainable Forest Management

Research Series, No. 8
The Impact of Carbon Dioxide and Other Greenhouse Gases on Forest Ecosystems

Research Series, No. 9
Environmental Change and Geomorphic Hazards in Forests

Research Series, No. 10
Forest Biodiversity – Lessons from History for Conservation

IUFRO SPDC

Manuel pour la préparation et la rédaction de propositions de recherche

Manual para la Preparación y Redacción de Propuestas de Investigación

Rehabilitation of Degraded Lands in Sub-Saharan Africa: Lessons Learned from Selected Case Studies

Public Relations for Forest Science

Fortalecimiento de las capacidades de científicos forestales latinoamericanos en criterios e indicadores, auditoría del manejo forestal sostenible y certificación forestal

TERMINOLOGY

World Series Vol. 9-ch, World Series Vol. 9-fr, Occasional Paper No. 14

WFSE

Forests for the New Millenium – making forests work for people and nature World Series Vol. 17

ELECTRONIC PUBLICATIONS AND NEWSLETTERS

16 E-Notes

6 Electronic newsletters (since 2004)

Occasional Paper No. 16 - Forest Research – Challenges and Concepts in a Changing World

4. IUFRO HQ responsibilities

As mentioned in the report of the IUFRO President, Peter Mayer was appointed as new Executive Secretary upon the retirement of Mr. Heinz Schmutzenhofer in December 2003.

The terms of reference of the IUFRO HQ staff have been revised in order to achieve a clear distribution of tasks and responsibilities within the HQ with the objective to facilitate communication with officeholders, members and third parties. The IUFRO HQ now consists of 12 staff persons with the following responsibilities:

IUFRO SECRETARIAT

Peter Mayer	Executive Secretary
Alexander Buck	Deputy Executive Secretary
Brigitte Burger	Web Management and Communication
Sylvia Fiege	Library and Database Administrator
Judith Stöger	Finances and Administration
Gerda Wolfrum	Publications and Translation

SPDC

Michael Kleine	Project Coordinator
Eva-Maria Schimpf	Project Administration and Translation Services
Margareta Khorchidi	Project Administration and Translation Services

SILVAVOC TERMINOLOGY

Renate Prüller	Project Coordinator

WFSE

Gerardo Mery	Project Coordinator

GFIS (CPF initiative)

Eero Mikkola	Coordinator GFIS Management Unit

The redistribution of tasks at the HQ and the improved communication tools (see chapter 3) have also made it possible for IUFRO to gradually strengthen the collaboration with international organizations and stakeholders and to prepare thematic contributions to international processes, in particular the United Nations Forum on Forests, the Collaborative Partnership on Forests, and the Convention on Biological Diversity. In this respect, the HQ has played a crucial role in synthesizing the scientific information provided by IUFRO Units and officeholders, and coordinating the participation of officeholders in related expert meetings and consultations.

Also the IUFRO Special Programmes and Projects and the Global Forest Information Service (GFIS) have continued to play a vital role in supporting the thematic collaboration within IUFRO by assisting in capacity development of scientists and research institutions, providing terminological services, enhancing access to all types of forest information, and critically analyzing key issues concerning forests and forestry by various means (e.g. training courses, publications).

The experiences gained by the IUFRO HQ during the past Board period in carrying out its administrative, communication and collaborative tasks have provided important input for the development of the IUFRO Strategy 2006-2010 (see separate document).

For more detailed information on activities of the IUFRO Secretariat, IUFRO Programmes and Projects as well as GFIS please have a look at the IUFRO web pages www.iufro.org, www.iufro.org/science/special/ and www.iufro.org/science/gfis/.

5. Financial Report for the period 2001 to 2005

This section gives an overview of general developments and the financial development of the budgets of the IUFRO Secretariat and the individual IUFRO Projects and Programmes.

5.1 General developments

Move of accounting to Vienna

In June 2002 the IUFRO Board decided that the daily accounting and bookkeeping would be shifted entirely from the Treasurer's Office at WSL in Zurich, Switzerland to the IUFRO Headquarters in Vienna. The Board also decided that the Secretariat should take over the financial management of the Union. Therefore the tasks of the Treasurer changed, and

his function was renamed into "Finance Officer". However, the nominated finance officer resigned in 2004.

In the course of the shift of the accounting and bookkeeping work, the accounting system was changed into a double-entry bookkeeping system. This requested a commercial valuation of values which led to an accounting loss in the year 2002.

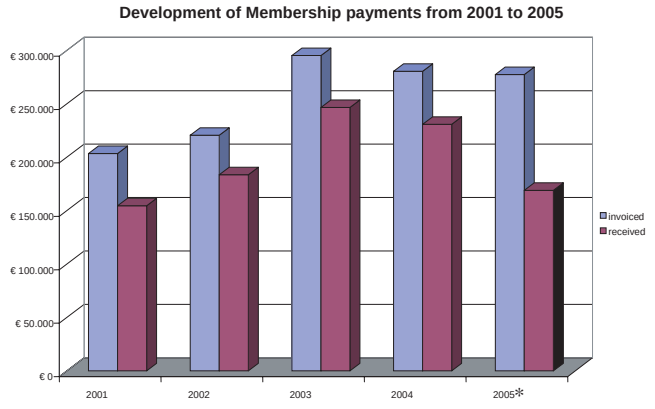
Membership fees

An important step was the restructuring of the IUFRO Membership Fees in the year 2003. The basic annual membership fees were adjusted to an adapted World Bank classification of economies. This led to a visible increase of membership fees received. However, the change failed to include a dynamic aspect matching the inflation rate of the country hosting the IUFRO Headquarters (Austria). As a consequence, the Board has already recommended to correct this omission.

Another attempt to increase the income of membership fees was not that successful. This was the "twinning" project" approach. "Richer" IUFRO members should have supported "poorer" IUFRO members. Ultimately this idea did not result in many concrete actions with the exemption of the USDA Forest Service. It kindly supports financially disadvantaged IUFRO Member Organizations every year with 15.000 USD.

The graph below shows the development in membership fees invoiced and received in the last five years. Due to the move of the accounting and invoicing from Switzerland to Vienna in 2002 also the percentage of received membership fees could be significantly increased in the years 2002-2005 compared to 2001.

Development of Membership payments from 2001 to 2005



(payments considered until 31 May 2005)

The following table shows the detailed figures of the membership fees invoiced and received in the last five years.* Furthermore, the amounts sponsored are indicated in a separate line.

Survey of Membership Fees 2001 – 2005

	Invoiced	Paid by member	Sponsored	Received
2001	203,520 €	142,419 €		142,419 €
2002	220,610 €	166,992 €	16,650 €	183,642 €
2003	295,260 €	233,919 €	12,749 €	246,668 €
2004	280,480 €	206,442 €	24,390 €	230,832 €
2005*	277,490 €	169,049 €	0,000 €	169,049 €
Total	**1,073,840 €**	**776,402 €**	**53,789 €**	**830,191 €**

(payments considered until 31 May 2005)

IUFRO contract with the Austrian Government

The contract between IUFRO and the Austrian Government as of 21 April 1995 was renewed and expanded on 8 September 2003. The main change in this new contract is that the Austrian Government - in addition to the in-kind support provided for one full-time and two part-time staff positions – committed itself to cover all staff expenses for the IUFRO Secretariat. The respective donation amounts to 230.000 EURO per year. Therefore none of the membership fees are used for salaries of IUFRO Secretariat staff.

IUFRO sponsors

During the last five years a range of sponsors have supported the IUFRO Secretariat and especially the activities of the IUFRO Programmes and Projects. IUFRO would like to thank the following sponsors:

800,000 EUR - 500,000 EUR
Austrian Government
European Union

499,999 EUR - 200,000 EUR
Finnish Ministry of Foreign Affairs
METLA
German Government (BMZ)
ODA Japan
Korea Forest Research Institute / Korea Forest Service

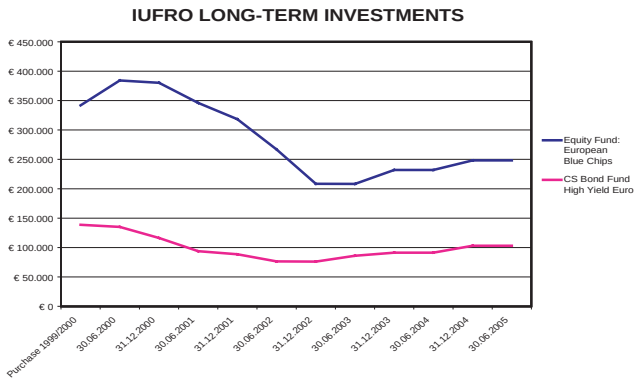
199,999 EUR - 10,000 EUR
USDA Forest Service
WSL Switzerland
DANIDA
Finnish Foundation of Foresters
Canadian Forest Service
FAO
Austrian National Bank
National Land Afforestation Promotion Organization Japan

Sponsoring of Annual Report

From 2001 onwards the Annual Report was produced differently regarding design and, since 2003, also regarding content. It was agreed to try to find sponsors for each year to cover the production and mailing costs of the Annual Report. While this strategy was successful for 2001-2003 no sponsor could be found for the Annual Report 2004.

IUFRO investments at Credit Suisse, Switzerland

IUFRO owns long-term funds which were invested at the Credit Suisse Asset Management in Switzerland in 1999 after a Board decision. Unfortunately the development of these investments was not very satisfactory reflecting a global trend (see below table). Nevertheless, the investments are currently slowly increasing.



5.2 Development of income, expenses and capital from 2001 to 2004

IUFRO Secretariat

In general the financial development of the Secretariat is satisfying. The lower income and higher expenses in 2002 were due to the move of the accounting to Vienna. As mentioned before the change to a double-entry bookkeeping system made necessary a commercial valuation of values which led to an accounting loss in 2002.

Income and expenses of IUFRO Secretariat 2001-2004

Secretariat	2001 in EUR	2002 in EUR	2003 in EUR	2004 in EUR
Income	386,240	253,164	529,285	494,773
Expenses	-368,647	-465,207	-443,807	-482,450
Balance	17,593	-212,043	85,478	12,323
Capital	**722,737**	**528,286**	**613,764**	**626,086**

In July 2003 the final short-term investments were discontinued and transferred to the Headquarters in Vienna. Furthermore, the change of the member fee structure in 2003 as well as the new contract with the Austrian Government led to a higher income in comparison to the previous years. The years 2003 and 2004 therefore resulted in a positive balance.

For the year 2005 a slight loss is expected. This is due to the extra budgetary needs for the IUFRO cash honoraria to be paid to the recipients of the respective IUFRO awards at the XXII IUFRO World Congress in Brisbane. Without these costs the budget would be balanced.

The following table shows the figures per 31 May 2005 in comparison to the estimated income and expenditures for the whole year 2005.

Estimated income and expenses of IUFRO Secretariat 2005

Secretariat	Status 31 May 2005 in EUR	Estimation 31 Dec 2005 in EUR
Income	384,787	445,000
Expenses	-177,951	-493,500
Balance	206,837	-48,500

IUFRO Special Programmes and Projects

The developments of the IUFRO Special Programmes and Programmes are mixed. While WFSE has secure funding and therefore a positive development, the other Projects have had difficulties in finding long-term sponsors. Therefore the respective reserves of the Projects and Programmes have been used to guarantee continued work. When observing the developments of the Terminology Project and to some extent IUFRO-SPDC, it unfortunately becomes evident that they are on the brink of existence, if new donors cannot be found for the coming years. Both Project/Programme Coordinators currently are in intense contact with potential donors. The results of these negotiations will determine whether they will be able to continue their work in 2006.

GFIS had significant budget imbalances in 2002 and 2003. GFIS was able to reduce its loss substantially in 2004, inter alia, through becoming a CPF initiative since a CPF initiative implies a shared input of resources of the involved partners (currently FAO, CIFOR, CABI, UNFF Secretariat). In addition, GFIS aims at having a balanced budget in 2005 and a prospect to be supported also in the coming years.

The NEFIS, GFIS Africa and the GTZ projects have been EU and BMZ/GTZ financed projects that did not result in any profit or loss for IUFRO. They have been completed in 2004 and 2005 or will be completed in 2006 (NEFIS). The indicated balances over the years reflect advance payments or delays in payment by the respective donors.

Income and Expenses of IUFRO Programmes and Projects 2001-2004

		2001 in EUR	2002 in EUR	2003 in EUR	2004 in EUR
SPDC	Income	376,517	115,291	118,216	3,359
	Expenses	-286,084	-261,162	-147,818	-149,922
	Balance	90,433	-145,871	-29,602	-146,563
	Capital	436,987	312,662	283,060	136,497
GFIS	Income	120,232	64,477	83,478	124,637
	Expenses	-61,909	-147,549	-148,535	-143,608
	Balance	58,323	-83,072	-65,057	-18,971
	Capital		-24,748	-89,805	-108,776
Terminology	Income	50,310	12,091	25,004	7,847
	Expenses	-124,946	-77,556	-86,020	-57,683
	Balance	-74,636	-65,465	-61,016	-49,836
	Capital	256,832	104,640	43,625	-6,212
WFSE	Income			61	50,413
	Expenses			-61	-50,413
	Balance			0	0
	Capital			0	0
NEFIS	Income			28,425	6,013
	Expenses			-28,982	-30,749
	Balance			-557	-24,736
	Capital			-557	-25,294
GFIS AFRICA	Income	179,847	141,644	328,293	217,000
	Expenses	-255,464	-298,431	-210,585	-87,445
	Balance	-75,617	-156,787	117,708	129,555
	Capital	134,605	-92,982	24,726	-62,503
GTZ / BMZ	Income		38,325	86,564	53,416
	Expenses		-107,213	-86,564	-53,416
	Balance		-68,888	0,000	0,000
	Capital	68,888	0	0	0

IUFRO Union

For auditing reasons all financial activities of IUFRO are summarised in the IUFRO Union. The decrease of capital reflected in the table is mainly caused by the financial developments of the IUFRO Programmes and Projects.

Income and expenses of IUFRO UNION 2001-2004

Secretariat	2001 in EUR	2002 in EUR	2003 in EUR	2004 in EUR
Income	1.113,146	524,780	1.199,326	739,806
Expenses	-1.097,050	-1.268,997	-1.152,373	-1.054,819
Balance	16,096	-744,217	46,953	-315,013
Capital	**1.551,161**	**827,857**	**874,811**	**559,799**

BRISBANE RESOLUTIONS

Two Congress Resolutions were adopted at the closing plenary session:

English Version

Resolution 1:

Promoting Global Cooperation in Forest-related Research

The XXII IUFRO World Congress "*Forests in the Balance – Linking Tradition and Technology*" provided a unique forum to present the results of the collective global research related to forests and trees.

The Congress identified a range of issues where research could significantly aid the better understanding of forest-related problems, including the achievement of balanced approaches towards forest conservation and sustainable forest management; the adaptation of forests to climate change; the use of genetic resources and biotechnology to further sustainable forest management; the involvement of indigenous groups in forest science and forestry; increasing the value of forest and forest products through innovative technologies; and the role of education, communication and capacity building in ensuring a sustainable future for forests.

Driven by the desire to address these and other forest-related problems and to further strengthen IUFRO as a home for scientists and research institutions related to forests and trees, including those currently operating outside the IUFRO network, IUFRO and its members will work to:

1. provide an improved thematic structure and flexible mechanisms within our organization that allow us to address key issues relevant to forest scientists and their stakeholders and to respond to research questions that are emerging as a result of the ongoing changes in society and the global environment;
2. continue to ensure that our scientific work lives up to the highest quality standards;
3. strengthen the participation of scientists and research institutions of developing countries and countries with economies in transition in the activities of IUFRO, including through providing assistance in capacity development of scientists and research institutions;
4. actively promote gender mainstreaming and cultural diversity within IUFRO and support and encourage the participation of women, young scientists and students in IUFRO's activities;
5. increase our cooperation with scientists and research institutes working in other scientific disciplines on forest-related research topics that cross the traditional boundaries of forest science;
6. more actively communicate our research findings within the scientific and educational communities;
7. fully implement the IUFRO Strategy 2006-2010 to position IUFRO as a truly global network of forest-related science knowledge and cooperation.

Resolution 2:

Promoting Science for Decision-making

The XXII IUFRO World Congress noted that, despite the scientific advances so far, the understanding of forest ecosystem dynamics and their relation to continuously changing human demands and global developments such as population growth, migration, urbanization, technology changes and climate change remains incomplete, and that there continues to be a need for advancement of forest-related scientific knowledge.

In spite of that, the status and capacities of traditional forest research institutions and universities as well as the funding available to carry out forest research is decreasing in many countries, notably as a result of shifting priorities of policy and decision-makers as well as donors.

It is therefore essential that in the future resource inputs into science and technology are seen primarily as an investment in forest-related socio-economic development and in preserving forests as natural life-support systems for present and future generations.

Driven by the desire to provide relevant, scientifically sound information and advice to policy and decision makers and other stakeholders, IUFRO and its members will work to:

1. enhance the provision of relevant problem–oriented forest research results to policy and decision makers and other stakeholders, including the private sector, and encourage them to make better use of scientific outputs;
2. increase efforts to translate research results of the forest science community into language that is readily understood by policy makers and other stakeholders;
3. further enhance our contributions to the work of international processes and conventions such as the United Nations Forum on Forests, the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, inter alia, through the active involvement in the Collaborative Partnership on Forests;
4. contribute to the possible establishment of an advisory body to international processes and conventions with the specific purpose of giving scientific advice on forest-related issues similar to the Intergovernmental Panel on Climate Change in climate issues;
5. further increase partnerships and collaboration with international organizations and stakeholders;
6. contribute to reaching the Millennium Development Goals through science collaboration, capacity building and education activities aimed at reducing poverty and improving the livelihoods of forest-dependent people, and at ensuring environmental sustainability.

German Version

DIE BRISBANE RESOLUTIONEN

Resolution 1:

VERSTÄRKTE WELTWEITE ZUSAMMENARBEIT IN DER WALDBEZOGENEN FORSCHUNG

Der XXII IUFRO-Weltkongress mit dem Thema "Wälder im Gleichgewicht – Verbindung von Tradition und Technologie" bot ein einzigartiges Forum, um die Ergebnisse der gemeinsamen weltweiten Forschung im Bereich Wälder und Bäume zu präsentieren.

Am Kongress wurde eine Reihe von Themenbereichen aufgezeigt, in denen die Forschung einen signifikanten Beitrag zum besseren Verständnis waldbezogener Probleme leisten könnte. Zu diesen Themenbereichen zählen unter anderem: die Suche nach ausgewogenen Ansätzen zum Waldschutz und einer nachhaltigen Waldbewirtschaftung; die Anpassung der Wälder an den Klimawandel; die Nutzung der genetischen Ressourcen und der Biotechnologie zur Förderung einer nachhaltigen Waldbewirtschaftung; die Partizipation indigener Gruppen an den Waldwissenschaften und der Forstwirtschaft; die Erhöhung des Wertes des Waldes und seiner Produkte durch innovative Technologien; sowie die Rolle von Bildung, Kommunikation und Ausbau der Kapazitäten zur nachhaltigen Sicherung der Wälder in der Zukunft.

Geleitet von dem Wunsch, diese und andere waldbezogene Problemkreise zu behandeln und in weiterer Folge die Rolle IUFROs als Heimstätte für jene WissenschaftlerInnen und Forschungseinrichtungen zu bekräftigen, die sich mit Wäldern und Bäumen beschäftigen, einschließlich jener, die derzeit außerhalb IUFROs tätig sind, werden wir unser Wirken darauf richten:

8. eine verbesserte thematische Struktur sowie flexible Mechanismen innerhalb unserer Organisation zur Verfügung zu stellen, die es uns erlauben, Schlüsselthemen von Bedeutung für WaldwissenschaftlerInnen und ihre Interessensgruppen zu bearbeiten und auf die als Ergebnis gesellschaftlicher Veränderungen neu entstehenden Forschungsfragen zu antworten;
9. weiterhin zu gewährleisten, dass unsere wissenschaftliche Arbeit den höchsten Anforderungen gerecht wird;
10. die Teilnahme von WissenschaftlerInnen und Forschungseinrichtungen aus Entwicklungsländern und Reformstaaten an der Arbeit IUFROs zu verstärken, indem unter anderem die Aus- und Weiterbildung von WissenschaftlerInnen und der Ausbau von Forschungseinrichtungen unterstützt werden;
11. das Gleichgewicht der Geschlechter und die kulturelle Vielfalt innerhalb IUFROs zu fördern und den Anteil an Frauen, jungen WissenschaftlerInnen und StudentInnen in unserer Organisation zu erhöhen;
12. die Zusammenarbeit mit den in anderen wissenschaftlichen Fachbereichen tätigen WissenschaftlerInnen und Forschungseinrichtungen in jenen waldbezogenen Themenbereichen zu verstärken, die die Grenzen der traditionellen Waldwissenschaften überschreiten;
13. die Ergebnisse unserer Forschung aktiver innerhalb der Wissenschafts- und Wissensvermittlungsgemeinschaft zu kommunizieren;
14. die IUFRO-Strategie 2006-2010 vollständig umzusetzen, um IUFRO als ein globales Netzwerk für wissenschaftliche Information und Zusammenarbeit zum Thema Wald zu positionieren.

Resolution 2:

VERSTÄRKTE MITWIRKUNG DER WISSENSCHAFT AN DER ENTSCHEIDUNGSFINDUNG

Der XXII IUFRO-Weltkongress hat festgehalten, dass trotz der bisherigen Fortschritte in der Wissenschaft das Wissen über die Dynamik von Waldökosystemen und deren Zusammenspiel mit den sich ständig verändernden Anforderungen durch den Menschen und die globalen

Entwicklungen wie Bevölkerungswachstum, Migration, Verstädterung, technologische Veränderungen und Klimawandel unvollständig ist, und dass es weiterhin einen ausgeprägten Bedarf an waldbezogener wissenschaftlicher Information gibt.

Dennoch haben traditionelle Institutionen und Universitäten im Bereich der Waldforschung an Stellenwert verloren, und die für die Ausübung ihrer Forschung verfügbaren Ressourcen und Finanzmittel sind in zahlreichen Ländern rückläufig. Diese Entwicklung kann insbesondere auf die sich verändernden Prioritäten der politischen Entscheidungsträger und Geldgeber zurückgeführt werden.

Es ist deshalb von besonderer Bedeutung, dass die für Forschung und Entwicklung bereitgestellten Ressourcen in der Zukunft in erster Linie als Investitionen angesehen werden, die der waldbezogenen sozialen und wirtschaftlichen Entwicklung dienen und der Bewahrung der Wälder als eine natürliche Lebensgrundlage für jetzige und künftige Generationen.

Geleitet von dem Wunsch, politischen Entscheidungsträgern und sonstigen Interessensgruppen relevante, wissenschaftlich fundierte Information und Beratung zur Verfügung zu stellen, werden wir unser Wirken darauf richten:

7. mehr problemorientierte Waldforschung von Bedeutung für politische Entscheidungsträger und sonstige Interessensgruppen zu betreiben und Entscheidungsträger aufzufordern, wissenschaftliche Ergebnisse besser zu nutzen;
8. verstärkte Anstrengungen zu unternehmen, um die Ergebnisse unserer gemeinsamen Waldforschung unmissverständlich so zu beschreiben, dass sie für politische Entscheidungsträger und sonstige Interessensgruppen leicht verständlich sind;
9. einen noch größeren Beitrag zur Arbeit internationaler Prozesse und Konventionen wie dem Waldforum der Vereinten Nationen, der Konvention über die biologische Vielfalt, der Klimarahmenkonvention der Vereinten Nationen sowie der Konvention der Vereinten Nationen zur Bekämpfung der Wüstenbildung zu leisten, indem wir unteren anderem aktiv zur kollaborativen Waldpartnerschaft beitragen.
10. zur möglichen Einrichtung eines Beratungsgremiums für internationale Prozesse und Konventionen beitragen, das den spezifischen Zweck der wissenschaftlichen Beratung zu waldbezogenen Themen hätte, ähnlich der regierungsübergreifenden Expertengruppe über den Klimawandel (IPCC).
11. weitere Partnerschaften mit internationalen Organisationen und Interessensgruppen einzugehen und die Zusammenarbeit mit ihnen zu verstärken;
12. durch wissenschaftliche Zusammenarbeit, Aus- und Fortbildungsmaßnahmen zur Erreichung insbesondere jener Millennium Entwicklungsziele beizutragen, die die Linderung äußerster Armut und des Hungers, die Verbesserung der Lebensgrundlagen der Menschen, die vom Wald abhängen, sowie die Gewährleistung der Nachhaltigkeit im Bereich der Umwelt anstreben.

French Version

LES RESOLUTIONS DE BRISBANE

Resolution 1 :

PROMOUVOIR LA COOPERATION INTERNATIONALE EN MATIERE DE RECHERCHE FORESTIERE

Le XXIIème Congrès Mondial de l'IUFRO articulé autour du thème « Forêts en équilibre : entre tradition et technologie » a constitué une plate-forme unique pour les résultats de la recherche forestière mondiale.

Le congrès a identifié une large gamme de sujets susceptibles de contribuer à améliorer la compréhension des questions relatives aux forêts, y compris le développement d'approches équilibrées pour la conservation et la gestion durable des forêts ; l'adaptation des forêts aux changements climatiques ; l'utilisation des ressources génétiques et de la biotechnologie pour la promotion de la gestion durable des forêts ; la participation des peuples indigènes aux sciences forestières et à la foresterie ; la valorisation des forêts et des produits forestiers à travers les technologies innovatrices ; et le rôle de la formation, de la communication et du renforcement des capacités pour assurer le développement durable des forêts.

Motivés par le désir d'aborder les problèmes ci-dessus ainsi que d'autres questions liées à la forêt, et de renforcer le rôle de l'IUFRO comme point d'ancrage pour les chercheurs et les institutions de recherche liés aux forêts et aux arbres, y compris pour ceux qui travaillent actuellement en dehors du réseau de l'IUFRO, nous déploierons tous nos efforts pour :

1. mettre en place une structure thématique plus adaptée et des mécanismes flexibles au sein de notre organisation afin d'aborder les thèmes-clés intéressant les chercheurs forestiers et leurs parties prenantes et de répondre aux questions d'actualité qui reflètent les changements de la société et de l'environnement global ;
2. continuer à garantir un haut niveau de qualité du travail scientifique ;
3. renforcer la participation aux travaux de l'IUFRO des chercheurs et des institutions de recherche des pays en développement et en transition, y compris en contribuant au développement des capacités des chercheurs et des institutions de recherche ;
4. promouvoir activement la diversité culturelle et l'équilibre entre les sexes au sein de l'IUFRO et augmenter et

encourager la participation des femmes, des jeunes chercheurs et des étudiants dans notre organisation ;

5. renforcer notre coopération avec les chercheurs et les instituts de recherche qui travaillent dans d'autres disciplines scientifiques sur les thèmes connexes au-delà de la sylviculture forestière traditionnelle ;
6. communiquer plus activement nos résultats de recherche au sein de la communauté scientifique et à la société dans son ensemble ;
7. mettre en œuvre pleinement et intégralement la Stratégie de l'IUFRO 2006-2010 pour positionner l'IUFRO comme réseau mondial de connaissances et de coopération en matière de science forestière.

Resolution 2:

PROMOUVOIR LA SCIENCE POUR LES DECIDEURS

Le XXIIème Congrès Mondial de l'IUFRO a constaté que malgré les progrès de la recherche, notre compréhension de la dynamique des écosystèmes forestiers et de leur relation avec les nouveaux besoins de l'humanité et avec les développements globaux tels que la croissance démographique, la migration, l'urbanisation et les changements technologiques et climatiques demeure incomplète, et qu'il est nécessaire d'améliorer les connaissances scientifiques liées à la forêt.

En dépit de cet état de fait, le statut et les capacités des institutions traditionnelles de recherche forestière et des universités, ainsi que les ressources financières disponibles pour la conduite des travaux de recherches diminuent dans de nombreux pays, notamment en raison des nouvelles priorités définies par les politiciens, les décideurs et les bailleurs de fonds.

C'est pourquoi il est indispensable de considérer les futures ressources financières consacrées à la science et à la technologie en premier lieu comme un investissement dans le développement socio-économique lié aux forêts, la préservation des forêts étant une garantie pour la survie des générations présentes et futures.

Motivés par le désir de fournir une information scientifiquement fondée et des recommandations pertinentes aux politiciens, décideurs et autres parties prenantes, nous déploierons tous nos efforts pour :

1. mieux informer les politiciens, les décideurs et autres parties prenantes (y compris dans le secteur privé) sur les recherches forestières pertinentes et orientées vers la résolution de problèmes, et les encourager à faire plus ample usage des résultats scientifiques ;
2. augmenter nos efforts pour traduire les résultats de la communauté scientifique dans une langue qui puisse être comprise facilement par les décideurs politiques et autres parties prenantes ;
3. renforcer encore nos contributions aux processus internationaux et aux conventions, tels que, entre autres, le Forum des Nations Unies sur les Forêts, la Convention sur la Diversité Biologique, la Convention-Cadre des Nations Unies sur les Changements Climatiques, la Convention des Nations Unies sur la Lutte contre la Désertification, à travers la contribution active dans le Partenariat Collaboratif sur les Forêts ;
4. contribuer à la mise en place éventuelle d'un organisme consultatif aux conventions et processus internationaux dans le but de fournir des orientations sur les thèmes liés à la forêt, à l'instar du Groupe international d'experts sur les questions climatiques (IPCC) ;
5. favoriser encore plus les partenariats et la collaboration avec les organisations internationales et les parties prenantes ;
6. contribuer à la réalisation des Objectifs de Développement du Millénaire, notamment ceux qui abordent la pauvreté extrême et la faim, tout en protégeant l'environnement et en favorisant le développement durable.

Spanish Version

LAS RESOLUCIONES DE BRISBANE

Resolución 1:

PROMOVER LA COOPERACIÓN MUNDIAL EN LA INVESTIGACIÓN SOBRE BOSQUES

El XXII Congreso Mundial IUFRO "El Bosque en el Balance – Vinculando Tradición y Tecnología" sirvió como especial foro para presentar los resultados de la investigación colectiva sobre bosques y árboles en el mundo.

El Congreso identificó numerosos temas donde la investigación podría contribuir de manera significativa a un mejor entendimiento de los problemas relacionados con el bosque como, por ejemplo, el desarrollo de enfoques equilibrados sobre la conservación forestal y el manejo forestal sostenible; la adaptación de los bosques al cambio climático; el uso de los recursos genéticos y la biotecnología para avanzar hacia el manejo forestal sostenible; la participación de grupos indígenas en la ciencia forestal y la silvicultura; el aumento del valor del bosque y de los productos forestales mediante innovaciones tecnológicas; y el papel de la enseñanza, comunicación y capacitación para asegurar un futuro sostenible para los bosques.

Impulsado por el deseo de abordar estos y otros problemas relacionados con el bosque y reforzar más la función de IUFRO como lugar de encuentro para científicos e instituciones de investigación relacionada con los bosques y árboles,

incluyendo también aquellos que trabajan actualmente fuera de la red de IUFRO, el trabajo de IUFRO y sus miembros se dirigirá a:

15. proveer y establecer una mejor estructura temática y mecanismos flexibles dentro de nuestra organización que nos permitan abordar asuntos claves de importancia para los científicos forestales y sus partes interesadas y contestar a las preguntas de investigación que se desarrollen como resultado de los cambios continuos en la sociedad y el medio ambiente mundial;
16. seguir verificando que nuestro trabajo científico cumpla con los estándares más altos de calidad;
17. reforzar la participación de científicos e instituciones de investigación de países en vías de desarrollo o con economías en transición en las actividades de IUFRO, incluyendo la asistencia en el desarrollo de las capacidades de científicos e instituciones de investigación;
18. promover activamente asuntos de género y la diversidad cultural dentro de IUFRO y fomentar y estimular la participación de mujeres, científicos jóvenes y estudiantes en las actividades de IUFRO;
19. aumentar nuestra cooperación con científicos e instituciones de investigación de otras disciplinas científicas que se dedican a temas de investigación relacionados con el bosque que atraviesan las fronteras tradicionales de la ciencia forestal;
20. comunicar más activamente nuestros resultados de investigación dentro de la comunidad científica y educacional;
21. implementar completamente la Estrategia de IUFRO para los años 2006-2010 con el fin de posicionar a IUFRO como una verdadera red mundial de conocimientos y cooperación en la ciencia relacionada con el bosque.

Resolución 2:

PROMOVER EL PAPEL DE LA CIENCIA EN LA TOMA DE DECISIONES

Durante el XXII Congreso Mundial IUFRO se observó que, a pesar del progreso científico logrado hasta la fecha, el entendimiento de la dinámica de los ecosistemas forestales y su relación con las demandas humanas, que cambian continuamente, no es aún suficiente ni acorde con los desarrollos a nivel mundial como el crecimiento demográfico, la migración, la urbanización, los cambios tecnológicos y el cambio climático, por lo que todavía existe una gran necesidad de adelantos en el conocimiento científico relacionado con el bosque.

En muchos países sin embargo, la situación de las instituciones tradicionales y las universidades que realizan investigación forestal se empeora respecto a su estado y sus capacidades y disminuyen los fondos disponibles para la investigación forestal, debido a cambios de prioridades por parte de los políticos, de quienes toman las decisiones, y también de los donantes.

En consecuencia, es imprescindible para el futuro que la inversión de recursos en ciencia y tecnología se considere primordialmente como inversión en el desarrollo socio-económico relacionado con el bosque y en la conservación de bosques como sistemas naturales de sustento para las generaciones presentes y futuras.

Impulsado por el deseo de dar información y consejos importantes y científicamente acertados a los politicos, a quienes toman las decisiones y a otras partes interesadas, el trabajo de IUFRO y sus miembros se dirigirá a:

13. mejorar la gestión de resultados de investigación forestal relevantes y orientados hacia la solución de problemas ante los políticos, ante quienes toman las decisiones y otras partes interesadas, incluyendo el sector privado, y animar a todos ellos a aprovechar los resultados científicos de una mejor manera;
14. aumentar los esfuerzos de traducir los resultados de investigación obtenidos por la comunidad científica forestal a un idioma que pueda ser entendido fácilmente por políticos y otras partes interesadas;
15. promover más nuestras contribuciones al trabajo de los procesos y convenciones internacionales, tales como el Foro de las Naciones Unidas sobre Bosques, el Convenio sobre Diversidad Biológica, la Convención Marco de las Naciones Unidas sobre el Cambio Climático, la Convención de Lucha contra la Desertificación de las Naciones Unidas mediante la participación activa en la Asociación de Colaboración en materia de Bosques, por ejemplo;
16. contribuir al posible establecimiento de un órgano consultivo para los procesos y convenciones internacionales con el fin particular de dar consejo científico sobre temas relacionados con los bosques de manera semejante a cómo el Panel Intergubernamental sobre el Cambio Climático lo hace en asuntos climáticos;
17. aumentar más las asociaciones y la colaboración con organizaciones internacionales y partes interesadas;
18. contribuir a alcanzar los objetivos de desarrollo de la ONU para el milenio, mediante la cooperación científica, actividades de capacitación y formación dirigidas a reducir la pobreza, a mejorar la vida de la gente que depende del bosque y a garantizar la sostenibilidad del medio ambiente.

IUFRO Officers 2006-2010

The New President and Vice-Presidents:

President Elect: Don Koo Lee, Republic of Korea;

Vice-President Policy Elect: John Innes, Canada;

Vice-President Science Elect: Niels Elers Koch, Denmark

Immediate Past President, President, President elect

The New Board:

Division Coordinators:

D1 Björn Hånell, Sweden;

D2 Bailian Li, United States;

D3 Hans Heinimann,Switzerland;

D4 Margarida Tomé, Portugal;

D5 Cathy Wang, China – Taipei;

D6 Perry Brown, United States;

D7 Mike Wingfield, South Africa;

D8 Alex Mosseler, Canada

General Board Members:

Mohammed Ellatifi, Morocco;

Vitor Hoeflich, Brazil;

Roberto Ipinza, Chile;

Su See Lee, Malaysia;

Shirong Liu, China;

Tohru Nakashizuka, Japan;

Piotr Paschalis-Jakubowicz, Poland;

Heinrich Spiecker, Germany;

Victor K. Teplyakov, Russia

Congress Delegates

Over 2100 persons from 90 countries participated in the XXII IUFRO World Congress held August 2005 in Brisbane, Australia, comprising;

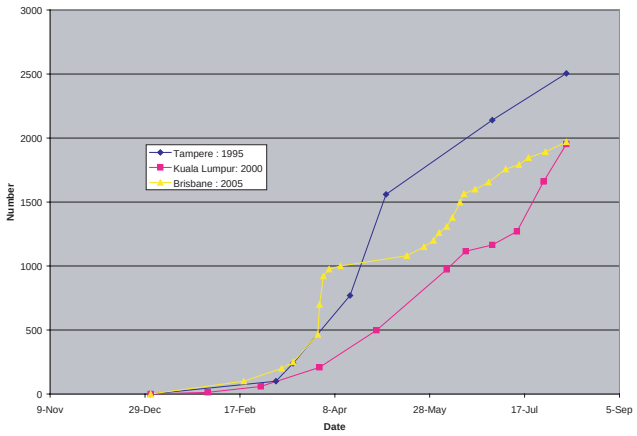
Paid Registrations: 1718

Complimentary Registrations: 174

Exhibitors:. 78

Volunteers: 156

Total Participation: 2126



Congress Evaluation

Congress delegates were requested to complete a survey of their assessment of Congress events and record their comments/feedback for the consideration of future Congress planning teams. A prize was offered to entice respondents. Some 249 completed evaluation forms were returned and these were analysed using Zoomerang freeware (www.zoomerang.com). The major results are tabulated below and the complete matrix of individual responses has been provided to IUFRO and the 2010 Seoul Congress Organising Committee.

DELEGATE EVALUATION FEEDBACK		
Question	**Average Score**	**Approval Rating**
1. Range of Topics	4.1 (82%)	93%
2. Quality of speakers	3.8 (76%)	95%
3. Speaker facilities eg. Audiovisual support	4.7 (94%)	98%
4. Poster program	4.0 (80%)	93%
5. Trade exhibition	3.9 (78%)	94%
6. In-congress tours	3.8 (76%)	86%
7. Social events	3.7 (74%)	87%
8. Overall congress organisation	4.2 (84%)	95%
9. Value for money	3.6 (72%)	87%
10. Catering	3.7 (74%)	85%
11. Venue facilities	4.5 (90%)	98%

Notes:
Evaluation based on 249 completed survey forms
Scores: 5 = excellent through to 1 = poor
Approval: score 3 and over.

A separate case study of the IUFRO World Congress was prepared by consultants on behalf of the Brisbane Convention and Exhibition Centre.

IUFRO Congress Backpack

Congress Publications

Information Package

Registration Package

Invitation to Exhibit

Postcards (2)

Poster

Abstracts Publication

Congress Handbook

Congress Newsletters (5)

[1] The IC elects all voting members of the Board but not the Executive Secretary, Finance Officer and the IUFRO Headquarters host country representative. The Immediate Past President is an ex officio voting member of the Board.

The Congress logo, commissioned from local aboriginal artist Laurie Nilsen, incorporates cross hatching which represents an indigenous presence on the land. The two leaves represent the northern and southern hemispheres, and reflect the element of balance. The motif under the leaves is representational of communication and the flow between the water and land elements on a stylised Australia. The logo aligns with the Congress Theme "Forests in the Balance: Linking Tradition and Technology".

INTERNATIONAL HOST

IUFRO

AUSTRALIAN HOST

Queensland Government
Department of Primary Industries and Fisheries

PRINCIPAL SPONSOR

Australian Government
Department of Agriculture, Fisheries and Forestry

DIAMOND SPONSORS

DPI Forestry
Queensland Government
Department of Primary Industries and Fisheries

Australian Government
Forest and Wood Products Research and Development Corporation

PLATINUM SPONSOR

CSIRO

GOLD SPONSORS

An Australian Government Initiative

Joint Venture Agroforestry Program
Rural Industries Research & Development Corporation
Forest & Wood Products Research & Development Corporation
Land & Water Australia
Murray-Darling Basin Commission

行政院農業委員會林務局
FORESTRY BUREAU
COUNCIL OF AGRICULTURE, EXECUTIVE YUAN
CHINA-TAIPEI

SILVER SPONSOR

GUNNERSEN TIMBERMARK

AGENCY SPONSORS

State Government Victoria
Department of Sustainability and Environment

FORESTS NSW

Forestry Tasmania
GROWING OUR FUTURE

Tasmania
PRIVATE FORESTS TASMANIA

Forest Products Commission
WESTERN AUSTRALIA

ForestrySA

ACT Forests