

**Research Symposium:
*Underpinning sustainable tree plantations
in Southern Africa***

Co-hosted by

**The Institute for Commercial Forestry Research (ICFR) &
The International Union of Forest Research Organisations (IUFRO)**



held at the International Convention Centre,
Durban, KwaZulu-Natal, South Africa
4 September 2015



*Pre-Congress Event of the 14th World Forestry Congress
7-11 September 2015*

Science Committee

Sally Upfold (Organiser)
Pierre Ackerman
Flic Blakeway
Prof Paxie Chirwa
Dr Marius du Plessis
Prof Colin Dyer
Dr Ronald Heath
Dr Andrew Morris
Prof Jolanda Roux

Sponsorship

The Organisers acknowledge with sincere appreciation the following organisations and companies who have assisted us with sponsorship of this event.

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Welcome

From the ICFR Director



On behalf of the Institute for Commercial Forestry, it is a pleasure to welcome you as a valued delegate, to this forest research symposium. It is also our honour and privilege to welcome Minister Pandor from the National Department of Science and Technology, senior officials from the Department of Agriculture, Forestry and Fisheries, the Food and Agricultural Organisation of the United Nations, and the President of the International Union of Forest Research Organisations, who are our co-hosts for this event.

The Symposium forms part of the XIV World Forestry Congress being held in Durban, South Africa from 7 to 11 September 2015. It is the first time that the WFC has come to Africa in its almost 100 year history. So this is indeed an important event for South Africa and for South African forestry.

Forestry research in South Africa celebrated 100 years of organised activity in 2012, and in this time, has contributed significantly to the sector in the broadest sense, i.e. to our understanding and management of all of the major forest types in South Africa – forests, woodlands and plantations.

This research symposium showcases the depth and breadth of forestry research underpinning the commercial forestry sector, that part of forestry dealing with growing the resource for industrial wood supply to a range of primary processors. This sector is a significant contributor to the South African economy and employs upward of 100 000 people, many in the rural areas of the country.

The Scientific Committee have developed a programme which highlights research being undertaken by a range of individuals and institutions across the country. This had provided a unique opportunity to bring together the researchers and technologists whose work contributes towards the growth and sustainability of the sector.

In linking this symposium to the XIV World Forestry Congress, we have invited our African and international colleagues to attend and share their experience and learning. We will be presenting the outcomes of this symposium at the World Forestry Congress next week, and in so doing, highlight the importance of forestry research in underpinning a vibrant and competitive sector to the global forestry community.

On behalf of the ICFR, I would like to thank our sponsors whose generous support has enabled us to add more value to this event. To all of the delegates, we trust that you will find the Symposium stimulating and interesting. Please enjoy the day with us. Last, but not least, thank you to the Science Committee under the leadership of Sally Upfold, who made this Symposium a reality.

Prof. Colin Dyer
Director, ICFR
September 2015

Programme

Session 1: Introductory Session (08h15 – 09h25)		Chair: Sally Upfold (ICFR)
07h45 - 08h15	REGISTRATION & TEA	Venue: ICC Foyer
08h15 – 08h20	Welcome	
08h20 – 08h40	S&T Policy, in support of the forest sector and forest research	Min. Naledi Pandor (DST)
08h40 – 08h50	Linking research to policy: The international forestry agenda	Tiina Vähänen (FAO)
08h50 - 09h05	IUFRO Strategy: 2015-2019	Prof Mike Wingfield (IUFRO)
09h05 - 09h15	Forestry Research through the lens of sustainable forest management: A South African perspective	Dr Mmaphaka Tau (DAFF)
09h15 – 09h25	The Southern African Forestry Research and Development Landscape	Dr Ronald Heath (FSA) & Prof Colin Dyer (ICFR)
Session 2: 09h25 – 10h25		
09h25 – 09h45	Research in support of a changing forest sector	Dr Andrew Morris (ICFR)
09h45 – 10h05	Biologically sustainable production from industrial wood plantations - the challenges	Prof Mary Scholes (Wits)
10h05 – 10h25	Sustainability, certification and the license to operate; the research needs	Dr David Everard (Sappi) & Brent Corcoran (Mondi)
10h25 – 10h55	TEA & COFFEE (30 mins)	Venue: ICC Foyer
Session 3: 10h55 – 11h55		Chair: Prof Colin Dyer (ICFR)
10h55 – 11h15	Forests of the Future - Role of classical tree breeding research	Dr Arnulf Kanzler (Sappi)
11h15 – 11h35	Forests of the Future - Role of molecular breeding and its application in plantation forestry	Dr Zander Myburg (FMG, UP) & Dr Kitt Payn (Mondi)
11h35 – 11h55	Site specific application of tree growing practices in South Africa	Dr Keith Little (NMMU)
Session 4: 11h55– 12h55		
11h55 – 12h15	Forests at Risk: Pest and Pathogen threats	Prof Jolanda Roux (FABI, UP)
12h15 – 12h35	Climate change: A risk to forests	Prof Bob Scholes (Wits)
12h35 – 12h55	Industrial plantation species as invaders – a global review and options for management	Prof Dave Richardson (SUN)
12h55 – 14h00	Africa My Africa – Dance by Russell High School LUNCH (55 mins)	Venue: ICC Foyer
Session 5: 14h00 – 16h00		Chair: Dr Andrew Morris (ICFR)
14h00 – 14h20	How can the forestry sector make best use of the water it is allocated?	Dr Mark Gush (CSIR)
14h20 – 14h40	Assessing the contribution of industrial plantations to carbon stocks	Dr Steven Dovey (ICFR) & Dr Oscar Mokotedi (DEA)
14h40 – 15h00	Obtaining more value from forestry supply chains; SCM/VCO and research opportunities	Prof Reino Pulkki (LU) & Pierre Ackerman (SUN)
15h00 – 15h20	Application of remote sensing to management of industrial wood plantations	Dr Moses Cho (CSIR)
15h20 – 15h40	Extracting the full value from industrial wood plantations	Dr Charlie Clarke (Sappi)
15h40 – 16h00	Solid wood products research in South Africa: Challenges & opportunities	Dr Melanie Blumentritt (SUN)
16h00 – 16h30	TEA & COFFEE (30 mins)	Venue: ICC Foyer
Session 6: 16h30 – 18h00		Chair: Dr Ronald Heath (FSA)
16h30 – 16h50	Information and technology needs of small scale tree growers	Sally Upfold (ICFR) & Prof Paxie Chirwa (UP)
16h50 – 17h10	Role of forest research networks in Africa (FORNESSA)	Dr Joe Cobbinah (FORNESSA)
17h10 – 17h30	Forestry education and training to support a changing forest sector	Prof Jos Louw (NMMU)
17h30 – 17h50	Public-private partnerships for building a research foundation	Prof Colin Dyer (ICFR)
17h50 – 18h00	Closure	

Plenary Speakers



Dr Naledi Pandor
National Minister: Science & Technology
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Naledi Pandor is South Africa's Minister of Science and Technology. A life of exile from 1961 until 1984 resulted in an international flavour to her education. She holds a BA from the University of Botswana and Swaziland and an MA in Education from the University of London. In 1992 she studied for a Diploma in Higher Education, Administration and Leadership at Bryn Mawr in the USA. In 1997 she completed an MA in Linguistics at the University of Stellenbosch and a Diploma in Leadership in Development at the Kennedy School of Government at Harvard, while she was serving as an MP. She became an MP in 1994 and has amassed impressive experience in positions of public office, including deputy chief whip of the ANC in the National Assembly from 1995 to 1998, deputy chairperson of the National Council of Provinces in 1998, and its Chairperson from 1999-2004. Her experience in education policy planning made her a welcome appointment as South Africa's Minister of Education from 2004-2009. She was appointed Minister of Science and Technology in May 2009, and Minister of Home Affairs in October 2012. She was again appointed as Minister of Science and Technology in May 2014 following the 5th democratic elections in South Africa. The Cape Peninsula University of Technology and Stellenbosch University have awarded her honorary doctorates.

Tiina Vähänen



*Deputy Director, Forest Management, Assessment
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*Associate Secretary-General, XIV World Forestry
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Tiina Vähänen is currently Associate Secretary-General of the XIV World Forestry Congress, leading the preparations by FAO. She is also Deputy Director the Division on Forest Management, Assessment and Conservation at Food and Agriculture Organization of the United Nations (FAO).

Before, she coordinated FAO's contributions to the global climate change debates, notably the UN Framework Convention on Climate Change (UNFCCC). She was also leading the FAO work within the Collaborative Programme on Reduction of Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD), a joint programme among FAO, the UN Development Programme (UNDP) and the UN Environment Programme (UNEP). She has worked on international forest and natural resources policy issues at FAO since 2001.

Previous to this, she coordinated international forest policy issues and FAO contributions to international agreements, notably the Collaborative Partnership on Forests (a coalition of 14 international forestry-related UN, World Bank, CGIAR and other key international agencies).

Between 1998 and 2001, Ms Vähänen undertook an assignment at the United Nations Headquarters in New York, working on national reporting system and analyses for the UN Commission on Sustainable Development and then moved to the Secretariat of the UN Forum on Forests, playing a key role in creating the Collaborative Partnership on Forests.

Ms Vähänen, "forester" by her education (MSc, Forestry and Agriculture), has also worked in the Finnish forest industry in international timber marketing, and as Senior Adviser at the Ministry of Agriculture and Forestry of Finland.



Prof. Michael J Wingfield
President: IUFRO
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Michael (Mike) Wingfield, PhD, University of Minnesota (1983), Harvard Business School AMP175 has been involved in IUFRO activities since the early days of his career. During this time he has served as an office-holder in most of IUFRO's structures including being a Division Co-ordinator, Vice President responsible for the Divisions and served on the IUFRO Management Committee for nine years prior to becoming President of the Union in October 2014. While Mike is broadly interested in forests and forestry, his specific research experience has been in the field of tree health. In this regard, he has conducted research on tree pests and pathogens especially concerning their global movement for more than thirty years. Amongst his most important contributions to forestry has been his role as an advisor to more than 70 PhD students, many of who now hold very senior positions globally. He was responsible for establishing the Tree Protection Co-operative Programme (TPCP) in 1990, which became the catalyst for the establishment in 1998 of the Forestry and Agricultural Biotechnology Institute (FABI; www.fabinet.up.ac.za) of which he is the founding director. He has published widely on the topic of tree health in more than 700 research papers, seven books and in numerous prestigious invited presentations globally. He serves/has served in many prestigious positions and has received numerous awards and honours, in South Africa and elsewhere in the world. He has been elected as a fellow of scientific societies including the Royal Society of South Africa, Academy of Sciences of South Africa the Southern African Society for Plant Pathology and the American Phytopathological Society. He has received honorary doctorates from the University of British Columbia, Canada (2012) and North Carolina State University (2013) and received the highest scientific award (Kwame Nkrumah Scientific Award) from the African Union in 2013.



Dr Mmaphaka Tau
Acting DDG: Forestry and Natural Resources,
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Dr Tau is currently the Acting Deputy Director General for the Branch: Forestry and Natural Resources Management (FNRM) within the Department of Agriculture, Forestry and Fisheries (DAFF) where he is formally appointed as the Chief Director responsible for Natural Resources Management (NRM). His career spans from 1998 when he was appointed as an Assistant Planner in the then Department of Land Affairs (DLA) in the North West Province (based in Mafikeng). He later moved to the Free State Province as Assistant Director responsible for Policy and Planning Coordination in 2001. In December 2001, Dr Tau joined the then Department of Water Affairs and Forestry (DWAF) as an Assistant Director responsible for Forest Land Management following the restructuring of state forest administration function. He was appointed Deputy Director responsible for the National Veld and Forest Fires Act 1998 in 2005 and in May 2008, he joined the National Disaster Management Centre (NDMC), within the Department of Cooperative Governance (DCOG), as a Director responsible for Capacity Building and Research. In April 2014 Dr Tau joined DAFF as Chief Director responsible for Natural Resources Management (NRM), which he performs concurrently with his acting responsibility as Deputy Director-General: Forestry and Natural Resources Management. Dr Tau hold a BA (1995), HED (1996) and a BA Hons (1997) from the University of Limpopo. He also has a Masters in Development Studies from UNISA (2003), a Masters in Disaster Management from the University of the Free State (2008) and a PhD in Development and Management from North West University (2014). In addition, Dr Tau is a founding member and Advisory Committee Member (ACM) of the Jamba journal for Disaster Studies; co-author of the Risk and Development Review (RaDAR) publication; an Advisory Board Member (ABM) of Stellenbosch University: Department of Disaster Management; an Advisory Board Member (ABM) of the Nelson Mandela Metropolitan University's Certificate in Fire Management; and a founding member of the Southern African Society for Disaster Reduction (SASDiR).



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09h15 – 09h25	The Southern African Forestry Research and Development Landscape	Dr Ronald Heath (FSA) & Prof Colin Dyer (ICFR)

The Southern African Forestry Research and Development Landscape

Ronald Heath¹ & Colin Dyer²

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Forestry research in South Africa has a long history, with co-ordinated research being initiated over 100 years ago. In the early years almost all of the forestry research undertaken was initiated and supported by the State, in national research institutes (e.g. South African Forestry Research Institute; National Timber Research Institute; South African Bureau of Standards; National Botanical Research Institute; Universities). This was true for neighbouring countries in the SADC Region as well.

With the emergence of the large forestry grower-processor firms, in-house forestry research capacity grew, primarily focused on serving specific research needs of these firms. The State reviewed its role in commercial forestry in the 1980s, and this led to the closure of the national forestry research institutes and its transfer to the CSIR in 1990. Government funding for forestry research also declined significantly. In the forestry research landscape supporting commercial forestry has been largely supported by the private sector. This is starting to change with public sector funding again being invested in forestry research.

Today, the forestry research landscape in South Africa is concentrated into two research institutes (ICFR and FABI), in the in-house research functions of the large forestry firms, at the CSIR and at the Higher Education institutions offering forestry training. The variation of the forest research landscape over the past 100 years in South Africa has exhibited strengths and weaknesses of various models and could be used for shaping the future forest research landscape.



Dr Ronald Heath
Research Director: FSA
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Dr Ronald Heath has extensive experience in a diverse range of areas in forestry. He obtained a National Diploma: Forestry at and B-Tech degree: Forestry both at Saasveld. He thereafter shifted focus and obtained his Masters degree in Plant Pathology at the University of Pretoria and continued to complete his Doctoral degree in Genetics also at the University of Pretoria researching wound infecting fungi and their insect associates.

In 2009, Ronald was appointed as the Forestry Science, Technology and Innovation Advisor with the National Department of Agriculture, Forestry and Fisheries and in 2012 he was promoted to the position of Deputy Director: Forestry Regulation. During his time at DAFF, Ronald's responsibilities included amongst others, science and technology coordination, future scenarios and modelling, policy and strategy development and he was instrumental in the development and approval of both the National Forest Research and Development Strategy and the National Forest Protection Strategy. In 2014 Ronald joined Forestry South Africa as Research Director and Forest Sector Innovation Fund Coordinator.

Through his studies and career in forestry Ronald has published extensively both nationally and internationally on forest pathology and forest policy.

Notes



Session 2: 09h25 – 10h25

09h25 – 09h45	Research in support of a changing forest sector	Dr Andrew Morris (ICFR)
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10h05 – 10h25	Sustainability, certification and the license to operate; the research needs	Dr David Everard (Sappi) & Brent Corcoran (Mondi)
10h25 – 10h55	TEA & COFFEE (30 mins)	Venue: ICC Foyer

Research in support of a changing forest sector

Andrew Morris

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The forest products industry in South Africa, based on industrial wood plantations, is economically competitive in a global market place. Exports generate foreign exchange and important domestic markets are supplied with key products. The industry is an important source of employment in rural areas. Further expansion in plantation area to increase wood supply for this successful sector of the economy can realistically only occur to a limited extent. Hence, unlike similar plantation based sectors in other southern hemisphere countries who are expanding areas under plantation, South Africa must manage a finite resource for sustained production. After steady increases in plantation area for more than a century the period of expansion in South Africa has ended. Consequently, the vast majority of plantations are now supporting second, third, fourth or more successive crops. The opportunity for large increases in production may now be confined to only the higher site potentials but more reliable production from all sites represents an opportunity to raise sustainable harvests. So the first challenge for is improved sustainable production. There are four distinct element where research can support this need;

1. Sites must be managed to ensure soil resources remain resilient and productive.
2. Forest management must adapt to increasing numbers of pests and pathogens.
3. The mitigation of climate change impacts must be included in forest management decisions.
4. Global market access must be maintained by meeting internationally accepted criteria for sustainable production and retaining competitive production costs.

Increased participation and equitable access to the economic benefits of the forest products sector is a national imperative which is producing major changes in ownership of the plantation resource. The many new and emerging smaller scale timber growers represents a second and particular challenge for research. Making available tree growing technology, including the best suited genetics as planting stock, together with business models and financial support in an effective way will require a much clear understanding of the constraints and objectives of smaller scale growers. Industrial wood production must become a recognised and integrated element of rural development. Research support must include a much better understanding of socioeconomic issues. Wood is one of mankind's most versatile renewable resources and planted trees are playing an increasing global role in supplying this material. Markets for wood-based products are changing today faster than ever before. The dominance of paper and packaging markets is declining in the digital age. At the same time woody biomass is now viewed as chemical feedstock for an increasing range of renewable materials as well as a source of renewable energy. Forest ecosystems are also one the largest terrestrial carbon sinks with carbon sequestration presenting a potential new 'market' for forest management. These changes present research with a third challenge. The plantation resource in South Africa must be fit-for-purpose for a wide range of current and potential new markets. Research linking the wood resource to end-use requirements and opportunities will be needed to give guidance in forest management decisions. Increased sustainable production from a finite land base with widened economic benefit for rural communities and the flexibility to meet changing market requirements are challenges that present many opportunities for investment in relevant research. The research community must respond with relevant and well-motivated proposals.



Dr Andrew Morris

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Andrew Morris is currently Research Manager at the ICFR, with the overall responsibility of research leadership and mentorship, at project, programme and Institute levels. Prior to joining the ICFR, Andrew held the post of General Manager: Research at Sappi's Tweedie Research Centre. He has more than 35 years' experience in research and research management on industrial wood plantations. Through his career Andrew has worked on various aspects of silviculture, site classification, wood properties and tree improvement, he has a passion and a flare for practical research, and is well respected as an international forest scientist.

Biologically sustainable production from industrial wood plantations – the challenges

Mary Scholes

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Sustainable forest management will ensure that the values derived from the forest meet present-day needs while at the same time ensuring their continued availability and contribution to long-term development needs. The newly declared sustainable development goals specifically includes forests: SDG 15 – Protect restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss. Biological challenges range from the protection of hydrological function to the maintenance of soil productivity and biodiversity. The paper will address the need for applying an integrated, soil, plant, atmosphere and social approach. Soil biological processes are key to achieving sustainable production. Advances in soil microbiological techniques as well as examples of integrated studies will be addressed.



Prof. Mary Scholes

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Prof Mary Scholes, a graduate of the University of the Witwatersrand, is currently a full professor in the School of Animal, Plant and Environmental Sciences and serves as the Director of the Graduate Affairs at Wits. Her research activities focus on soil fertility, food security and biogeochemistry in savannas, plantation forests and croplands. Her research funds are mostly sourced from industry and the government and she is currently actively involved in monitoring the impacts, on human health and the environment, of the new power stations in the Waterberg. She chairs the advisory boards of the Max Planck Institute for Chemistry and the International Institute of Applied Systems Analysis. She is also a member of the jury for the Volvo Environment Prize. These activities involve extensive collaborative research with a number of overseas and local institutes. Her publication record is extensive; she has mentored over 70 postgraduate students and she teaches at postgraduate level at the University. She has been awarded the Vice-Chancellors Teaching and Research awards. She is a fellow of the Royal Society of South Africa and of the South African Academy of Science. She is the recipient of a number of national and international awards including being elected as a foreign member of the Royal Swedish Academy of Agriculture and Forestry. She has served on Senate at Wits for over 25 years and has served on Council for two terms. She is married to Bob Scholes, a systems ecologist, and they have an 18 year old son.

Sustainability, certification and the license to operate; the research needs

David Everard¹ & Brent Corcoran²

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Sustainable forest management means many things to many people. To the forester it generally focuses on narrow sense sustainability where the goal is to economically, efficiently and continuously supply sufficient volume of wood that is fit for purpose. The more affluent consumers of wood products may expect a much greater range of issues to be covered by forest management including the broader internal and external environmental, social and economic costs and benefits. Sustainable forest management can cover a wide set of issues which interact making it a complex process. The development and implementation of forest certification was aimed at monitoring forests, tracing and labelling forest products where the quality of forest management is judged against a set of agreed standards (WWF definition). It was largely driven by the global recognition that the rate of deforestation needed to be reduced and halted. Certification was expected to deliver many things like a transformed forest sector where resource use would produce economic, social and economic benefits and assurance to consumers that the products they use come from known sources that are responsibly managed.

This presentation explores current views on the effectiveness of certification and suggests that independent research is required to evaluate its costs and benefits. The presentation also proposes that it is time to move beyond certification and that there may be better ways of improving sustainable forest management. Research is required to clearly identify the causes of unsustainable deforestation so that we can be clear on what sustainable forest management can deliver and not make ill-informed decisions about a land-use that may well be part of the solution rather than the problem.



Dr Dave Everard

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Dr David Everard is the Divisional Environmental Manager for Sappi Forests. He, together with his team is responsible for the implementation and management of the Risk Management System which Sappi Forests has developed, to manage all Safety, Health, Environmental and Quality aspects of the business. This system has met the requirements the Forest Stewardship Council. He has also been appointed as a member of the Sappi Group Sustainable Development Council which is responsible for providing leadership in setting policy and objectives on sustainable development for Sappi as a group. Dr Everard contributes to various industry wide forums and committees in South Africa including chairing the Forestry South Africa Environmental Management Committee and is an economic sector representative of the South African Standards Development Group which is currently transferring the South African National FSC standard to the new version V standard. Before joining Sappi in 1998 he was a Business Area Manager at the CSIR where he studied ecological processes in terrestrial ecosystems, with the aim of implementing sustainable management systems.

Dr Everard is a graduate of the Universities of Stellenbosch, Natal and Rhodes in South Africa and completed his PhD under the supervision of Prof. Donald Pigott at Cambridge University in the U.K. He has had extensive field experience in South Africa and in other parts of Africa and Indian Ocean Islands. He has published in the scientific literature in South Africa, especially in the field of indigenous forest and thicket vegetation. He is also an associate editor of *Southern Forests, a Journal of Forest Science*.



Session 3: 10h55 – 11h55		Chair: Prof Colin Dyer (ICFR)
10h55 – 11h15	Forests of the future - role of classical tree breeding research	Dr Arnulf Kanzler (Sappi)
11h15 – 11h35	Forests of the future - role of molecular breeding and its application in plantation forestry	Dr Zander Myburg (FMG, UP) & Dr Kitt Payn (Mondi)
11h35 – 11h55	Site specific application of tree growing practices in South Africa	Dr Keith Little (NMMU)

Forests of the future – role of classical tree breeding research

Arnulf Kanzler

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Tree Breeding has had a long and successful history in plantation forestry in Southern Africa. Some milestones from this are highlighted with emphasis on the role that breeding has played in the development of the healthy and economically important industry that we have today. Some of the important achievements that breeders have delivered in the last few years are listed and these examples are used to illustrate the way the discipline has been utilised to add value to our forestry crop in the region. Current challenges and opportunities are discussed and the future direction is analysed to examine where we can and should be in the next 20 years and beyond.



Arnulf Kanzler is programme leader for the breeding team with Sappi. Arnulf holds a PhD in Forest Genetics from North Carolina State University and has 26 years of experience as a Tree Breeder in Southern Africa. He is currently based at the Sappi Forest Research station in Howick, South Africa and has been involved as a softwood breeder since 1990, and managing both the pine and eucalypt programmes since 2008. The focus of research at Sappi is on providing improved, site matched material that supplies the furnish for several kraft and dissolving pulp mills. Due to opportunities for increased gains in wood properties and emerging disease and insect pest threats, the emphasis in the breeding programme is shifting from deploying pure species as seedlings, to specific hybrids as clones or families.

Dr Arnulf Kanzler

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Forests of the future – role of molecular breeding and its application in plantation forestry

Zander Myburg¹ & Kitt Payn²

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With the completion of the *Eucalyptus grandis* genome sequence, a genomic reference has become available for molecular breeding of *Eucalyptus*, an important plantation forestry genus. Similar efforts are ongoing in conifers and will place plantation forestry for wood fibre firmly in the post-genomic era in the next five years. How can we use this information to identify and manage genetic variation for commercially relevant growth and adaptation traits to enhance productivity and sustainability? This joint presentation will explore the application of genomic technologies in tree improvement from the perspective of tree molecular genetics research and integration into operational tree breeding programmes. The Forest Molecular Genetics (FMG) Programme hosted at the University of Pretoria has initiated two pilot *Eucalyptus* genomic breeding efforts with industrial partners (Mondi and Sappi). These experiments give us the first indications of the potential value and factors affecting the performance of genome-assisted breeding, as well as the possibilities and constraints of integrating this technology into long-term tree breeding programmes. The outcome of this work will be to develop a platform for genome-based improvement of forest plantations that will be one of the cornerstones of the bioeconomy.



Prof Zander Myburg
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Zander Myburg is a professor in the Department of Genetics at the University of Pretoria (UP) and holds the Chair in Forest Genomics and Biotechnology at UP. His research programme in the Forestry and Agricultural Biotechnology Institute (FABI) and Genomics Research Institute (GRI) focuses on the genetic control of wood development in fast-growing forest trees and, in particular, the genetic regulation of cellulose biosynthesis in wood fibre cells. The Forest Molecular Genetics (FMG) Programme is supported by South African forestry industry partners (through the FMG Consortium), THRIP, NRF and DST. His research team is pioneering the use of population genomics and systems genetics approaches to unravel the genetic control of growth and wood formation in *Eucalyptus* trees. He was also the lead investigator of the US Department of Energy (DOE) funded *Eucalyptus* Genome Project which generated the reference genome for the genus published in the journal *Nature* in 2014. This information is being used to develop biotechnology applications for tree improvement including DNA fingerprinting, genome-assisted breeding and genetic engineering towards enhancing woody biomass for pulp, paper, timber and other bioeconomy applications. He has supervised 39 postgraduate (MSc and PhD) students and is author of 69 peer-reviewed papers and book chapters in the field of plant molecular genetics and genomics.



Dr Kitt Payn
Forest Technology Prog. Leader
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Kitt Payn commenced his tertiary education at the University of Natal. He did his MSc at the CSIR in Durban where he focused primarily on the inheritance of wood property traits. In January 2002, Kitt joined Mondi's Tree Improvement Research Department and shortly thereafter was given the opportunity to study for a PhD at North Carolina State University. Upon completion of his studies Kitt returned to Mondi where he was employed as the Pine breeder. Recently he obtained new position within Mondi as the Forest Biotechnology Programme Leader, where he is focused on the sustainable improvement of trees through the application of new molecular technologies that enhance both breeding and clonal commercialisation processes.

Site specific application of tree growing practices in South Africa

Keith Little

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Silviculture is a complex, dynamic, yet goal orientated practice which is geared towards ensuring “product with specification”. A transition from extensive to intensive management, or increased investment in land, requires an increase in the need for knowledge. Intensively managed plantations, as occur in South Africa, are considered technological forests in that they require high levels of silvicultural understanding and input to aid their management.

Within South Africa, the collation and interpretation of treatment data from numerous silvicultural trials has resulted in the development of fairly detailed, discipline-specific knowledge, albeit mainly related to the magnitude and longevity of any treatment-induced response. Dependent on their specific end-objectives, forest companies have successfully applied knowledge of these different kinds of treatments, or interventions, in a logical sequence to control stand establishment and development (growth).

As important as the magnitude and longevity of any treatment-induced response, is the degree of precision and accuracy with which that treatment can be applied to any given site, the interaction between different treatments, and the relative importance of these different treatments over time. Using trials conducted in South Africa that contain treatments with different combinations of silvicultural practices and/or forest disciplines, data are explored so as to provide an insight into their relative importance to site, as well as the degree with which they can be applied on a site-specific basis.



Dr Keith Little

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Keith Little is involved with Silvicultural Research and Lecturing at the Nelson Mandela Metropolitan University. He regards himself as a “generalist silviculturalist” with a passion for applied research and helping others – and if these two can be combined then “nirvana”.

Prior to joining NMMU, he was Research Manager and Programme Manager for Re-establishment Research at the ICFR, where he worked for 20 years. Keith has a PhD from the University of Natal and his research interests include reducing current levels of forest vegetation management without compromising costs, productivity or sustainability, through a combination of reduced herbicide use and improved cultural weed control techniques.



Session 4: 11h55- 12h55

11h55 – 12h15	Forests at risk: Pest and pathogen threats	Prof Jolanda Roux (FABI, UP)
12h15 – 12h35	Climate change: A risk to forests	Prof Bob Scholes (Wits)
12h35 – 12h55	Industrial plantation species as invaders – a global review and options for management	Prof Dave Richardson (SUN)
12h55 – 14h00	<i>Africa, My Africa – Dance by Russell High School</i> LUNCH (55 mins)	<i>Venue: ICC Foyer</i>

Forests at risk: Pest and pathogen threats

Jolanda Roux¹, Bernard Slippers, Brett P Hurley, Brenda D Wingfield and Michael J Wingfield

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When plantation forestry utilising non-native trees was first established in Africa, and this is also true for most other countries, little or no attention was paid to the possible impact that pests (including insects and microbial pathogens) might have on these resources. This lack of concern was reinforced by the absence of tree-health problems in these newly established plantations. As time has passed, this situation has changed dramatically. In many countries, a situation has been reached where the appearance of a new tree health problems has become increasingly intolerable to forestry industries. The initial absence of pest problems can be attributed to “enemy release”, where trees have been separated from their natural enemies, allowing them to allocate the majority of their resources to growth. Over time, ongoing selection for growth and wood quality as well as a general reduction in relative tree genetic diversity, plantation trees have become vulnerable to pest attack. The increasing numbers of accidental introductions of non-native pests and the adaptation of native pests has exacerbated a deepening tree health problem. As an example, South African forestry has been faced with the appearance of at least one serious eucalypt insect pest annually in the last three years. The rust pathogen *Puccinia psidii* has also been found in the country for the first time in this period. Likewise, a host jump by the eucalypt canker pathogen *Chrysosporthe austroafricana* from native African Myrtaceae to eucalypts, came close to destroying early clonal plantings in the 1980's. More recently, the cossid moth, *Coryphodema tristis*, has expanded its host range to cause serious damage to *Eucalyptus nitens* trees in the country. The South African plantation forestry situation, however, provides an example of how such pest threats can be managed. In this case, the establishment of a co-operative programme (www.fabinet.up.ac.za/tpcp) bringing together the support of private sector forestry, with leverage from Government, State and academic institutions has provided investments in infrastructure, equipment, facilities and most importantly the development of sustainable human capacity to deal with the growing number of problems. Looking ahead, there will clearly be new and challenging pests and it is becoming increasingly evident that greater efforts will need to be made to enhance the capacity of other African countries to deal with them. In this regard, multi-institutional collaboration and government support at all levels will become increasingly necessary to at least slow down new pest introductions and insure the sustainability of forestry on the continent.



Prof Jolanda Roux

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Prof Jolanda Roux is a professor in the Department of Plant Science in the Faculty of Natural and Agricultural Sciences at the University of Pretoria and a research leader in the Tree Protection Co-operative Programme (TPCP) and DST/NRF Centre of Excellence in Tree Health Biotechnology (CTHB) of the Forestry and Agricultural Biotechnology Institute (FABI) at the University of Pretoria. She is a forest pathologist and conducts research on micro-organisms, especially fungi, and their insect associates that cause diseases of trees. This involves the early detection and identification of tree diseases, the characterization of the causal agents of tree disease and the elucidation of the epidemiology of the pathogens and the diseases they cause. Prof Roux has published more than 130 scientific papers in ISI rated journals and serves on the editorial board of a number of ISI journals. She is the research co-ordinator of the research group on forest pathology of the International Union of Forestry Research Organizations (IUFRO) and honorary Professor of the Chinese Academy of Forestry.

Climate change: A risk to forests

Bob Scholes

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The world is committed to at least a 2 °C mean global temperature rise over the next century, and possibly more if efforts to curb greenhouse gas emissions fail. The regional climatology means that the interior of southern Africa experiences about twice the global mean warming. Projections of rainfall change are much less certain, but are in the order of $\pm 15\%$, with increased extremes. The eastern part of southern Africa, where most of the forests are, may get slightly wetter, but the western part is likely to become drier.

Climate changes of this magnitude and rate are of concern to the managers of both indigenous forests and plantation forests. Rising temperatures, drought, severe storms, insect pest outbreaks and more intense and frequent fire often combine to form a lethal syndrome for forests. Worldwide there has been an observed increase in tree mortality, which in some places is sufficiently widespread to constitute forest dieback. Parts of southern Africa will continue to be suitable forest habitat in the future, but the optimal species mix and locations for plantation forestry will shift upslope and southwards, with consequences for forest industry infrastructure. Pest and fire management will require increasing attention. Competition for water resources, only partly due to climate change, will continue to be a defining strategic issue.

An international emissions-reduction regime holds some opportunities for the forest industry; firstly because timber is a low-embodied energy construction material, and secondly because of the potential of tree crops and their byproducts as a source of bioenergy.

The dry miombo woodlands of south-central Africa are likely to become the major global axis of tropical deforestation, as they make way for croplands, plantation forests and biofuels. This could be a significant source of CO₂ to the atmosphere if not properly planned and regulated.

Broadening the definition of forests to include all the sparsely-treed and short-stature savannas and shrublands shows a different pattern for southern Africa as a whole. The grasslands are likely to be increasing invaded by trees and the trend towards greater tree cover in open savannas is likely to continue.



Prof Bob Scholes
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Bob Scholes is a Professor of Systems Ecology at the University of the Witwatersrand in Johannesburg, South Africa. After graduation with a PhD in Ecology from the University of the Witwatersrand in 1988, he ran the South African Savanna Biome research programme until 1992, when he joined the Council for Scientific and Industrial Research, where he was appointed a Fellow in 1994. He led several major research programmes, such as the Southern African Fire-Atmosphere Research Initiative (SAFARI 2000). He was one of the four-person Implementation Plan Task Team for the Global Earth Observation System of Systems and was founder-chair of the GEO Biodiversity Observation Network. He has held leadership positions in the International Geosphere-Biosphere Programme and Diversitas, has been a Lead Author or Convening Lead Author on the 3rd to 5th Assessment Reports of the Intergovernmental Panel on Climate Change, and was a working group co-chair for the Millennium Ecosystem Assessment. He is a Fellow of the Royal Society of South Africa, a Member of the South African Academy, a Foreign Associate of the US National Academy of Sciences and a National Research Foundation A-rated scientist. He has served on the boards of the World Agroforestry Centre, South African Parks, and the South African National Space Agency.

Industrial plantation species as invaders – a global review and options for management

David Richardson

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Woody plants were not widely considered to be important invasive alien species until fairly recently. Thousands of species of trees have however been moved around the world in the last century. Many species have spread from planting sites and some are now among the most widespread and damaging of invasive organisms. A recent global review listed 434 species of trees that are known to be invasive outside their native ranges. Ninety-seven of these (22%) are used in some form of forestry.

Of the tree species used in commercial forestry, the biggest problems with invasive spread from plantations have been experienced with species in the genera *Acacia*, *Eucalyptus* and *Pinus*. Several species in these three genera are major weeds in some parts of the world. Invasions of these species have been well studied, especially in the southern hemisphere (Australia, New Zealand and South Africa in particular). For *Pinus* species, all the major industrial plantation species are invasive; life-history traits and factors relating to planting history explain the invasive success of different species. As with pines, all Australian *Acacia* species that are used in commercial forestry are invasive. However, in this group, no life-history traits or syndromes separate invasive from non-invasive species, and propagule pressure, residence time and other factors relating the extent of planting explain the current extent of invasiveness. A similar situation exists for eucalypts, where planting history rather than biological features explain invasiveness.

This presentation reviews the emergence of problems with invasive forestry trees around the world, with special reference to the situation in South Africa. It reviews the history of perceptions of invasive spread of forestry trees as a growing environmental problem and of efforts to deal with these invasions.

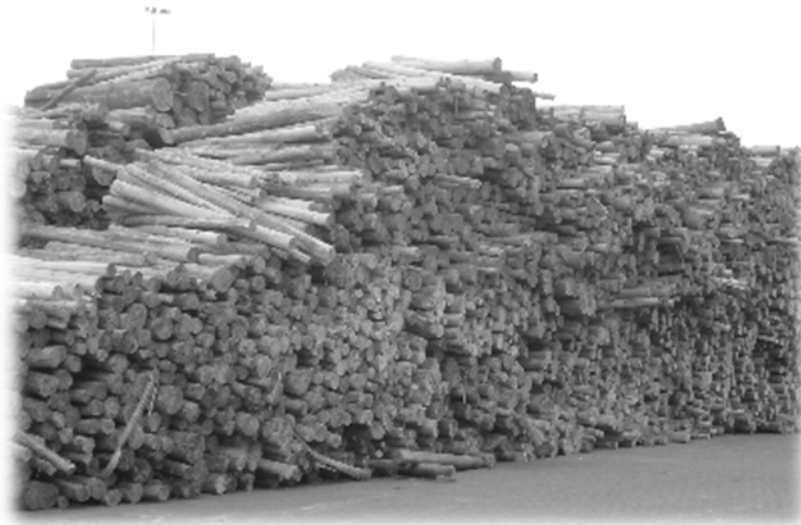
Challenges and trade-offs in the management of invasive alien trees are discussed. The management of alien tree populations needs to be strategic and adaptive, combining all possible management interventions to promote the sustainable delivery of optimal outcomes. Examples, mainly from South Africa (where issues relating to invasive alien trees introduced for forestry have received most attention) are discussed. Proposals are advanced for holistic and collaborative approaches to alien tree management.



Prof Dave Richardson

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Dave Richardson is Director of the DST-NRF Centre of Excellence for Invasion Biology and is a Distinguished Professor of Ecology at Stellenbosch University. His research focuses mainly on plant invasions, especially trees and shrubs. He is interested in the biogeography, ecology and management of invasions. He is author/co-author of 335 peer-reviewed journal papers and chapters in edited books. He has edited/co-edited six books, including *Fifty years of invasion ecology* (Wiley-Blackwell, 2011). He has been Editor-in-Chief of the journal *Diversity and Distributions* since 1998, is Associate Editor of *Biological Invasions*, and serves on several other editorial boards. He was awarded the Hans Sigrist Prize for 2006 by the University of Bern, Switzerland, and in 2009 won the National Science and Technology Forum Award in Category B. In 2012 he received the John F.W. Herschel Medal, the senior medal of the Royal Society of South Africa.



Session 5: 14h00 – 16h00		Chair: Dr Andrew Morris (ICFR)
14h00 – 14h20	How can the forestry sector make best use of the water it is allocated?	Dr Mark Gush (CSIR)
14h20 – 14h40	Assessing the contribution of industrial plantations to carbon stocks	Dr Steven Dovey (ICFR) & Dr Oscar Mokotedi (DEA)
14h40 – 15h00	Obtaining more value from forestry supply chains; SCM/VCO and research opportunities	Prof Reino Pulkki (LU) & Pierre Ackerman (SUN)
15h00 – 15h20	Application of remote sensing to management of industrial wood plantations	Dr Moses Cho (CSIR)
15h20 – 15h40	Extracting the full value from industrial wood plantations	Dr Charlie Clarke (Sappi)
15h40 – 16h00	Solid wood products research in South Africa: Challenges & opportunities	Dr Melanie Blumentritt (SUN)
16h00 – 16h30	TEA & COFFEE (30 mins)	Venue: ICC Foyer

How can the forestry sector make better use of the water it is allocated?

Mark Gush

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This talk highlights water-related issues associated with managing both introduced commercial plantations and indigenous forests in South Africa. Commercial plantation forestry in this country is unique in that it is classified as a Streamflow Reduction Activity (SFRA) due to incremental differences in water use between introduced tree plantations and the natural vegetation they replace. The industry is strictly regulated as a result. Long-term research supports this premise, but the implication is that expansion of land under commercial plantation forestry is limited due to water constraints. In light of this, the presentation considers management interventions that could be considered in order for the forestry industry to optimally utilise the water that it has been allocated. These include species choices, planting areas, planting densities, invasive alien plant / weed management, water-use efficiency considerations and groundwater aspects. Recently completed research on the water use and socio-economic benefit of indigenous trees is presented, and the applicability of these findings is discussed from an ecohydrological perspective.



Dr Mark Gush
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Mark completed a BSc in Forestry and Conservation at Stellenbosch University, followed by post-graduate studies in Forest Hydrology at the University of Natal, and a PhD in Botany at the University of Cape Town on the topic “Water-use, growth and water-use efficiency of indigenous tree species in a range of forest and woodland systems in South Africa”. Mark has been a scientist with the CSIR for the last 18 years, specialising in vegetation water-use, land-use hydrology and agro-meteorology. His professional interests and experience lie in the measurement and modelling of vegetation water-use and growth, irrigation-use efficiencies in agricultural crops (particularly commercial fruit tree orchards), the water-use efficiencies of trees (including natural forest species, introduced plantation tree species and alien invasive plants), and the hydrological impacts of land-use change. He specialises in the use of the Heat Pulse Velocity technique for measuring sap flow (transpiration) in trees, together with the Eddy Covariance method of measuring total evaporation of forests and agricultural crops. Based in Stellenbosch, he currently leads the Hydrosociences Research Group at the CSIR.

Assessing the contribution of industrial plantations to carbon stocks

Steven Dovey¹ & Oscar Mokotedi²

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This talk will comprise two parts:

Part 1: ICFR

Commercial forest plantations have been recognised for their potential to sequester atmospheric carbon dioxide (CO₂) and thus play a role in mitigating the effects of greenhouse gases on climate change. Information on carbon sequestration forms part of national government reporting on strategies and initiatives to mitigate and adapt to greenhouse gas induced climate change. This information will benefit the commercial forestry industry by improving understanding around management activities on carbon while possibly providing a rebate on carbon taxes through carbon sequestration.

Carbon sequestration and/or emission of forest plantations can be calculated by estimating the size of the carbon stocks and comparing changes in these stocks between years. The total carbon stock is the sum of above-ground tree components, below-ground root system, forest floor litter layer, dead material, and soil carbon pools. Fluxes within each pool can vary according to site attributes and plantation management practices. The South African forest plantation industry and government alike require country-specific carbon quantification methods that are accurate and compatible with a wide range of existing local and/or regional forest plantation inventory and management systems.

A robust and standardised methodology to account for carbon stocks in commercial forest plantations in South Africa does not exist. This is due to limited availability of the two information types. Site and stand inventory data are not available for the majority of plantation areas as it is held as confidential within the larger companies (36% of commercial plantations), collected inconsistently or not at all within the remaining companies and landowners.

Some data and information are available that can be used to generate equations to predict some of the carbon pools using site and stand data, but this does not include all major sites and species. Soil and litter data is also limited with no local models currently developed. International literature may be used in the interim, but this may be ineffective in representing local conditions.

A need to develop South African specific allometric or expansion functions and acquire high quality activity data (plantation inventory and management operations) has been identified. This is required to enable carbon stocks and fluxes to be accurately quantified and monitored across all forest plantations. A comprehensive modelling framework is required that draws on a combination of South African data and models, drawing on local and international literature and expertise. Research needs to assess the sensitivity of model components and address knowledge gaps accordingly.

To this end various commercial forestry representatives have initiated projects to improve carbon stock estimation models for the major plantation forestry species and clones. This work capitalises on available tree, litter and soil data in conjunction with field sampling programs to generate models and expansion functions to predict soil, litter and tree carbon from forest plantation site and stand data. These models and functions will however only serve well where site and stand data is available and verified. Alternative methods, such as remote sensing, are required for rapid and routine collection of site and stand data. In addition, a long-term monitoring system is required for tracking changes in carbon stocks (particularly soil) and for verifying model predictions (a government reporting requirement). Further to this, all methods need to be developed through partnership and agreement between government, industry and research bodies and their representatives.

Part 2: DEA

The Department of Environmental Affairs, through the Climate Change Monitoring and Evaluation chief directorate, is mandated to co-ordinate the development of robust tools to track the extent to which South Africa is transitioning towards lower carbon and climate resilience. The outputs will inform domestic policies on land management as well as international reporting obligations under the UNFCCC. The role of industrial tree plantations and forestry in general, in climate change mitigation is recognized, hence the need to define how government can support ongoing initiatives around the development of robust carbon accounting methodologies.

This presentation will focus on:

- Acknowledging the role of forestry in climate change mitigation;
- Development of a national IPCC compliant MRV system for the land sector – role of forestry;
- Indicators for long term monitoring and evaluation.

The establishment and formalization of institutional arrangements among the stakeholders will enhance data and information sharing, including the communication of lessons learned about the contribution of industrial plantations in the sequestration of carbon.



Steven Dovey studied for a BSc in agriculture and horticulture at UKZN, followed by an MSc in Biology at the UKZN and a PhD in forestry at the Stellenbosch University. He is currently a Senior Research Scientist at the ICFR, and project leader for Nutritional Sustainability. His primary research focus is in building understanding around sustainable nutrient supply for productive commercial plantation forests in South Africa. This has enabled him to collaborate with academics and researchers to develop models for carbon stocks estimation of soil, litter and tree biomass.

Dr Steven Dovey

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Oscar Mokotedi has expertise and interests in tree biotechnology and physiology, as well as the relationship between plants and the environment. Oscar recently joined the South African national Department of Environmental Affairs (DEA), Monitoring and Evaluation (M&E) chief directorate, as a specialist advisor to develop the MRV system for the Agriculture, Forestry and Other Land Use (AFOLU) sector. Before joining the DEA, Oscar was a senior researcher with the Forestry and Forest Products research unit at the CSIR, where the focus of his work was on tree improvement (primarily *Eucalyptus* hybrids) for changing climatic conditions. Oscar has also invested more than a decade at the University of KwaZulu-Natal (UKZN) as a lecturer in plant sciences, and remains an honorary lecturer at UKZN. He was a member of professional societies such as the International Society of Horticultural Science and the South African Forestry Institute, and is currently registered with the South African Council for Natural Scientific Professions (SACNASP).

Dr Oscar Mokotedi

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Notes

Obtaining more value from forestry supply chains; SCM/VCO and research opportunities

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One of the cornerstones of sustainable forestry is the wise use of wood resources to achieve maximum value or benefit for society, while not jeopardizing the future. At the same time forest companies must compete internationally, otherwise they themselves risk becoming non-sustainable. Supply Chain Management (SCM), now evolving into Value Chain Optimization (VCO), is a business management approach which strives to achieve the wise use of inputs, while ensuring the health of a company in tough international competition, through breaking down barriers of communication and information flow within and between organizations and companies. In SCM/VCO the decision focus is the entire supply chain stretching from the raw materials (standing trees), right through to final consumption, with the objective to achieve maximum value from our natural resources. In this way sub-optimization of lower-level operations and processes does not put the over-all objectives of the organization at risk or limit future opportunities. The objectives of this presentation are to outline what SCM is and its' evolving into VCO, show why SCM/VCO has emerged as an important field in wood procurement and research, and finally give four examples of how a wider view of wood procurement can influence the wise and sustainable use of wood resources.



Prof Reino Pulkki

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Dr Pulkki, started his forestry career in 1978, is a graduate of Lakehead University (B.Sc.F. '78), and continued his education at the University of Helsinki (M.Sc.F. '80, Lic.Sc.F. '82, Dr.Sc.F. '85). He returned to Lakehead in 1987 as an Associate Professor.

He has been coordinator of the PhD (Forest Sciences) program since its start in 2005. From 1991 to 1999 he served as program director for the Forest Management Department and as Dean of the Faculty from April 15, 2001 until June 30, 2009 after serving two terms. He was also Acting Vice President (Academic) and Provost (February 1, 2004 – August 31, 2004) and Acting Dean Graduate and International Studies (February 1, 2004 – June 30, 2004)

Dr Pulkki's expertise is in forest operations, roads, transport and business, with special interest in harvesting and transport systems analyses, wood flow logistics, and supply chain management and value chain optimization. Areas in which he conducts research and teaches are; harvesting systems and equipment analyses, economic impacts of intensive silviculture, forest road construction, wood transport and logistics, operations research, wood quality and its impact on the total supply chain, environmental impacts of logging, and forest workers and ergonomics.

He holds an appointment as Professor Extraordinary at Stellenbosch University, South Africa since 2000, and has had close collaboration with Stellenbosch since 1999 when he spent a year as visiting professor in Forest Engineering. Since then he has supervised numerous MSc students to completion.

Application of remote sensing to management of industrial wood plantations

Moses Cho

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The need for high technology sensing and analytical tools to support inventory, planning and management of plantation forest is crucial to improving production and competitiveness of the South African plantation forest sector. Optimal production of timber in South Africa is stymied by increasing cost of production, shrinking land area and threat of pest and diseases. Several fungal and insect pests are known to affect pine and eucalyptus trees, causing poor growth and in many cases mortality of trees. Traditional field-based methods for monitoring trees growth over large areas are laborious and time consuming, thereby increasing the input cost of producing timber. Alternatively, earth observing systems have been used over broad areas for forest inventories (timber volume, mean diameter, tree height, species composition, tree health and management); disaster risk reduction e.g. forest fire, tree dieback resulting from disease and pest attack and invasive species mapping and management. In combination with geospatial technologies such as Global Positioning Systems (GPS) and Geographic Information Systems (GIS), earth observation satellites can assist forest management and planning in site-specific silvicultural operations i.e. used in combination with variable-rate technology to improve the efficiency of herbicide spraying and fertilizer application, and in harvest and transportation planning and management.

Earth observation satellites have been used to support the forest sector since the era of aerial photography and passive optical multispectral spaceborne sensors such as Landsat satellites. However, until recently, the use of Landsat and other traditional multispectral sensors has been limited to estimating areal coverage of planted fields because of their limited spatial, spectral and radiometric resolutions. New high spatial resolution sensors such as IKONOS, QUICKBIRD and WorldView-2, some with additional spectral properties suited for charactering vegetation biochemistry (e.g. chlorophyll and N contents) offer new potential for inventorying tree biochemistry and health. In contrast to passive sensors, active sensing devices such as light detection and ranging (LiDAR) provide the most accurate means to estimate forest structural features e.g. tree height and volume. However, LiDAR is operated mostly at airborne level and is thus limited in spatial and temporal coverage. Satellite-based synthetic aperture Radar (SAR) sensors offer the possibility to scale airborne LiDAR or ground estimates to a much broader scale. In conclusion, the effective use of earth observation systems, particularly satellite-based remote sensing has the potential to reduce the cost of wood production.



Dr Moses Azong Cho

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Dr Moses Azong Cho is a principal research scientist with the Earth Observation (EO) group at The Council for Scientific and Industrial Research (CSIR), South Africa and a research fellow with the University of KwaZulu Natal South Africa. He received a BSc in natural sciences (Botany) from the University of Yaoundé, Cameroon in 1991, an MSc in biodiversity conservation from the University of Greenwich, London, U.K., in 2001, and a PhD degree in Remote Sensing from Wageningen University and the International Institute from Geoinformation Science and Earth Observation, Enschede, Netherlands in 2007. He is involved in the development of remote sensing algorithms for modelling and mapping vegetation biochemistry and biophysical properties, and for discriminating vegetation communities or species. He has authored 37 peer reviewed journal articles, and over 42 peer reviewed conference papers and 10 book/book chapters. He has successfully co-supervised and mentored 4 PhD and 5 MSc candidates. He has extensive research experience in Europe and Africa in assessing forest and grassland resources. He is a member of the Society for Conservation Biology (SCB), African Association of Remote Sensing of the Environment (AARSE) and International Association of Landscape Ecologists (IALE), Council member of IALE, an National Research Foundation (NRF) rated scientist, convenor of the technical committee on algorithm development and application of AARSE and a visiting lecturer with the University of Twente under the Erasmus Mundus Programme. He is an associate editor for one of the leading International Journals in remote sensing, the International Journal of Applied Earth Observation and Geoinformation (ranked 3rd in remote sensing). He has coordinated several projects related to remote sensing of forest and grassland systems, and speaks and writes English and French.

Extracting the full value from industrial wood plantations

Charlie Clarke

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Historically, the pulp and paper industry has been extremely wasteful with one of their most expensive raw materials. Twenty years ago, the combination of relatively cheap labour, fuel and energy costs as well as excellent growing conditions gave the South African industry a competitive edge over their northern hemisphere counterparts. However, with the migration of commercial pulp production from North America to South America that has changed and in order to remain globally competitive, the local industry must now extract the full value from the plantation trees.

This presentation shows that for South African grown *Eucalyptus*, less than half of the tree was converted into a saleable product. Lignin is used to generate energy even though it potentially has a higher value as a chemical additive for the cement or dust suppression industries. Eucalyptus bark is left in-field when it could be used for energy production or as a source of fine chemicals if it was brought into the mill with the tree. The only part of the tree to add true value is the cellulose while the remainder is collectively fed to a recovery boiler regardless of calorific value. Hemicellulose sugars could be used to produce high value chemicals such as lactic acid or polypropylene glycol. Organic acids are sent to effluent along with breakdown products such as furfural even though there is a chemicals market with a growing appetite for green, sustainable, bio-renewable products. There is little doubt that the pulp mill of the future will make as much revenue from the other fifty percent of the tree as it does today from cellulose.



Dr Charlie Clarke

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Charlie completed an Honours Forestry Degree at University College of North Wales (UCNW), Bangor in 1978, followed by an MSc in agriculture (genetics) at University of KwaZulu-Natal, Pietermaritzburg in 1991 and, lastly, a PhD at UCNW, Bangor in 1996. He joined Sappi Forests in South Africa in 1984 in the planning office. Two years later he moved to the newly formed Sappi Forests Research and Development Department and took up the position of Hardwood Tree Breeder. Fifteen years later he formed the Fibre Research Section within Forests R&D and in 2002 he was appointed to the position of manager of the Fibre Processing department at the Sappi Technology Centre in Pretoria. In 2008 he took over the position of Technology Centre manager leading 60 scientists and technicians in the fields of pulping, bleaching, biorefinery, paper making and environmental solutions. Having completed 20 Comrades marathons this year, he describes himself as well travelled, globally renowned, locally underrated and unbelievably modest. He is also an acknowledged connoisseur of good coffee and locally brewed kraft beers.

Solid wood products research in South Africa: Challenges and opportunities

Melanie Blumentritt

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This presentation will give a summary of solid wood products research conducted at the Department of Forest and Wood Science at Stellenbosch University during the last decade. The main challenges and opportunities for research in this sector will also be discussed.

As with other southern hemisphere countries where the forestry resource is dominated by plantations, the ever increasing portion of juvenile or corewood has been a challenge over the last decade. This problem is a direct result of the success of our tree-breeding and plantation management research efforts in South Africa which resulted in faster growth and hence reduced rotation ages. The lower stiffness (MOE) of corewood is the main concern as more than 60% of sawn lumber in SA is used in structures. An overview of the research dealing with low MOE resources will be given including the prediction and modelling of MOE, and possible forest management strategies to counteract this effect.

A concern for the SA sawmilling industry is the limited future supply of softwood sawlogs. In 2008, for the first time in nearly half a century, significant volumes of structural lumber was imported from countries such as Argentina, Brazil and New Zealand. One possible solution to the limited softwood saw log supply is the use of young Eucalypt resources for sawn lumber. The development of adhesives which can be applied to wet or green wood opens many possibilities for solid wood products from Eucalypt including fingerjointed structural lumber and cross-laminated timber (CLT). Research into new products from young Eucalypts will be summarised. Another opportunity to increase the saw log resources in SA is to plant drought resistant trees in the semi-arid areas of the country not normally associated with commercial forestry. A research project dealing with the wood quality of some high-value, drought resistant Eucalypt trees will be discussed.

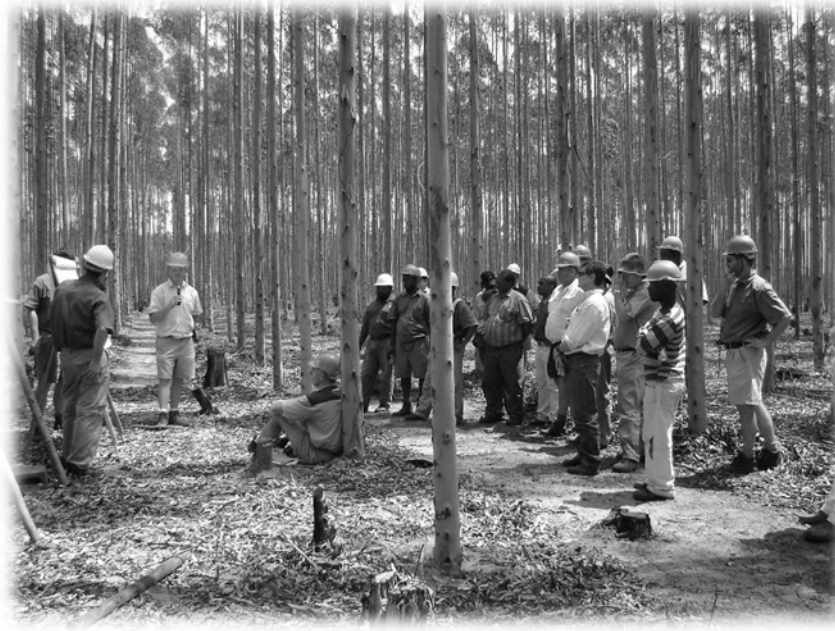
Finally, current research into the environmental sustainability of buildings (“green building”) and the role that timber can play in reducing environmental impacts that buildings have on our environment, will be discussed.



Melanie Blumentritt, PhD, is a post-doctoral fellow in the Department of Forest and Wood Science at Stellenbosch University. She holds a BSc and MSc in Forest Biology and Forest Ecology from Göttingen University, Germany and received her PhD in Forest Resources from the University of Maine, USA in 2014. Dr Blumentritt’s research has focussed on wood composite production in the setting of forest based biorefineries, electron microscopic evaluation of thermally modified wood and environmental performance of wood and wood-products compared to other materials using life-cycle assessment (LCA) methodology.

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Session 6: 16h30 – 18h00		Chair: Dr Ronald Heath (FSA)
16h30 – 16h50	Information and technology needs of small scale tree growers	Sally Upfold (ICFR)
16h50 – 17h10	Role of forest research networks in Africa (FORNESSA)	Dr Joe Cobbinah (FORNESSA)
17h10 – 17h30	Forestry education and training to support a changing forest sector	Prof Jos Louw (NMMU)
17h30 – 17h50	Public-private partnerships for building a research foundation	Prof Colin Dyer (ICFR)
17h50 – 18h00	Closure	

Information and technology needs of small scale tree growers

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The South African Forest Industry contributes significantly to the country's economy. Tree growing is predominantly a rurally based activity, creating over 92 700 direct and indirect jobs. Historically, plantation forestry was dominated by large corporate firms and private commercial tree farmers. More recently, tree farming has become attractive to small scale emerging growers, driven by changing land ownership patterns, development of timber markets, and government support for small, micro and medium enterprises (SMMEs). To operate as sustainable, productive tree farmers, SMMEs require support in capacity building, skills development, start-up capital and access to technical knowledge. The role of forestry research in this process is twofold. Firstly, to exploit existing knowledge to develop useful, practical information, and provide training and support in using this knowledge. This includes all aspects of sustainable tree growing from planting through to harvesting and transport, as well as timber and non-timber products/processing, managing risk, and the business enterprise of tree growing. Research also needs to investigate and address gaps in our knowledge of appropriate technologies for these stakeholders and provides information about contribution made by these SMMEs in both the local and national economy. Currently there are a number of initiatives aimed at addressing forest grower issues, supporting and uplifting small-scale growers, including field-based community projects, industry co-ordinated activities, toolkits and technology transfer material. This paper explores these projects, highlighting the strengths and successes of each, as well as investigating proposed synergies and identifying knowledge gaps where new research is required.



Sally J Upfold

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Sally Upfold is currently the Knowledge Manager at the Institute for Commercial Forestry Research. She has an MSc in Plant Physiology from the (then) University of Natal and more than 10 years' experience in the transfer of technology and knowledge from forestry and applied research. She has written and edited over 50 publications, including peer-reviewed papers, technical reports, handbooks and company annual reports and is co-editor of the South African Forestry Handbook (2010). In addition she has presented more than 15 papers or posters at national and international conferences. As the ICFR's Knowledge Manager, Sally is responsible for leading all aspects of Institute-level knowledge and communication management, technology transfer, information dissemination and event management. She has co-ordinated and organised a number of forestry industry events including the biennial national research symposia and is currently serving on the XIV World Forestry Congress Local Organising and Technical Committees as well as organising the Research Symposium pre-event. Her interests lie in developing new and innovative ways of transferring applied research technology and knowledge to meet the needs of a range of stakeholders, and in particular, new entrants into the tree growing business in South Africa.

Role of forest research networks in Africa (FORNESSA)

Joe Cobbinah

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The Forestry Research Network of sub-Saharan Africa (FORNESSA) was set up as an umbrella body of three sub-regional networks namely the Association of Forest Research for East Africa (AFREA), West and Central Africa Council for Agricultural Research and Development (CORAF-Foret) and Southern Africa Development Community, Food, Agriculture and Natural Resources (SADC-FANR). FORNESSA has been the rallying flag for forestry research cooperation in the region. Its overarching goal is to support the conservation and sustainable management and utilization of forest resources in Africa. Cooperation and collaboration among researchers and research institutions is not only desirable but inevitable. In the Africa region, where the institutions are under-resourced in terms of human and material resources collaboration of institutions and researchers allow for pulling the minds of many on common problems, avoid duplication and catalyse the generation of information/knowledge. FORNESSA has been able to network institutions, build capacity of researchers, established thematic working groups to address challenges specific to the region and released state of the art publications in climate change, rehabilitation of degraded forest lands and Traditional forest-related knowledge and sustainable forest management in Africa. FORNESSA has also created opportunities and supported African researchers to participate in global forest meetings and initiatives and through these facilitated North-South and South- South collaboration and networking of researchers and institutions.



Dr Joe Cobinnah

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Dr Joe Cobbinah has PhD from University of Adelaide in South Australia. He rose through the ranks from Research Entomologists to Chief Research Entomologist from 1979 to 1990. In 1997, he became the Director of the Forestry Research Institute of Ghana (FORIG). Under his leadership FORIG grew to be globally recognised as one of the leading national forest research Institutes in the tropics and simultaneously provided valuable leadership and insight to the forestry industry in Ghana. His International reputation attracted valuable research funding for work at FORIG. Dr Cobbinah has served on numerous international, national and private boards including, chairman of the board of directors of Plant Resources of Tropical Africa (PROTA); Country Representative, UN Commission of Science and Technology; Country representative, IUFRO International council; Coordinator, IUFRO Working Group on Protection of Forests in the Tropics; Chairman, IUFRO-GFIS Africa Project. In addition, Dr Cobbinah has also been a Senior Fulbright Fellow and Rockefeller Fellow. He is a member of the Governing Council of Africa Forest Forum (AFF), member of Tropenbos International board; Chairman of board of UNFF Major Groups Partnership on Forests (MGPoF) and Coordinator of the Forestry Research Network of sub-Saharan Africa (FORNESSA). Dr Cobbinah received IUFRO Distinguished Service Award in 2012. Dr Cobbinah lives in Kumasi, Ghana and provides scientific and strategic support to various national and international projects and initiatives.

Forest education and training to support a changing forest sector

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The South African education system has significantly developed and transformed over the last two decades in terms of qualification structure and curriculum content. Despite many initiatives aimed at quality improvement and substantial government subsidization, the education system is confronted with some very harsh realities and inequalities. This presentation is structured in two parts, namely a general perspective on South African education, including school level, followed by a more in-depth discussion of the forestry higher education sector.

Several reasons for concern will be highlighted, including shortcomings in the quality of schooling, under-preparedness of science and mathematics teachers with resultant poor performance of students in these disciplines, and the poor throughput rates across the entire education system. The question arises whether our education system produces the competencies required for a country facing several challenges pertaining to its natural resources, as well as its socio-economic profile and dynamics.

Forestry education in South Africa is provided by several tertiary level institutions of high calibre, and is generally well resourced. The range of academic programme options are illustrated in the presentation according to the new Higher Education Qualifications Framework introduced in 2010. Contrary to the old binary system of technikons and conventional universities, the new structure provides opportunities for improved access, qualification articulation and student mobility. With well-designed partnerships between universities and industry, this can make a substantial contribution to research capacity and productivity. The presentation concludes with recommendations for curriculum design for the purpose of improved employability in an innovative, vibrant and sustainable forest industry.



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Prof Jos Louw is the Director of the School of Natural Resource Management at the NMMU George Campus – one of four schools within the university’s Faculty of Science. He studied at the Universities of Stellenbosch, Potchefstroom and Wits. His research interests include Soil Science and its various applications in Natural Resource Management, Landscape Ecology and Environmental Management. Prior to his appointment at the Nelson Mandela Metropolitan University (George Campus), he held project management and research positions at the CSIR (Forestek) and the South African Forestry Research Institute. He has published widely in both local and international forest science journals, and also produced several industry technical reports. Prof Louw regularly participates in forestry-related conference and symposia proceedings, nationally and internationally. He is a member of several professional organisations, work groups and industry committees, such as the SA Institute of Forestry; the SA Soil Science Society; Forestry Industry Human Resource Committee, and the National Forestry Advisory Committee. Prof. Louw has supervised numerous students on Masters and Doctoral level in a variety of research spheres.

Public-private partnerships for building a research foundation

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The South African Forestry sector is based on short-rotation, intensively managed plantations of introduced tree species which yield a range of forest products to primary and secondary processors. It is a rural-based sector, comprising tree farmers at various scales. The sector contributes significantly to the South African economy, both at national and provincial levels. It has a significant impact on rural economies, particularly through direct and indirect employment in the sector. Many rural households are dependent on the forestry sector.

The forest sector is anchored on principles of sustainable forest management which require a sound and dynamic knowledge and technology base and a need to understand the external impacts of forest plantations to further improve their social and environmental impacts in a rural development context. Fast growing even-aged forest plantations can provide the economic sustainable supplies of renewable material vital to developing green economies. Sustainable production requires that plantations are managed appropriately in the face of global climate change, the worldwide spread of pests and pathogens and the challenges of multiple rotations on the same site.

In South Africa, forestry research has a 100-year history, with significant public sector support initially. Over the past 25 years, Research, Development and Innovation (R, D & I) to service the needs of the sector have been largely supported by the private sector. Public sector funding has been increasing, primarily in the area of forest protection, and through public-private partnerships.

This presentation demonstrates the importance of public-private partnerships, both in building and maintaining the R, D & I foundation, and in delivering specific outcomes. This mechanism is a valuable one for building and deploying core R, D & I competence to support a transforming South African forestry sector.



Prof Colin Dyer

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Colin is currently the Director of the ICFR in Pietermaritzburg. He holds a PhD in Plant Systematics from the University of the Witwatersrand in South Africa. After working at the South African Forestry Research Institute and the CSIR as both researcher and research manager, he took up the directorship of the ICFR in 1998. Colin serves on the boards of several forestry research and science organisations and is the Chair of the South African Sirex Control Programme. For the XIV World Forestry Congress, Colin serves on the International Advisory Committee and the Local Organising Committee.

