COOPERATIVE RESEARCH CENTRE
FOR SUSTAINABLE PRODUCTION FORESTRY

ANNUAL REPORT

2000

CRC AUSTRALIA

Established and supported under the Australian Government's Cooperative Research Centre's program

Mission Statement

The role of the Cooperative Research Centre for Sustainable Production Forestry (CRC-SPF) within the forestry sector is:

To sustain the productivity of and enhance the economic benefit from Australia's forests, through excellence in research, training and technology transfer.

Objectives

The CRC-SPF will provide the following benefits:

- Ensure the long-term viability of Australia's forestry industry through high-quality, relevant research in sustainable plantation forestry.
- Produce research outcomes which improve the competitiveness of industry partners, as well as being of interest to a wider range of stakeholders.
- Improve the efficiency and effectiveness of the applied research and development of industry partners through fostering and facilitating cooperative research.
- Provide an avenue to international science to ensure relevant new approaches and techniques are available in Australia.
- Provide innovative and relevant education and training that meets the skill formation needs of the forestry industry and the national forestry objectives.
- Ensure that all stakeholders capture the benefits of Centre research through effective technology transfer.

COOPERATIVE RESEARCH CENTRE FOR SUSTAINABLE PRODUCTION FORESTRY

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Established and supported
under the Australian Government's
Cooperative Research Centres Program

Australian Forest Growers

Australian Paper Plantations Pty Ltd

Australian Plantation Timber Ltd

CSIRO Entomology

CSIRO Forestry and Forest Products

Department of Primary Industries Queensland

Forest Enterprises Australia Pty Ltd

Forestry Tasmania

Griffith University

Gunns Forest Products Pty Ltd

Gunns Limited

Norske Skog Paper Mills (Australia) Limited

Private Forests Tasmania

Serve-Ag Pty Ltd

Southern Cross University

Southern Tree Breeding Association Inc

The Australian National University

The University of Queensland

Timbercorp Limited

University of Tasmania

Wacap Treefarms Pty Ltd

Contents

Chairman's Report

This has been a year of great application. It is pleasing to see a lift in the rate of publication and completion of Postgraduate and Honours student projects. Unusually, there were no reviews of the CRC or major conferences run by the CRC this year, giving more time for researchers to devote to research and publication. There has also been an increase in technology transfer to industry and in external grants successfully obtained by CRC staff.

The last few months have been difficult for industry, and this has been reflected in a substantial restructuring. Whilst the area of plantation establishment this year has reached record levels of 120 000 ha, there is likely to be a drop in investment in plantation forestry which may mean a reduction to only two-thirds of this area planted in 2001/02. Controversy over tax rulings has reduced confidence in tax-effective investments in plantations. This is placing strain on some CRC industrial partners.

There is also change afoot for the management of our CRC. The Director, Prof Jim Reid, who has steered the CRC so successfully for nearly 10 years, has accepted the position of Dean of Science and Technology at the University of Tasmania and his resignation is effective from 31 August 2001. It is with great regret that the Board and I witness Jim's departure and wish him good fortune in his new position. The Board has already interviewed for Jim's replacement, and hopes to announce a new Director soon.

The CRC started the year with a new Visitor, Dr Max Whitten. He attended the very successful Annual Meeting of the CRC in Hamilton, hosted by Timbercorp, and met most of the key staff and partners. We welcome him warmly and thank him for his positive approach and advice on his recent visit to Hobart.

Next year will be an important year for the CRC. We have ahead of us a Fifth Year Review and development of a bid for a new forestry CRC. A particular scientific vision and set of relationships with industry will be required to realise the goal of attaining a new CRC.

John Kerin
Chairman

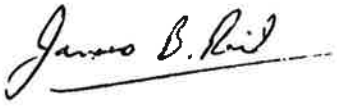
Director's Report

The CRC for Sustainable Production Forestry continued to expand during 2000/2001 with Australian Plantation Timber Ltd joining the CRC as a core member. It was a year with considerable turbulence in the eucalypt plantation industry and several partners had ownership and name changes. Gunns Limited purchased Boral Timber Tasmania and North Forest Products, and consequently became a core member. Sotico Treefarms Ltd changed its name to WACAP Treefarms Pty Ltd, and Fletcher Challenge was taken over by Norske Skog Paper Mills (Australia) Ltd. It was, however, a year in which there was a major increase in the area of new plantations established (120 000 ha for 2000/01). Although there may be reduced plantation establishment in 2001/02, the figure for 2000/01 is a ten-fold increase in area from a decade ago when the original CRC for Temperate Hardwood Forestry was established with the aim of providing research to allow a major expansion of the industry.

Research and research training outcomes through the year continued to be excellent as evidenced by the quantity and quality of both publications and theses produced. The staff and students of the Centre deserve to be proud of these achievements. Perhaps of even more note was the strong transfer of these research outcomes to industry. CRC research initiated by the Western Australian plantation industry into two invertebrate pests, autumn gum moth and African black beetle, has produced management systems now widely adopted by industry. A new dynamic growth model, CABALA, has also been developed as a tool for silvicultural management. The model is more complex than its predecessor ProMod but is a better predictor where conditions change during a rotation. For example, this allows plantation managers to better time fertiliser applications or determine the effects of soil water depletion on second rotation growth. Further, continued close collaboration with the Southern Tree Breeding Association has allowed the theoretical work on tree breeding to be applied to the major breeding programs in Australia, resulting in major benefits to the industry. Through the technology transfer scheme clear benefits are being provided to the wide range of industry partners in the CRC, particularly the small to medium sized or new enterprises which now make up much of the industry.

The staff of the CRC have been successful in attracting substantial funding for work relevant to the CRC but beyond its current financial resources. The value was over $1 million and came from a wide range of sources including the Australian Research Council, research and development corporations, Natural Heritage Fund as well as the forest industry.

During the year there have been a number of important changes in CRC staff and partner representatives. At the Board, Prof Bill Hogarth (Griffith University) replaced Assoc Prof Jane Hughes, Richard Breidahl (WACAP) replaced Murray Vitlich (Sotico Treefarms), and Dr Erica Shedley became a board member when APT joined the CRC. Our Visitor, Dr Peter Nelson, retired and was replaced by Dr Max Whitten. There were numerous other changes amongst the staff and students of the Centre. I welcome the newcomers and thank those leaving for their important contributions to the CRC and wish them well in their new endeavours.



Prof James B Reid
Director

Management

The Board

The Board of Management of the Centre comprises an independent Chair, a representative of each Core Member organisation, the Director and Deputy Director of the Centre, and the Chair of the Advisory Panel. The Board determines policy and strategic direction, and sets guidelines for the effective operation and management of the Centre. The management structure and links are shown in Figure 1.

Operation of the Centre is facilitated through:

Advisory Panel

The Advisory Panel has the role of providing scientific advice to the Board. The Panel includes Dr David de Little (Chair), three external scientific experts - Dr Peter Ades (University of Melbourne), Prof Roger Sands (University of Canterbury, NZ), Dr Tim New (La Trobe University) - and the Chair of each Program Coordinating Committee.

Management Committee

This committee assists the Director in the day-to-day running of the Centre and in implementing the policies set by the Board. The Committee comprises:

Prof Jim Reid (Director)
Dr Russell Haines (Deputy Director)
Mr David Lyons (Business Manager)
Ms Jean Richmond (Secretary to the Board)
Program Managers:
Dr Brad Potts (Genetic Improvement)
Dr Chris Beadle (Sustainable Management)
Dr Clare McArthur (Resource Protection)
Dr Neil Davidson (Education and Technology Transfer)

CRC Board


Mr John Kerin
Chairman

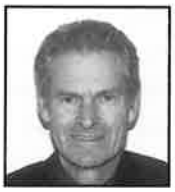

Prof Jim Reid
Director


Dr Russell Haines
Deputy Director


Dr David de Little
Chair, Advisory Panel


Mr Ron Beck
Executive Director Forestry
Department of Primary
Industries Queensland


Prof Andrew Glenn
Pro-Vice-Chancellor
(Research)
University of Tasmania


Mr John Cameron
General Manager
Australian Paper Plantations
Pty Ltd


Mr Ian Ravenwood
Project Manager-North West
Queens Forest Products
Pty Ltd


Dr Glen Kile
Chief
CSIRO Forestry and Forest
Products


Dr Hans Drielsma
General Manager
(Forest Management)
Forestry Tasmania


Mr Ian Bail
Manager, Treefarm Services
Timbercorp Limited


Prof Peter Baverstock
Dean
Graduate Research College
Southern Cross University


Mr Arnold Willems
Performance Manager-Fibre
Norske Skog Paper Mills
(Australia) Limited


Dr Erica Shedley
Senior Research Scientist
Australian Plantation Timber Ltd


Mr Richard Breidahl
General Manager
Plantation Operations
WACAP Treefarms Pty Ltd


Prof Bill Hogarth
Dean, Faculty of
Environmental Sciences
Griffith University

Program Coordinating Committees

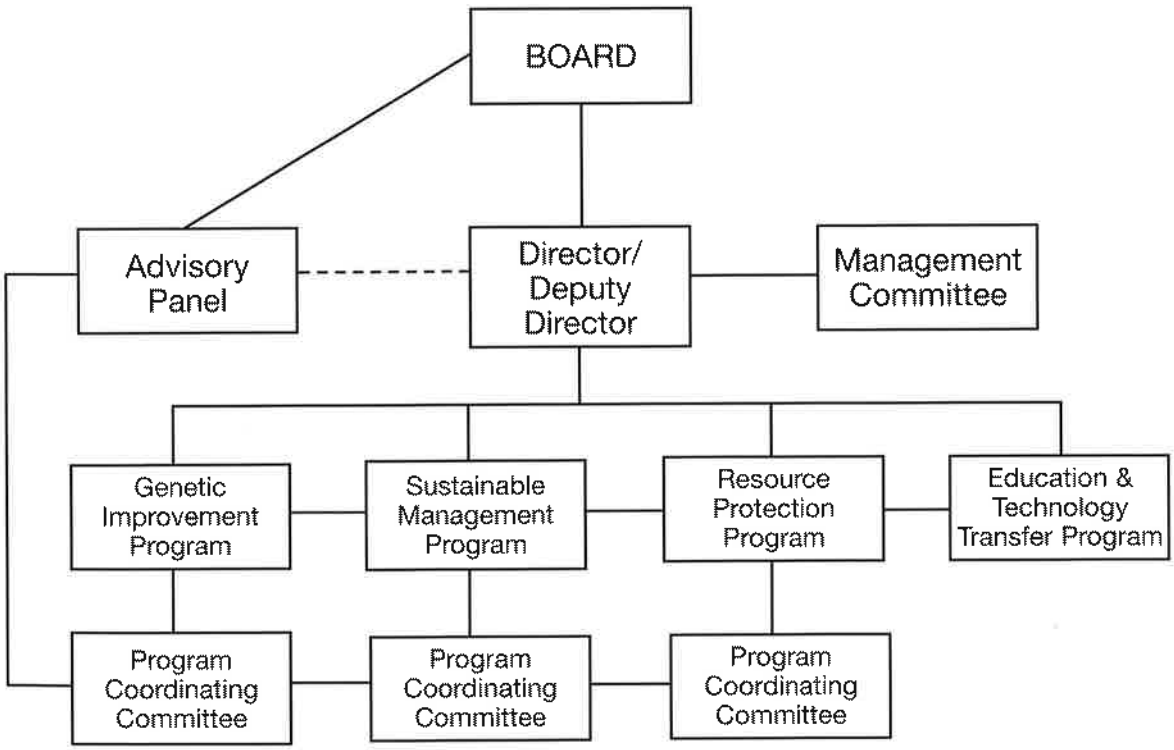
The Program Coordinating Committees meet at least twice each year to review and preview research with regard to its scientific and technological merit and to set and review research program outcomes. The committees are chaired by an industry partner representative, and consist of the Program Manager, at least three industry partner representatives and Project Leaders.

Genetic Improvement Program
Mr Peter Volker (S-Ag, Chair)
Prof Jim Reid (Director)
Dr Brad Potts (Program Manager)
Ms Helen O'Sullivan (TC)
Ms Sandra Hetherington (NS)
Mr Peter Kube (FT)
Mr Simon Hunter (WACAP)
Dr David de Little (GFP)
Dr Tony McRae (STBA)
Mr Arthur Hartmann (APT)
Mr Ian Last (DPIQ)
Mr Maarten Krygsman (APP)
Dr Neil Davidson (Program Manager ETT)
Project Leaders

Sustainable Management Program
Ms Sandra Hetherington (NS, Chair)
Prof Jim Reid (Director)
Dr Chris Beadle (Program Manager)
Mr Ian Last (DPIQ)
Dr Greg Holz (GFP)
Mr Bill Neilsen (FT)
Mr Richard Breidahl (WACAP)
Mr Henry Lieshout (APP)
Mr Paul Smale (TC)
Dr Erica Shedley (APT)
Dr Neil Davidson (Program Manager ETT)
Project Leaders

Resource Protection Program
Dr Humphrey Elliott (FT, Chair)
Prof Jim Reid (Director)
Dr Clare McArthur (Program Manager)
Dr David de Little (GFP)
Ms Sandra Hetherington (NS)
Dr James Bulinski (TC)
Ms Anne Partridge (APP)
Dr John Madden (Hon CRC Fellow)
Dr Bill Foley (ANU)
Dr Ross Wylie (DPIQ)
Dr Neil Davidson (Program Manager ETT)
Project Leaders

Figure 1 Management Structure



MAJOR DEVELOPMENTS

Autumn gum moth management system for WA plantation industry

A management system for autumn gum moth (*Mnesampela privata*) has been developed recently for the blue gum (*Eucalyptus globulus* ssp *globulus*) plantation industry in Western Australia. This system was developed from the initial findings of a research trial investigating the impact of feeding by autumn gum moth on the growth of young blue gums. Results from this trial show that there is a positive correlation between early counts of autumn gum moth hotspots (number of live egg masses and larval aggregations) per tree, and the resultant damage two months later (Figure 2). These results have enabled the designation of provisional economic thresholds that can be used by the plantation industry to gauge the extent of future damage and to initiate early controls to prevent serious damage from occurring. These thresholds will be updated once the long-term impacts of autumn gum moth feeding on tree growth are accurately quantified.

The current management system outlines times for surveillance and monitoring of pest levels, and gives recommended economic thresholds for control intervention. Surveillance is conducted during May and June when autumn gum moth damage is just beginning to appear. If autumn gum moth numbers and damage at a plantation are high, then intensive monitoring is initiated to determine if intervention is necessary. Trees in the worst affected parts of the plantation are searched for egg masses and larvae and the number of hot-spots per tree is recorded. If the average number of hot-spots per tree exceeds the economic threshold then insecticidal control is recommended.

Adoption of this management system by the industry has been good, with many finding the system easy to use and effective.

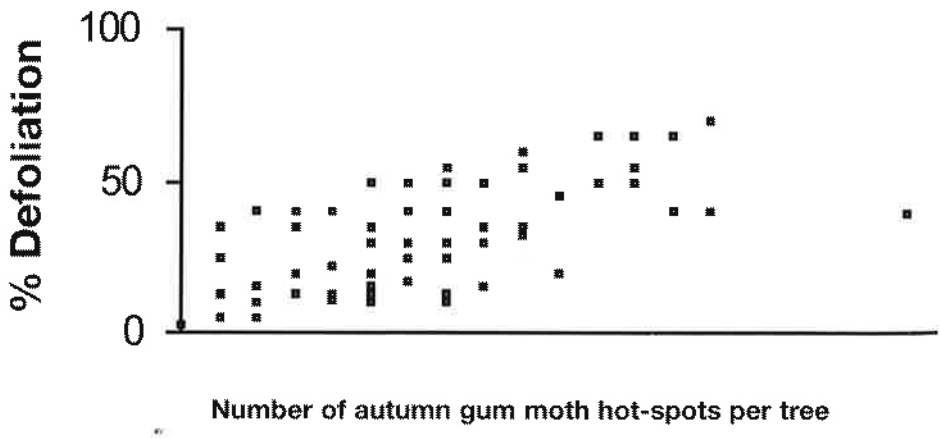


Figure 2: Relationship between the number of autumn gum moth hot-spots (number of live egg masses plus larval aggregations) recorded per tree in June 2000, and the subsequent level of defoliation recorded per tree in August 2000, at a *Eucalyptus globulus* plantation planted in 1999 in Western Australia.

MAJOR DEVELOPMENTS

A new approach to managing African black beetle

African black beetle (*Heteronychus arator*) trapped by the protective mesh barrier around seeding roots.

The African black beetle (*Heteronychus arator*) was accidentally introduced to Western Australia (WA) in the 1930s. Since then it has become a major pest for vegetable crops, grape vines, turf and commercial treefarms. In blue gum (*Eucalyptus globulus*) plantings, beetle attack is common on the sandy, high rainfall sites in the Manjimup, Denmark and Albany regions. Adult beetles feed on newly planted seedlings, girdling young trees at ground level. Damaged seedlings frequently die and heavy attacks result in areas of low stocking and costly replanting programs. This damage, and the control programs aimed at preventing it, costs WA growers hundreds of thousands of dollars annually.

Historically, plantation companies operating in WA have tried to reduce beetle numbers on newly planted 'risky' sites by applying insecticide to the soil surface during the first four months after planting. However, despite the high costs involved, operational experience has been that insecticide applications are not always successful in preventing beetle attack. Some plantings are still severely damaged even though they may have had a number of insecticide treatments in the months following planting.

In 2000, Ross Alexander and Dr James Bulinski of Timbercorp Limited developed a novel idea to reduce damage by African black beetle. Working in collaboration with Dr John Matthiessen of CSIRO Entomology, they established a series of trials that aimed to determine whether there was any scope for using 'physical barriers' to prevent beetle attack. Trials were established in the Albany region on treefarms heavily infested with beetles. Just prior to planting, 2 200 blue gum seedlings were treated with a range of barriers.

Of the range of barrier types tested, three offered a very high level of protection from beetles compared to both the untreated and insecticide-treated trees. One of these, a small mesh stocking, was considered to have more operational feasibility than the others. On average, only 7% of the seedlings treated with this barrier were 'severely' damaged. By comparison, severe damage was found on 36% of seedlings treated with insecticide, and 37% of the untreated seedlings (Figure 3).

Timbercorp is so encouraged by the trial results that it has ceased to use insecticide for African black beetle control. Instead it will be using a new, improved version of the mesh sleeves. Turning the research findings into an operationally feasible process, however, has not been an easy task. Working closely with Active Industries, an employment agency for people with disabilities, and staff from the WAPRES nursery at Manjimup, a system for cutting and applying some 200 000 mesh sleeves to seedlings was developed. Timbercorp has deployed these seedlings to areas supporting dense resident beetle populations, identified using a risk assessment method developed by Dr Matthiessen. Timbercorp and the CRC are using this operational scaling-up of the trial results to continue improvement of the system, which is sure to see wider application by industry in future years.

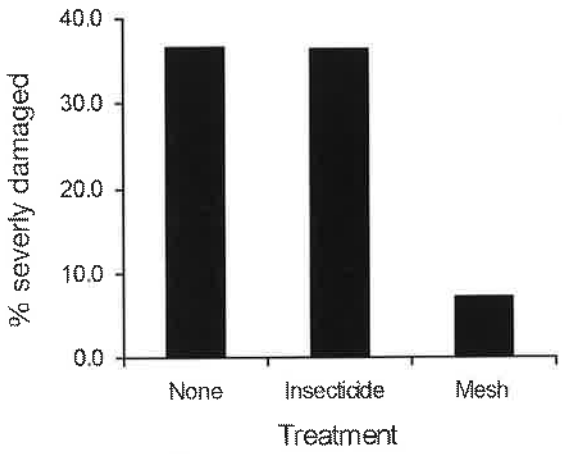


Figure 3: The percentage of seedlings, from each treatment, that were severely damaged (severe damage is where the stem of a tree is girdled for more than 30% of its circumference).

MAJOR DEVELOPMENTS

Dynamic ProMod – a tool for silvicultural management

Key questions facing industry include how to maintain stand growth into the second rotation, minimise the risk of losses due to pests, diseases and drought, and optimise silvicultural intervention. There is also interest in issues such as carbon accounting, and carbon or salinity credits, and the increased plantation estate raises questions about the impact of trees on values such as the use of groundwater. Simple models like ProMod provide effective tools for identifying likely sites, but are not well suited to answer these new questions.

A new model, dynamic ProMod (CABALA), predicts the time course of stand development and its response to silvicultural interventions such as fertilisation, thinning and defoliation. It predicts distribution of biomass above and below ground, growth under changing conditions (e.g. trees drying the profile), and can use real weather sequences.

The canopy production submodel in dynamic ProMod extends ProMod by linking leaf nitrogen concentration to photosynthetic rate, and by including photo-inhibitory effects of frost. It couples this submodel to biomass, respiration and allocation models, to a more detailed model of stand hydrology, and to simple nitrogen mineralisation and litter breakdown models. Resource uptake is linked to supply and characteristics of foliage and fine roots. Biomass allocation attempts to minimise growth limitations due to inability to capture resources.

These developments mean dynamic ProMod is more complex and difficult to use than ProMod, but where conditions change during a rotation it is a better predictor of stand growth. Use of dynamic ProMod to examine effects of soil water depletion on second rotation growth is given later in this report. The following example shows how it can compare nitrogen supply from soil process with demand due to growth. This allows accurate prediction of timing and amount of fertiliser application.

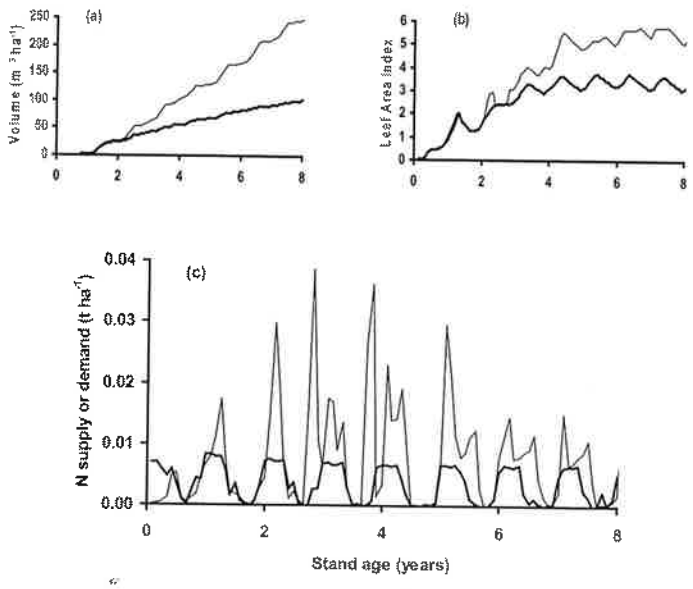


Figure 4:
Predicted (a) stem volume and (b) stand leaf area index response to later-age fertilisation at a site near Manjimup, WA, and (c) comparison of the time course of nitrogen supply from the unfertilised stand (—) with a stand fertilised at later-age (---). The soil organic carbon is 3% in the top 10 cm, and 0.7% and 0.3% between 10–20 cm and 20–50 cm, respectively. The simulated stands received 40 kg N ha^{-1} after planting. The later-aged fertilised stand received 125 kg N ha^{-1} (as urea) in two applications from age two years onwards.

MAJOR DEVELOPMENTS

New soil nutrient analysis system and national training program

A new system of assessing soil fertility has been developed, and staff of several industrial partners have been trained in its use.

The theoretical basis of the system is that the rate of nutrient uptake by plant roots and mycorrhizal hyphae is dependent primarily on its concentration in the soil solution in which they grow. At low concentrations the rate of uptake becomes limiting to plant growth, and nutrient deficiencies develop. Although this principle has been known for decades, and researchers have often studied nutrient concentrations in soil or hydroponic solutions, practical applications have been impeded by difficulties in sampling and interpreting these concentrations, and by their perceived high temporal variability.

A method for estimating concentrations of nutrients in soil solution based on a paste extract was developed, and useful interpretations of these concentrations were possible. However, these methods were applicable only to well-equipped research laboratories.

During the past three years, aspects of the method have been tested using widely applicable and relatively inexpensive methodologies based on commercially available soil water samplers and a portable water analysis system. This system offers industrial partners the opportunity for rapid, in-house analysis of soil fertility. Interpretation of the results is based on CRC-SPF research into the macro-nutrients of most interest, i.e. nitrogen, phosphorus and potassium.

To facilitate adoption of the technology, several staff from five industrial partners in three states have been trained.

Ruth Osborne with the nutrient analysis meter and some examples of the solutions measured by the meter. Ruth helped develop and test the system, and recently trained several industry staff in three states.

MAJOR DEVELOPMENTS

Molecular markers reveal new insights into the *Eucalyptus globulus* gene pool

Molecular markers are now providing new insights into the structure and affinities of the *Eucalyptus globulus* gene pool. For example, the Jeeralang population in the Strezlecki Ranges in Gippsland, Victoria is important to breeders and seed collectors due to its high wood density and good growth. It is morphologically intermediate between the three subspecies, ssp *globulus*, ssp *bicostata* and ssp *pseudoglobulus*, and it is important to understand the relationship of this population to other populations of *E. globulus*. Using molecular markers, this population has now been shown to have close affinities to more southern populations of ssp *globulus* growing on the Gippsland coastal plain (Figure 5). The Gippsland coastal ssp *globulus* occurs as small remnants in farmland and differs from the core distribution of this subspecies in eastern Tasmania, which has implications for its conservation status. In a second example, clues to the affinities and diversity of the Portuguese land race of *E. globulus* have been obtained using hypervariable chloroplast DNA markers. Improved material from the Portuguese land races of *E. globulus* is being increasingly tested in Australia and may eventually be incorporated into Australian breeding programs. However, in order to predict the genetic characteristics of this material and avoid inbreeding when crossing with Australian selections, it is important to know the Australian origin of this overseas material. Chloroplast DNA is maternally inherited, does not recombine, and is spatially structured in the native gene pool (Figure 6). The maternal geographic origin can thus potentially be traced, even after several generations of crossing. Studies have now shown that the Portuguese land races of *E. globulus* developed from introductions over two centuries have a diverse origin, but a component can be traced to south-eastern Tasmania.

Our marker database is also providing a means of native stand seed certification, fingerprinting, and pedigree recovery, as well as providing a base line for monitoring genetic diversity in breeding and deployment populations.

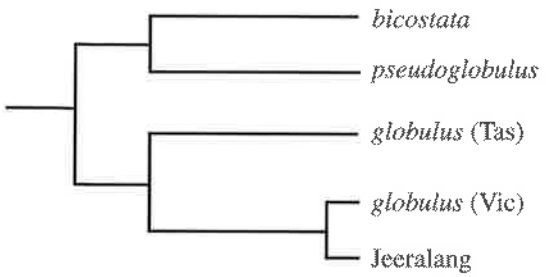


Figure 5. The commercially important Jeeralang population is more closely related to subspecies *globulus* in Victoria and Tasmania than other subspecies (*pseudoglobulus* and *bicostata*).

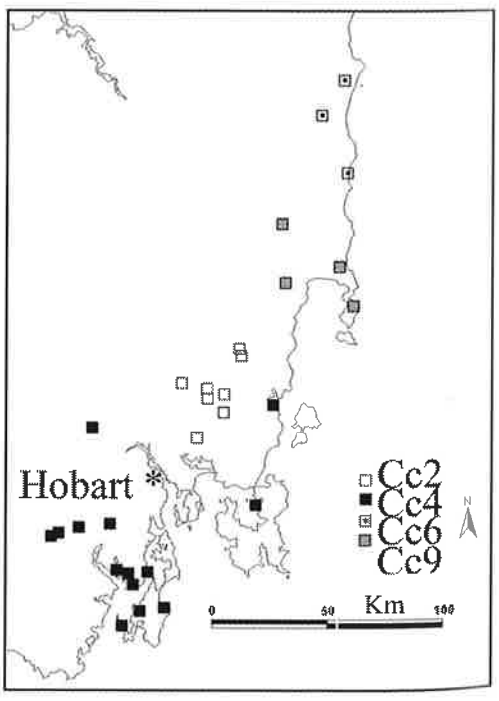


Figure 6. The distribution of four selected chloroplast DNA types (Cc2, 4, 6 and 9) of *E. globulus* ssp *globulus* shows they are confined to different regions of south-eastern Tasmania. Therefore chloroplast DNA types of overseas material can be used to identify region of origin in Australia.

Table 1 Cooperative Linkages

Genetic Improvement Program

International links	CRC Staff	Collaborator	Research
Project A1: Genetics and reproductive biology of eucalypts	Dr B Potts Dr H Dungey	Prof T Whitham (UNA, USA) Dr P Minchin (UL, USA)	The effect of forest genetics on biodiversity
	Dr B Potts	Dr C Balocchi (Bioforest, Chile) Mr P Rojas	Hybridisation of temperate eucalypts
	Dr B Potts Mr G Dutkowski Dr L Apiolaza	Mr G Lopez (INTA, Argentina) Mr P Gelid Mr J Rodriguez Traverso	Quantitative genetics of *Eucalyptus globulus* grown in Argentina
Project A2: Breeding strategies	Mr G Dutkowski	Dr J Costa e Silva (Denmark) Dr M Henson (Shell, Uruguay)	Spatial analysis
	Dr L Apiolaza Mr G Dutkowski	Dr T Ericsson (Skogforsk, Sweden)	Spatial and longitudinal analysis of progeny trials (growth and wood properties)
	Dr L Apiolaza Dr B Potts	Ms M Serra (Universidad de Chile)	Origin of Chilean landraces
	Dr L Apiolaza	Dr H Dungey (Forest Research, NZ) Dr S Kumar Dr L Gea	Genetic parameters and breeding value prediction for *E. fastigata*
Project A4: Molecular genetics of eucalypts	Dr R Vaillancourt Dr B Potts	Dr C Marques (RAIZ, Portugal) Dr N Borralho	Finding the origin of the Portuguese *E. globulus* landraces
Project A6: Hybrid breeding	Dr M Dieters Dr H Dungey	Prof B Li (NCSU, USA)	Application of finite-locus models in hybrid populations
	Dr M Dieters	Dr Y Zheng (Chinese Academy of Forestry)	Variation within natural and domesticated populations of *Pinus caribaea* var *bahamensis*
Project A7: Molecular genetic improvement for tropical and subtropical production	Prof R Henry Dr M Shepherd	A/Prof C Williams (Texas A&M University, USA)	Genetic mapping in *Pinus* spp
	Dr M Shepherd	Dr S Carson (Carson Associates Limited, NZ)	QTL detection in *Pinus* spp

National Links

Project A1: Genetics and reproductive biology of eucalypts	Dr B Potts Mr P Tilyard	Mr R Brereton (DPIWE)	Flowering patterns in *E. globulus* and their effect on the reproductive success of the swift parrot
	Dr B Potts Dr R Vaillancourt	Ms L Pound (UA)	Mechanism of self incompatibility in *E. globulus* and *E. nitens*
	Mr A Hingston Dr B Potts	Dr P McQuillan (UT)	Pollination ecology of *E. globulus* and *E. nitens*

	CRC Staff	Collaborator	Research
Project A2: Breeding strategies	Mr G Dutkowski	Dr D Boomsma (STBA) Mr R Breidahl (WACAP) Ms S Hetherington (NS) Mr A Gray (ForSA) Mr H Stewart (Treecorp) Mr D Jamieson (ACT Forests) Mr S Penfold (HVP)	Breeding management
	Mr G Dutkowski	Dr A Gilmour (NSW Agriculture)	Improvements in quantitative genetic models
	Mr G Dutkowski	Mr R Mazanec (CALM)	Analysis of progeny trials
	Mr G Dutkowski Dr L Apiolaza	Dr T McRae (STBA) Dr H Graser (AGBU) Dr R Kerr (AGBU)	Breeding value prediction software for tree breeding
Project A3: Molecular approaches to tree improvement	Dr G Moran Dr R Thumma Ms K Groom Ms J Murrell	Dr S Read (UM) Dr G Bossinger (UM)	Mapping cambial specific sequences in *E. globulus*
Project A4: Molecular genetics of eucalypts	Dr R Vaillancourt Mr J Freeman	Dr M Rossetto (SCU)	Transferability of *Melaleuca* microsatellites to *Eucalyptus*
	Dr R Vaillancourt Dr D Steane Dr B Potts Prof J Reid	Australian Genome Research Facility (AGRF)	Sequencing the chloroplast genome of *E. globulus*
	Dr D Steane Dr R Vaillancourt Dr B Potts	Mr M Lavery (Arianda Pty Ltd)	Genetic diversity in *E. globulus*
Project A5: Wood quality	Ms C Raymond	Dr R Evans, CSIRO FFP	Assessment of microfibril angle and density variation
	Ms C Raymond	Mr J Ilic, CSIRO FFP	Non-destructive assessment of wood stiffness
Project A6: Hybrid breeding	Dr M Dieters Dr H Dungey	Dr R Kerr (AGBU, UNE)	Development of program to simulate hybrid breeding strategies, and investigation of finite-locus models
	Mr A Joseph Dr M Dieters Dr H Dungey	Dr H Wallace (USC)	Genetics of intra- and inter-provenance hybrids in *P. caribaea* var *hondurensis*
Project A7: Molecular genetic improvement for tropical and subtropical production	Dr M Shepherd Mr R Mellick	Dr G Dale (Tree Crop Technology)	Genetic mapping of vegetative propagation characteristics in *Pinus* spp
	Prof R Henry Dr M Shepherd Ms M Jones	Mr S Bruskin (SF NSW) Prof A Delves (SCU)	Gene flow and genetic diversity of hardwood plantations in NSW

Within Centre Links	CRC Staff	Collaborator	Research
Project A1: Genetics and reproductive biology of eucalypts	Dr B Potts Dr G Jordan Mr G Dutkowski Mr A MacDonald	Mr K Joyce (GFP)	Genetic variation, age to age correlations and genotype-environment interactions for base population trials of *E. globulus*
	Dr B Potts	Mr P Gore (STBA) Mr D Pilbeam (STBA)	Genetic control of self incompatibility in *E. globulus* (partly STBA funded)
	Dr B Potts	Mr P Gore (STBA) Mr D Pilbeam (STBA)	Early success of inter- and intra-race crosses of *E. globulus* (partly STBA funded)
	Dr B Potts	Mr D Pilbeam (STBA)	Inbreeding and SCA effects in inter- and intra-race crosses of *E. globulus* (partly STBA funded)
	Dr L Apiolaza Dr B Potts Mr G Dutkowski	Mr P Gore (STBA) Mr K Joyce (GFP) Mr D Pilbeam (STBA) Mr M Krygsman (APP)	Genetic control and estimation of breeding values for flowering time in *E. globulus* (partly STBA funded)
	Dr D Williams Dr B Potts	Mr P Kube (FT) Mr N McCormick (FT)	Seed orchard management and optimising seed and seedling quality
	Mr R Barbour Dr B Potts Dr R Vaillancourt	Dr D de Little (GFP) Mr K Joyce (GFP)	Gene flow between planted and native eucalypt forests (ARC funded)
	Dr B Potts Mr P Tilyard	Dr C McArthur (RP) Ms J O'Reilly (RP)	Genetic variation in *E. globulus*, *E. nitens* and their hybrids to marsupial browsing
	Dr B Potts Dr R Vaillancourt	Dr D de Little (GFP) Dr G Allen (RP) Mr L Rapley (RP)	Genetic basis of susceptibility to insect pests
Project A2: Breeding strategies	Dr L Apiolaza	Dr R Vaillancourt (A4)	Haplotype identification system
	Dr L Apiolaza	Dr R Vaillancourt (A4)	Analysis of marker information
	Mr G Dutkowski Dr L Apiolaza	Mr P Kube (FT) Dr T McRae (STBA) Dr B Potts (A1) Mr G Lopez (A1) Ms C Raymond (CSIRO FFP, A3)	ASREML usage
	Mr G Dutkowski Dr L Apiolaza	Ms S Hetherington (NS) Dr T McRae (STBA) Mr D Pilbeam (STBA) Mr G Lopez (A1)	Breeding value prediction
	Mr G Dutkowski	Mr P Gore (STBA) Mr C O'Connor (TC)	*E. globulus* geographic variation
	Mr G Dutkowski	Mr P Gore (STBA) Mr P Kube (FT) Ms S Hetherington (NS)	*E. nitens* geographic variation

	CRC Staff	Collaborator	Research
Project A2: cont	Mr G Dutkowski Dr L Apiolaza	Mr P Gore (STBA) Mr D Pilbeam (STBA) Dr T McRae (STBA)	Breeding strategies
Project A3: Molecular approaches to tree improvement	Dr G Moran Dr R Thumma Dr E Williams Ms K Groom Ms J Murrell	Ms C Raymond (A5)	QTL analyses for wood and fibre properties in *E. globulus*
Project A4: Molecular genetics of eucalypts	Dr R Vaillancourt Mr A Milgate Mr J Freeman Dr B Potts	Dr C Mohammed (C5) Dr D de Little (GFP)	The genetic basis of *Mycosphaerella* resistance in *E. globulus*
Project A5: Wood quality	Ms C Raymond Ms K Surridge	Dr G Moran (A3)	QTL analysis of wood and fibre properties in *E. globulus*
	Ms C Raymond Ms K Surridge	Mr P Kube (FT)	GxE interaction for density, fibre length, fibre coarseness, cellulose content, microfibril angle and density variation in *E. nitens*
	Ms C Raymond Mr L Savage	Mr P Kube (FT) Dr E Pinkard (FT) Mr A Bradley (NS)	SIF project on growth strain in *E. globulus*
	Ms C Raymond	Dr D de Little (GFP) Mr J French (GFP)	Genetic control and correlations between wood properties in families of *E. globulus* with different densities
Project A6: Hybrid breeding	Dr M Dieters Dr H Dungey Dr G Nikles	Prof R Henry (A7) Dr M Shepherd (A7) Ms R Stokoe (A7) Mr L Scott (A7) Mr R Mellick (A7) Dr D Lee (QFRI)	Molecular genetics of *E. cloeziana*, *Araucaria cunninghamii*, and propagation traits in *P. elliottii* x *P. caribaea* var *hondurensis* hybrids
	Dr M Dieters Dr H Dungey	Prof P Kanowski (ANU) Mr D Kain (ANU)	Investigations into the genetic control of wood properties in *P. caribaea*, *P. elliottii*, and the F_1 hybrid
Project A7: Molecular genetic improvement for tropical and subtropical production	Prof R Henry Dr M Shepherd	Dr M Dieters (A6) Dr G Nikles (A6) Mr P Toon (A6)	Genetic characterisation of commercial traits in hybrid pines
	Prof R Henry Dr M Shepherd Ms R Stokoe	Dr B Potts (A1)	Investigation of a putative inter sub-generic *Eucalyptus* hybrid
	Prof R Henry Dr M Shepherd Ms R Stokoe	Dr G Nikles (A1) Dr D Lee (A1)	Molecular genetics of *E. cloeziana*

	CRC Staff	Collaborator	Research
Project A7: cont	Dr M Shepherd Mr R Mellick	Dr M Dieters (A6)	Genetic analysis of vegetative propagation traits in hybrid pine
	Prof R Henry Dr M Shepherd Mr L Scott	Dr G Nikles (A6) Dr M Dieters (A6)	Molecular genetics of *A. cunninghamii*

Sustainable Management Program

International Links

Project B1: Site Productivity	Dr A Mitchell	Dr B Ludwig (Göttingen, Germany)	Modelling soil chemistry
	Dr P Smethurst	Dr N Comerford (Gainsville, USA) Dr N Barros (Vicosa, Brazil)	Modelling nutrient uptake
Project B2: Management of tropical soils	Dr Z Xu Ms N Mathers A/Prof S Berners-Price A/Prof P Saffigna	Prof X Mao Mr R Luo Mr Y Zhang (National NMR Laboratory, Wuhan, China)	Application of ^{13}C, ^{15}N and ^{14}N NMR to soil organic matter studies
	Ms N Mathers Dr Z Xu Dr S Boyd A/Prof P Healy A/Prof P Saffigna	Dr C Preston (Pacific Forestry Centre, Natural Resources Canada)	Application of ^{13}C and ^{15}N to soil organic matter studies
	Dr Z Xu Dr N Prasolova Mr T Leaman Dr C Beadle	A/Prof K Lundkvist (Swedish University of Agricultural Sciences)	Use of carbon isotope composition for selection of pine clones and hoop pine families with improved water use efficiency and tree growth
	Dr Z Xu	Prof X Yang Mr J Liu Prof Y Yang Prof J Xu (Zhejiang University, Hangzhou, PR China)	Application of stable isotopes (^{13}C and ^{15}N) to soil chemistry and plant physiology studies
	Dr Z Xu	Prof X Yan Dr H Shen (South China Agricultural University, Guangzhou, PR China)	Application of ^{13}C NMR to soil chemical studies
	Dr C Chen Ms N Mathers Dr Z Xu	Dr L Condron (Lincoln University, NZ)	NMR application to soil chemical studies
Project B4: Modelling production and wood quality	Dr M Battaglia Dr P Sands	Mr L Esprey (ICFR)	Adaptation of ProMod to *E. grandis*
	Dr M Battaglia	Dr N Borralho (RAIZ, Portugal)	Application of ProMod
	Dr P Sands	Dr E Voit (South Carolina Medical University)	Application of S-systems to forest growth modelling
	Dr P Sands	Mr A Almeida (Aracruz)	Application of 3-PG to *E. grandis*

National Links	CRC Staff	Collaborator	Research
Project B1: Site productivity	Dr P Smethurst Dr C Beadle	Dr N Mendham (UT) Mr P Adams (FT)	Weed management studies
	Ms M Cherry Dr P Smethurst Mr G Unwin	Mr C McFarlane (UWA) Dr D White (CSIRO FFP)	LAI estimation technologies
	Dr P Smethurst	Dr K Paul (CSIRO FFP)	N mineralisation modelling
Project B2: Management of tropical soils	A/Prof P Saffigna Ms N Mathers Dr Z Xu	Dr T O'Connell (CSIRO FFP)	Application of ^{13}C NMR to soil organic matter studies and denitrification studies with soils treated with residue management regimes
	Dr Z Xu Dr N Prasolova A/Prof P Saffigna	Prof G Farquhar (ANU)	Carbon and oxygen isotope compositions and tree water use efficiency
Project B3: Silvicultural systems	Dr C Beadle	Dr E Pinkard (FT) Mr G Britton (Britton Bros) Mr D Stackpole (CFTT) Mr A Warner (PFT) Mr T Bird (FFIC)	Silvicultural management of blackwood
	Dr C Beadle Mr D Worledge	Mr W Lee (Brighton Council)	Effluent irrigation of pines
Project B4: Modelling plantation systems	Dr M Battaglia	Mr P Pennington (CSIRO FFP)	Analysis of native forest productivity
	Dr M Battaglia	Dr D White (CSIRO FFP)	Water use by trees in WA
	Mr P Ryan	Qld Dept Natural Resources	Landscape modelling, spatial analysis
	Mr P Ryan	Dr T Thaung (UQ)	Nitrogen nutrition of *E. cloeziana*
	Mr P Ryan	Dr D Lee (QFRI Hardwood) Mr M Nester (QFRI)	Genetic evaluation, breeding, silviculture studies
	Mr P Ryan	Mr M Ngugi (UQ)	Physiology of *E. cloeziana* and *E. argophloia*
	Mr P Ryan Dr P Sands	Mr C Hackett (Plantsoft Services) Dr J Landsberg (Landsberg Consulting)	Modelling productivity
	Mr P Ryan	Dr N Huth (CSIRO SE) Dr J Carter (CRC-CA)	Modelling productivity
	Dr P Sands	Mr A Goodwin (FT)	Software development

Within Centre Links	CRC Staff	Collaborator	Research
Project B1: Site productivity	Dr P Smethurst	Dr M Battaglia (B4)	Predictions of LAI and growth responses to fertilisation
	Dr P Smethurst	Mr S Candy (FT)	Predictions of growth responses to silvicultural options
	Dr P Smethurst	Dr C McArthur (RP)	Use of non-palatable browsing deterrents
Project B2: Management of tropical soils	Dr Z Xu Dr N Prasolova	Dr C Beadle (B3) Dr M Hunt (QFRI)	Hoop pine water use efficiency and nitrogen nutrition
	Dr Z Xu Dr N Prasolova	Dr M Dieters (A6)	Genetic variation in foliar carbon isotope composition of hoop pine families and exotic pine clones
Project B3: Silvicultural systems	Dr C Beadle Ms J Medhurst	Mr P Naughton (GL) Ms A LaSala (FT)	Thinning regimes for pulpwood plantations
	Dr C Beadle Mr D Worledge	Ms S Hetherington (NS) Dr G Holz (GFP)	Impacts of irrigation on wood quality
	Dr C Beadle Dr P Smethurst	Dr N Mendham (UT) Mr P Adams (FT)	Vegetation management
	Dr C Beadle Dr C Mohammed	Dr E Pinkard (FT)	Green pruning of *E. globulus*
	Mr D Close	Mr I Bail (TC) Mr Q Clasen (TC)	*E. globulus* seedling specifications
Project B4: Modelling production and wood quality	Dr M Battaglia	Mr S Candy (FT)	Empirical growth modelling
	Dr M Battaglia	Dr E Pinkard (FT)	Modelling effects of pruning
	Dr M Battaglia	Mr T Smith (TC)	Site effects on productivity
	Dr M Battaglia	Dr C Mohammed (CSIRO FFP)	Impact of *Mycosphaerella*; analysis of stem decay data
	Mr D Mummery Dr P Sands	Dr C McArthur (RP)	Modelling browsing
	Mr D Mummery	Mr P Taylor (PFT)	Private land productivity predictions
	Mr D Mummery	Dr R Wiltshire (UT)	Modelling plant distribution
	Ms C Raymond	APP, FT, GFP, WACAP	Pulp wood quality in *E. globulus*
	Ms C Raymond	FT, NS, CSIRO FFP	Pulp wood quality in *E. nitens*

Resource Protection Program

International Links	CRC Staff	Collaborator	Research
Project C1: Biology, ecology and economic impact of insect pests	Dr G Allen	Mr B Murphy (University of Canterbury / Forest Research, NZ)	Biocontrol of leaf beetles using egg parasitoids
	Dr M Steinbauer	Ms M Summerill (BBC Natural History Unit, London)	Filming of stick insect outbreak in Australian Alps for the 'Natural History of Australasia' series
	Dr M Steinbauer	Dr F Schiestl (University of Vienna)	Electrophysiology of odour detection in *M. privata*
	Dr M Steinbauer	Dr C Müller (University of Leiden, Berlin) Dr S Eigenbrode (University of Idaho, Moscow, USA)	Assays to measure effects of epicuticular waxes on behaviour of *M. privata*
Project C2: Insect control techniques and IPM	Mr M Short	Dr D Wahl (American Entomological Institute) Dr C Taylor (British Museum of Natural History)	Taxonomy of *Megaceria* and *Neolevansa*
	Dr M Steinbauer	Dr F Östrand (Lund University, Sweden)	Sex pheromone of *M. privata*
Project C3: Resistance of planting stock to vertebrate browsers	Dr C McArthur	Dr M Schwartz (UC Davis)	Modelling seedling growth as a function of browsing damage and site quality
	Dr C McArthur	Dr A Duncan (MLURI)	Linking foraging decisions of mammalian herbivores: from plant chemistry to landscape
Project C4: Strategies to reduce vertebrate browsing damage	Dr C McArthur	Dr M Schwartz (UC Davis)	Modelling methods for sampling damage on plantations
Project C5: Strategies to minimise loss due to fungal attack	Dr C Mohammed Ms K Barry	Dr F Schwarze (University of Freiburg, Germany) Dr R Irianto (FNCRDC, Indonesia) Dr A Rimbawanto (RDCBFTI, Indonesia) Dr E Hardiyanto (GMU, Indonesia) Dr S Lee (FRIM, Malaysia)	Better understanding of the passive and active mechanisms of defence against decay in *E. nitens* and *E. globulus*
	Dr C Mohammed	Dr R Kennedy Ms A Wakeham (Horticulture Research International) Dr M Dewey (University of Oxford, UK) Dr E Rodriquez (Bioforest SA, Chile)	*Mycosphaerella* research
	Dr C Mohammed Ms A Eyles	Dr M Taksaki (Kyoto Pharmaceutical University, Japan)	Kino and wound tissue formation in eucalypts
	Dr C Mohammed	Dr L Macaskie (University of Birmingham, UK)	Eucalypt defence mechanisms (electron paramagnetic imaging of free radicals)

National Links	CRC Staff	Collaborator	Research
Project C1: Biology, ecology and economic impact of insect pests	Ms T Simmul Dr G Allen	Dr A Clarke (GU)	Biology of fireblight beetle
	Dr B Howlett Dr J Madden	Dr A Clarke (GU)	Factors influencing *C. bimaculata* oviposition
	Mr A Rice Dr G Allen	Dr D Colless (CSIRO Ento, ANIC, Canberra)	Taxonomy and identity of tachinid parasitoids of leaf beetles
	Dr M Steinbauer	Dr L Hunter Ms J Clevers (ABC Natural History Unit, Melbourne)	Filming of stick insect outbreak in Australian Alps
	Dr A Loch Mr J Matthiessen Dr R Floyd	WA Industry Pest Management Group	Ecology and economic impact of insect pests of post-establishment eucalypts in south-western Australia
	Mr J Matthiessen	WA Industry Pest Management Group	Ecology and economic impact of insect pests of the establishment phase of eucalypts in south-western Australia
	Dr A Loch	Dr N dos Anjos (University of Vicosa, Brazil) Dr J Majer (Curtin University of Technology, WA) WA Industry Pest Management Group	Biology and ecology of the *Eucalyptus* leaf beetle *Cadmus excrementarius* in Western Australian blue gum plantations
Project C2: Insect control techniques and IPM	Mr M Short	Dr S Schmidt (CSIRO Entomology) Mr T Semmens (DPIWE) Ms R Schumacher (UQ) Dr T Houston (WA Museum)	Taxonomy of hymenopteran parasitoids of *M. privata*
	Dr M Steinbauer	Dr T Bellas (CSIRO Ento) Dr M Lacey (CSIRO Ento)	Sex pheromone of *M. privata*
	Dr M Steinbauer	Dr G Taylor (UA) Dr M Mallipatil (Natural Resources & Environment)	Review of 'Heteroptera of Economic Importance'
	Dr M Steinbauer	Mr P Ebner (Lower Murray Water)	Light trapping of *M. privata*
	Dr A Loch Mr J Matthiessen Dr R Floyd	WA Industry Pest Management Group	Monitoring, surveillance and control of pests of established eucalypts in southwestern Australia
	Mr J Matthiessen	WA Industry Pest Management Group	Management of insect pests of the establishment phase of eucalypts in southwestern Australia
Project C3: Resistance of planting stock to vertebrate browsers	Dr C McArthur Ms J O'Reilly	Dr W Foley (ANU)	NIR analyses of eucalypt leaves in relation to palatability
	Dr C McArthur Ms N Wiggins	A/Prof S McLean (UT) Dr R Boyle (UT)	Effect of plant secondary metabolites on feeding behaviour in brushtail possums

	CRC Staff	Collaborator	Research
Project C3: cont	Dr C McArthur	Mr A Goodwin (FT)	Plant preferences of herbivores
Project C5: Strategies to minimise loss due to fungal attack	Dr C Mohammed Ms K Barry Ms A Eyles	Mr N Davies (UT) Mr E Peacock (UT) Dr K Old (CSIRO FFP, Canberra) Dr I Tommerup (CSIRO FFP, Perth) Dr N Bougher (CSIRO FFP, Perth) Dr M Leitch (UM) Dr W Foley (ANU) Dr T Hillis (CSIRO FFP, Clayton)	Mechanisms of defence against decay in *E. nitens* including kino defect and wound tissue formation
	Dr C Mohammed	Dr K Old (CSIRO FFP, Canberra) Dr N Coops (CSIRO FFP, Clayton) Dr D Culvenor (CSIRO FFP, Clayton)	*Mycosphaerella* research
Within Centre Links			
Project C1: Biology, ecology and economic impact of insect pests	Ms T Simmul Dr G Allen	Dr D de Little (GFP)	Biology of fireblight beetle
	Dr B Howlett Dr J Madden	Dr P McQuillan (UT)	Factors influencing *C. bimaculata* oviposition
	Mr H Redgrove Dr M Hurley Dr G Allen	Dr D de Little (GFP) Dr P McQuillan (UT)	Biology of *Heteronyx* beetles interfering with the establishment of *E. nitens* plantations
	Dr M Hurley	Mr P Naughton (GL) Dr C McArthur (C4)	The impact of *Heteronyx* beetles on the establishment of *E. nitens* plantations
	Dr J Elek Ms N Ramsden	Dr D de Little (GFP)	Manual defoliation trial in joint venture plantation
	Dr M Steinbauer	Dr B Potts (GI) Dr G Allen (C2) Mr L Rapley (C2)	Host utilisation by *M. privata*
	Dr M Steinbauer	Ms H Nahrung (RP)	Collection of *C. agricola* from Australian Alps for molecular studies
Project C2: Insect control techniques and IPM	Mr L Rapley Dr G Allen	Dr D de Little (GFP) Dr B Potts (A1)	Genetic susceptibility of eucalypts to insect attack
	Dr G Allen	Dr B Potts (A1)	Impact and susceptibility of *E. globulus* to sawfly attack
	Mr H Redgrove Dr M Matsuki Dr G Allen	Dr C McArthur (C4) Mr D Close (C4)	Pre-planting seedling treatment and leaf/scarab beetle attack
	Mr M Short	Mr R Bashford (FT)	Identification of Hymenoptera from Warra surveys
	Dr M Steinbauer	Dr J Elek (FT)	Application for registration of MIMIC

	CRC Staff	Collaborator	Research
Project C2: cont	Dr M Steinbauer	Dr D de Little (GFP)	Inter-provenance selection of *E. nitens* by *M. privata*
	Dr M Steinbauer	Mr M Krygsman (APP)	Light trapping *M. privata*
	Dr M Steinbauer	Dr M Matsuki (RP)	Population modelling of *M. privata*
	Dr M Steinbauer	Dr G Allen (RP)	Sex pheromone of *M. privata*
Project C3: Resistance of planting stock to vertebrate browsers	Dr C McArthur Mr H Fitzgerald Mr S Paterson	Dr M Hurley (C2) Mr P Naughton (GL)	Comparison of insect versus mammalian herbivore damage to eucalypt seedlings in plantations
	Dr C McArthur Mr D Close Mr S Paterson	Mr A Walsh (FT)	Mammalian preferences for seedlings grown under different fertiliser and shade treatments
	Ms J O'Reilly Dr C McArthur	Dr B Potts (A1) Ms S Hetherington (NS)	Genetic variability in resistance to browsing of *E.nitens* foliage
	Dr C McArthur	Mr R Appleton (APP)	Effect of stem diameter on damage to eucalypt seedlings by rabbits in the field
	Dr C McArthur	Mr R Appleton (APP)	Differential field damage by swamp wallabies to provenances of *E. nitens*
Project C4: Strategies to reduce vertebrate browsing damage	Dr C McArthur Mr H Fitzgerald Mr S Paterson	Mr P Naughton (GL)	Influence of seedling type and weeds on growth and damage to *E. nitens* seedlings on a plantation
	Ms E Pietrzykowski Dr C McArthur	Ms S Hetherington (NS)	Influence of small-scale vegetation patches on susceptibility of seedlings to browsing
	Ms K le Mar Dr C McArthur	Dr D de Little (GFP)	Use of a plantation and surrounding habitat by mammalian herbivores
Project C5: Strategies to minimise loss due to fungal attack	Dr C Mohammed Ms K Barry Ms A Eyles Dr C Beadle Dr P Smethurst	Dr E Pinkard (FT) Mr B Neilsen (FT)	Mechanisms of defence against decay in *E. nitens* and *E. globulus*, including kino defect and wound tissue formation
	Dr C Mohammed Dr R Vaillancourt Dr B Potts	Dr D de Little (GFP)	Infection biology of *Mycosphaerella* and development of a bioassay to test for eucalypt resistance
	Dr C Mohammed Dr Y Zi Qing Ms M Yee	Mr T Wardlaw (FT) A/Prof A Richardson (UT) Dr D de Little (GFP) Mr P Mineely (GFP)	Ecologically sustainable forest management: fungal and invertebrate biodiversity

Education and Technology Transfer Program

	CRC Staff	Collaborator	Research
National Links	Dr N Davidson	Mr P Volker (S-Ag) Mr M Leech (TFGA) Mr A Lyons (PFT)	Production of a book: 'Farm Forestry Technical and Business Handbook' (funded by NHT)
	Dr N Davidson Mr D Close	Midlands Tree Committee, PFT, TFGA, Greening Australia, S-Ag and local farmers	Development of a protocol for establishing plantations to combat rural tree decline in the Midlands of Tasmania (funded by NHT)
	Dr N Davidson	Mr D Vickers, Mr D Hamilton (Forest Education Foundation)	Production of a CD for schools (grades 7-12) on managing farm forestry
	Dr N Davidson	Mr M Castley (PFT)	Agfest displays
	Dr N Davidson	Coordinator of Science Week	Presentations to school children during Science Week
	Dr N Davidson	Mr R Philips (Springfield Primary School) Ms K Ancher (Glenorchy City Council) Mr M Castley (PFT)	Production of two arboreta of all 29 Tasmanian native eucalypts (partly funded by NHT)
	Dr N Davidson	Science communicators from other CRCs	Interaction and coordination of science communication
	Dr N Davidson Mr A Gibbons	Dr H Locher (Hydro Tasmania) Ms J Griggs (Hydro Tasmania)	Assessment of riparian vegetation on the Gordon River
Within Centre Links	Mr G Dutkowski	CRC partners and scientists	Facilitation of adoption of outcomes of CRC research
	Mr G Dutkowski Ms T Bildstein	CRC research scientists	CRC publications database
	Ms T Bildstein Mr G Dutkowski Dr N Davidson	CRC staff and partners	CRC newsletter 'Overstorey'
	Dr N Davidson Mr D Lyons	CRC staff and partners	CRC web site

RESEARCH

Genetic Improvement Program

Manager
Dr Brad Potts

Introduction

A major expansion of the plantation estate of eucalypts and pines is occurring throughout Australia. Improved genetic quality of the plantation stock is essential if Australia is to be competitive in international markets when this estate is harvested. Large tree breeding programs being run by CRC partners in both the tropical and temperate regions demonstrate the importance of breeding and aim to increase the returns from wood production.

The research undertaken in the Genetic Improvement Program aims to ensure that plantation stock is of the highest possible genetic quality. It aims to improve the efficiency of breeding and ensure the genetic gains are rapidly and efficiently transferred to Australia's increasing plantation estate. In brief, the program aims to:

- define appropriate breeding objectives for individual firms and the sector, from forest growers to industrial processors;
- identify selection criteria and methods for assessing wood quality, growth, pest and disease resistance, and other key traits, and statistical methods for their analysis;
- determine the molecular and quantitative genetic control of important traits, and how this changes with age, site and silviculture;
- improve strategies to select, breed and deploy elite genotypes;
- improve our ability to control and manipulate reproductive characteristics in order to optimise deployment systems;
- ensure rapid uptake of technological advances made in Australia and overseas, particularly in the rapidly changing field of molecular genetics; and
- provide training and education in forest genetics and breeding, and be a forum for discussion in Australia.

The research outcomes will directly assist breeders of pines, eucalypts, and other native species in our member organisations, as well as organisations multiplying and distributing improved seed.

Project A1

Leader
Dr Brad Potts

Staff
Dr Luis Apiolaza
Mr Robert Barbour
Mr Greg Dutkowski
Mr Peter Gore
Mr Andrew Hingston
Dr Greg Jordan
Mr Kelsey Joyce
Mr Maarten Krygsman
Mr Gustavo Lopez
Mr David Pilbeam
Prof Jim Reid
Dr Wayne Tibbits
Mr Paul Tilyard
Dr René Vaillancourt
Mr Peter Volker
Dr Dean Williams

Genetics and reproductive biology of eucalypts

Background

This project aims to provide the basic biological information necessary for effective exploitation and management of temperate eucalypt gene pools. It will determine the extent to which traits of economic and biological importance are under genetic control and amenable to artificial selection and breeding. Such traits include growth, wood quality, pest and disease resistance and reproductive characteristics. There is high demand for improved eucalypts for plantation establishment, and the project will study factors affecting sexual reproduction in order to optimise eucalypt seed production systems. This project is closely linked to project A4 (Molecular genetics of eucalypts), and staff supervise two externally funded ARC SPIRT grants.

Outcomes

- Genetic variation in cold hardiness of *Eucalyptus nitens* was demonstrated at the provenance and family level from both natural frosting of two to four-year-old trees in the field and artificial frosting of seedling leaf tissue. Field frost damage had a deleterious effect on growth and survival. There was only moderate genetic correlation in damage across sites subject to the same autumn frost event and between field and laboratory frosts.
- A comparison of exotic land race and native stand samples of *E. globulus* has confirmed Tasmanian and Victorian native stands are highly differentiated and has shown that, while landrace samples are variable, samples from Portugal and Chile have closer quantitative genetic affinity to native stand samples from southern Tasmania.

- A genetic basis to self-incompatibility has been demonstrated for the first time in eucalypts, with the more self-compatible *E. globulus* trees tending to set more seed per capsule under open-pollination.

- Pollinator studies indicate that despite honey bees visiting *E. globulus* flowers and consuming large amounts of nectar they do not appear to be effective pollinators of *E. globulus* in Tasmania. By contrast, the swift parrot (*Lathamus discolor*) which feeds on pollen and nectar appears to be a very effective pollinator of *E. globulus*.

- F_1 and advanced generation hybrids between *E. nitens* and *E. globulus* show reduced survival and growth at six years of age compared to pure species outcrosses, and F_1 and F_2 hybrids, and are more susceptible to browsing by brushtail possums (Figure 7).

- Maternal tree effects associated with seed orchard site, year of harvest and family of origin were shown to have little impact on the physical composition and germination characteristics of *E. globulus* seed lots. A large component of the variation in seed germination and early seedling growth occurs within seed lots, with larger seed germinating better and quicker and resulting in faster growing seedlings.

Goals

To determine:

- the importance of additive and non-additive genetic effects in *E. globulus* and *E. nitens*;

- the impact of inbreeding depression on growth and wood properties in *E. globulus*;

- the impact of maternal and nursery effects on subsequent field growth of *E. globulus*;

- genetic and environmental control of flowering time and self-sterility in *E. globulus* and the use of this information to improve flowering synchrony and outcrossing rates in seed orchards;

- the pollinators of *E. globulus* and *E. nitens*;

- levels of pollen-mediated gene flow between plantation and native forest eucalypts and factors affecting it;

- the later age performance and genetics of F_1 and advanced generation *E. nitens* x *globulus* hybrids.

Goals for external grants

To determine the environmental and genetic factors affecting the quantity and quality (e.g. size and density) of seed produced in *E. nitens* and *E. globulus* seed orchards.

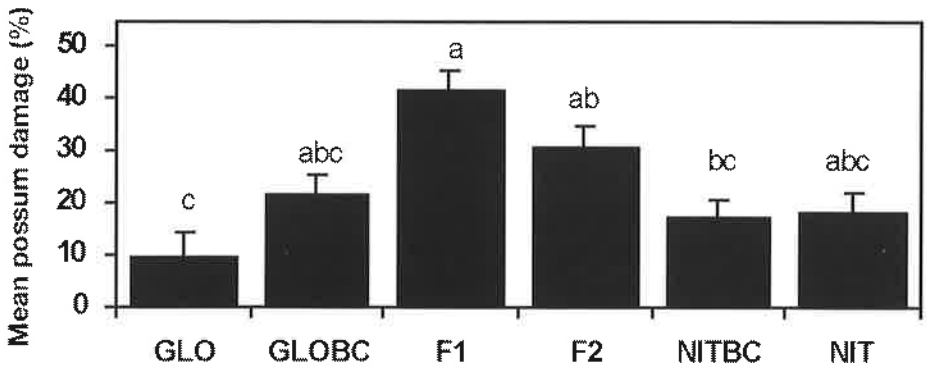


Figure 7.
The mean percentage of the new season's foliage in the upper canopy lost through possum browsing in an *E. nitens* x *globulus* advanced generation hybrid trial. F_1 and outcrossed F_2 represent the first and second generation *E. nitens* x *E. globulus* hybrids respectively. NIT represents *E. nitens*, GLO *E. globulus*, GLOBC F_1 hybrids backcrossed to *E. globulus*, and NITBC F_1 hybrids backcrossed to *E. nitens*. Different letters above the cross-types represent significant differences at the 0.05 level.

Project A2

Leader
Dr Luis Apiolaza

Staff
Mr Greg Dutkowski
Dr Paul Chambers
Dr Bruce Greaves
Mr Andrew MacDonald

Breeding strategies

Background

The main objective of this project is to develop strategies that maximise the profit of breeding programs of the CRC partners. This objective is achieved by using more sophisticated genetic and statistical models to improve estimation of breeding values, integration of better economic models in the selection and mating processes, optimisation of decision making for breeding and deployment, and supporting partners in planning and implementation of breeding programs. Much of this work is done in close association with the Southern Tree Breeding Association (STBA), which has most CRC industrial partners as members. The project integrates information on growth, wood properties, risk traits and reproductive biology, and relies heavily on collaboration with project A1 (Genetics and reproductive biology of eucalypts) and project A5 (Wood quality), as well as interacting with other CRC programs.

Outcomes

- A review and update of the STBA *E. globulus* breeding strategy was completed. This work involved updating the main breeding objective, defining potential secondary objectives, refining the genetic testing and evaluation system, and finding ways to optimise the transfer of genetic gains from breeding to deployment operations. The project was also involved in a review of the STBA *Pinus radiata* breeding strategy.

- The first version of the STBA data management and breeding values prediction system is nearing completion. Staff in this project have been heavily involved in the design of this system which will integrate many of the research findings of the project, as well as supporting a more efficient implementation of the 'Rolling Front' strategy for both *E. globulus* and *P. radiata*.

Participants and presenters in the workshop 'Breeding objective definition and breeding value calculation'.

- Genetic control of two risk traits for *P. radiata*, *Dothistroma* infection and stem deformation, was studied. The additive genetic control of *Dothistroma* infection was moderate to high, with heritabilities ranging from 0.3 to 0.5. Defoliation caused by heritability of stem deformation was moderate (0.3), and the study suggests that deformation on highly fertile sites is unrelated to deformation on less fertile sites. Genetic control of growth (height and diameter) was low. The relationship between stem deformity and growth was unclear.

- Integration of spatial analysis into prediction of breeding values shows substantial improvements of model fit, but only low to moderate gains through improved selection.

- A major workshop held on the development of breeding objectives and prediction of breeding values, which encap-sulated much of the work of the project, attracted national and international participants.

- Simulation of a partially selfed population has shown that in models used to estimate genetic effects, accounting for selfing in the numerator relationship matrix gives unbiased estimates of heritability.

Goals

- Develop strategies to account for heterogeneous environments and genetic expressions in the prediction of breeding values.

- Integrate risk traits such as disease resistance, frost and drought tolerance in the breeding and deployment systems.

- Include more realistic assumptions about the relationship between trees derived from natural populations to improve the prediction of breeding values.

- Develop breeding and deployment objectives for solid wood products of *E. globulus* and determine their relationship with the current pulpwood objectives.

- Provide technical support to CRC partners in the definition of breeding objectives, the design of breeding and deployment strategies, and the application of genetic evaluation systems.

Project A3

Leader
Dr Gavin Moran

Staff
Ms Kylie Groom
Ms Jan Murrell
Dr Karen Thamarus
Dr Reddy Thumma
Dr Emlyn Williams

Molecular approaches to tree improvement

Background

The aim of this research is to understand the molecular genetic basis of traits with high commercial value, such as wood and fibre characteristics, and to use this knowledge to more efficiently develop improved breeds for deployment in plantations.

The approach involves characterising quantitative trait loci (QTL) and candidate genes for wood and fibre traits and growth. The traits used include wood density, kraft pulp yield, cellulose levels, fibre length and microfibril angle, and the candidate genes include those involved in lignin and cell wall polysaccharide biosynthesis and cambial specific genes.

Work is concentrating on:

- characterising QTL controlling wood and fibre properties in *E. globulus* and *E. nitens*;
- defining the role of candidate genes in expression of wood and fibre traits; and
- developing strategies to utilise QTL data in selection procedures in eucalypt breeding programs.

Jan Murrell P^{32}-labelling a DNA probe for RFLP assays of *E. globulus* progeny.

The project has strong links with project A5 (Wood quality) and utilises technologies developed in the CSIRO Forest Products laboratory in Clayton. Two full-sib families from the CSIRO/GFP hybrid trial are being used for the QTL work on wood and growth traits in *E. globulus* and a CSIRO progeny trial for the QTL work on *E. nitens*.

Outcomes

- In the mapping pedigree a total of 18 putative quantitative trait loci have been identified that are involved in control of five wood and fibre traits. Generally, individual QTL accounted for only a small proportion of the phenotypic variation.
- Seven of the QTL positions were also found to be significant in a second family and these included QTL for wood density, predicted pulp yield and microfibril angle. About a third of the QTL could not be validated in this second pedigree. Five QTL segregating only on the female side in the mapping pedigree have yet to be validated.
- A number of candidate gene loci have been found to colocate with QTL positions for some traits and have been selected for further study.
- For 29 cDNA loci that showed significant associations with the wood and fibre traits, the RFLP probes have been sequenced and, by comparison with gene databases, 20 have been assigned a putative gene function. This increases by 50% the number of known genes mapped in eucalypts.

Goals

- Develop procedures that utilise QTL information for wood and fibre traits in breeding and deployment programs.
- In *E. nitens* mapping pedigree, assay molecular markers tagging QTL for wood density and microfibril angle (from *E. globulus*).
- Test transference of QTL locations between *E. globulus* and *E. nitens*.
- Assess variation in candidate genes colocating with the key QTL for microfibril angle and wood density and determine the relationship to variation in traits.

Project A4

Leader
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Mr Peter Bundock
Ms Susan Foster
Mr Jules Freeman
Mr Carl Grosser
Mr Timothy Jones
Ms Gay McKinnon
Mr Andrew Milgate
Ms Fiona Poke
Dr Brad Potts
Dr Jim Reid
Mr Adam Smolenski
Dr Dorothy Steane

Molecular genetics of eucalypts

Background

Molecular tools are now being used in fingerprinting for quality control in breeding and deployment programs, in understanding gene flow, determining relatedness and conducting paternity and outcrossing studies, as well as understanding the genetic control of quantitative traits. However, these applications are probably just the beginning since the rapidly changing field of molecular genetics is providing unprecedented insights into genomes and the identification of genes of interest (candidate genes). The identification of genes and alleles that affect traits of economic importance will offer powerful tools for use by tree breeders.

A large (10 m in diameter) clump of *E. globulus* ssp *bicostata* from South Australia which by molecular analysis was shown to be a single clone. Because this lignotuberous stand is likely to have originated from a single genetic individual and later formed a giant clone, it is likely to be very old, indicating it is natural and not established by pastoralists.

This project focuses on eucalypts and aims to use molecular markers to:

- provide a better knowledge of inbreeding, heterosis and genetic diversity in breeding and base populations of eucalypts;
- quantify factors affecting outcrossing rates and patterns of gene flow, and contamination levels in seed orchards, in close cooperation with project A1 (Genetics and reproductive biology of eucalypts) and externally funded projects; and
- characterise major genes affecting commercially important traits (e.g. growth, wood properties and pest resistance).

Outcomes

- Molecular fingerprinting technology was applied to study a disjunct population of *E. globulus* ssp *bicostata* in South Australia, where the large size of one clone (a clump of trees 10 m in diameter) provided evidence against the possibility that it was planted by pastoralists. The large size of this *E. globulus* clone is a warning to seed collectors operating in woodlands.
- Confusion about the taxonomic affinities of the important Jeeralang provenance of *E. globulus* was resolved in a molecular study that showed it had closest affinities to Victorian *E. globulus* ssp *globulus* and not ssp *bicostata* nor ssp *pseudoglobulus*.
- New analysis of 3 700 base pairs of cpDNA confirmed the significant divergence of *Corymbia* and *Angophora* from core *Eucalyptus*.

Outcomes from external grants

- A microsatellite study undertaken by a SPIRT-funded PhD student found high but variable outcrossing rates, unequal male contribution and four per cent contamination in a grafted seed orchard of *E. nitens*. Variation in self-incompatibility was shown to be a major factor affecting outcrossing rates in *E. globulus*. Canopy position also affected outcrossing rates in self-compatible trees (Figure 8).
- The maternal inheritance of the chloroplast genome in *E. globulus* and interspecific hybrids was demonstrated.

Goals

- Study resistance to *Mycosphaerella* infection in *E. globulus* using a QTL approach.
- Sequence the entire chloroplast genome of *E. globulus*.

Goals for external grants

- Use microsatellites to study genetic diversity and gene flow in breeding and natural populations of *E. globulus*.

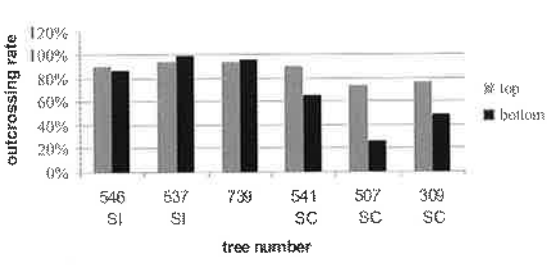

Figure 8:
Outcrossing rates estimated using allozymes from open-pollinated seed samples from the upper (top) and lower (bottom) canopies of self-incompatible (SI) and self-compatible (SC) *E. globulus* trees. Outcrossing rates are significantly greater in the upper canopy of self-compatible trees.

Project A5

Leader
Ms Carolyn Raymond

Staff
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Mr Peter Kube
Mr Leon Savage
Ms Kirsty Surridge

Wood Quality

Background

Wood quality is one of the most important determinants of profitability, whether plantations are harvested for pulp, sawn timber or other solid wood products. However, wood property traits are expensive and difficult to measure and there is a poor understanding of their genetic control and relationships with breeding objectives. For these traits to be integrated into breeding and deployment programs it is essential to develop cost-effective, non-destructive sampling techniques which can be used on a large scale.

Work in the Genetic Improvement Program is concentrating on:

- developing non-destructive sampling strategies for wood and fibre properties;
- defining relationships between wood, pulping and sawn timber properties;
- determining the magnitude and importance of genotype by environment interactions for wood properties; and
- developing breeding objectives for a range of wood products.

This project has very strong links with CSIRO Forest Products Laboratory, with some of the technologies developed there (SilviScan 2, cellulose content analysis and Near Infrared Reflectance Analysis) being implemented and applied to genetic material in member breeding programs for both *E. globulus* and *E. nitens*. Research is also conducted in collaboration with the pulping laboratories of the industrial partners.

Alex Bradley ripping a *E. globulus* plank into boards for determining effects of growth strain.

Outcomes

- Microfibril angle appears to be under moderate to strong genetic control in both *E. globulus* and *E. nitens*.
- Strategic initiatives funding (SIF) was secured for a joint study with Forestry Tasmania on assessment of growth strain and the relationship between peripheral strain measurements and deflection in sawn boards. Ten trees from each of three provenances of *E. globulus* were assessed for growth strain and a range of wood properties, felled and sectioned. No strong relationship was found between the degree of deflection in sawn boards and peripheral strain measurements.
- A review of research on wood properties, incorporating all research conducted in the CRC on this topic, was submitted by Carolyn Raymond as part of her PhD.

Goals

- Determine relationships between board deflection and other wood properties.
- Process SilviScan data to determine changes in heritability with age and the age-age correlations for density and microfibril angle in *E. globulus* and *E. nitens*.
- Determine genetic parameters and correlations between basic density, fibre length, cellulose content and microfibril angle in selected families of *E. globulus*.
- Sample base population trials of *E. nitens* to determine race effects and genetic parameters for basic density and cellulose content from a broad genetic base.
- Complete sampling and processing of shrinkage, collapse and stiffness samples and determine optimum non-destructive sampling strategy.

Project A6

Leader
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Dr Kevin Harding
Mr Amal Joseph
Mr Dominic Kain
Dr Garth Nikles

Hybrid Breeding

Background

Through its partner organisations, the CRC has one of the best genetic bases of artificial forest tree hybrids in the world.

The project aims to:

- understand the genetics of hybrid populations, focusing on growth and wood properties; and
- develop or introduce into Australia the most advanced strategies for breeding hybrids.

This project focuses on the tropical pine species *P. elliottii* and *P. caribaea* var *hondurensis* and their hybrids being deployed commercially by Department of Primary Industries Queensland, and interacts closely with project A7 (Molecular genetic improvement for tropical and subtropical production).

Outcomes

- A collaborative project between the CRC and the Animal Genetics Breeding Unit (AGBU) at the University of New England investigated the application of finite-locus genetic models to the analysis of hybrid data. It also developed a simulation program (HYPERSIM) which allows the comparison of various breeding strategies for the genetic improvement of hybrids in forestry. The need to use simulated data to fully evaluate the utility of finite-locus models was evident, and strategies to further improve HYPERSIM were identified.

Dr Kevin Harding sampling six-year-old F1 slash x Caribbean pine hybrids using QFRI locally developed motorised increment corer, MASTA (Motorised Apparatus for Sampling Trees for wood Assessment).

- The first comparison of genetic parameters derived from new finite-locus models with REML models was completed. Results showed a three-allele locus model appeared to describe the genetic variation in the hybrid and one of the pure species populations. Further testing is required to determine fully the use of these models in hybrid tree breeding.
- Indirect selection for wood density and basal area at age-11 was reliable using age-4 measurements of the same traits in the slash x Caribbean pine hybrid and in both parental species. Selection efficiency of pilodyn measurements for predicting age-11 density approached or exceeded one in all three taxa.

Goals

- Determine genetic parameters from factorial matings in *P. caribaea* var *hondurensis*, *P. elliottii*, *P. elliottii* x *P. caribaea* var *hondurensis* hybrids, and *P. caribaea* var *hondurensis* x *P. oocarpa* and *P. tecunumanii*.
- Modify HYPERSIM to include epistatic effects, and true reciprocal recurrent selection.
- Undertake new simulations of hybrid breeding strategies.
- Use simulated data to further test the application of finite-locus models in forest tree hybrids and apply the most appropriate finite-locus models to the analysis of data from Queensland pine hybrid trials.
- Complete studies on the densitometry of wood samples from *P. elliottii*, *P. caribaea* var *hondurensis* and their F_1 hybrid, and the indirect assessment of wood properties through bark-windows.
- Undertake collaborative research with Professor Bailian Li, North Carolina State University, on the development of breeding strategies for hybrid pines in Queensland.

Project A7

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Dr Russell Haines
Dr Kevin Harding
A/Prof Jane Hughes
Ms Rachel King
Mr Rohan Mellick
Mr Leon Scott
Dr Mervyn Shepherd
Mr Steven Smith
Ms Rhonda Stokoe
Mr Paul Toon

Molecular genetic improvement for tropical and subtropical production

Background

This project applies molecular genetics to the improvement and sustainable management of tropical forest species, including *Pinus* hybrids, *Araucaria cunninghamii* (hoop pine) and eucalypts. The major focus is mapping and QTL analysis of juvenile wood, growth and vegetative propagation traits in *P. elliottii* x *P. caribaea* hybrids. Study of the natural diversity, breeding system, taxonomic relationships and hybridisation for species such as *E. cloeziana* is being facilitated by the development of new molecular markers. This research supports tree improvement programs for the emerging hardwood plantation industry of subtropical and tropical Australia.

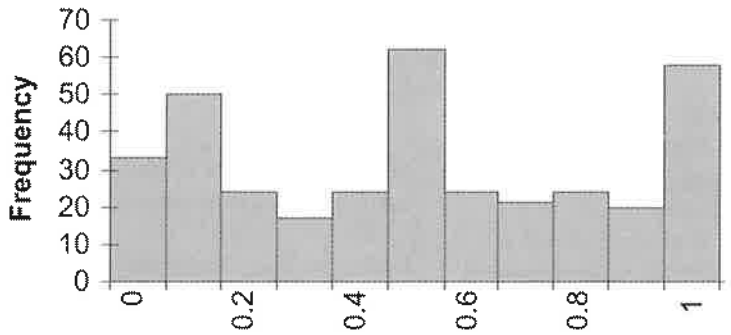

Figure 9: Proportion of rooted cuttings per clone in a family denied from an interspecific *P. elliottii* var *elliottii* X *P. caribaea* var *hondurensis* F_1 family (n=289). Rooting performance for each clone was expressed as the proportion of the 12 cuttings per family member which were rooted at 14 weeks post-harvest. The distribution of rooting performance of the clones was multi-modal. This was suggestive of major gene effects segregating in both families.

Outcomes

- A study of branching architecture in hybrid pines indicated many characters are under genetic control and that a large scale QTL detection experiment will be required to determine accurate genetic models. Most branching characters were not correlated with other branching traits or with growth, form or wood density, presenting little opportunity for rationalisation of the number of branching characters requiring assessment. The exception to this was branch diameter that was positively correlated with stem diameter and average whorl spacing.

- A plan for a large scale QTL detection experiment and a strategy for marker-aided selection (MAS) in hybrid pines were developed in collaboration with a visiting scientist, Dr Sue Carson. This experiment integrates existing experiments and utilises available genetic maps and hybrid pine pedigrees, and should allow more reliable and accurate estimates of QTL parameters.

- A further 70 *Pinus* microsatellite loci were evaluated for genetic mapping in *P. elliottii* and *P. caribaea*, bringing the total to 120.

- High throughput DNA extraction methodology for forest species was implemented in the laboratory during the past year. Larger scale population and genetic mapping studies are now feasible because DNA extraction has previously been a major limitation.

- Studies were initiated into vegetative propagation in interspecific F_1 and F_2 hybrid pine families. The proportion of hybrid pine cuttings that successfully produced roots in each clone is under genetic control. Clonal repeatabilities estimated for two families were moderate (0.4 and 0.5). The frequency distributions for these two families were multimodal, suggesting major effect genes segregate in both families (Figure 9).

Goals

- Conduct QTL analysis for early growth, form, branching characteristics and wood density on an enlarged sample of a *P. elliottii* x *P. caribaea* F_1 hybrid family.

- Evaluate a further 70 microsatellite markers for pines and map polymorphic markers culminating in a genetic map for hybrid pine with greater than 100 microsatellite markers.

- Complete protocols for fingerprinting hybrid pines.

- Locate QTLs for wood properties in a half-sib hybrid pine family.

Rooted cuttings of hybrid pines in a glasshouse at Gympie, Queensland.

Sustainable Management Program

Manager
Dr Chris Beadle

Introduction

Plantations, including farm forests, can be considered a sustainable resource only if the factors necessary for production remain favourable over successive crop cycles. This program examines the environmental factors and silvicultural practices that influence forest production and casts these into a quantitative framework with the use of process-based models. We play a critical role in delivering the knowledge needed to ensure that practices implemented by forest managers in Australia are sustainable and subject to ongoing improvement in terms of economic and environmental performance. This provides a valuable adjunct to the work of other research organisations involved in the definition of criteria for sustainability.

Project B1

Leader
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Staff
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Mr Richard Appleton
Mr Craig Baillie
Mr Chris Barnes
Dr Chris Beadle
Ms Maria Cherry
Mr Keith Churchill
Ms Sandra Hetherington
Dr Greg Holz
Mr Andrew Knowles
Dr Bob McCormack
Dr Andrew Mitchell
Mr Peter Naughton
Mr Bill Neilsen
Mr Chris O'Hara
Ms Ruth Osborne
Ms Carolyn Ringrose
Dr Chris Shedley
Dr Erica Shedley
Ms Diane Spurr
Ms Ann Wilkinson

Site productivity

Background

The aims of this project are to:

- determine the extent to which nutrient and water supply can sustain high leaf areas and tree growth rates after canopy closure;
- evaluate the effects of alternative slash management strategies (during the inter-rotation period) on nutrient supply and other soil conditions that affect productivity;
- improve our understanding of water storage and access to it in relation to soil profile characteristics, rainfall, and ground water.

Outcomes

- Canopy condition is a key factor guiding management decisions in eucalypt plantations. The 'densiometer' method gave a good estimate of leaf area index (LAI) 3–7 of *Eucalyptus nitens* plantations (Figure 10). The densiometer, when used together with a visual guide (based on canopy photographs), was shown to give reliable assessment of canopy size and therefore was useful in an operational context.
- Intensive fertilisation of *E. nitens* plantations with nitrogen (N) at ages 0 and 8 years, on sites responsive to fertilisers (increased growth and LAI), resulted in increased concentrations of N in foliage and increased maximum rates of photosynthesis in the lower part of the canopy.
- N fertilisation that increased LAI also led to higher rates of litter-fall, higher concentrations of N in litter, a thicker litter layer, and higher rates of N mineralisation even at sites with low soil temperature.
- Intensive N fertilisation (>600 kg ha^{-1}, depending on soil type) of *E. nitens* plantations reduced base cation availability at some sites. This effect could adversely affect productivity in later rotations. In glasshouse studies where *E. globulus* seedlings were grown in surface soil collected from the Westfield plantation, intensive N fertilisation (equivalent of 200 kg ha^{-1} per month) caused depletion in base cations Mg and K, and deficiencies in seedlings. Research is continuing to determine the likelihood of base cation deficiencies at specific field sites.
- A quick-test meter proved useful for assessing soil fertility in plantation soils.

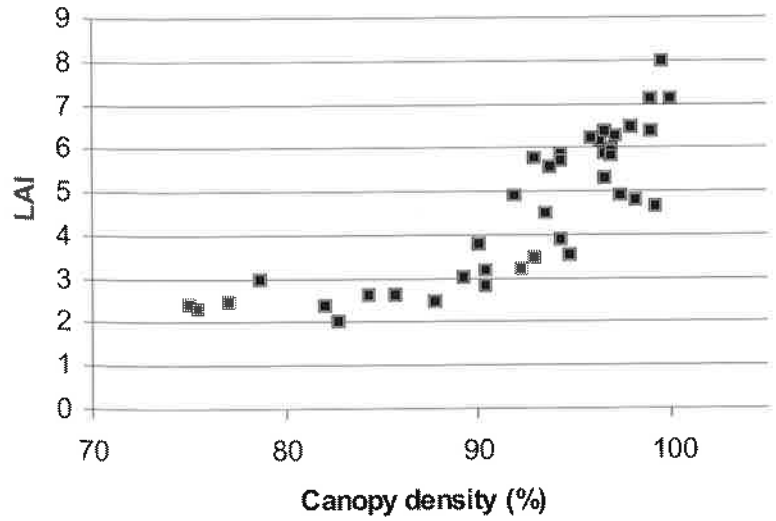

Figure 10: Canopy density as estimated by the 'densiometer' can be a good predictor of LAI in the range 3–7, as shown here for several *E. nitens* plantations in Tasmania.

Example of a vertical photograph of the canopy of a *E. nitens* plantation of LAI 2.

Goals

- Model the effect of N supply on LAI and growth in *E. nitens* plantations.
- Link plant and soil research on base cations by modelling soil solution concentrations at root surfaces.
- Incorporate work above into mechanistic and empirical productivity models.

Project B2

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Ms Elisha Ladhams
Ms Nicole Mathers
Mr David Osborne
Dr Senake Perera
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Dr Nina Prasolova
Dr Heather Proctor
Dr Guixin Pu
Prof Calvin Rose
A/Prof Paul Saffigna
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Ms Sally Ward
Dr Grant Wardell-Johnson
Dr Bofu Yu

Management of tropical soils

Background

The aims of this project are to:

- evaluate the impacts of soil and stand management on both quantity and quality of soil organic matter (SOM) for sustaining the productivity of subtropical pine plantations in south-east Queensland;
- evaluate the impacts of silvicultural practices on nitrogen (N) pools and dynamics in hoop pine plantations of south-east Queensland;
- test, develop and apply advanced DNA, stable isotope and nuclear magnetic resonance (NMR) for developing improved biological indicators of soil quality;
- test and identify soil invertebrates as potential indicators of biodiversity in hoop pine plantations;
- quantify the effects of both silvicultural practices and environmental conditions on soil N availability and on plantation N demands;
- quantify the effects of harvesting, site preparation practices and seasonal conditions on soil physical processes in subtropical pine plantations.

Outcomes

- During the first three years of windrow management, significant changes in the carbon (C) composition were detected for all residue components, except for the bark, in the top 0–10 cm of the soil profile, suggesting that most of the windrowed harvest residues would be decomposed in the first three years of windrow establishment. The solid state ^{13}C NMR spectra of hoop pine SOM indicate that in the areas where windrows are present, SOM does not necessarily show compositional changes. Increases in quality are mainly due to inputs from the decomposition of windrowed residue components.
- There were significant reductions in soil C and N pools in the top 20 cm in a first rotation hoop pine plantation. A further decline in these C and N pools occurred in a second rotation hoop pine plantation. This indicates that mineralisable N is a very sensitive biochemical indicator of soil N fertility, more sensitive to the forest management practices than soil total N. When considered in conjunction with other research on hoop pine in Queensland, these results suggest that widespread N deficiencies may occur in second rotation hoop pine plantations (>3 years of age). Further, evidence from a number of fertiliser experiments suggests that N application significantly improves the productivity of second rotation hoop pine plantations.

- An intensive study in a N fertilisation experiment of an eight-year-old hoop pine plantation grown on the second rotation site has indicated that:
  a) application of fertiliser N at 300 or 600 kg N ha^{-1} significantly increased foliar N concentration and crown foliage biomass as well as tree growth in the first four years after N addition (suggesting the hoop pine stand had the capacity to take up large amounts of fertiliser N);

  b) foliar N concentration at the middle inner canopy position was much more responsive to N application, compared with that at the upper outer canopy position which is usually sampled for routine foliar nutrient analysis;

  c) canopy water use efficiency as reflected in foliar C isotope composition was significantly improved by the N application; and

  d) ^{15}N recovery in the above-ground biomass (particularly in the crown foliage) and ^{15}N retranslocation from the old foliage to the new foliage within the tree canopy indicate that hoop pine is very efficient in taking up the fertiliser N and recycling the ^{15}N within the tree canopy.

CRC researchers, DPIQ Forestry managers and operation staff, on a field day in March 2001, inspecting a second rotation hoop pine plantation which received later-age N fertilisation (at 6–8 years).

- All evidence suggests that application of N fertilisers to second rotation hoop pine plantations could significantly enhance productivity. Preliminary analyses suggest N fertilisation of these plantations is economically attractive and has the potential to reduce the hoop pine rotation length by six to eight years.

Goals

- Further develop and apply ^{13}C, ^{14}N and ^{15}N NMR methodologies to characterising SOM composition and quality in hoop pine and exotic pine plantations.

- Quantify denitrification, immobilisation and leaching of ^{15}N-labelled fertilisers applied to microplots installed under different residue management regimes and environmental conditions in the second-rotation hoop pine plantations.

- Develop and apply soil biological methods, particularly microbial biomass C and N assays, to characterise soil organic C dynamics and N cycling in subtropical pine plantations.

- Develop improved biological indicators of soil quality by testing, developing and applying advanced DNA, stable isotope and NMR techniques.

- Develop potential soil invertebrates as indicators of biodiversity in hoop pine plantations.

- Assess the suitability of existing data from long-term catchment studies for incorporation into a predictive model of soil loss from subtropical pine plantation catchments.

- Estimate the infiltration parameters using the rainfall-runoff model SRM for the site selected storm events.

Project B3

Leader
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Ms Maria Cherry
Mr Keith Churchill
Prof Robert Clark
Mr Dugald Close
Mr Paul Dargusch
Dr Neil Davidson
Ms Amabel Fulton
Ms Sandra Hetherington
Dr Greg Holz
Dr Ryde James
Dr Sarah Jennings
Mr Kelsey Joyce
Prof Peter Kanowski
Mr Sven Ladiges
Dr S Mahendrarajah
Ms Jane Medhurst
Prof Robert Menary
Dr Neville Mendham
Mr Peter Naughton
Dr Libby Pinkard
Ms Rebecca Pryor
Ms Ingrid van Putten
Mr Digby Race
Ms Jacki Schirmer
Dr Chris Shedley
Dr Philip Smethurst
Mr Tim Tabart
Mr Grant Westphalen
Ms Ann Wilkinson
Mr Dale Worledge

Silvicultural systems

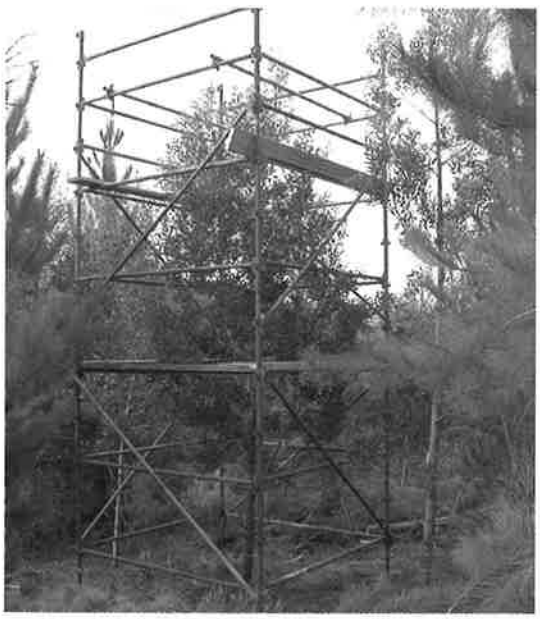
Background

The aims of this project are to:

- provide guidelines for the preparation and management of seedling stock during plantation establishment;
- develop weed management systems which minimise the use of herbicides, including the use of non-competing species as cover crops;
- develop pruning, thinning and spacing systems which are suitable for converting industrial pulpwood plantations to clearwood regimes and for farm forestry;
- assess the benefits and costs of trees on farms, and the real or perceived barriers to the adoption of commercial forestry on part or all of the farm enterprise, and develop an enhanced understanding of the factors which determine regional timber supply.

Outcomes

- Cold-induced photoinhibition (reduced photosynthesis associated with excessive light and chemical energy from chlorophyll) is associated with increased anthocyanin (a leaf pigment) and photodamage (damage to the phytochemistry of photosynthesis) in non-shaded *E. nitens* and *E. globulus* seedlings. Shaded seedlings have levels of photoinhibition and anthocyanin that are similar to those before planting, and no photodamage. Mortality was greater in unshaded *E. globulus*. Thus photoinhibition, and not just frost tolerance, is probably a factor that determines its planting range.



Scaffolding used to gain access to the upper crowns of blackwood for physiological measurements.

- Xanthophyll cycle pigments per unit chlorophyll in *E. nitens* seedlings were greater in nutrient-deprived and in non-shaded seedlings in winter. Thus nutrient status strongly affects xanthophyll engagement during seedling establishment, and fertilised seedlings can use a greater proportion of incident light under cold temperatures.
- Visually estimated hardiness of *E. globulus* seedlings based on leaf size, thickness, colour and leaf and stem lignification is negatively correlated to foliar N content. Seedling foliar N (Figure 11), and to a lesser extent root ball size, explains observed growth after planting.
- The higher water use of individual trees of *E. nitens* following thinning is largely driven by significant changes to the radial pattern of sap velocity throughout the sapwood. The use of a canopy fraction factor in the Penman-Monteith equation to cater for discontinuous canopies is a simple and effective method of scaling this model to predict transpiration from thinned plantations.
- No difference in the relationship between leaf area (A_l) and sapwood area (A_s) was found eight years after thinning *E. nitens*. The relationship is non-linear, implying a causal relationship between growth rate and $A_l:A_s$. That larger trees have greater hydraulic conductivity and higher $A_l:A_s$ supports the argument that resource capture, and hence growth rate, influences hydraulic conductivity.
- While thinning the nurse crop can improve growth in blackwood plantations (see photo) with a *P. radiata* nurse crop, heavy thinning before a sawlog length of stem is established leads to poor stem form. Due to relatively wide spacing, form pruning is vital for blackwood grown with a commercial nurse crop.
- If viable, self-sustaining farm forestry industries are to develop, thousands of landholders will need to be involved in the growing of trees for forest products. Understanding the socio-economic factors affecting landholders can assist industry and government to identify those most likely to adopt farm forestry.

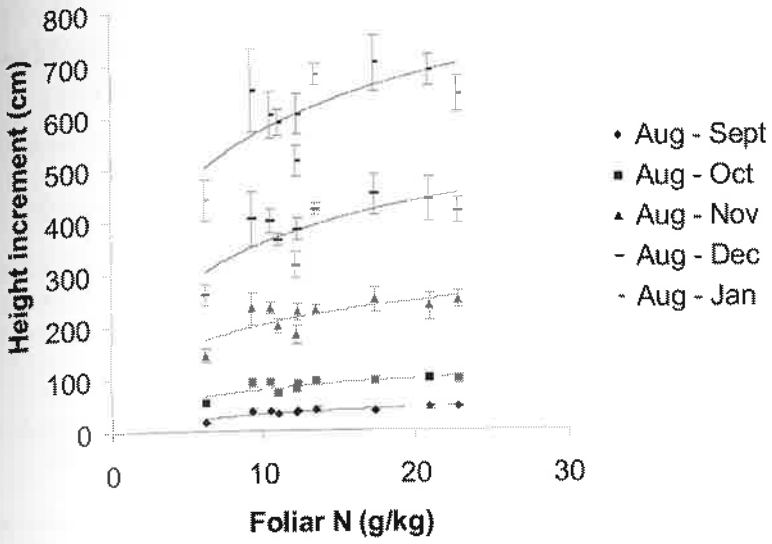


Figure 11:
Foliar N content of *E. globulus* seedlings from ten nurseries at planting and its effect on height increment over five growth periods after planting.

Goals

- Identify potential sources of transplant shock and suggest options for its management.
- Synthesise the outcomes and success of previous plantation establishment in the Tasmanian midlands.
- Model the requirements of blackwood for sidelight suppression to induce good form in plantations.
- Develop a schedule for managing effluent irrigation of plantations managed for solid wood.
- Study the determinants of non-industrial private owner's timber harvest and management decisions.
- Provide support to IUFRO Symposium on 'Forest extension: assisting forest owner, farmer and stakeholder decision-making'.

Project B4

Leader
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Dr Roger Braddock
Mr Alex Bradley
Dr Kerrie Catchpoole
Dr David Doley
Dr Kevin Harding
Dr Frieda Henskens
Dr Mark Hunt
Dr Mark Lewty
Mr Daryl Mummery
Dr Marks Nester
Mr David Osborne
Dr Libby Pinkard
Ms Carolyn Raymond
Dr Sigrid Resh
Mr Paul Ryan
Mr Leon Savage
Ms Kirsty Surridge

Modelling production and wood quality

Background

The aims of this project are to:

- produce process-based models which
  a) enable the productivity of plantations to be predicted,
  b) address specific management questions,
  c) have a transparent structure, and
  d) allow input data to be readily and cheaply obtained by forest managers;
- define the effects of site and climatic factors on wood properties, determine the feasibility of altering wood properties via silvicultural treatments, and develop tools for predicting response of wood properties to environmental factors; and
- develop decision support systems for plantation management.

Outcomes

- ProMod was used to predict potential production of *E. nitens*, *E. globulus* and *P. radiata* over three million hectares of the Murray-Darling Basin. Isolated areas were identified where potential moderate productivity would be obtained for unirrigated *P. radiata*. No areas were found suitable for *E. nitens* or *E. globulus* without irrigation.
- Detailed above-ground biomass harvests and measurements of gas exchange and within-canopy light distribution have been made for trees grown as isolated trees, in single rows, or in regular plantations. The results have provided a physiological explanation for the differences in tree growth and form, and allow effects of planting geometry to be included in process-based tree growth models. These studies also explained why eucalypt plantations may maintain high leaf area indices when conventional calculations suggest the lower crowns should be in carbon deficit. The reason is that sun flecks result in higher than expected illumination low in tree crowns.
- Excavation of coarse roots from trees differing in age, species, site and silvicultural history has provided a basis for estimating below-ground biomass of eucalypt plantations. Below-ground biomass accounts for 16–23% of total stand biomass in trees aged 8–10 years. The ratio of

above to below ground biomass is similar for *E. nitens* and *E. globulus*, does not appear to be affected by stand fertilisation, but does vary between sites. Tree basal area appeared to be a strong predictor of tree coarse-root biomass for trees at the same site and aged three months to eight years.

- The plantation growth model dynamic ProMod was developed by combining components from the growth model CABALA and the site productivity model PROMOD with mineralisation and nitrogen uptake sub-models. The model allows:

- Simulation of stand water dynamics, showing productivity in the second rotation may be less than in the first (Figure 12) at sites with deep soils in sub-900 mm rainfall zones in Western Australia;

- Prediction of stand response to fertiliser by comparing the rate of fertiliser added to sites, nitrogen mineralisation rates, and the nitrogen demand due to stand growth; and

- Estimation of the effects of *Mycosphaerella* infection on stand production.

Goals

- Develop and validate AgGro, a productivity model for wide spacings and row plantings.

- Develop and apply techniques for measuring respiration rates of coarse roots in eucalypt plantations.

- Validate dynamic ProMod using observed seasonal climatic data and long-term plantation data from CRC fertilisation trials, including the effects of mid-rotation fertilisation.

- Perform climatic sensitivity and risk analyses for three major plantation species in Tasmania.

- Determine interactions between spacing and rainfall for fibre length and cellulose content in wood samples from spacing trials.

- Incorporate into ProMod empirical sub-models for the effects of site factors on selected wood properties of *E. globulus* and *E. nitens*.

- Develop and document branching and predictive grading models for sub-tropical pines.

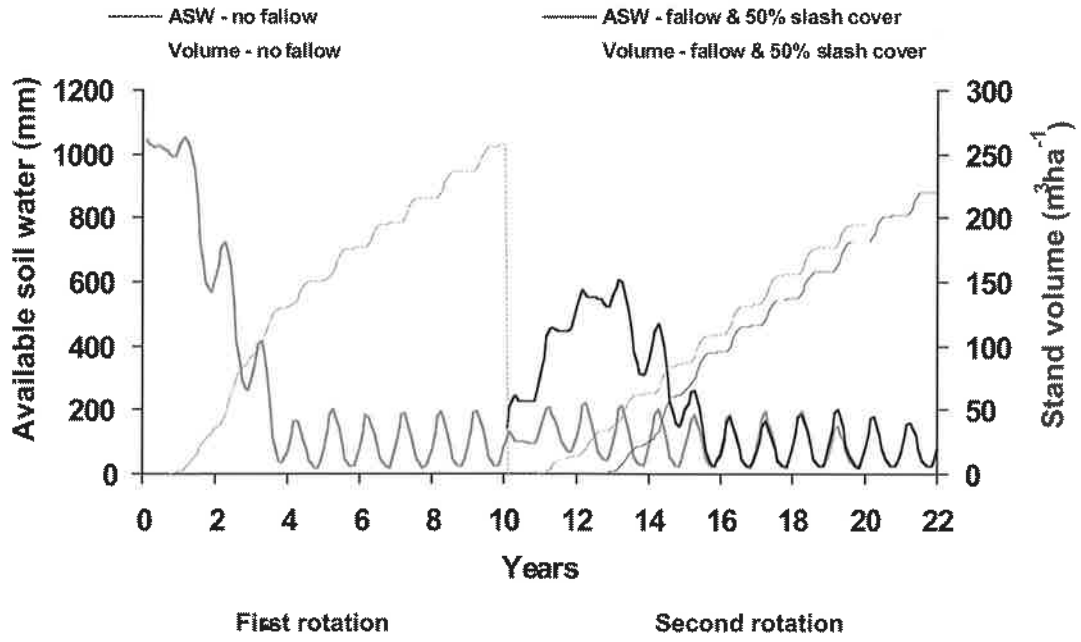

Figure 12:
Application of dynamic ProMod shows, at sites with deep soils in sub-900 mm rainfall zones in Western Australia, that productivity in the second rotation may be less than in the first. The imposition of a two-year fallow period, with slash retention to reduce soil evaporation by 50%, allows partial recharge of the soil profile and a subsequent increase in second rotation productivity. ASW is available soil water. Scenarios include a plantation established at time 0 (first rotation), at 10 years (second rotation) with no fallow, and at 2 years in the second rotation with fallow and 50% slash cover. Harvest of the first rotation occurred at year 10. Final volume was assessed after 10 years growth in each scenario.

Resource Protection Program

Manager
Dr Clare McArthur

Introduction

The Resource Protection Program aims to:

- develop a comprehensive understanding of the biology, ecology and impact of a number of key pests (insect and vertebrate) of eucalypt plantations in temperate Australia;
- identify and study the biology, ecology and control of a number of eucalypt fungal pathogens, to provide the basis for future development of integrated pest management (IPM) strategies;
- develop efficient and effective monitoring protocols for some pest and disease species to determine if and when control is necessary;
- develop IPM strategies for a number of key pests such as the Tasmanian leaf beetle (*Chrysophtharta bimaculata*), autumn gum moth (*Mnesampela privata*) and several marsupial herbivores; and
- develop management techniques and products to minimise the effects of pests and diseases on the quantity and quality of forest products, consistent with the principles of sustainable forest management.

Project C1

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Dr Bradley Howlett
Dr Marina Hurley
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Dr John Madden
Ms Linda Maddern
Dr Mamoru Matsuki
Mr John Matthiessen
Ms Helen Nahrung
Mr Vin Patel
Mr Stephen Paterson
Ms Nita Ramsden
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Mr Hilton Redgrove
Mr Anthony Rice
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Ms Tara Simmul
Dr Martin Steinbauer
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Ms Trudi Wharton

Biology, ecology and economic impact of insect pests

Background

This project aims to provide a strong foundation of basic research on the biology and ecology of the major insect species across various geographic regions so that Integrated Pest Management Strategies (IPM) can be developed. Particular emphasis in the project is centred upon *Mnesampela privata* (autumn gum moth) across all regions of southern Australia, and the leaf beetles *Chrysophtharta agricola* and *Chrysophtharta bimaculata* in Tasmania. Other insect species currently under study include *Acacicola orphana* (fireblight beetle), *Heteronyx* spp (Melolonthine scarab beetles) and *Heteronychus arator* (African black beetle). Areas of research include phenology, host-plant interactions, natural enemies, mating systems, monitoring protocols and impacts on tree growth.

Outcomes

- Leaf toughness, neonate density and leaf damage all significantly affect *C. agricola* larval survival. In the field ca. 85% of larvae and eggs occur on the first two leaf pairs, with average neonate survival on older pairs decreasing seven-fold over that on the first two leaf pairs.
- Egg parasitism by *Enoggera nassaui* of *C. agricola* (see photo) was frequently greater than 50% for egg batches collected in south-eastern Australia, and less than 1% for egg batches collected in Tasmania. Reciprocal laboratory experiments suggest significant differences in the ability of the south-eastern Australian and Tasmanian parasitoids to parasitise and develop in eggs.
- Mortality of *C. agricola* in the field, through all life stages from egg to adult, exceeds 99% and is spatially variable. This variability is greater within trees than between trees, with spider predation having a large impact on intra-tree larval survival. Egg mortality is lower in *C. agricola* than in *C. bimaculata* with the agents responsible differing, though early instar mortality is greater in *C. agricola* than *C. bimaculata*.
- Electrophysiological studies have revealed that the antennae of female autumn gum moth respond to leaf monoterpenes (so far these include 1,8-cineole, α-pinene and terpineol) and epicuticular waxes.
- Seasonal phenology of the chrysomelid pest *Cadmus excrementarius* in Western Australian blue gum plantations has been determined, with adult beetles emerging from December onwards and causing most damage during January and February. A trial is in place to assess the economic impact of feeding by this species.
- An exclusion trial for autumn gum moth showed a strong correlation between the number of initial larval hotspots per tree and subsequent percentage defoliation of one-year-old trees. Approximately 8–10 larval hotspots per tree leads to 50% defoliation, with most damage occurring in July and August (see Major Development for details).

Goals

- Determine the developmental parameters and reproductive strategies used by the parasitoids of *C. agricola*.
- Assess the distribution and biology of *Heteronyx* spp in newly established plantations.
- Estimate the impact of insect browsing on trees to different exents (25, 50, 100%) in a one-year-old *E. nitens* plantation.
- Estimate the temperature threshold for reproductive development from overwintering to egglaying for *C. bimaculata* and *C. agricola*. Use this to predict the optimum time for monitoring the peak of chrysomelid egglaying in different climatic regions/years in Tasmania.
- Study the biology, distribution and impact of *Heteronyx elongatus* larvae with the aim of devising appropriate prophylactic management practices in at-risk areas.
- Quantify economic impact of defoliation by *Gonipterus scutellatus*, chrysomelid beetles, *C. excrementarius*, *M. privata* and *Phylacteophaga froggatti* on *Eucalyptus globulus* ssp *globulus* in WA.
- Determine seasonal phenology of leafblister sawfly and identify times of most damage.

The egg parasitoid wasp, *Enoggera nassaui*, parasitising a leaf beetle egg.

Project C2

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Dr John Madden
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Ms Michelle Michie
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Mr Vin Patel
Mr Stephen Paterson

Insect control techniques and Integrated Pest Management

Background

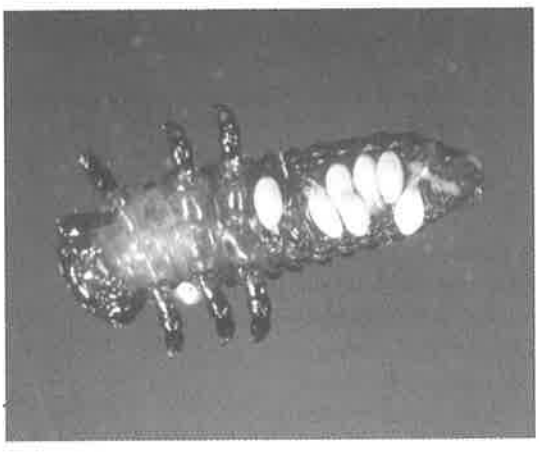
Forest managers are constantly looking for non-chemical options for insect control that are both effective and economically viable. Individual non-chemical control approaches are generally not as efficacious as chemical insecticides and must be used in conjunction with other options in an IPM strategy to achieve adequate control. However, there are very few non-chemical options currently available to managers of eucalypt plantations in temperate Australia. This project is investigating a number of control options, including the use of more environmentally-friendly chemical insecticides, for incorporation into IPM strategies.

Outcomes

- Trials of the biological insecticide, Success™ (active ingredient: spinosad), showed that low volume aerial applications can reduce young leaf beetle populations in a *E. nitens* plantation below the economic threshold, while having an insignificant effect on the natural enemy population. A laboratory trial found no effect on large ladybird larvae or mirid egg predators at the field application rates (50 ml Success™ in 10 L water / ha).

- Label registration by the chemical manufacturer of Mimic™ (active ingredient: tebufenozide), is proceeding for controlling autumn gum moth in eucalypt plantations by aerial spraying at low volumes.

- Field screening of *E. globulus* in three north-west Tasmanian plantations following *M. privata* outbreaks has identified variation in insect tree defoliation in relation to leaf wax chemicals. A survey of *M. privata* egg batches at Woolnorth (*E. globulus* plantation) and laboratory bioassays showed that these leaf wax chemicals correlate with moth oviposition choice.



Fly eggs placed upon a larval *C. agricola* following attack by the parasitoid fly *Paropsivora* sp (Tachinidae).

- The physiologically active component of sex pheromones in autumn gum moth have been identified and the chemical structures have been resolved.

- Various methods for control of African black beetle in establishment plantations have been evaluated. A range of physical barriers (developed by Timbercorp) were found to be significantly superior to insecticide applications in reducing African black beetle damage (see Major Development for details).

- Two field manuals have been produced for the Blue Gum Industry Pest Management Group in Western Australia. One outlines key times for surveillance, monitoring and control of the major insect pests of blue gums in Western Australia. The other is specifically for autumn gum moth and prescribes an economic threshold based on counts of eggs and early instar larvae during May and June. Insecticidal control, if required, must be conducted by June.

Goals

- Conduct further trials using Success™ against autumn gum moth and the gum leaf skeletoniser, and also determine resistance to Success™ of the natural enemies of leaf beetles.

- Complete label registration of Mimic™ against autumn gum moth, and continue progress on label registration for Novodor™ and Success™ against chrysomelid leaf beetles.

- Investigate the role of leaf waxes in the oviposition behaviour of *M. privata*.

- Correlate population peaks of the anomalonine parasitoid wasp with population peaks of autumn gum moth life stages (its prey).

- Use wind tunnel bioassays to quantify the relationship between previous flight activity by female autumn gum moth and the release of sex pheromone and subsequent mating.

- Determine the efficacy of prophylactic insecticide treatments localised at seedlings in reducing damage by African black beetle.

- Produce further field manuals for management of *Eucalyptus* weevil, chrysomelid beetles and leafblister sawfly.

Project C3

Leader
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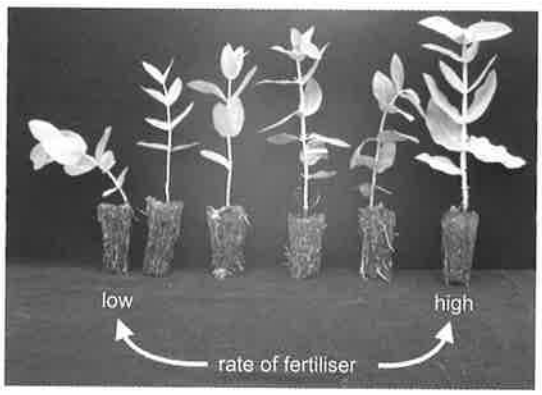
Mr Stephen Paterson
Ms Natasha Wiggins

Resistance of planting stock to vertebrate browsers

Background

A key method for reducing browser damage to eucalypts is through the production of more resistant trees. This should be achievable by the genetic and phenotypic manipulation of those trees. The information we obtain will be used to identify resistant genotypes, develop a rapid method for estimating susceptibility as detected by leaf chemistry, and predict susceptibility of seedlings as a function of their environment. These three aspects can be incorporated into an overall strategy for predicting and reducing browser damage of eucalypts at plantation establishment. Specific aims of this project are to:

- determine the relative damage to and preferences for various plant types by browsing herbivores;
- investigate both the genetic basis of resistance of eucalypts, and the effects of environment on this resistance;
- determine whether resistance can be modelled as a function of leaf chemistry, mainly using near-infra-red spectroscopy (NIRS).



Eucalyptus nitens seedlings grown under different conditions for feeding trials with possums and pademelons.

Outcomes

- Captive brushtail possums consuming adult *E. nitens* foliage from a genetics field trial showed a two-fold increase in intake of foliage, from the least to most preferred plant, but this difference was not significant (P=0.214). Furthermore, no significant differences in intake were detected amongst *E. nitens* localities and families (P=0.522, P=0.712 respectively). This contrasts with results for juvenile *E. globulus* foliage reported previously.
- Captive animal trials confirmed that differences in palatability of *E. nitens* seedlings could be obtained by altering environmental (nursery) conditions. In No Choice Trials, brushtail possums showed a strong response to variation in seedling fertiliser/shade treatments (P=0.0020), with a 43% increase in intake between the least and most fertilised seedlings. Pademelons showed a similar, though weaker pattern of response (P=0.0564). In Paired Feeding Trials with pademelons (not done for possums), differences between seedling treatments were generally augmented compared to the No Choice Trials.
- NIRS models developed for whole leaves were similar to models for ground leaves.

Goals

- Establish relationship between leaf chemistry of *E. globulus* and intake by possums and pademelons.
- Determine effect of the terpene cineole on feeding behaviour in brushtail possums.
- Quantify effects of stem diameter on field damage to eucalypt seedlings by rabbits.

Project C4

Leader
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Ms Kirsten le Mar
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Strategies to reduce vertebrate browsing damage

Background

This project addresses the problem of reducing browsing damage to seedlings, using characteristics of the environment (whole plantation and its surrounding habitat) as its framework. These environmental characteristics should have a significant influence on the browsers: how many browsers are present, and how they use plantations and other habitats as refuges and feeding areas. The aims of this project are to:

- understand the interaction between browsers and the environment, and the consequences on damage to seedlings;
- investigate the impact of vegetation immediately around a seedling on its risk of being browsed;
- develop methods for monitoring damage and predicting risk;

- design appropriate options to reduce browsing damage through various planting strategies.

Outcomes

- In a forestry environment in north-west Tasmania comprising a young *E. nitens* plantation, established plantations, native forest and grassland, the 12-hour foraging range of individual Bennett's wallabies, Tasmanian pademelons and brushtail possums was generally less than 10 ha (Table 2). During this period, which began one hour before sunset, animals also moved less than 1.6 km and not all animals used the young plantation (Figure 13).

- Highly visible *Pinus radiata* seedlings were more damaged by browsing mammals than seedlings hidden by vegetation on a plantation in south-eastern Tasmania. When browsing pressure was high, however, most seedlings were eventually found and eaten.

- In captive animal trials, *P. radiata* seedlings were more damaged if they were planted in large patches of grass than on bare ground. If the patches were small and easy to move between, there was no difference in damage to seedlings on grass or bare ground patches.

- Insect damage in the establishment phase of an unpoisoned *E. nitens* plantation was shown to be as, or more, severe than mammal damage. During the first six months after planting, mammal damage in the main region (~20 ha) of a plantation in northern Tasmania was minimal (though severe in small regions). Cumulative mammal damage (% foliage gone) reached a maximum of only 1.4% and mainly occurred within the first month after planting. Insect damage increased progressively and reached a maximum of 10.5%. Over the next six months, mammal damage increased, particularly between July and September, and cumulative damage reached 8.0%.

Figure 13: A Map of a Gunns Forest Product plantation site at Ridgley showing the 12 hour foraging ranges of two radio-collared animals during one night. This Bennett's wallaby spent most of her time on the young plantation whereas, on this occasion, the possum stayed mainly in native forest.

Table 2 : Mean 12-hour foraging range for Bennett's wallabies, pademelons and possums.

Species	Sample size	Foraging range ± s.d. (ha)
Bennett's wallaby	6	$4,66 \pm 2,02^{ab}$
Tasmanian pademelon	15	$3,47 \pm 2,71^{a}$
Brushtail possum	18	$7.34 \pm 5,70^{b}$

Goals

- Describe relationship between browsing mammal densities on a newly established *E. nitens* plantation and damage to seedlings over time.

- Quantify the extent to which herbivores reduce vegetation biomass and/or change the plant community on plantations.

- Develop an efficient user-friendly monitoring system for operations staff to quantify browsing damage on new plantations.

Project C5

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Ms Marie Yee
Dr Yuan Zi Qing
Ms Kate Harrison

Strategies to minimise loss due to fungal attack

Background

The objective of this project is to acquire knowledge that will allow the development of management tools to limit the impact of micro organisms, especially fungi, such as stem decay fungi and the leaf spot pathogen *Mycosphaerella*. Benefits to industry are likely to be significant if stem defects in pruned and thinned eucalypts can be better understood and predicted, and management strategies prescribed to reduce incidence in solid wood products.

Specific objectives are to:

- identify defence mechanisms used to restrict the spread of decay, especially in pruned and thinned *E. nitens* and *E. globulus* plantations destined for solid wood production;
- determine the identity and pathogenicity of the decay fungi involved in pruning-associated decay;
- elucidate the role and mechanisms of formation of kino veins and pockets;
- determine the effects of pruning severity and soil nutrition on severity of decay;
- develop a bioassay to screen for resistance to the pathogen *Mycosphaerella;* aim to use this assay as a tool for disease resistance breeding, whether by classical or molecular techniques.

Outcomes

- A study of *E. nitens* assessing the defence responses to decay showed that the season of wounding, and the type of fungi that become established in wounds, influence the degree of defence response. Sterile inoculations and weakly-aggressive fungi were associated with little or no reaction zone formation, while aggressive fungi elicited more discolouration and phenolic accumulation in advance of infection. This suggests that non-aggressive fungi are less tolerant of the inherent xylem microenvironment, and active defence responses are not required.
- The severity of pruning conducted on young *E. globulus* in the field affected the level of decay observed at the final harvest in late 2000. *E. globulus* seems capable of withstanding removal of 50% of the crown length without reduction in growth or increase in decay. Removal of 70% of crown length resulted in reduced growth and a significantly greater incidence of axially spreading decay outbreaks.
- Approximately 100 unidentified fungal isolates were obtained from pruning-associated decay columns in *E. nitens* and *E. globulus* trees in the field. These isolates with reference isolates of identified decay fungi have been characterised and grouped by restriction fragment length polymorphism (RFLP) profiles.
- Colleagues at Wellesbourne induced the sexual form in culture for *Mycosphaerella cryptica* as well as *M. tasmaniensis,* pathogenic fungal leaf pathogens of *E. nitens* and *E. globulus* in Tasmania. Obtaining sexual spores in culture will permit the development of a controlled resistance-screening program based on artificial infection.
- Wound response to different stem damage treatments (application of dry ice, 2-chloroethyl-phosphonic acid [CEPA] injection, bruising, drilling with and without fungal inoculations) in 16-year-old *E. nitens* and *E. globulus* confirmed that kino vein formation is solely a wound response (i.e. not a biological agent).
- *E. nitens* trees droughted for three months produced only a few and small kino veins, and kino veins were generally not induced by CEPA. These findings are in accordance with anecdotal evidence suggesting that this species is ideal for the commercial production of kino-free timber.
- Investigation of fungal and insect assemblages associated with rotting wood in a 34-year-old regrowth forest dominated by *E. obliqua* in the Huon Valley, Warra, indicated that fungal species present and species richness can vary significantly between small and large logs at the same stage of decay (of the 51 species of fungi isolated, only 11 were common to both log types).
- Particular types of rotted wood were only found in the large logs and not small logs, and there appears to be a common community of beetles within these rot types. For example, prostomids, curculionids, cerylonids and pselaphids are consistently found in the red-brown blocky rot type. As expected, there is a distinct suite of beetle species occurring in the heartwood and the surface/sapwood.

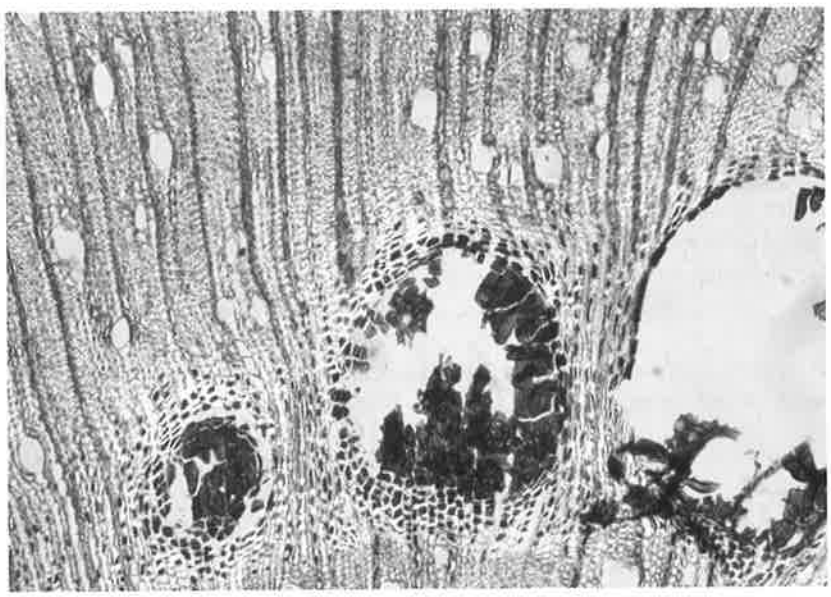
Goals

- Determine factors influencing antimicrobial defeuce mechanisms (reaction zone and wound tissue formation) in *E. nitens* and *E. globulus*, including both physiological and nutritional considerations.

- Examine the underlying mechanisms of kino formation and possible environmental and silvicultural influences on the incidence of this type of stem defect in plantation eucalypts.

- Identify fungi associated with decay columns originating from pruning wounds by a similarity analysis with the molecular profiles of known decay fungi. Further test the pathogenicity of these fungi to *E. nitens* and *E. globulus* on trees in the field.

- Continue studies to promote spore production in culture and to develop a screening method to be used on very young plants to test the resistance of eucalypts to *Mycosphaerella*. Work on methods to detect spores in the field by a user-friendly immunologically based spore-trapping technique.



Transverse section of kino vein in the xylem of 3-year-old *E. obliqua* 35 days post-induction with CEPA application. Stained with toluidine blue.

Education and Technology Transfer Program

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Dr Neville Mendham
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Prof Jim Reid
Dr Alistair Richardson
Dr Sergey Shabala
Dr Robert Wiltshire

Background

The Education and Technology Transfer Program coordinates:

- intake of postgraduate students across the three research programs and five university partners in the CRC, and involvement of CRC staff in education and training;
- transfer of technology from research programs to the industrial partners in the CRC and to small end users of forest technology, particularly farmer groups; and
- activities to raise public awareness of CRC research in sustainable forestry, and to develop a CRC ethos.

The principal objectives are to:

- develop a national centre of excellence for postgraduate training, with emphasis on training graduates relevant to the industry sector. This includes involving staff from partner organisations in teaching and supervision of university students;
- rapidly transfer the technology arising from research conducted at the Centre to industrial partners and other end users;
- publish research of international quality so Australia and the CRC are seen as world leaders in plantation forestry; and
- raise community awareness of CRC activities and the value to Australia of a sustainably managed forest industry.

Outcomes

Education

- The Centre has 74 PhD, MSc and Honours students currently enrolled. Of the postgraduate students, 16 were attracted from industry, 18 are on scholarships with industry support (APA-I, SPIRT/ARC, FFIC, LWRDC, FWPRDC, CSIRO, DPIQ, State Forests of NSW, a consortium of industries including CRC partners and Bioforest, Chile), and a further 23 are on competitive national scholarships (APA, ARC, AIDAB). Only 11 are supported solely by CRC PhD scholarships. Twelve students have CRC top-ups to APA or ARC scholarships (see Tables 3 and 4 for details).
- Two PhD students won awards this year: Dugald Close was awarded $1 500 by the Australian Academy of Science to attend 'Science at the Shine Dome' in Canberra, which provided advice to young scientists on early career development; and Helen Nahrung was awarded the Maxwell Ralph Jacobs Travel Grant to 'Sample populations of *Eucalyptus* leaf beetle (*Chrysophtharta agricola*) from mainland Australia for host range, distribution and genetic variation between sites and states'. Two students won Honours scholarships at the University of Tasmania: Fiona Poke received the J Malcom Gillies Scholarship of $1 500, and Susan Foster received the HN Barber Scholarship of $1 000.
- Supervision of postgraduate and Honours students is widely distributed amongst CRC partner institutions with 39 of the 76 supervisors of Honours, MSc and PhD projects being non-university departmental staff (see Table 5 for details).
- Eight CRC scientists, who are not staff of university departments, contributed to university courses in fields allied to their research: Dr Neil Davidson in Physiological Plant Ecology, Dr Philip Smethurst in Soil Fertility, Dr Brad Potts in Genetics, Dr Clare McArthur in Vertebrate Zoology, Dr Dorothy Steane in Phylogenetics, Dr Zhihong Xu in Soil Science, Dr Martin Steinbauer in Insect Management for Forestry, and Dr Mark Hunt in Plantation Silviculture. Dr Neil Davidson coordinates a four-year undergraduate course, 'Forest Ecology', designed for students with an interest in forestry at the University of Tasmania.
- Twelve postdoctoral fellows worked with the Centre in 2000/01: Dr K Thamarus in molecular genetics (CSIRO FFP, Canberra), Dr M Steinbauer in entomology (CSIRO Ento), Dr M Shepherd in molecular biology (SCU), Dr H Dungey in forest genetics (QFRI), Dr N Prasolova on soil nutrition (GU), Dr D Steane and Dr B Patterson in molecular genetics (UT), Dr F Henskens on canopy nitrogendynamics (CSIRO FFP, Hobart), Dr A Loch on pest management of blue gums (CSIRO Ento), Dr S Resh on biomass partitioning to roots and root respiration (CSIRO FFP, Hobart), Dr A Mitchell (CSIRO FFP) on availability of base cations, and J Medhurst (UT) on blackwood physiology and silviculture.
- The CRC hosted nine visiting scientists during 2000/01.

The Genetic Improvement Program had visits from Dr Sue Carson and Dr Mike Carson, both previously senior scientists with FRI in New Zealand and now private consultants.

- Dr Sue Carson spent six weeks (March–April 2001) working with Dr Merv Shepherd and Prof Robert Henry at SCU on genetic mapping, large-scale QTL experiments and marker-aided selection in hybrid pines.

- Dr Mike Carson worked with Dr Mark Hunt and Dr Mark Dieters at QFRI on the prediction of genetic gain from deployment options for tropical pine hybrids, and the options for the integration of biotechnology and molecular genetics into the current clonal testing and deployment program in Queensland.

The Sustainable Management Program had visits from Dr Kenneth Lundkvist, Assoc Prof Deping Li, Prof Don Rockwood and Dr Bernard Ludwig.

Genetic Improvement Program visiting scientist, Dr Sue Carson.

- Dr Kenneth Lundkvist (Department of Forest Genetics, Swedish University of Agricultural Sciences, Uppsala, Sweden) visited from 1 October–3 November 2000, and worked at QFRI with Dr Zhihong Xu on analysis of inheritance of water and nutrient use efficiency in hoop pine families and exotic F_1 hybrid clones.

- Assoc Prof Deping Li (Institute of Soil Science, Chinese Academy of Sciences, Nanjing, PR China) visited from 28 June–24 December 2000, and worked at QFRI with Dr Zhihong Xu on the effect of harvesting compaction on soil and mineral nitrogen dynamics.

- Prof Don Rockwood (School of Forest Resources and Conservation, University of Florida, Gainesville, Florida) visited QFRI for five months and worked with Dr Mark Dieters and Dr Marks Nester on 'Growth and yield predictions for F_1 clones of *Pinus elliottii* x *P. caribaea* var *hondurensis*'.

- Dr Bernard Ludwig (Institute of Soil Science and Forest Nutrition, University of Göttingen, Germany) visited Dr Andrew Mitchell in Hobart to work on modelling cation buffering capacity in a range of forest soils.

The Resource Protection Program had a visit from Prof David Lindenmayer, Prof Tony Dixon, and Brendan Murphy.

- Dr David Lindenmayer (Research School of Biological Sciences at ANU), expert on fragmentation of vertebrate populations, visited UT and attended a workshop run by the Resource Protection Program 'Plantation design and fauna conservation in Tasmania'.

- Prof Tony Dixon (Emeritus Professor, School of Biological Sciences, University of East Anglia), expert on ladybirds and biological control, visited the CRC in Hobart for two days.

- Brendan Murphy, PhD student from University of Canterbury, NZ, also worked with the Resource Protection Program for four months studying egg parasitoids of *Eucalyptus* leaf beetles in Tasmania.

Technology transfer

- Major events run by the CRC this year included:
  - an Annual Meeting held at Hamilton in October 2000, hosted by Timbercorp, which addressed the theme 'Site selection'. This meeting, with 120 participants, provided an excellent opportunity for all partners to discuss issues critical to the industry. Much discussion was focused on the issue of ground-water storage and its availability throughout a rotation. The proceedings were published as a CRC Technical Report;
  - a short course entitled 'Breeding objective definition and breeding value prediction' held in Hobart between 26 and 28 February 2001. Twenty-seven people attended, representing a broad cross-section of CRC members, other Australian breeders and students, with a number of international visitors. Participants were introduced to the basics of modern breeding objectives and genetic evaluation methods. The aim of the organisers was to empower participants to apply these methods in their operational breeding programs;
  - a 'Field day and workshop on monitoring browsing damage in plantations' held in March 2001 at Hollybank Forestry Centre, Lilydale, Tasmania, attended by 30 forest industry research and operations staff. The aim was to develop an industry-wide standard for assessing browsing damage;
  - a 'Fertiliser review workshop and field day', held on 19 and 20 March 2001, which compiled a national database on growth responses to fertilisers, from which a summary of fertiliser responses was developed;
  - a 'Blackwood workshop and field day', held on 30 November 2000, which summarised current knowledge on physiology and silviculture of Blackwood (30 participants);
  - a workshop, 'Autumn gum moth - Host preference, selection and resistance', held at GL's North-West Centre in Ridgley on 5 and 6 June 2001. It was designed to assist plantation managers in choosing plantation stock that may help to reduce pesticide use (25 participants);
  - a 'Hoop pine field day' held on 22 March 2001 to showcase major recent research findings in soil nutrition and silviculture of hoop pine (35 participants);
  - a 'Native forest management field day' at QFRI on 30 June 2001;
  - a 'Molecular genetics awareness forum' held in conjunction with DPIQ Forestry in Brisbane; and
  - two visits by CRC-SPF staff to China (funded by the Chinese government) to provide advice on eucalypt plantation forestry.
- The CRC ran a wide range of technology transfer activities for partners during 2000/01. These included 153 public presentations which consisted of 78 seminars, seven CRC-run workshops, and a total of 60 workshop presentations, one short course, seven field days, and meetings involving industry staff. The CRC produced 132 technical publications (26 in the CRC Technical Publication series), 24 news sheets ('Hot Off the Seed Bed', 'Beyond the Black Stump' and 'Pest Off'), and four articles in partner newspapers and news sheets (see Technology Transfer Table 6).
- The CRC published 103 research papers in refereed journals, 132 unrefereed articles, and 17 theses.
- The CRC publications database has been building progressively during 2000/01 and now provides a major resource for CRC partners (90 registered users).
- Documented visits to individual CRC partners and between nodes of the CRC (Hobart, Canberra, Brisbane, Gympie) total 508 person-days for 2000/01.
- CRC seminar presentations conducted in Hobart are now available on the web by video link to all partners.
- Four major outcomes from CRC research have been identified for development of technology transfer packages. These packages, directly useable in forestry operations, will be transferred to partners who have expressed interest in this technology.

Table 3: CRC Research Students

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CRC Research Students

First Name	Last Name	Degree	Funding	Start	Inst	Topic	Scientific Supervisors	CRC Program
Paul	ADAMS	PhD	LWRDC	1996	UT	Sources of competition from weeds in plantations	Dr N Mendham, Dr C Beadle, Dr P Smethurst	SM
Sue	BAKER	PhD	APA/CRC	2000	UT	Conservation of beetles in managed forests	A/Prof A Richardson	RP
Robert	BARBOUR	PhD	CRC	2000	UT	Gene flow between plantations and native forest	Dr B Potts, Dr R Vaillancourt	GI
Karen	BARRY	PhD	APA-I	1997	UT	Defence mechanisms against decay in *E. nitens*	Dr C Mohammed	RP
Tim	BLUMFIELD	PhD	CRC	1999	GU	Nitrogen dynamics and cycling in hoop pine plantations	Dr Z Xu, A/Prof P Saffigna, Dr I Philips	SM
Peter	BUNDOCK	PhD	APA	1995	UT	Genetic mapping and QTL analysis in *E. globulus*	Dr R Vaillancourt	GI
Uldis	CAKURS	PhD	APA/CRC	1999	GU	Effect of debris retention on run-off, soil loss and nutrient export in hoop pine plantations	Dr B Yu, Dr K Bubb, A/Prof P Saffigna	SM
Steven	CANDY	PhD		1993	UT	Mathematical models to support IPM of leaf beetles	Dr J Madden, Dr H Elliott	RP
Dugald	CLOSE	PhD	APA/CRC	1997	UT	Environmental constraints on early growth of seedlings in eucalypt plantations	Dr P Brown, Dr C Beadle, Dr G Holz, Dr M Hovenden	SM
Paul	DARGUSCH	MSc		1997	UT	Physical, social and economic barriers to the adaptation of farm forestry in NE Tasmania	Prof R Clark, Ms A Fulton	SM
Greg	DUTKOWSKI	PhD		1996	UT	Improvement of mixed models for prediction of breeding values in forestry	Dr B Potts, Dr A Gilmour	GI
Alieta	EYLES	PhD	APA/CRC	1999	UT	Role of kino in anti microbial defences of *E. globulus*	Dr C Mohammed	RP
Jules	FREEMAN	MSc	CRC	2001	UT	Linkage mapping and QTL analysis of *Mycosphaerella* resistance in *Eucalyptus globulus*	Dr R Vaillancourt, Dr B Potts, Dr D Steane	GI
Susan	FOSTER	Hons		2001	UT	The genetics of clines in *Eucalyptus globulus*	Dr R Vaillancourt, Dr B Potts, Dr D Steane	GI
Andrew	GIBBONS	PhD	CSIRO	1998	UT	Effect of intensive forest management on understorey and fauna in *E. delegatensis*	Dr M Battaglia, Dr R Whiltshire	SM
Carl	GROSSER	PhD	SPIRT/ARC	1999	UT	Seed orchard molecular biology	Dr R Vaillancourt, Dr B Potts	GI
Craig	HAWKINS	MSc		1998	UT	Response of *Brunonia australis* to forestry practices	Dr R Wiltshire, Dr P Barker	SM
Jim	HE	PhD	APA/CRC	2001	GU	Molecular bases of soil biological properties and processes in forest ecosystems	Dr Z Xu, A/Prof J Hughes, Dr I Phillips	SM
Andrew	HINGSTON	PhD	APA	1998	UT	Pollination ecology of *E. globulus* and *E. nitens*	Dr P McQuillan, Dr B Potts	GI
Bradley	HOWLETT	PhD	FFIC	1993	UT	Factors influencing *Chrysophtharta bimaculata* oviposition	Dr J Madden, Dr A Clarke, Dr P McQuillan	RP
Megan	JONES	PhD	SFNSW	1999	SCU	Gene flow and genetic diversity of hardwood plantations in NSW	Dr M Shepherd, Prof R Henry, Prof A Delves	GI
Tim	JONES	PhD	SPIRT/ARC	2000	UT	Genetic relationships in the breeding population of *Eucalyptus globulus*	Dr R Vaillancourt, Dr B Potts	GI
Amal	JOSEPH	MSc	QDPI/CRC	1998	USC	Performance and genetics of *Pinus caribea* var. *hodurensis* interprovenance hybrids	Dr H Wallace, Dr M Dieters, Dr H Dungey	GI
Dominic	KAIN	PhD	FWPRDC	1998	ANU	Genetics of wood properties of *Pinus elliottii*, *P. caribea* and their hybrid	Prof P Kanowski, Dr K Harding, Dr M Dieters, Dr B Li	GI
Rachel	KING	PhD	APA	2000	GU	Genetic variation in spotted gums and susceptibility to *Ramularica* desease	A/Prof J Hughes, Dr B Potts	GI
Andrew	KNOWLES	MSc	CRC	2000	UT	K and Mg uptake by eucalypts and pines.	Dr S Shabala, Dr P Smethurst, Dr P Brown	SM
Peter	KUBE	PhD		1996	UT	Breeding objectives for the production of sawlogs and pulpwood from plantation grown *E. nitens*	Ms C Raymond, Prof J Reid	GI
Elisha	LADHAMS	PhD	APA/CRC	2001	UQ	Testing and identifying soil invertebrates as indicators of biodiversity in hoop pine plantations	Dr G Wardell-Johnson, Dr A House, Dr H Proctor	SM
Sven	LADIGES	PhD	CRC	1996	UT	Micronutrient deficiencies in eucalypts induced by excess application of N & P	Prof R Menary, Dr C Beadle	SM
Keith	LAMB	MSc		1997	ANU	Modelling environmental characterisitcs for steep country plantations	Prof P Kanowski	SM
Kirsten	LE MAR	PhD	APA/CRC	1996	UT	Use of plantation and surrounding habitat by mammalian herbivores	Dr C McArthur, Dr D de Little, Dr M Statham	RP
Gustavo	LOPEZ	PhD	AIDAB	1998	UT	The importance of non-additive genetic effects in *E.globulus*	Dr B Potts, Dr R Vaillancourt	GI
Nicole	MATHERS	PhD	APA	1998	GU	Effective use of C^{13} and N^{15} NMR in C and N dynamics of forest soils	Dr Z Xu, A/Prof Saffigna, Dr S Berners-Price, A/Prof Healy	SM
Marian	McGOWEN	MSc	CRC	2000	UT	Reproductive biology of *Eucalyptus*	Dr B Potts, Dr R Vaillancourt	GI
Michelle	McGRANAHAN	PhD	APA	1996	UT	Genetic control of propagation ability in *Pinus radiata* and its use in breeding programs	Dr B Greaves, Dr B Potts	GI
Gay	McKINNON	PhD	ARC	2000	UT	Molecular evolution of eucalypts	Dr R Vaillancourt, Dr B Potts, Dr D Steane	GI
Jane	MEDHURST	PhD	FFIC	1996	UT	Thinning of *Eucalyptus nitens* stands	Dr C Beadle, Dr N Davidson	SM
Rohan	MELLICK	PhD	CRC	2000	SCU	Genetic analysis of vegetative propagation characteristics in hybrid pine	Dr M Shepherd, Dr H Dungey, Dr M Dieters	GI
Andrew	MILGATE	PhD	SPIRT/ARC	1997	UT	The genetic basis of resistance to *Mycosphaerella* in *Eucalyptus globulus*	Dr R Vaillancourt, Dr C Mohammed, Dr D de Little	GI/RP
Martin	MORONI	PhD	APA-I	1995	UT	Nitrogen mineralisation	Dr P Smethurst, Dr M Line	SM
Daryl	MUMMERY	MSc	CSIRO	1999	UT	Using landscape models to enhance plantation yield predictions	Dr E Bruce, Dr M Battaglia, Dr P Ryan	SM
Helen	NAHRUNG	PhD	APA	1999	UT	Biology and phenology of *Chrysophtharta agricola*	Dr G Allen	RP
Mark	NEYLAND	MSc		1998	UT	Alternative silvicultural systems for regenerating native forest	Dr N Davidson, Dr C Beadle, Mr J Hickey	SM
Chris	O'HARA	PhD	APA/CRC	1998	ANU	Phosphorus fractions in forest soils	Dr J Bauhus, Dr D Khanna, Dr J Raison, Dr P Smethurst	SM

Table 3: CRC Research Students cont.

CRC Research Students

First Name	Last Name	Degree	Funding	Start	Inst	Topic	Scientific Supervisors	CRC Program
Julianne	O'REILLY	PhD	UT/CRC	2000	UT	Genetic and chemical resistance of *E. globulus* and *E. nitens* to mammalian herbivores	Dr C McArthur, Dr B Potts	RP
Ross	PEACOCK	PhD		1994	UT	Regeneration after cable logging	Dr N Davidson, Dr M Brown	SM
Fiona	POKE	Hons		2001	UT	Lignin biosynthesis in *Eucalyptus globulus*	Prof J Reid, Dr R Vaillancourt	GI
Rebecca	PRYOR	Hons		2001	UT	The effect of waterlogging intensity on growth of blackwood (*Acacia melanoxylon*)	Dr N Davidson, Dr C Beadle, Dr E Pinkard	SM
Digby	RACE	PhD	ANU/CRC	1998	ANU	Economic aspects of farm forestry development in regional Australia	Prof P Kanowski	SM
Luke	RAPLEY	PhD	APA/CRC	2000	UT	Genetic variation in susceptibility of eucalypts to insect attack	Dr G Allen, Dr B Potts	RP/GI
Carolyn	RAYMOND	PhD		2001	UT	Wood properties and genetic variation in temperate eucalypts	Dr L Apiolaza, Prof J Reid	GI
Hilton	REDGROVE	PhD	APA-I	2000	UT	The ecology of *Heteronyx spp.* beetles: establishment pests of eucalypt plantations	Dr G Allen, Dr M Hurley, Dr P McQuillan, Dr D deLittle	RP
Anthony	RICE	PhD	APA	1999	UT	The ecology and host interactions of the larval parasitoids of *Chrysophtharta agricola*	Dr G Allen	RP
Carolyn	RINGROSE	MSc		1999	UT	N mineralisation in annually N-fertilised plantations	Mr R Doyle, Mr W Neilsen, Dr P Smethurst	SM
Patricio	ROJAS	PhD	Bioforest	2000	UT	Systems for eucalypt hybrid production	Dr B Potts	GI
Jackie	SCHIRMER	PhD	APA/CRC	2000	ANU	Evaluating the effectiveness of conflict resolution techniques in resource management disputes	Prof P Kanowski, Dr H Ross, Dr S Dovers	SM
Leon	SCOTT	PhD	CRC	1998	SCU	Molecular genetics of hoop pine	Dr M Shepherd, Prof R Henry, Dr M Deiters, Dr G Nikles	GI
Yetti	SETIAWATTI	PhD	AIDAB	1997	UQ	Enhancement of pollen production in *Araucaria cunninghamii* (hoop pine)	Dr D Doley, Dr M Dieters	GI
Mark	SHORT	PhD	APA/CRC	2000	ANU	Taxonomy and biology of hymenopteran larval parasitoids of *Mnesampela privata*	Dr M Steinbauer, Dr R Floyd, Dr J Tueman	RP
Tara	SIMMUL	PhD	APA-I	1996	UT	Biology of the fire blight beetle	Dr G Allen, Dr D de Little	RP
Diane	SPURR	PhD	CRC	1999	UT	Above-ground nitrogen dynamics in *E. nitens*	Dr P Smethurst, Dr M Hovenden	SM
Rhonda	STOKOE	PhD	CRC	1998	SCU	Molecular analysis of *Eucalyptus cloeziana*	Dr M Shepherd, Prof R Henry, Dr G Nikles, Dr D Lee	GI
Tim	TABART	MSc		1998	UT	Achieving sustainable economic development through collaborative community decision-making	Prof R Clarke, Ms A Fulton	SM
Paul	TOON	MSc	ARC	1998	USC	Wood properties of hybrids between *Pinus elliottii* and *P. caribea var. hondurensis.*	Dr H Wallace, Dr K Harding	GI
Greg	UNWIN	PhD		2000	UT	Response of tropical rainforest trees to stress	Dr N Davidson, Prof J Reid, Prof J Kirkpatrick, Dr C Beadle	SM
Peter	VOLKER	PhD		1992	UT	Estimation of genetic parameters for eucalypt hybrids	Dr B Potts	GI
Doug	WALCH	MSc		1997	ANU	Benefits of different designs of shelter belts in farm forestry	Prof P Kanowski	SM
Sally	WARD	Hons		2000	GU	Impacts of site management practices on soil C pools and N availability in hoop pine plantations	Dr Z Xu, Dr I Phillips, A/Prof P Saffigna	SM
Tim	WARDLAW	PhD		1994	UT	*Armillaria* butt and root rot of eucalypts	Dr C Mohammed, Dr G Kile	RP
Grant	WESTPHALEN	PhD	CRC	1996	UT	Indicator species for sustainibility in native forest systems	Dr M Brown, Mr J Hickey, Dr N Davidson, Dr C Beadle	SM
Trudi	WHARTON	PhD	Industry	1999	ANU	Biology and ecology of *Essigella californica* (Hemiptera: Aphididae)	Dr M Steinbauer, Dr R Floyd, Dr P Cooper	RP
Simon	WHITTOCK	PhD	SPIRT/ARC	2001	UT	Breeding for sustainability in *Eucalyptus globulus*	Dr L Apiolaza, Dr B Potts	GI
Natasha	WIGGINS	Hons		2001	UT	Effect of plant secondary metabolites on feeding behaviour in brushtail possums	Dr C McArthur, Dr S McLean, Dr R Boyle	RP
Marie	YEE	PhD	APA/CRC	1999	UT	Saproxylic insects and their associations with wood decay in wet sclerophyll forests	Dr C Mohammed, Dr A Richardson, Dr R Taylor, Dr G Allen	RP

Table 4. Student enrolments and funding source

Number of Students			Funding	
Total number of students		74	CRC Scholarship	11
			APA Scholarship	19
			CRC top-up of APA Scholarship	(12)
			ARC	2
Full/PartTime:	Full Time	61	APA-I	4
	Part Time	13	SPIRT/ARC	4
			University of Tasmania/CRC	1
			ANU/CRC	1
Degree	Hons	5	CSIRO	2
	MSc	13	Industry (CRC partners)	1
	PhD	56	DPIQ/CRC	1
			FFIC	2
			LWRDC	1
			FWPRDC	1
CRC Programs	Genetic Improvement	28	SFNSW	1
	Sustainable Management	29	AIDAB	1
	Resource Protection	17	Bioforest (Chile)	1
			Total	54

- In the last year there have been four articles in newspapers and industry news sheets, and 8 items in the electronic media, including four TV segments relating to Centre activities (see Public Presentations).

- A book 'Farm Forestry Technical and Business Handbook' being written by the CRC in association with Serve-Ag, PFT and TFGA, and funded by NHT, is now complete.

Goals

- Host an 'International Conference on Eucalypt Productivity: a synthesis of the environmental, physiological, genetic and silvicultural factors that affect eucalypt productivity', Eucprod 2002, in September 2002.

- Hold an Annual Meeting in October 2001 at Caloundra in Queensland on 'Maximising returns from plantations'. The aim of this meeting is to bring together a wide cross section of CRC scientists and industrial partners and to feature the postgraduate student contribution to the research of the CRC.

- Transfer four major outcomes from CRC research to industry as technology transfer packages directly useable in forestry operations.

- Use generic CRC technology for the benefit of other end users in the forestry sector. To this end, develop a protocol and establish demonstration native eucalypt plantations in low-rainfall regions of the midlands of Tasmania in areas affected by rural tree decline (funded by the Natural Heritage Trust).

Table 5: Supervisors and the number of CRC students they supervised

Supervisors					
Dr G Allen Ag Sci UT	6	Dr A Gilmour* NSW Ag	1	Dr I Phillips GU	3
Dr L Apiolaza* UT	2	Dr B Greaves* Plant Sci UT	1	Dr B Potts* CRC	17
Dr P Barker* NPWS	1	Dr K Harding* QFRI	2	Dr J Raison* CSIRO FFP	1
Dr M Battaglia* CSIRO FFP	2	Prof R Henry SCU	3	Ms C Raymond* CSIRO FFP	2
Dr H Bauhus ANU	1	Mr J Hickey* FT	2	Prof J Reid Plant Sci UT	4
Dr C Beadle* CSIRO FFP	8	Dr G Holz* NFP	1	Dr A Richardson UT	2
Dr S Berners-Price GU	1	Dr M Hovenden Plant Sci UT	2	Dr H Ross ANU	1
Dr M Brown* FT	2	Ass Prof J Hughes GU	2	Dr P Ryan* CSIRO FFP	1
Dr P Brown Ag Sci UT	2	Dr M Hurley Ag Sci UT	1	Ass Prof P Saffigna GU	4
Dr E Bruce Geog Env St UT	1	Prof P Kanowski ANU	5	Dr S Shabala UT	1
Dr K Bubb* QFRI	1	Dr P Khanna* CSIRO	1	Dr M Shepherd* CRC	4
Prof R Clark Ag Sci UT	2	Dr G Kile* CSIRO FFP	1	Dr P Smethurst* CSIRO FFP	5
Dr A Clark UQ	1	Prof J Kirkpatrick UT	1	Dr M Statham* TIAR	1
Dr P Cooper ANU	1	Dr D Lee** QFRI	1	Dr D Steane* UT	3
Dr N Davidson* CRC	6	Dr B Li** NCSU (USA)	1	Dr M Steinbauer* CSIRO Ent	2
Prof A Delves SCU	1	Dr J Madden* Ag Sci UT	2	Dr R Taylor* FT	1
Dr M Dieters* QFRI	6	Dr C McArthur* CRC	3	Dr J Trueman ANU	1
Dr D de Little* NFP	4	Ass Prof S McLean Pharmacy UT	1	Dr R Vaillancourt Plant Sci UT	11
Dr D Doley UQ	1	Dr P McQuillan Geography UT	3	Dr G Wardell-Johnson GU	1
Dr S Dovers UM (Creswick)	1	Prof R Menary Ag Sci UT	2	Dr D Williams UT	1
Mr R Doyle UT	1	Dr N Mendham Ag Sci UT	1	Dr R Wiltshire Plant Sci UT	2
Dr H Dungey* QFRI	3	Dr C Mohammed Ag Sci UT/CSIRO	5	Dr Z Xu* QFRI	4
Dr H Elliott* FT	1	Mr W Neilsen* FT	1	Dr B Yu GU	1
Dr R Floyd* CSIRO Ento	2	Dr G Nikles* QFRI	2		
Ms A Fulton Ag Sci UT	2	Dr E Pinkard* FT	1		
		Dr H Proctor* QFRI	1		

*Supervisors who are not university departmental staff.	= 39
**International supervisors	= 1
University departmental supervisors	= 36
Total	= 76

Utilisation and Application of Research

Strategy for the technology transfer program

The principal objective of the Technology Transfer Program is to transfer technology rapidly to the industrial partners and other end users. This involves the following steps:

1. *Involvement of industrial partners in planning research projects and running experiments*
Most CRC research is conducted using company trials, or trials established on company land, so companies are involved at the outset with the planning and implementation of research projects and have ownership of them. Research plans for these experiments are lodged with the companies, and include an agreed protocol for the research. The company partners allocate staff time (in-kind contributions) to CRC research projects so effective interaction can occur. The Program Coordinating Committees of the CRC retain an overview of these research projects. They prioritise research and set 'deliverables' (research outcomes that can be directly used by industry).

2. *Early transfer of results*
The early transfer of results starts with informal interactions (phone, fax, email and visits to company sites). Formal transfer starts with an electronic or faxed summary of the applications of recent research, as an A4 page, entitled 'Hot Off the Seedbed' (Genetic Improvement Program), 'Beyond the Black Stump' (Sustainable Management Program), or 'Pest Off' (Resource Protection Program). Company responses will then determine whether it is best to organise a seminar, workshop, short course or field day on the topic. Later stages of transfer are through technical reports, unrefereed papers and refereed journal papers. Technology Transfer Officer, Greg Dutkowski, liaises with industrial partners and researchers to develop a better understanding between these groups within the CRC and to facilitate the adoption of the technology most appropriate to each industry partner's needs.
A full list of technology transfer activities conducted by the CRC in 2000/01 is presented in Table 6.

3. *Development of training courses and workshops in modern forestry techniques for company staff and other end users of CRC research*

- Examples of technical training courses run by the CRC for company staff in 2000/01 include a short course entitled 'Breeding objective definition and breeding value prediction', and workshops on monitoring browsing damage in plantations, fertilisers, blackwood, autumn gum moth, hoop pine, and native forest management. A total of seven workshops, one course and seven field days were conducted during this year.

- Technology transfer also occurs through training provided by the CRC to its postgraduates. Recent PhD graduates transfer new technology to their employers. Fourteen company staff are enrolled in PhD and MSc courses while still employed: T Wardlaw (Forest Pathologist, FT); S Candy (Statistician, FT); P Kube (Tree Breeder, FT); P Volker (Consultant, Serve-Ag); R Peacock (Research Scientist, Department of Planning, NSW); C Hawkins (Forester, GL); M Neyland (Research Officer, FT); P Adams (Forest Nutrition, FT); D Mummery (Research Scientist, CSIRO FFP); C Raymond (Research Scientist, CSIRO FFP); G Lopez (Forester, INTA, Argentina); P Rojas (Forester, Bioforests, Chile); G Unwin (Lecturer in Farm Forestry, UT), and P Toon (Senior Technician, Exotic Pines, QFRI). Three resigned their positions to conduct research but intend returning to industry: G Dutkowski (Technical Manager, Bunnings Treefarms), J Medhurst (FT), and A Gibbons (Technician, CSIRO FFP). A further 19 of our students are on scholarships supported by industry (see Tables 3 and 4).

- The success of our students in obtaining employment in the forest industry was demonstrated by recent appointments: Dr E Pinkard (Forest Management, FT), Dr M Hunt (Manager, Genetics Program, QFRI), Dr D Race (Research Associate in farm forestry, ANU), Dr J Medhurst (Postdoc, Swedish University of Agricultural Sciences, Uppsala, Sweden), K Barry (Research Assistant in RP, CRC-SPF), D Close (Research Assistant in SM, CRC-SPF), T Simmul (Technical Sales Support Officer, BASF Aust Ltd), R Jones (Research Officer, Centre for Plant Conservation Genetics, SCU), L Pietrzykowski (Technical Assistant in RP, CRC-SPF), Dr B Howlett (Research Assistant, GU).

Industrial Uptake

The new technologies developed by the research programs, which have been transferred to industrial partners and other end users, are outlined below.

Genetic Improvement Program

- The assessment of reproductive traits such as self-incompatibility, flowering time and reproductive output are being integrated by the Southern Tree Breeding Association (STBA) and partners into the development of seed production systems for eucalypts.
- Studies of genetic parameters in *E. globulus* are being used to guide STBA analyses for breeding and selection.
- Eight-year growth data for *E. globulus*, collected by the CRC-SPF for research purposes, was passed on to STBA for the National Breeding Values Analysis.
- Breeding values for *Mycosphaerella* resistance were calculated as a spin-off of a research project and passed on to the industrial partner Gunns Limited.
- Working closely with industrial partner Forestry Tasmania on a collaborative SPIRT research grant aimed at improving *E. nitens* seed and seedling quality, this project has assisted in identifying factors resulting in seedling mortality and abnormalities in the Forestry Tasmania nursery.
- CRC representation on the STBA Board (Greg Dutkowski, Sandra Hetherington, Richard Breidahl), and on the Technical Committee, and Research, Quantitative Genetics and Data Management Sub-Committees (Greg Dutkowski), has assisted in the transfer of technology from the program to this partner.
- This year has seen further development in the design of TREEPLAN® and DATAMAN® breeding value prediction and data management systems. These constitute major innovations at the industry level.
- STBA now incorporates fingerprinting in its breeding strategy.
- Marker pollen technology was transferred to STBA, and is being used to optimise crossing procedures.

Sustainable Management Program

- Industrial partners have made increased use of the $CaCl_2$-P analysis system developed by the CRC.
- Intensive N-fertilisation program of later-age fertilising to maintain canopies for solid wood production is planned for the eucalypt plantations of a major partner.
- Recommendations on the effective use of N fertilisers in second rotation hoop pine plantations are currently being developed and adopted by DPI Forestry Queensland. This will lead to significant improvement in hoop pine plantation productivity and profitability in Queensland.
- Use of shading (with shadecloth) to reduce impact of cold-induced photoinhibition has been adopted by several nurseries.
- Based on CRC research on the physical and chemical characteristics of seedling leaves which are most favourable for different planting environments, seedling specifications have been revised by nurseries supplying Timbercorp.
- Private Forests Tasmania expanded PROMOD as a decision support system in Version 3 of the Farm Forestry Toolbox.
- PROMOD is now used by many companies to aid site selection. It is also used by independent foresters to audit productivity claims made by investment companies.
- The new dynamic PROMOD can simulate stand water dynamics, predict stand response to fertiliser and show productivity in the second rotation. It is now being used by two companies for examining the risks associated with plantation establishment.
- Statistical and modelling assistance has been provided to various CRC partners.

Resource Protection Program

- The new Farm Forestry Toolbox version 3, developed by Private Forests Tasmania, Forestry Tasmania and the CRC, has a major new innovation: keys and descriptions of common forest health problems. The diagnostic keys and descriptions include hundreds of images of the main pests and diseases that affect the health of eucalypt and pine plantations.

- The draft insect pest surveillance and monitoring manual produced for the Western Australian Blue Gum Industry Pest Management Group is being employed to improve current surveillance techniques and efficacy of insecticide applications.

- Western Australian eucalypt plantation companies are successfully employing monitoring techniques and economic thresholds for autumn gum moth as recommended in a field manual produced for the industry.

- Timbercorp is adopting the use of mesh sleeves (which enclose the root system and lower stem), instead of insecticide, to control the plantation establishment pest, African black beetle.

- Browsing damage assessment scores developed by the CRC are now being used by two partners, Forestry Tasmania and Norske Skog Paper Mills.

Staffing and Administration

Membership

On 1 July 2000, Australian Plantation Timber (APT) joined the CRC as a core partner with Dr Erica Shedley as its Board representative. A number of CRC-SPF members had a change of ownership and/or name during 2000/01. Fletcher Challenge Paper was taken over by Norske Skog Paper Mills (Australia) Pty Ltd. Boral Timber Tasmania and later North Forest Products Limited were taken over by Gunns Limited, the memberships being held in the name of Gunns Limited and Gunns Forest Products Pty Ltd. A proposal to change to one core membership is being considered. Sotico Treefarms Pty Ltd is now WACAP Treefarms Pty Ltd, and Primary Industries Corporation Queensland is now Department of Primary Industries Queensland.

Staff

All staff of the CRC are listed in Attachment B under their member organisations.

Director

The Director of the CRC-SPF, Prof Jim Reid, accepted an appointment as Dean of the Faculty of Science and Technology at the University of Tasmania and his resignation is effective from 30 August 2001. Although not strictly within the period covered by this report, it is fitting to pay tribute to him.

It is with great regret that the Board and I witness Jim Reid's decision to depart from the CRC for Sustainable Production Forestry. Jim leaves for totally understandable reasons. We congratulate him for his promotion within the University and acknowledge the fact that he has been CEO with the CRC for 10 years.

It is particularly significant that Jim has kept up his university responsibilities as well as those of the CRC for this period. I'll never forget the time when Geoff Vaughan of the CRC Committee asked Jim could he do the job with only 50 per cent of his time devoted to the CRC? Jim replied 'Then what am I not doing?' Geoff Vaughan was stumped.

The fact is, Jim Reid is possessed of an exceptional capacity and this has been evident in all that he has done for the CRC. Without putting too fine a point on it, the bid for a second round was a lay-down misère due to the way the CRC had performed under Jim's leadership, and because of the depth of the second round bid. Private sector companies have been very keen to become part of the CRC and, while it is fair to say life hasn't always been a bed of roses, either due to Jim or because of some degree of wisdom on the Board, we've always worked through any dissonance. The really big challenge for the CRC is to survive without Jim Reid and to try to re-invent itself for another round of Commonwealth funding, or to survive as a quasi-commercial entity. No one is irreplaceable but to my mind Jim must come close! And we all hope we'll see plenty of Jim in his new guise where he'll have some chance to interact.
John Kerin, Chairman

Staff movements

Dr Geoff Allen's contract as an Insect Ecologist (50%) with the CRC finished in December 2000. He accepted a full-time appointment with the School of Agricultural Science, University of Tasmania, and has remained joint Leader of CRC entomology projects C1 and C2 in the Resource Protection Program.

Dr Luis Apiolaza, Quantitative Geneticist with the Genetic Improvement Program, replaced Greg Dutkowski as Leader of project A2.
Linda Ballard commenced as part-time Technician in the Genetic Improvement Program (Hobart) in May 2001.

Karen Barry was appointed on a short-term contract as Research Assistant in the Resource Protection Program (Hobart) in March 2001.

Shelley Caswell, who was seconded to Human Resources, University of Tasmania, returned to the CRC as Administrative Officer in March 2001.

Kerrie Catchpoole commenced as Scientist, Decision Support Systems, in the Sustainable Management Program (Gympie, Qld) in September 2000.

Dr Paul Chambers finished his contract as Postdoctoral Fellow in the Genetic Improvement Program (Hobart) in December 2000.

Dr Chengrong Chen commenced as Research Fellow in the Sustainable Management Program (Griffith University) in January 2001.

Michael Cross, Technician in molecular genetics at Southern Cross University, reduced his appointment to part time in April 2001.

Dr Heidi Dungey, Quantitative Geneticist in the Genetic Improvement Program (Gympie Qld), resigned December 2000.

Dr Marina Hurley, Insect Ecologist in the Resource Protection Program (Hobart), finished her contract in December 2000.

Siobhan Jones, who was Administrative Officer during Shelley Caswell's secondment to Human Resources, resigned in October 2000.

David Lyons was appointed Business Manager in April 2001 following the resignation of Corrine Condie in January.

Andrew MacDonald, Technician in the Genetic Improvement Program (Hobart) resigned March 2001.

Dr Mamoru Matsuki commenced as Insect Ecologist in the Resource Protection Program (Hobart) in February 2001.

Jane Medhurst, Postdoctoral Fellow working on blackwood silviculture in the Sustainable Management Program (Hobart), resigned in May 2001.

Dr Garth Nikles, Principal Tree Breeder in the Genetic Improvement Program (Gympie Qld), retired July 2000.

Ruth Osborne, Technician in the Sustainable Management Program (Hobart), resigned in June 2001.

Dr Sigrid Resh, Postdoctoral Fellow, working on below-ground carbon allocation in the Sustainable Management Program (Hobart) resigned in May 2001.

Leon Savage commenced as Technician in the Genetic Improvement and Sustainable Management Programs (Hobart) in May 2001, replacing Alex Bradley who resigned in June 2001.

Dianne Tambling finished her contract as part-time Administrative Assistant in Hobart but returned later in the year on a short-term contract to assist in the Education and Technology Transfer program.
Dr Karen Thamarus, Molecular Geneticist in Genetic Improvement Program (Canberra), finished her contract in March 2001.

Dr Reddy Thumma was appointed Postdoctoral Fellow in molecular genetics in the Genetic Improvement Program (Canberra) in April 2001.

Ingrid van Putten commenced as part-time Economist (Hobart) in July 2000.

Postgraduate students

The following CRC-SPF students received their PhD degrees in 2000/01:

Karen Barry
Dugald Close
Bradley Howlett
Jane Medhurst
Digby Race
Tara Simmul

The following students commenced postgraduate research with the CRC in 2000/01:

Sue Baker—PhD, University of Tasmania
Jules Freeman—MSc, University of Tasmania
Jizheng He—PhD, Griffith University
Tim Jones—PhD, University of Tasmania
Elisha Ladhams—PhD, University of Queensland
Marian McGowan—MSc, University of Tasmania
Anne Perry—PhD, University of Queensland
Simon Whittock—PhD, University of Tasmania

Administration

The number of meetings held by the Board and other committees during 2000/01 were as follows:

Board of Management	3
Management Committee	12
Advisory Panel	1
Program Coordinating Committees	
Genetic Improvement	2
Sustainable Management	2
Resource Protection	2

SPECIFIED PERSONNEL

Title, Name and Role	Contributing Organisation	% time in CRC
Prof James Reid Director	University of Tasmania	50
Dr Russell Haines Deputy Director	Department of Primary Industires Queensland	40
Dr David de Little Chair, Advisory Panel	Gunns Forest Products	64
Program Managers		
Dr Chris Beadle Sustainable Mangement	CSIRO Forestry and Forest Products	80
Dr Clare McArthur Resource Protection	University of Tasmania	100
Dr Brad Potts Genetic Improvement	University of Tasmania	100
Dr Neil Davidson Education & Technology Transfer	University of Tasmania	100

Publications

Genetic Improvement Program

Books and book chapters

Potts BM, Pederick LA (2000). Morphology, phylogeny, origin, distribution and genetic diversity of the eucalypts. In 'Diseases and Pathogens of Eucalypts'. (Eds PJ Keane, GA Kile, FD Podger, and BN Brown) pp. 11-34. (CSIRO Publishing: Collingwood, Victoria)

Refereed publications

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Apiolaza LA, Garrick DJ (2001). Breeding objectives for three silvicultural regimes of Radiata Pine. *Canadian Journal of Forest Research* **31,** 654-662.

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Dungey HS (2001). Pine hybrids - a review of their use performance and genetics. *Forest Ecology and Management* **148,** 243-258.

Dungey HS, Potts BM, Whitham TG, Li HF (2000). A genetic component to community structure: Evidence from a synthetic eucalypt hybrid population. *Evolution* **54,** 1939-1946.

Jones TH, Potts BM (2000). Genetic variation in susceptibility of *Eucalyptus globulus* coppice regrowth to shoot feeding weevils (*Myllorhinus* sp.). *Tasforests* **12,** 147-153.

Jordan GJ, Potts BM, Chambers PG, Wiltshire RJ (2000). Quantitative genetic evidence that the timing of vegetative phase change in *Eucalyptus globulus* ssp. *globulus* is an adaptive trait. *Australian Journal of Botany* **48,** 561-567.

Lopez GA, Potts BM, Tilyard PA (2000). F_1 hybrid inviability in *Eucalyptus*: the case of *E. ovata* x *E. globulus*. *Heredity* **85,** 242-250.

McKinnon GE, Potts BM, Jackson HD, Vaillancourt RE (2001). Chloroplast capture in the Tasmanian eucalypts. *Evolution* **55,** 703-711.

Muneri A, Raymond CA (2000). Genetic parameters and genotype-by-environment interactions for basic density, pilodyn penetration and diameter in *Eucalyptus globulus*. *Forest Genetics* **7,** 321-332.

Muneri A, Raymond CA (2001). Non-destructive sampling of *Eucalyptus globulus* and *E. nitens* for wood properties. II. Fibre length and coarseness. *Wood Science and Technology* **35,** 41-56.

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Schimleck LR, Michell AJ, Raymond CA, Muneri A (2000). Estimation of basic density of *Eucalyptus globulus* using near-infrared spectroscopy. *Canadian Journal of Forest Research* **29,** 194-201.

Turner C, Wiltshire RJ, Potts BM, Vaillancourt RE (2000). Allozyme variation and conservation of the Tasmanian endemics, *Eucalyptus risdonii*, *E. tenuiramis* and *E. coccifera*. *Conservation Genetics* **1,** 209-216.

Turner C, Wiltshire RJ, Potts BM, Vaillancourt RE (2001). Variation in seedling morphology in the *Eucalyptus risdonii* Hook. *E. tenuiramis* Miq. complex. *Australian Journal of Botany* **49,** 43-54.

Vaillancourt RE, Boomsma DB, Nicolle D (2001). An interesting disjunct population of *Eucalyptus globulus* ssp. *bicostata* from South Australia. *Transactions of the Royal Society of South Australia* **125,** 65-68.

Vaillancourt RE, Jackson HD (2000). A chloroplast DNA hypervariable region in eucalypts. *Theoretical and Applied Genetics* **101,** 473-477.

Wei X, Borralho NMG (2000). Genetic gains and levels of relatedness from best linear unbiased prediction selection of *Eucalyptus urophylla* for pulp production in southeastern China. *Canadian Journal of Forest Research* **30,** 1601-1607.

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Freeman JS, Jackson HD, Steane DA, McKinnon GE, Dutkowski GW, Potts BM, Vaillancourt RE (2001). Chloroplast DNA phylogeography of *Eucalyptus globulus*. *Australian Journal of Botany* **49**.

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Kube PD, Raymond CA (2001). Prediction of whole tree basic density and pulp yield using wood core samples in *Eucalyptus nitens*. *Appita Journal.*

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Shepherd M, Cross MJ, Maguire TL, Dieters MJ, Williams GC, Henry RJ (2001). Transpecific microsatellites for hard pines. *Theoretical and Applied Genetics.*

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Thamarus KA, Groom K, Murrell JC, Byrne M, Moran GF (2001). A genetic linkage map for *Eucalyptus globulus* conmtaining microsatellite and candidate gene loci and cambium specific expressed sequence tags (ESTs). *Theoretical and Applied Genetics.*

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Carson SD (2001). Integrating molecular technology into QFRI clonal forestry program to improve stock. In 'Molecular Genetics and Biotechnology Awareness Forum'. (QDPI Forestry: Brisbane, Queensland)

Dieters MJ, Zheng Y (2001). Variation among natural and domesticated populations of *Pinus caribaea* var *bahamensis* when grown in Queensland and south China. In 'Southern Forest Tree Improvement Conference'. 26-29 June, Athens, GA, USA.

Dungey HS, Kerr RJ, Dieters MJ (2000). Comparison of genetic parameters estimated using an infinitesimal and a finite locus model in two subtropical pines and thier inter-specific hybrid. In 'Forest Genetics for the Next Millenium'. 8-13 October 2000, Durban, South Africa. pp. 98-102. (Institute of Commercial Forestry Research: Pretoria, South Africa)

Haines RJ (2001). The role of biotechnology in forestry - an overview. In 'Molecular Genetics and Biotechnology Awareness Forum'. (QDPI Forestry: Brisbane, Queensland)

Henry RJ (2001). Forestry in the genomics and post genomics eras. In 'Molecular Genetics and Biotechnology Awareness Forum'. (QDPI Forestry: Brisbane, Queensland)

Jones ME, Shepherd M, Henry RJ, Bruskin S, Delves A (2001). Gene flow and genetic diversity in eucalypt plantations and native forest. In 'Molecular Genetics and Biotechnology Awareness Forum'. (QDPI Forestry: Brisbane, Queensland)

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Stokoe RL (2001). Genetic diversity and hybridisation patterns of *Eucalyptus cloeziana*. In 'Molecular Genetics and Biotechnology Awareness Forum'. (QDPI Forestry: Brisbane, Queensland)

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Chambers PG, Dutkowski GW, Elms S, McRae TA, Powell MB, Sasse J (2000). The estimation of genetic parameters and breeding values for growth, deformity and *Dothistroma* traits and a method for the selection of deformity resistant and *Dothistroma* resistant genotypes. Technical Report No. TR00-02, 31 pp. (STBA, Hobart, Tasmania)

Cross MJ, Shepherd M, Henry RJ (2001). Genotyping of two stems from QFRI hybrid trial at Byfield. Confidential Report, 2 pp. (CRC-SPF, Lismore, New South Wales)

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Dutkowski GW (2000). Capital Expenditure Planning. Confidential Report, 15 pp. (STBA, Hobart, Tasmania)

Dutkowski GW (2000). Draft Communication Strategy. Confidential Report, 7 pp. (STBA, Hobart, Tasmania)

Dutkowski GW (2000). Comments on the STBA data management systems specification by Hutchinson software. Confidential Report, 4 pp. (STBA, Hobart, Tasmania)

Dutkowski GW (2000). Prediction of selection criterion and breeding objective trait breeding values for trials of the Q'Connor and CFTT *Eucalyptus globulus* collection - Consultancy Report for STBA. Confidential Report, 9 pp. (CRC-SPF, Hobart, Tasmania)

Dutkowski GW, Apiolaza LA, Gore PL, McRae TA, Pilbeam D (2000). The STBA Cooperative Tree Improvement Strategy for *Eucalyptus globulus*. Revised for the period 2000-2005. Technical Report No. TR00-03. (STBA, Mount Gambier, South Australia)

Haines RJ, Potts BM, Henry RJ, Carson M, Carson SD, Shepherd M, Dale G, Jones ME, Stokoe RL, Mellick R (2001). Molecular Genetics and Biotechnology Awareness Forum. Technical Report No. 62, 57 pp. (CRC-SPF, Hobart, Tasmania)

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Joseph AA (2001). Performance and genetics of provenance hybrids of *Pinus caribaea* var *hondurensis* in Queensland. Masters, Applied Science Department, Sunshine Coast University, Sippy Downs, Queensland.

McGowen MH (2000). Clinal variation in the yellow gum complex. Honours, School of Plant Science, University of Tasmania, Hobart, Tasmania.

Watson MC (2000). Seed and seedling quality in *Eucalyptus globulus*. Honours, School of Plant Science, University of Tasmania, Hobart, Tasmania.

Whittock S (2000). Chloroplast DNA phylogenetic reconstruction of *Eucalyptus* L'Herit. (Myrtaceae). Honours, School of Plant Science, University of Tasmania, Hobart, Tasmania.

Sustainable Management Program

Books and book chapters

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Tabart T, Fulton A, Clark R (2001). Farm forestry and regional development: communities making collaborative decisions. In 'Socio-economic research to support successful farm forestry'. (Ed. D Race), pp. 53-65. (RIRDC: Canberra, ACT)

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O'Reilly J, McArthur C, Potts BM, Foley WJ (2000). Genetic and chemical variation in resistance of *Eucalyptus globulus* foliage to mammal browsing. Technical Report No. 32, 30 pp. (CRC-SPF, Hobart, Tasmania).

Theses

Barry KM (2000). Antimicrobial defence in the sapwood of *Eucalyptus nitens*: studies of the reaction zone. PhD, School of Agriculture, University of Tasmania, Hobart.

Brown G (2001). Preliminary investigations into the biology and ecology of *Heteronyx* spp (*scarabidae*). Honours, School of Agriculture, University of Tasmania, Hobart, Tasmania.

Howlett BG (2000). Oviposition Site Selection by the Eucalypt Herbivore *Chrysophtharta bimaculata* (Olivier) (Coleoptera: Chrysomelidae) and the implications for larval establishment. PhD, University of Tasmania, Hobart, Tasmania.

Pietrzykowski E (2000). The effect of vegetation heterogeneity on damage to *Pinus radiata* seedlings by native herbivores. Honours, Zoology Department, University of Tasmania, Hobart, Tasmania.

Simmul TL (2001). Biology of the Fireblight Beetle, *Acacicola orphana* (Erichson) (Coleoptera: Chrysomelidae), a defoliator of *Acacia dealbata* (Link.). PhD, University of Tasmania, Hobart, Tasmania.

Public Presentations

Genetic Improvement Program

Apiolaza LA (2000). An overview of the forest industry in Chile. Seminar. 10 November. Hobart, Tasmania.

Apiolaza LA (2000). The Chilean forest sector - a soap opera view. Seminar. Hobart, Tasmania, Australia.

Apiolaza LA, Chambers, PG (2000). Breeding for risk traits. Presentation at 'RWG7 Workshop on "Breeding for resistance to pathogens and pests."' 15-17 November, for RWG7 Forest Health. Port Huon, Tasmania.

Apiolaza LA, Dutkowski GW, Raymond CA, Greaves BL, McRae TA (2001). Breeding objective definition and breeding value prediction. Workshop 26-28 February. Hobart, Tasmania.

Banham PW (2000). Effect of wood quality on thermo-mechanical pulping for newsprint. Seminar 13 October. Hobart, Tasmania.

Barbour RC (2001). Introductory PhD seminar. 16 March, for School of Plant Science. Hobart, Tasmania.

Borralho NMG (2001). RAIZ breeding program. Seminar 24 April. Hobart, Tasmania.

Borralho NMG (2001). Key research for eucalypt plantations. Presentation 24 April 2001. Hobart, Tasmania.

Carson SD (2001). Application of marker-aided selection (MAS) in forest trees. Seminar 4 May, for CRC-SPF. Hobart, Tasmania.

Chambers PG (2000). An introduction to breeding objectives. 'STBA Quantitative Genetics Sub-Committee Meeting' 2-3 August, for STBA. Canberra, ACT.

Chambers PG (2000). Development of breeding objectives for *Pinus radiata* - a preliminary investigation. Presentation at 'STBA Meeting with Hancock Victorian Plantations' 22 December 2000, for STBA. Melbourne, Victoria.

Chambers PG, McRae TA, Dutkowski GW (2000). Tree improvement objectives for *Eucalyptus globulus*. Presentation at 'STBA Field Day' 4-5 October, for STBA. Western Australia.

Dieters MJ (2000). Genetic improvement of conifers in Queensland. Seminar 14 July. Chinese Academy of Forestry, Beijing.

Dieters MJ (2000). Provenance variation in *Pinus caribaea* var *hondurensis*. Seminar 14 July, for Public. Beijing Forestry University, Beijing, China.

Dieters MJ (2000). Genetic improvement of conifers in Queensland. Seminar 21 July, for Public. South China Agricultural University, Guangzhou, China.

Dungey HS (2000). Genetic improvement of conifers in Queensland. Seminar September. Raleigh, North Carolina State University.

Dungey HS (2001). Report on trip to the USA and South Africa. Seminar. Gympie, Queensland.

Dutkowski GW (2000). The role of inventory in modelling. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000, for All Partners. Hamilton, Victoria.

Dutkowski GW (2001). Introduction to breeding. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 30 May, for Fujian Agricultural and Forestry University, College of Forestry. Nanping, Fujian, China.

Dutkowski GW (2001). Quantitative genetic methods for tree breeding. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 27 May, for Nanjing Forestry University. Nanjing, Jiangxi, China.

Dutkowski GW (2001). Tree breeding for maximum gain. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 29 May, for Fujian Forest Research Institute. Fuzhou, Fujian, China.

Gore PL, Potts BM (2000). Outcrossing in open pollinated seed orchards of *Eucalyptus globulus*. Presentation at 'STBA Field Day' 4-5 October, for STBA. Western Australia.

Greaves BL (2000). Greenhouse and forestry: the credibility of carbon credits. Seminar. Hobart, Tasmania.

Henry RJ (2000). Diversity of plant genomes revealed by analysis of gene sequences and microsatellites. Invited Presentation at 'Integration of Biodiversity and Genome Technology for Crop Improvement' 27 November- 1 December, for National Institute of Agrobiological Resources. Tsukuba, Ibaraki Japan.

Jones TH, Potts BM, Vaillancourt RE, Davies NW (2001). Investigation into defense mechanisms of *Eucalyptus globulus* to AGM using clonally replicated F_2 families. Invited presentation by Luke Rapley at 'CRC-SPF Workshop on "Autumn Gum Moth - Host Preference, Selection and Resistance"' 5-6 June, for CRC-SPF Partners. Gunns Limited North-West Centre, Ridgley, Tasmania.

McRae TA (2000). Managing genetic gain to lift productivity. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October, for All Partners. Hamilton, Victoria.

Milgate AW, Vaillancourt RE, Potts BM, Yuan ZQ, Battaglia M, Mohammed CL (2000). Development of a bioassay to test for *Mycosphaerella* resistance. Presentation at 'RWG7 Workshop on "Breeding for Resistance to Pathogens and Pests."' 15-17 November, for RWG7 Forest Health. Port Huon, Tasmania.

Moran GF, Thamarus KA, Raymond CA, Deyou Q, Uren T, Southerton SG (2001). Genomics of *Eucalyptus* wood traits. Presentation at 'IUFRO Conference on 'Wood, Breeding, Biotechnology and Industrial Expectations" June. Bordeaux, France.

O'Reilly J, McArthur C, Potts BM (2001). Natural plant resistance to mammalian browsing: can we breed for it? Poster at '12th Australian Vertebrate Pest Conference' 21-25 May. Melbourne, Victoria.

Potts BM (2000). Emergent technologies in controlled pollination of *Eucalyptus* and experiences with hybrid production. Presentation at 'Tecnologias emergentes en polinization controlada de *Eucalyptus* para la generacion de hibridos F_1' 22-23 August. Concepcion, Chile.

Potts BM (2000). Reproductive biology of *Eucalyptus* and applications to genetic improvement. Workshop at 'Tecnologias emergentes en polinization controlada de Eucalyptus para la generacion de hibridos F_1' 22-23 August, for Bioforest, SA. Concepcion, Chile.

Potts BM (2000). The relevance of CRC molecular genetic research to tree breeding. Presentation at 'CRC-SPF Annual Meeting' 16 October, for CRC-SPF Board. Hamilton, Victoria.

Potts BM (2000). Advances in eucalypt seed production. Seminar 24 November, for Dongmen Forest Farm. Dongmen Fusui Guangxi, PR China.

Potts BM (2000). Advances in eucalypt seed production. Seminar 29 November, for China Eucalypt Research Centre. Zhanjiang, PR China.

Potts BM (2000). Exploitation of base populations of *Eucalyptus*. Seminar 29 November, for China Eucalypt Research Centre. Zhanjiang, PR China.

Potts BM (2000). Exploitation of base populations of *Eucalyptus*. Seminar 30 November, for Forestry Bureau of Hainan Province. Haikou, China.

Potts BM (2001). Introduction to the CRC-SPF. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 29 May 2001, for Fujian Forest Research Institute, Fujian Provincial Forestry Department. Fuzhou, Fujian, China.

Potts BM (2001). Introduction to the CRC-SPF. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' for Nanjing Forestry University. Nanjing, Jiangxi, China.

Potts BM (2001). Advances in eucalypt seed production systems. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 27 May 2001, for Nanjing Forestry University. Nanjing, Jiangxi, China.

Potts BM (2001). Advances in eucalypt seed production systems. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 29 May, for Fujian Forest Research Institute, Fujian Provincial Forestry Department. Fuzhou, Fujian, China.

Potts BM (2001). Advances in eucalypt seed production systems. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 30 May, for Fujian Agricultural and Forestry University, College of Forestry. Nanping, Fujian, China.

Potts BM, Barbour RC, Vaillancourt RE (2000). Assessing the risk and management of genetic pollution. Presentation at 'CRC-SPF Annual Meeting: Site Selection and Productivity Estimation Workshop' 17-19 October, for CRC-SPF. Hamilton, Victoria.

Potts BM, Gore PL, Pilbeam D (2000). Screening selections of *E. globulus* for self-incompatibility, pollen viability and genetic load. Presentation at 'Southern Tree Breeding Association Technical Meeting' 6 October, for STBA. Perth, WA.

Pound L (2000). Self-incompatibility in *Eucalyptus globulus* and *E. nitens*. Seminar 25 January, for School of Plant Science, University of Tasmania. Hobart, Tasmania.

Raymond CA (2000). Selecting traits for wood products and potential impacts of insect pests and fungi. Presentation at 'RWG7 Workshop on "Breeding for Resistance to Pathogens and Pests."' 15-17 November, for RWG7 Forest Health. Port Huon, Tasmania.

Raymond CA (2001). Genetics of *Eucalyptus* wood properties. Keynote address at 'International Conference on "Wood, Breeding and Biotechnology and Industrial Expectations"' 11-14 June. Bordeaux, France.

Rockwood DL (2000). Growth and yield predictions for F_1 clones of slash x Caribaea Pines. Seminar 21 November. Hobart, Tasmania.

Rojas Vergara P (2001). Introductory PhD seminar. 18 May, for School of Plant Science. Hobart, Tasmania.

Shepherd M (2001). DNA techniques. Workshop for ACIAR.

Shepherd M (2001). Transpecific microsatellites in pines. Invited Presentation at 'Conifer Microsatellite Workshop' 4-7 June. Institute of Plant Genomics, Texas A&M University.

Steane DA (2001). Extracting DNA from wheatgerm. Invited Presentation at 'Women in Science Week' 16 March, for Fahan School. Hobart, Tasmania.

Steane DA (2001). What does a plant scientist do? Invited Presentation at 'Jobs in our community' 29 May, for South Hobart Primary School. Hobart, Tasmania.

Thamarus KA (2001). Molecular genetics of wood and fibre properties in *Eucalyptus globulus*. Seminar 10 February, for CSIRO Forestry and Forest Products. Canberra, ACT.

Thamarus KA (2001). Quantitative trait loci for wood and fibre properties in *Eucalyptus globulus*. Seminar 10 March, for CRC-SPF. Hobart, Tasmania.

Vaillancourt RE (2000). Genetically modified organisms: friend or foe? Seminar at 'University Open Day Seminar' 4 September. Hobart, Tasmania.

Vaillancourt RE (2000). GMOs - are they required and what are their potential environmental impacts? Workshop at 'Aquaculture and GMO's' 9 October. Hobart, Tasmania.

Vaillancourt RE, Potts BM (2000). Genetic pollution - the risk of gene flow from plantations into natural forest communities. Presentation at 'RWG7 Workshop on "Breeding for Resistance to Pathogens and Pests."' 16 November, for RWG7 Forest Health. Port Huon, Tasmania.

Vaillancourt RE (2001). Application of molecular genetics in forestry: the case of *Eucalyptus globulus*. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 27 May, for Nanjing Forestry University. Nanjing, Jiangxi, China.

Vaillancourt RE (2001). Application of molecular genetics in forestry: the case of *Eucalyptus globulus*. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 29 May, for Fujian Forest Research Institute; Fujian Provincial Forestry Department. Fuzhou, Fujian, China.

Vaillancourt RE (2001). Introduction to the CRC-SPF. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 30 May 2001, for Fujian Agricultural and Forestry University, College of Forestry. Nanping, Fujian, China.

Vaillancourt RE, Potts BM (2001). Risks of genetic pollution from plantation forestry. Invited talk at 'RWG7 Workshop on "Breeding for resistance to pathogens and pests"' 15-17 November, for RWG7 Forest Health. Port Huon, Tasmania.

Wimmer R, Downes GM (2000). The GST (growth sensitivity of trees) and its effect on wood quality. Seminar. Hobart, Tasmania.

Sustainable Management Program

Bail I (2000). Timbercorp. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000, for All Partners. Hamilton, Victoria.

Bail I (2000). Site evaluation and productivity estimation - the way forward. Discussion at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000, for All Partners. Hamilton, Victoria.

Battaglia M, Sands PJ (2000). Dynamic growth modelling: management and silvicultural support. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16 - 18 October, for CRC-SPF. Hamilton, Victoria.

Battaglia M, Mummery D, Smith A (2000). Economic analysis of site survey and productivity modelling for the selection of plantation areas. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16 - 18 October, for CRC-SPF. Hamilton, Victoria.

Beadle CL, Warner A, Brown A (2000). Advancing blackwood silviculture. Public Workshop at 'Advancing Blackwood Silviculture' 30 November-1 December. Smithton, Tasmania.

Beadle CL (2001). CSIRO-research provider in partnership. Seminar at 'Workshop on Research and Development for Tasmania's Forest Industry: Opportunities and Challenges' 19 - 20 March. Hobart, Tasmania.

Beadle CL (2001). Factors driving site selection and productivity modelling systems - an overview. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16 - 18 October, for CRC-SPF. Hamilton, Victoria.

Beadle CL, Medhurst J (2001). Physiological and growth responses to thinning - implications for management. Public Seminar at 'Workshop on National Farm Forestry Silviculture Project'. Brisbane, Queensland.

Catchpoole K (2001). Development of a silvicultural decision support system for exotic pine plantations. Seminar 18 June 2001. Hobart, Tasmania.

Close DC (2000). Photosynthesis, photoinhibition and pigment chemistry of *E. nitens* and *E. globulus* seedlings: How do seedlings cope with the big bad world after leaving the warm, cuddly nursery? Seminar for University of Tasmania, 4 August 2000. Hobart, Tasmania.

Close DC (2000). Are you inhibited? - How to cope with (photo)inhibition in a cold environment. Seminar 3 November. Hobart, Tasmania.

Close DC (2001). Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle. Seminar at 'SIF project presentation' for LaTrobe University, March 2001. Melbourne, Victoria.

Close DC (2001). Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle. Seminar at 'SIF project presentation' 14 February 2001, for Timbercorp treefarms. Hamilton, Victoria.

Close DC (2001). Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle. Seminar at 'SIF project presentation' for CRC-SPF Researchers and Partners, May 2001. Hobart, Tasmania.

Close DC (2001). Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle. Seminar at 'SIF project presentation' for Forestry Tasmania, May 2001. Perth, Tasmania.

Close DC (2001). Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle. Seminar at 'SIF project presentation' for Gunns Forest Products, May 2001. Ridgley, Tasmania.

Close DC, Beadle CL, Hovenden MJ, Davies NW (2001). Chlorophyll fluorescence and xanthophyll-cycle conversion during cold-induced photoinhibition throughout establishment of *Eucalyptus nitens* seedlings: non-xanthophyll cycle-mediated energy quenching. Public Presentation at 'International Congress of the Federation of European Societies of Plant Physiology' August 2000. Budapest, Hungary.

Davidson NJ (2000). The effect of managed flow rates from the Gordon River Power Scheme on riparian vegetation in the Gordon River. Seminar at 'Seminar' 8 December. Hobart, Tasmania.

Davidson NJ (2001). Sustainable management in plantation forestry (soil nutrition, molecular biology and mammalian browsing). Presentation at 'Science Week' 10-11 May 2001, for Tasmanian schools. Hobart, Tasmania.

Davidson NJ, Close DC (2001). Plantation establishment to combat rural tree decline in the Midlands. Seminar at 'Talk to the Midlands Tree Committee' 18 June 2001. Midlands, Tasmania.

Davidson NJ, Gibbons AK (2000). Riparian vegetation. Presentation at 'The Joint Assessment Panel Assessing the Basslink Project' 22 November 2000, for Hydro Tasmania.

Davidson NJ, Gibbons AK (2001). Riparian vegetation. Presentation at 'Assessment of the impact of Basslink' 21 March 2001, for Department of Primary Industries, Water and Environment. Hadley's Hotel. Hobart, Tasmania.

de Little DW (2000). Re-focussing forest research in a changing environment. Seminar. Hobart, Tasmania.

de Little DW, Beadle CL (2001). Workshop at 'Research and Development for Tasmania's Forest Industry: Opportunities and Challenges' 7 June 2001, for Forest Industry. Hobart, Tasmania.

de Little D, Elliott H (2001). Research and development needs: an overview. Seminar at 'Workshop on Research and Development for Tasmania's Forest Industry: Opportunities and Challenges' 19-20 March. Hobart, Tasmania.

Downes GM (2001). Wood quality and fertiliser in eucalypts. Presentation at 'Review of CRC Fertiliser Experiments in Eucalypt Plantations' 19-20 March 2001. Hobart, Tasmania.

Esprey L (2001). Forest productivity research at the Institute for Commercial Forestry Research, South Africa. Seminar 12 April 2001. Hobart, Tasmania.

Gibbons AK (2000). Understorey dynamics following thinning in *E. delegatensis* native forest. Seminar 10 November. Hobart, Tasmania.

Hancock H (2000). Soil respiration in *Eucalyptus globulus* plantations. Seminar for the Plant Science Department, University of Tasmania.

Holz GK (2001). *Eucalyptus nitens* site indices for sites in north-west Tasmania compared using ProMod and NFP forest inventory plot estimates. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

Hunt M (2000). Nutrient loading or nutrient starvation. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

Laffan MD (2000). Soil mapping: a tool for site selection. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000. Hamilton, Victoria.

Last I (2000). *Pinus* plantations on the coastal lowlands of south-east Queensland. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

Ludwig B (2001). Modelling effects of selected forest management practices (clearfelling, slash burning) on soil chemical processes. 15 February, for CRC-SPF. Hobart, Tasmania.

Lundkvist K (2000). Genetic variation in water- and nutrient-use efficiency in *Pinus sylvestris* and *Picea abies*. Seminar 30 October. Hobart, Tasmania.

Lyons A (2000). Small scale farm forestry. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

McFarlane C (2001). Growth and respiration of *Eucalyptus globulus* Labill. Seminar 27 February. Hobart, Tasmania.

Mummery DC, Battaglia M (2000). Spatial extrapolation of a simple forest productivity model into the landscape. at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October. Hamilton, Victoria.

Mummery DC (2000). Scale and error propogation in GIS and environmental modelling. Seminar at 'Tasmania Branch Annual General Meeting' 5 December 2000, for Australian Urban and Regional Information Systems Association Inc (AURISA).

Mummery DC (2001). Landscape and productivity modelling for plantation site selection. Seminar 20 February 2001, for School of Geography and Environmental Studies Annual Seminar Series. Hobart, Tasmania.

Pinkard EA (2000). The current experience and new options with nurse crops. Public Seminar at 'CRC/Private Forests Tasmania Workshop on Advancing Blackwood Silviculture' 30 November-2 December. Smithton, Tasmania.

Resh S (2000). Tropical N-fixing tree species sequester soil carbon. Public Seminar at 'Current Activities in Tasmanian Soil Science' 25 July. Launceston, Tasmania.

Resh S, Worledge D, Battaglia M (2000). The most efficient way to get a root in Tasmania. Seminar. Hobart, Tasmania.

Rockwood DL (2000). Growth and yield predictions for F_1 clones of slash x Caribaea Pines. Seminar 21 November. Hobart, Tasmania.

Sands PJ (2000). Productivity models: a comparative analysis. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000, for All Partners. Hamilton, Victoria.

Sands PJ (2000). Productivity models - a comparative analysis. CRC-SPF 'Annual General Meeting'. Hamilton, Victoria.

Sands PJ, Battaglia M (2001). Nutrient supply and demand - incorporating results from fertiliser experiments into productivity models. Presentation at 'Review of CRC Fertiliser Experiments in Eucalypt Plantations' 19-20 March 2001. Hobart and Florentine Valley, Tasmania.

Sankaran KV (2000). Enhancing productivity of eucalypt plantations through improved silviculture - the Kerala experience. 12 December. Hobart, Tasmania.

Shedley C (2000). Coping with factors at the margin of our control. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

Smethurst PJ (2000). Soil and canopy area as indicators of productivity. Seminar at 'CRC Workshop on Site Selection and Productivity Estimation' 16-18 October, for CRC-SPF. Hamilton, Victoria.

Smethurst PJ (2001). Workshop at 'Fertiliser Workshop' 19-20 March, for CRC-SPF. Hobart, Tasmania.

Smethurst PJ (2001). Research into indicators of soil fertility. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 27 May 2001, for Nanjing Institute of Soil Science. Nanjing, Jiangxi, China.

Smethurst PJ (2001). Sustainable forest management research. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 27 May 2001, for Nanjing Forestry University. Nanjing, Jiangxi, China.

Smethurst PJ (2001). The plantation management cycle in Australia and sustainable forest management research. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 29 May 2001, for Fujian Forest Research Institute Fujian Provincial Forestry Department. Fuzhou, Fujian, China.

Smethurst PJ (2001). The plantation management cycle in Australia. Presentation at 'Australia China Agricultural Cooperation Agreement Eucalypt Mission' 30 May 2001, for Fujian Agricultural and Forestry University, College of Forestry. Nanping, Fujian, China.

Smethurst PJ, Mitchell AJ (2000). Base cations: a potential limitation to plantation productivity. Seminar. Hobart, Tasmania.

Smith T (2000). The effects of weather patterns on risk. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October. Hamilton, Victoria.

Tabart T (2000). Economic renewal (Farm Forestry). Seminar for University of Tasmania. Hobart, Tasmania.

Volker PW (2000). Site selection - Show me the money! Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October 2000. Hamilton, Victoria.

Waugh G, Yang JL (2001). Growth stress and its role in processing eucalypts for solid wood products. Seminar 22 May. Hobart, Tasmania.

Williams KJ, Ryan PA (2000). 3PG and PlantGro: What they are, how parameters are determined, how they are used and their limitations. Seminar 11 October, for QDPI-Forestry Resources and QDPI-Hardwood Plantation Group. Brisbane, Queensland.

Worledge D (2000). Root distribution of *E. nitens* and *E. globulus* in irrigated and droughted soil. Seminar. Hobart, Tasmania.

Xu Z (2001). Hoop Pine. Field day at 'Hoop Pine Field Day 2001' 22 March, for Queensland Primary Industries Corporation. Gympie, Queensland.

Resource Protection Program

Barry KM (2000). Wound response and the role and properties of the reaction zone in *E. nitens*. Workshop at 'CRC-SPF Pruning and Thinning Workshop' 3-5 May. Gympie, Queensland.

Barry KM (2000). *Eucalyptus nitens* sapwood vs decay fungi: tactics and rule breaking of reaction zone formation. Seminar. Hobart, Tasmania.

Bulinski J (2000). Considering pests in site selection. Presentation at 'Site Selection and Productivity Estimation: A CRC-SPF Workshop' 17-19 October, for All Partners. Hamilton, Victoria.

Candy SG (2000). Analysing repeated measures data from field trials: a demonstration of statistical methods. Seminar 3 November. Hobart, Tasmania.

Dixon AFG (2001). Ladybirds and biological control. Seminar; Talk; Meeting 11 April, for CRC-SPF. Hobart, Tasmania.

Elek JA (2000). Forestry Tasmania's entomology research. Presentation October, for University of Tasmania Agricultural Science year 4 students. Hobart, Tasmania.

Elek JA (2000). Life history of leaf beetles. Seminar October, for Hobart Fly-tying Association.

Elek JA (2000). Life history of leaf beetles. Seminar November, for Bridgewater Anglers. Hobart, Tasmania.

Eyles A (2000). Expression of kino: its role in wound defence? Workshop at 'CRC-SPF Pruning and Thinning workshop' 3-5 May. Gympie, Queensland.

Eyles A (2001). Anatomy and chemistry of wound tissue in *Eucalyptus globulus* and *Eucalyptus nitens*. Seminar 22 June, for University of Melbourne. Creswick, Victoria.

Floyd RB (2000). Is there a role for transgenic eucalypts containing *B.t.* toxins in Australian plantations? Workshop at 'Research Working Group 7, Forest Health Workshop in Tasmania', November, 2000.

Grove S (2001). Vindicators of indicators: old trees as surrogate measures of saproxylic beetle biodiversity. Seminar 10 May 2001. Hobart, Tasmania.

Loch AD (2000). Surveillance, monitoring and management methods for autumn gum moth in Western Australia. Field Day 7 June. Western Australia.

Loch AD (2000). Insect pests of eucalypt plantations, and the role of insect resistance. Presentation to STBA members 5 October, for STBA. Manjimup.

Loch AD, Floyd RB, Matthiessen JN (2000). Surveillance and monitoring methods for insect pests of blue gums in Western Australia. Field Day 20 September. Western Australia.

Matsuki M (2001). Pest-resistant *Eucalyptus* trees in agroforestry. Seminar 2 May, for School of Agricultural Science, University of Tasmania. Hobart, Tasmania.

McArthur C (2000). Managing browsing damage in eucalypt plantations - alternatives to 1080? Invited Presentation February 2001 for Tasmanian Field Naturalists Association. Hobart, Tasmania.

McArthur C (2001). Research on managing browsing damage. Presentation at 'Browsing Animal Control Workshop' 5 April, Quarantine Centre. Hobart, Tasmania.

Mohammed CL (2000). Stem defect following pruning in wound defence in temperate eucalypts. Workshop at 'CRC-SPF Pruning and Thinning Workshop' 3-5 May. Gympie, Queensland.

Old K (2001). Diseases of eucalypts and acacias in south-east Asia. Seminar 12 June 2001, for University of Tasmania. Hobart, Tasmania.

O'Reilly J (2000). Plant vs herbivore. Resistance of eucalypts to mammals: genetic and chemical influences. Seminar 24 November, for All Partners. Hobart, Tasmania.

O'Reilly J, McArthur C, Potts BM (2001). Natural plant resistance to mammalian browsing: can we breed for it? Poster at '12th Australian Vertebrate Pest Conference' 21-25 May. Melbourne, Victoria.

Rapley L, Allen GR, Potts BM (2001). Resistance of *Eucalyptus globulus* to autumn gum moth (AGM). Invited Presentation at 'CRC-SPF workshop on Autumn Gum Moth - Host Preference, Selection and Resistance' 5-6 June, for CRC Partners. Gunns Limited North-West Centre. Ridgley, Tasmania.

Steinbauer MJ (2000). Forests full of choices: each one could be your offspring's last! Seminar at 'CSIRO Entomology, Natural Resources and Biodiversity Program' 13 February. Canberra, ACT.

Steinbauer MJ (2001). Life history, host utilisation and population management issues concerning autumn gum moth in Australian pulpwood plantations. Seminar 1 May. ANU School of Forestry. Canberra, ACT.

Steinbauer MJ (2001). Host preference and selection by autumn gum moth: why avoid some trees and not others? 'CRC-SPF Workshop' 5 June 2001. Ridgley, Tasmania.

Steinbauer MJ, Floyd RB (2000). Risk assessment for autumn gum moth. 16-18 October. Workshop. Hamilton, Victoria.

Media Activities

Print

Onwood, 2000. C. Beadle: 'Testing thinning options for eucalypt plantations'.

Onwood, 2000. A Gibbons: 'How does thinning affect species composition?'.

Onwood, 2001. P Smethurst: 'Potassium can boost young pines'.

Between the Leaves, 2001. H Dungey, M Dieters: 'Hybrids propel forest plantation productivity'.

Electronic media

Chinese Hunan Satellite TV. B. Potts: interview about the expansion of *Eucalyptus* plantations into Hunan Province, China. 20 November 2000.

ABC Radio Australia. C Beadle: interview about thinning eucalypt plantations for solid wood products. 7 December 2000.

ABC Radio, *Morning Show*. C McArthur: interview about the problem of browsing in forestry and alternatives to 1080. 11 April 2001.

ABC Radio National, *Country Hour*. B Potts: interview about Tasmanian eucalypts and the CRC, for Science Week. 11 May 2001.

ABC TV, *Stateline*. J Reid: Interview about future funding for CRC-SPF under threat. 18 May 2001.

Chinese Zhangzhou TV, Zhangzhou. P Smethurst: interview about an Australian's perspective on eucalypt plantations in China. 1 June 2001.

ABC TV, *Stateline*. J Reid: Interview about genetically modified crops. 4 June 2001.

ABC Radio National, *Country Hour*. B Potts: interview about CRC-SPF China visit. 26 June 2001.

Technology Transfer Activities

Date	Function	Topic	Reach	Pgm	Time (days)
2000					
July	Monthly meetings	Browsing damage management, Browsing Damage Management Group with research and operations staff from forestry industry, TFGA, TCT	18	RP	6 days
July	School talk Hobart	Entomology, to Hutchins students G Allen	20	ETT	60 min
July	Seminar Guangzhou, China	Genetic improvement of conifers in Queensland M Dieters	30	GI	90 min
July	Seminar Beijing, China	Provenance variation in *Pinus caribaea* var *hondurensis* M Dieters	30	GI	50 min
July	Seminar Beijing, China	Genetic improvement of conifers in Queensland M Dieters	20	GI	50 min
July	Beyond the Black Stump	No 18 Pre-hardening seedlings in the nursery D Close, C Beadle, G Holz	100	SM	
July	Hot off the Seed Bed	No 20 Inbreeding depression in *Eucalyptus globulus*: relationship with the inbreeding coefficient B Potts, C Hardner, P Tilyard	50	GI	
July	CRC-SPF Technical Report	No 39 Sensitivity of *E. globulus* growth in plantations to environmental factors: a modelling analysis M Battaglia		SM	
Aug	CRC-SPF Technical Report	No 32 Genetic and chemical variation in resistance of *E. globulus* foliage to mammal browsing J O'Reilly, C McArthur, B Potts, W Foley		RP	
Aug	CRC-SPF Technical Report	No 40 Economic analysis of site survey and productivity modelling for the selection of plantation areas M Battaglia, D Mummery, T Smith		SM	
Aug	CRC-SPF Technical Report	No 52 A genetic linkage map for *E. globulus* with candidate gene loci for wood and fibre traits K Thamarus, K Groom, J Murrell, G Moran		GI	
Aug	Seminar USA	Genetic improvement of conifers in Queensland H Dungey	30	GI	50 min
Aug	Meeting Canberra	An introduction to breeding objectives P Chambers	15	GI	45 min
Aug	Seminar Hobart	Genetically modified organisms: friend or foe? R Vaillancourt	40	GI	60 min
Aug	Seminar Chile	Emergent technologies in controlled pollination of *Eucalyptus* and experiences with hybrid production B Potts	20	GI	90 min
Aug	Hot off the Seed Bed	No 21 Hybrids in forestry H Dungey	50	GI	
Sept	CRC-SPF Technical Report	No 38 Cellulose content, near infrared reflectance analysis and predicted pulp yield – which is the best option for predicting whole tree kraft pulp yield? C Raymond, L Schimleck, P Kube		GI	
Sept	CRC-SPF Technical Report	No 41 Evaluation and development of microsatellite primers for *P. caribaea* var *hondurensis* and *P. elliottii* var *elliottii*:: Series I M Shepherd, M Cross, T Maguire, M Dieters, C Williams, R Henry		GI	
Sept	CRC-SPF Technical Report	No 42 Plantation forestry disputes: case studies on concerns, causes, processes and resolution J Schirmer		SM	
Sept	CRC-SPF Technical Report	No 43 Genetic parameters and predicted gains for *E. nitens* wood fibre production in Tasmania P Kube, C Raymond, P Banham		GI	

Date	Function	Topic	Reach	Pgm	Time (days)
Sept	CRC-SPF Technical Report	No 44 Prediction of whole tree basic density and pulp yield using wood core samples in *E. nitens* P Kube, C Raymond		GI	
Sept	CRC-SPF Technical Report	No 46 Characterisation of microsatellite loci isolated from *Araucaria cunninghamii* L Scott, M Shepherd, R Henry		GI	
Sept	Seminar Hobart	*E. nitens* sapwood vs decay fungi: tactics and rule-breaking of reaction zone formation K Barry	27	RP	60 min
Sept	Field day Western Australia	Surveillance and monitoring methods for insect pests of blue gums in Western Australia A Loch, R Floyd, J Matthiessen	15	RP	0.5 day
Sept	Field day Western Australia	Surveillance, monitoring and management methods for autumn gum moth in Western Australia A Loch	20	RP	90 min
Sept	Beyond the Black Stump	No 19 Stem volume equation for *E. nitens* P Smethurst, D Spurr, C Baillie, R Osborne	100	SM	
Sept	Hot off the Seed Bed	No 22 Gene flow between planted and native eucalypt forests R Barbour, B Potts, R Vaillancourt, W Tibbits, R Wiltshire	50	GI	
Sept	Hot off the Seed Bed No 23	An economic breeding objective for plantation radiata pine grown to produce timber flitch and newsprint P Chambers	50	GI	
Oct	CRC-SPF Technical Report	No 45 Tree breeding issues for solid wood production C Raymond		GI	
Oct	CRC-SPF Technical Report	No 48 Genetic based susceptibility of *E. globulus* to autumn gum moth defoliation and the associated role of foliar chemistry T Jones, B Potts, R Vaillancourt, N Davies		RP	
Oct	Presentation Hobart	Wood quality and fertiliser in eucalypts G Downes	15	SM	45 min
Oct	CRC-SPF Annual Meeting Hamilton	Theme 'Site Selection', hosted by TC	120	ETT	5 days
Oct	Presentation Hamilton	Risk assessment for autumn gum moth M Steinbauer, R Floyd	30	RP	60 min
Oct	Presentation Hamilton	Productivity models – a comparative analysis P Sands	30	SM	20 min
Oct	Presentation Hamilton	Site selection – show me the money! P Volker	40	SM	30 min
Oct	Presentation Hamilton	Effects of weather patterns on risk T Smith	30	SM	20 min
Oct	Presentation Hamilton	Soil mapping: a tool for site selection M Laffan	30	SM	20 min
Oct	Presentation Hamilton	Spatial extrapolation of a simple forest productivity model into the landscape D Mummery, M Battaglia	30	SM	20 min
Oct	Presentation Hamilton	Productivity models: a comparative analysis P Sands	30	SM	30 min
Oct	Presentation Hamilton	The role of inventory in modelling G Dutkowski	30	GI	20 min
Oct	Presentation Hamilton	Managing genetic gain to lift productivity T McRae	45	GI	20 min
Oct	Presentation Hamilton	Considering pests in site selection J Bulinski	30	RP	20 min
Oct	Presentation Hamilton	Timbercorp I Bail	30	SM	15 min

Date	Function	Topic	Reach	Pgm	Time (days)
Oct	Discussion Hamilton	Site evaluation and productivity estimation – the way forward I Bail	30	SM	30 min
Oct	Presentation Hamilton	The relevance of CRC molecular genetic research to tree breeding B Potts	20	GI	30 min
Oct	Presentation Hamilton	Assessing the risk and management of genetic pollution B Potts, R Barbour, R Vaillancourt	40	GI	20 min
Oct	Seminar Hobart	Soil respiration in *E globulus* plantations H Hancock	40	SM	30 min
Oct	Seminar Hobart	Effect of wood quality on thermo-mechanical pulping for newsprint P Banham	16	GI	60 min
Oct	Seminar Hobart	Base cations: a potential limitation to plantation productivity P Smethurst, A Mitchell	26	SM	60 min
Oct	Seminar Hobart	Genetic variation in water- and nutrient-use efficiency in *P. sylvestris* and *Picea abies* K Lundkvist	22	GI	60 min
Oct	Seminar Hobart	The GST (growth sensitivity of trees) and its effect on wood quality R Wimmer, G Downes	23	GI	60 min
Oct	Workshop Western Australia	Outcrossing in open-pollinated seed orchards of *E. globulus* P Gore, B Potts	30	GI	20 min
Oct	Seminar Brisbane	3PG and PlantGrow: What they are, how parameters are determined, how they are used and their limitations K Williams, P Ryan		SM	60 min
Oct	School talk Hobart	Sustainable management in plantation forestry (soil nutrition, molecular biology and mammalian browsing) N Davidson	15	ETT	60 min
Oct	Presentation Western Australia	Tree improvement objectives for *E. globulus* P Chambers, T McRae, G Dutkowski	30	GI	30 min
Oct	Seminar Hobart	The Chilean forest sector – a soap opera view L Apiolaza	20	GI	50 min
Oct	Workshop Hobart	GMOs – are they required and what are their potential environmental impacts? R Vaillancourt	20	GI	35 min
Oct	Presentation Hobart	Forestry Tasmania's entomology research, to UT Agricultural Science students J Elek	5	RP / ETT	60 min
Oct	Seminar Canberra	Molecular genetics of wood and fibre properties in *E. globulus* K Thamarus	25	GI	35 min
Oct	Hot off the Seed Bed	No 24 The performance and relaibility of paclobutrazol in promoting the flowering of *E. nitens* can be enhanced by nitrogen fertilisation D Williams, B Potts, P Smethurst	50	GI	
Oct	Hot off the Seed Bed	No 25 CRC microsatellites are operational and reveal marked differentation among races of *E. globulus* D Steane, R Vaillancourt, B Potts	50	GI	
Nov	Workshop Lismore	DNA techniques M Shepherd	6	GI	3 days
Nov	Seminar Hobart	Life history of leaf beetles J Elek	25	RP	60 min
Nov	Presentation Manjimup	Insect pests of eucalypt plantations, and the role of insect resistance A Loch	18	RP	60 min

Date	Function	Topic	Reach	Pgm	Time (days)
Nov	Workshop Canberra	Is there a role for transgenic eucalypts containing *B.t.* toxins in Australian plantations? R Floyd	25	RP	60 min
Nov	Workshop and Field day Smithton	Summary of current knowledge on physiology and silviculture of blackwood CRC-SPF, FT	30	ETT	1 day
Nov	Tour Queensland	Hardwoods Plantations Research Tour of central and southern Qld for industry and other key stakeholders CRC-SPF, QFRI	40	ETT	3 days
Nov	Tour Queensland and NSW	Hardwoods Plantations Research Tour of southern Qld and northern NSW CRC-SPF, QFRI	35	ETT	2 days
Nov	Seminar Hobart	Are you inhibited? – how to cope with (photo) inhibition in a cold environment D Close	32	SM	60 min
Nov	Seminar Hobart	Plant vs herbivore. Resistance of eucalypts to mammals: genetic and chemical influences J O'Reilly	25	RP	40 min
Nov	Seminar Hobart	Understorey dynamics following thinning in *E. delegatensis* native forest A Gibbons	28	SM	60 min
Nov	Seminar Hobart	An overview of the forest industry in Chile L Apiolaza	26	GI	60 min
Nov	Presentation Hobart	Riparian vegetation N Davidson, A Gibbons	30	SM	45 min
Nov	Presentation Port Huon	Selecting traits for wood products and potential impacts of insect pests and fungi C Raymond	25	GI	20 min
Nov	Talk Port Huon	Risks of genetic pollution from plantation forestry R Vaillancourt, B Potts	25	GI	2 days
Nov	Presentation Port Huon	Breeding for risk traits L Apiolaza, P Chambers	20	GI	30 min
Nov	Seminar Hobart	Re-focussing forest research in a changing environment D de Little	30	SM	50 min
Nov	Seminar Zhanjiang, China	Advances in eucalypt seed production B Potts	12	GI	60 min
Nov	Seminar Zhanjiang, China	Exploitation of base populations of *Eucalyptus* B Potts	12	GI	120 min
Nov	Seminar Guangxi, China	Advances in eucalypt seed production B Potts	8	GI	60 min
Nov	Presentation Port Huon	Genetic pollution – the risk of gene flow from plantations into natural forest communities R Vaillancourt, B Potts	20	GI	30 min
Nov	Seminar Hobart	Analysing repeated measures data from field trials: a demonstration of statistical methods S Candy	30	RP	60 min
Nov	Presentation Melbourne	STBA communication strategy – a draft for discussion G Dutkowski	20	ETT	20 min
Nov	Presentation Port Huon	Development of a bioassay to test for *Mycosphaerella* resistance A Milgate, R Vaillancourt, B Potts, Z Yuan, M Battaglia, C Mohammed	20	GI	30 min
Nov	Seminar Hobart	The most efficient way to get a root in Tasmania S Resh, D Worledge, M Battaglia	30	SM	30 min
Nov	Seminar Hobart	Greenhouse and forestry: the credibility of carbon credits B Greaves	30	GI	50 min
Nov	Seminar Hobart	Root distribution of *E. nitens* and *E. globulus* in irrigated and droughted soil D Worledge	30	SM	25 min

Date	Function	Topic	Reach	Pgm	Time (days)
Nov	Seminar Hobart	Growth and yield predictions for F_1 clones of Slash x Caribaea Pines D Rockwood	20	GI / SM	50 min
Nov	Seminar Gympie	Report on trip to USA and South Africa H Dungey	30	GI	60 min
Nov	Beyond the Black Stump	No 20 NMR spectroscopy: a new technique for determining the quality of soil organic matter (SOM) N Mathers	100	SM	
Nov	Hot off the Seed Bed	No 26 Hybrid breeding and genetics symposium. Post-symposium summary H Dungey	50	GI	
Nov	Hot off the Seed Bed	No 27 A genetic linkage map for *E. globulus* with candidate gene loci for wood and fibre traits K Thamarus, K Groom, J Murrell, G Moran	50	GI	
Dec	CRC-SPF Technical Report	No 53 Seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle D Close, I Bail, C Beadle, Q Clasen		SM	
Dec	CRC-SPF Technical Report	No 54 Growth and yield predictions for Queensland produced F_1 clones of Slash x Honduras Caribbean pines D Rockwood		SM	
Dec	Seminar Hobart	Enhancing productivity of eucalypt plantations through improved silviculture – the Kerala experience K Sankaran	15	SM	60 min
Dec	Seminar Hobart	The effect of managed flow rates from the Gordon River power scheme on riparian vegetation in the Gordon River N Davidson, A Gibbons	50	SM	60 min
Dec	Seminar Hobart	Scale and error propogation in GIS and environmental modelling D Mummery	25	SM	30 min
Dec	Seminar Haikou, China	Exploitation of base populations of *Eucalyptus* B Potts	25	GI	60 min
Dec	Presentation Hobart	CRC-SPF publications data base G Dutkowski	20	ETT	30 min
Dec	Presentation Melbourne	Development of breeding objectives for *P. radiata* – a preliminary investigation P Chambers	15	GI	50 min
Dec	Hot off the Seed Bed	No 28 Comparison of genetic parameters estimated using an infinitesimal and finite locus model in two subtropical pines and their inter-specific hybrid H Dungey, R Kerr, M Dieters	50	GI	
Dec	Hot off the Seed Bed	No 29 What are the pollinators of *E. globulus* and *E. nitens*? A Hingston, P McQuillan, B Potts	50	GI	
2001					
2001	Sponsorship	2001 Tasmanian Community Landcare Conference 'Landcare: celebrating our volunteers' ($1 000)			
Jan	Presentation Japan	Diversity of plant genomes revealed by analysis of gene sequences and microsatellites R Henry	150	GI	40 min
Jan	Tutorial Hobart	CRC-SPF publications data base G Dutkowski	11	ETT	60 min
Jan	Hot off the Seed Bed	No 30 Molecular evidence for hybridisation between eucalypt subgenera R Stokoe, M Shephers, D Lee, R Henry, D Nikles	50	GI	

Date	Function	Topic	Reach	Pgm	Time (days)
Jan	Hot off the Seed Bed	No 31 Canopy position can have a marked effect on outcrossing rate B Patterson, R Vaillancourt, B Potts	50	GI	
Jan	CRC-SPF Technical Report	No 29 3PGpjs – a user friendly interface to 3PG, the Landsberg and Waring model of forest productivity P Sands		SM	
	CRC-SPF Technical Report	No 37 *E. globulus* diallel trials and *E. globulus* F_2 *Mycosphaerella* trials P Tilyard, G Lopez, B Potts, R Vaillancourt		GI	
Jan	CRC-SPF Technical Report	No 47 Genetic mapping in *P. elliottii* var *elliottii* and *P. caribaea* var *hondurensis* using AFLP and microsatellite markers M Shepherd, M Cross, M Dieters, C Williams, R Henry		GI	
Jan	CRC-SPF Technical Report	No 51 How tree form changes with spacing and why: implications for farm foresters F Henskens, M Battaglia, M Cherry, C Beadle		SM	
Feb	CRC-SPF Technical Report	No 50 Silvicultural options for plantation-grown *Acacia melanoxylon*: form pruning and nurse-crop thinning J Medhurst, D Worledge		SM	
Feb	CRC-SPF Technical Report	No 55 Factors driving site selection and productivity modelling systems – an overview C Beadle *Pinus* plantations on the coastal lowlands of south-east Queensland I Last Small-scale farm forestry A Lyons Spatial extrapolation of models into the landscape. Pathology in modelling for site selection D Mummery Coping with factors at the margin of our control C Shedley Soil and canopy area as indicators of productivity P Smethurst The effects of weather patterns on risk T Smith Productivity models – a comparative analysis P Sands		SM	
Feb	CRC-SPF Technical Report	No 57 Multi-model analysis of *E. nitens* and *E. globulus* plantation growth M Battaglia		SM	
Feb	Presentation Hobart	Managing browsing damage in eucalypt plantations – alternatives to 1080? Field Naturalists Association. C McArthur	50	ETT	60 min
Feb	Seminar Canberra	Life history, host utilisation and population management issues concerning autumn gum moth in Australian pulpwood plantations M Steinbauer	20	RP	30 min
Feb	Presentation Hobart	Managing browsing damage in eucalypt plantations – alternatives to 1080? C McArthur	40	RP	50 min
Feb	Seminar Hobart	Self-incompatibility in *E. globulus* and *E. nitens* L Pound	40	GI	30 min
Feb	Seminar Hobart	Growth and respiration of *E. globulus* Labill C McFarlane	10	SM	60 min
Feb	Seminar Hobart	Modelling effects of selected forest management practices (clearfelling, slash burning) on soil chemical processes B Ludwig		SM	30 min

Date	Function	Topic	Reach	Pgm	Time (days)
Feb	Seminar Hamilton	Working towards seedling specifications for *E. globulus* planted in Mediterranean environments, including south-west WA and the Green Triangle D Close	14	SM	60 min
Feb	Short course Hobart	Breeding objective definition and breeding value prediction L Apiolaza, G Dutkowski, C Raymond, B Greaves, T McRae	27	GI	3 days
Feb	Seminar Hobart	Landscape and productivity modelling for plantation site selection D Mummery	50	SM	40 min
Feb	Beyond the Black Stump	No 21 Yellow, potassium-deficient pines P Smethurst, A Lyons, K Churchill	100	SM	
Feb	Hot off the Seed Bed	No 32 *E. globulus* race classification confirmed and extended G Dutkowski	50	GI	
Feb	Hot off the Seed Bed	No 33 Easy monitoring of outcrossing rates and seed orchards R Vaillancourt, B Patterson, B Potts	50	GI	
Mar	Seminar Melbourne	Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle D Close	10	SM	60 min
Mar	Presentation Hobart	Extracting DNA from wheatgerm, for Fahan School 'Women in Science Week' D Steane	50	ETT	120 min
Mar	Field day and workshop Lilydale	Monitoring browsing damage in plantations at Hollybank Forestry Centre	30	ETT	
Mar	Field day	Hoop pine CRC-SPF, QFRI	35		1 day
Mar		Workshop and field day Fertiliser review CRC-SPF			
Mar	Seminar Hobart	Quantitative trait loci for wood and fibre properties in *E. globulus* K Thamarus	25	GI	60 min
Mar	Presentation Hobart	Riparian vegetation N Davidson, A Gibbons	50	SM	
Mar	Presentation Hobart / Florentine Valley	Nutrient supply and demand incorporating results from fertiliser experiments into productivity models P Sands, M Battaglia	15	SM	20 min
Mar	Presentation Hobart	Extracting DNA from wheatgerm D Steane	50	GI / ETT	30 mins
Mar	Hot off the Seed Bed	No 34 A comparison of native stand and land race localities of *E. globulus* grown in Argentina G Lopez, B Potts, G Dutkowski	50	GI	
April	CRC-SPF Technical Report	No 49 Genetic parameters for cold hardiness in *E. nitens* (Deane & Maiden) Maiden W Tibbits, G Hodge		GI	
April	CRC-SPF Technical Report	No 62 Molecular genetics and biotechnology awareness forum R Haines, B Potts, R Henry, M Carson, S Carson, M Shepherd, G Dale, M Jones, R Stokoe, R Mellick		GI	
April	Workshop Hobart	Research on managing browsing damage C McArthur	30	ETT	60 min
April	Poster Melbourne	Natural plant resistance to mammalian browsing: can we breed for it? Australian vertebrates pest conference J O'Reilly, C McArthur, B Potts	250	GI / RP	60 min
April	Forum Brisbane	Molecular genetics and biotechnology awareness, for DPI(Qld) forestry and CRC-SPF partners			

Date	Function	Topic	Reach	Pgm	Time (days)
April	Workshop Chile	Reproductive biology of *Eucalyptus* and applications to genetic improvement B Potts	20	GI	90 min
April	Seminar Hobart	Ladybirds and biological control A Dixon	70	RP	60 min
April	Seminar Hobart	Forest productivity research at the Institute for Commercial Forest Research, South Africa L Esprey	20	SM	40 min
April	Presentation Hobart	Research on managing browsing damage. Browsing animal control workshop C McArthur	30	RP	60 min
April	Presentation Hobart	Key research for eucalypt plantations N Borralho	30	GI	70 min
April	Seminar Hobart	RAIZ breeding program N Borralho	20	GI	80 min
April	Beyond the Black Stump	No 22 Physical frost damage vs photo damage of seedlings D Close, G Holz, C Beadle	100	SM	
April	Hot off the Seed Bed	No 35 Microsatellites reveal high but variable outcrossing rates in a *E. nitens* seed orchard C Grosser, R Vaillancourt, B Potts	50	GI	
April	Pest Off	No 5 Two simple indices to compare palatabilities of leaves of plantation species to insect defoliators M Steinbauer	50	RP	
May	Presentation Ridgley	Investigation into defense mechanisms of *E. globulus* to autumn gum moth using clonally replicated F_2 families T Jones, B Potts, R Vaillancourt, N Davies	20	GI	60 min
May	Seminar Ridgley	Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle D Close	12	SM	60 min
May	Seminar Perth, Tas	Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle D Close	14	SM	60 min
May	Seminar Hobart	Working towards seedling specifications for *E. globulus* planted in mediterranean environments, including south-west WA and the Green Triangle D Close	20	SM	45 min
May	Seminar Hobart	Introductory PhD seminar P Rojas Vergara	50	GI	30 min
May	Seminar Canberra	Forests full of choices: each one could be your offspring's last! M Steinbauer	20	RP	60 min
May	Workshop Gympie	Wound response and the role and properties of the reaction zone in *E. nitens* K Barry	40	RP	20 min
May	Workshop Gympie	Stem defect following pruning in would defence in temperate eucalypts C Mohammed	40	RP	20 min
May	Workshop Gympie	Expression of kino: its role in wound defence? A Eyles	40	RP	20 min
May	Presentation Hobart	Sustainable management in plantation forestry (soil nutrition, molecular biology and mammalian browsing) N Davidson	245	SM	2 days
May	Presentation Hobart	Tasmanian eucalypt display and quiz N Davidson	245	ETT	2 days

Date	Function	Topic	Reach	Pgm	Time (days)
May	Seminar Hobart	Application of marker-aided selection (MAS) in forest trees S Carson		GI	60 min
May	Field day Carrick	Display of 29 Tasmanian eucalypts at Agfest N Davidson	480	ETT	
May	Seminar Hobart	Pest resistant *Eucalyptus* trees in agroforestry M Matsuki	30	RP	60 min
May	Display Carrick	All insects are not pests? G Allen	80	ETT	3 days
May	Presentation Jiangxi, China	Sustainable forest management research P Smethurst	30	SM	15 min
May	Presentation Jiangxi, China	Research into indicators of soil fertility P Smethurst	30	SM	30 min
May	Presentation Jiangxi, China	Application of molecular genetics in forestry: the case of *E. globulus* R Vaillancourt	30	GI	50 min
May	Presentation Jiangxi, China	Quantitative genetic methods for tree breeding G Dutkowski	30	GI	50 min
May	Presentation Jiangxi, China	Introduction to CRC-SPF B Potts	30	GI	15 min
May	Presentation Jiangxi, China	Advances in eucalypt seed production systems B Potts	30	GI	50 min
May	Presentation Fujian, China	Application of molecular genetics in forestry: the case of *E. globulus* R Vaillancourt	15	GI	60 min
May	Presentation Fujian, China	The plantation management cycle in Australia and sustainable forest management research P Smethurst	15	SM	90 min
May	Presentation Fujian, China	Advances in eucalypt seed production systems B Potts	15	GI	60 min
May	Presentation Fujian, China	Introduction to the CRC-SPF B Potts	15	GI	15 min
May	Presentation Fujian, China	Tree breeding for maximum gain G Dutkowski	15	GI	80 min
May	Presentation Fujian, China	The plantation management cycle in Australia P Smethurst	50	SM	90 min
May	Presentation Fujian, China	Advances in eucalypt seed production B Potts	50	GI	60 min
May	Presentation Fujian, China	Introduction to the CRC-SPF R Vaillancourt	50	GI	15 min
May	Presenation Fujian, China	Introduction to breeding G Dutkowski	50	GI	60 min
May	Seminar Hobart	Vindicators of indicators: old trees as surrogate measures of saproxylic beetle biodiversity S Grove	25	RP	50 min
May	Seminar Hobart	Growth stress and its role in processing eucalypts for solid wood products G Waugh, J Yang	20	SM	60 min
May	Presentation Hobart	What does a plant scientist do? D Steane	18	GI / ETT	50 min
May	Hot off the Seed Bed	No 36 Genetic variation in the lignotuber development of *E. globulus* seedlings C Kelly, B Potts	50	GI	
June	CRC-SPF Technical Report	No 56 High throughput DNA extraction for forest species M Cross, R Stokoe, L Scott, M Jones, M Shepherd		GI	

Date	Function	Topic	Reach	Pgm	Time (days)
June	CRC-SPF Technical Report	No 58 Review of Decision Support Systems relevant to plantation forestry in Queensland K Catchpoole, S Papps SM			
June	CRC-SPF Technical Report	No 59 Current status and future needs of Decision Support Tools in Queensland forestry K Catchpoole, E Keady, K Harding, M Nester		SM	
June	Presentation Ridgley	Resistance of *E. globulus* to autumn gum moth L Rapley, G Allen, B Potts	20	RP	30 min
June	Presentation France	Genomics of *Eucalyptus* wood traits G Moran, K Thamarus, C Raymond, Q Deyou, T Uren, S Southerton	240	GI	30 min
June	Keynote address France	Genetics of *Eucalyptus* wood properties C Raymond	270	GI	45 min
June	Presentation Ridgley	Host preference and selection by autumn gum moth: why avoid some trees and not others M Steinbauer	20	RP	60 min
June	Seminar and laboratory	Discussion on entomology G Allen	50	ETT	60 min
June	Presentation Launceston	Research presentation G Allen	100	ETT	15 min
June	Seminar Launceston	All insects are not pests? at TIAR Presentation Day G Allen	100	ETT	
June	Seminar Hobart	Introductory PhD seminar R Barbour	50	GI	30 min
June	Seminar Tasmania	Plantation establishment to combat rural tree decline in the midlands N Davidson, D Close	8	SM	45 min
June	Presentation USA	Transpecific microsattelites in pines M Shepherd	40	GI	30 min
June	Seminar Creswick	Anatomy and chemistry of wound tissue in *E. globulus* and *E. nitens* A Eyles	12	RP	40 min
June	Workshop Hobart	How do I get my publications into the Annual Report? G Dutkowski, T Bildstein	5	ETT	90 min
June	Seminar Hobart	Diseases of eucalypts and acacias in south-east Asia K Old	18	RP	90 min
June	Seminar Hobart	Development of a silvicultural decision support system for exotic pine plantations K Catchpoole	20	SM	50 min
June	Hot off the Seed Bed	No 57 Maternal effects in the seed orchard appear to have little implact on the quality of *E. globulus* seed M Watson, D Williams, B Potts, M Krygsman	50	GI	
	Presentation Perth WA	Screening selections of *E. globulus* for self-incompatibility, pollen viability and genetic load B Potts, P Gore, D Pilbeam	30	GI	30 min
			Total 7 390		

Grants and Awards

Genetic Improvement Program

Grant/Award	Awarded for	Duration	Recipient	Amount $
ARC Large Equipment Grant	Establishing a centralised genetics facility within the Central Science Laboratory	1 year	Prof J Reid Prof T McMeekin Prof M Clark Dr M Sale Dr B Potts Dr J Bowman Dr J Vickers	390 000
Chinese State Foreign Expert Bureau	Invited visit to China (funded by Chinese Government)	21 days	Dr B Potts	Fully funded
Australia-China Agricultural Cooperation Agreement	Invited visit to China	12 days	Dr B Potts Dr R Vaillancourt G Dutkowski Dr P Smethurst	Fully funded
SPIRT / ARC	Alternative breeding and deployment objectives for *E. globulus*	3 years	G Dutkowski Dr P Chambers Dr T McRae C Raymond Dr L Apiolaza Dr B Greaves	223 112
Strategic Initiatives Fund (CRC-SPF)	MAXDEPLOY – a software tool for evaluating multi-stage multi-trait assessment strategies in the selection of deployment populations	1 year	Dr B Greaves Dr L Apiolaza	9 250
STBA	Estimation of additive and non-additive effects for volume and wood density in STBA full sib family trials, and their effect on gains from MSP/OP seed production	1 year	Dr L Apiolaza P Gore	2 000
Strategic Initiatives Fund (CRC-SPF)	Sequencing the chloroplast genome of *E. globulus*	1 year	Dr R Vaillancourt Dr D Steane Dr B Potts Prof J Reid	55 000

Sustainable Management Program

Strategic Initiatives Fund (CRC-SPF)	Soil fertility assessment: survey and training using a quick-test meter	1 year	Dr P Smethurst	12 600
Strategic Initiatives Fund (CRC-SPF)	Convenient methods of estimating LAI in eucalypts and pines	1 year	Dr P Smethurst	10 000
Natural Heritage Trust	Prescription for site selection and plantations establishment to combat tree decline	2 years	Dr N Davidson	95 350
Australian Academy of Science	Science at the Shine Dome	2 weeks	D Close	1 500
Strategic Initiatives Fund (CRC-SPF)	Seedling specifications	1 year	D Close	9 583

Natural Heritage Trust	Choosing native hardwoods for commercial plantations in farm systems	3 years	Dr K Williams (DNR-FERA) P Ryan (QFRI)	330 000
Joint Venture Agroforestry	Estimating the productivity of forest systems in south-east Queensland	2.5 years	Dr K Williams (DNR-FERA) P Ryan (QFRI)	197 421
RIRDC	Silvicultural decision support for farm forestry	2.5 years	Dr M Battaglia	200 953
RIRDC	Seed and information support for farm forestry	3 years	Dr T Booth (CSIRO FFP)	34 200

Resource Protection Program

Maxwell Ralph Jacobs Travel Grant	Sampling populations of *C. agricola* from mainland Australia for host range, distribution and genetic variation between sites and states	1 year	H Nahrung	1 221
Browsing Damage Management Group	Understanding how herbivores use the forestry environment	1 year	Dr C McArthur K le Mar	8 060
Strategic Initiatives Fund (CRC-SPF)	Determining effects of environment on *E. nitens* leaf chemistry and resistance to mammal browsing	1 year	Dr C McArthur D Close Dr C Beadle A Walsh	20 787
FT	Determining effects of environment on *E. nitens* leaf chemistry and resistance to mammal browsing	1 year	Dr C McArthur D Close Dr C Beadle A Walsh	2 000
Australian Academy of Science	Scientific visit to Canada to study Hemlock Looper behaviour and pheromone technologies at the Pacific Forestry Centre, British Columbia	6 weeks	Dr M Steinbauer	7 850
Australian Academy of Science Young Researchers Award	Attendance at the Forum for European-Australian Science and Technology (FEAST) cooperation (see www.france.net.au/feast)	2 days	Dr M Steinbauer	600
Strategic Initiatives Fund (CRC-SPF)	Validation of attraction of sex pheromone of *M. privata*	1 year	Dr M Steinbauer	7 000
Overseas Travel Award (CSIRO)	Presentation of seminar at 'Symposium on insect-plant relationships', Denmark	9 days	Dr M Steinbauer	1 500

Consultancies

Organisation	Subject	Duration	Recipients	Amount $
STBA	*E. globulus* Exeter base population density assessment	7 weeks	G Dutkowski A MacDonald	22 000
STBA	Prediction of selection criterion and breeding objective trait breeding values for trials of the O'Connor and CFTT *E. globulus* collection	3 days	G Dutkowski	4 000
APP	Statistical analyses and reports	4 days	Dr P Smethurst	3 042
PFT	Dry demo site analysis	4 days	Dr P Smethurst	3 000
Various	Chemical analyses	12 days	Dr P Smethurst	9 000
Hydro Tasmania	Assessment of riparian vegetation on the Gordon River, as part of the 'Basslink Integrated Impact Assessment: Potential effects of changes to hydro power generation'	22 days	Dr N Davidson A Gibbons	32 670
PFT	Develop and implement *E. nitens* version of PROMOD for Farm Forestry Toolbox version 3	5 days	Dr M Battaglia Dr P Sands	5 000
APT	Application of models	3 days	Dr M Battaglia Dr P Sands	3 000
APT	Recommendation on site assessment methods	1 day	Dr M Battaglia Dr P Sands	1 500
NCE	Application of models	5 days	Dr M Battaglia Dr P Sands	6 000
URS	Model checking	2 days	Dr M Battaglia Dr P Sands	1 200
Lower Murray Water	Surveillance of and recommendations for leaf-eating insect management issues at Koorlong	1 year	Dr R Floyd	16 100
FT	Taxonomic identification of wasps from Warra	2 months	Dr M Short	200

CRC-SPF scientists Dr Philip Smethurst, Greg Dutkowski, Dr René Vaillancourt and Dr Brad Potts with staff and students of the Forest Genetics Department at Nanjing Forestry University, China. A CRC-SPF mission to China was requested and funded by Agriculture, Fisheries and Forestry Australia under their Australia-China Agricultural Cooperation Agreement.

Performance Indicators

Cooperative arrangements

- *Level of participation of contributors in major decisions concerning the research direction of the Centre*

Most CRC research is conducted using company trials, or trials established on company land, so companies are involved at the outset with the planning and implementation of research projects and have ownership of them. Research plans for these experiments are lodged with the companies, and these include an agreed protocol for the research. The company partners allocate staff time (in-kind contributions) to CRC research projects so effective interaction can occur. The Program Coordinating Committees (PCCs) of the CRC retain an overview of these research projects. They prioritise research and set 'deliverables' (research outcomes that can be directly used by industry). The PCCs are chaired by industry representatives and consist largely of the partners' staff to ensure that they are involved in deciding what research is undertaken.

- *Level of interchange of personnel among different sites and participating institutions*

Documented visits to individual CRC partners and between nodes of the CRC (Hobart, Canberra, Brisbane, Gympie) totalled 508 person-days for 2000/01.

- *Proportion of joint publications with other research groups*

In the publications list, 116 of the 252 publications (103 refereed + 132 unrefereed + 17 theses) were written with other research groups.

- *Number and duration of stay of visitors to the Centre from Australia and overseas*

There were a large number of visitors to the CRC and to CRC-arranged seminars. Those who stayed for longer periods and had a particular influence on CRC activities were:

Dr Sue Carson (private consultant, previously senior scientist with FRI in New Zealand) visited for six weeks, March–April 2001.

Dr Mike Carson (private consultant, previously senior scientist with FRI in New Zealand) visited for six weeks, March–April 2001.

Dr Kenneth Lundkvist (Department of Forest Genetics, Swedish University of Agricultural Sciences, Uppsala, Sweden) visited from 1 October–3 November 2000.

Assoc Prof Deping Li (Institute of Soil Science, Chinese Academy of Sciences, Nanjing, China) visited QFRI from 28 June–24 December 2000.

Prof Don Rockwood (School of Forest Resources and Conservation, University of Florida, Gainesville, Florida, USA) visited QFRI for four months from 21 August–21 December 2000.

Dr Bernard Ludwig (Institute of Soil Science and Forest Nutrition, University of Göttingen, Germany) visited for five days from 12 February–16 February 2001.

Dr David Lindenmayer (Research School of Biological Sciences, Australian National University) visited for five days in July 2000.

Prof Tony Dixon (School of Biological Sciences, University of East Anglia, UK) visited for two days in November 2000.

Brendan Murphy (University of Canterbury, NZ) visited for four months (July–October 2000).

- *The degree of interaction among scientific staff at dispersed locations on core activities of the research program, included:*
  - *the economic importance and genetic control of growth, stem characteristics and wood properties at the quantitative and molecular levels*

The genetics program is structured to ensure close interaction between projects both within and across nodes of the CRC. The quantitative and molecular genetics projects are paired to ensure synergies between these different fields. For example, the northern node projects A6 and A7 closely interact on work on tropical hybrid pines, A1 and A4 work closely together on the molecular genetics of temperate eucalypts, and A3 and A5 interact in studying the genetic control and mapping of wood property genes in *Eucalyptus globulus*. The breeding strategies project A2 integrates research in the other temperate projects for strategy development. There is also regular interaction between the various groups working in the same field across different nodes. They are linked by common technologies, and technological advances made in one project are usually directly relevant to the other projects. For example, the quantitative genetics projects interact on the application of genetic models and use of specialised programs (e.g. ASREML) for estimating genetic parameters and breeding values. Project A2 works with scientists from QFRI, GL, STBA, CSIRO and FT on the use of ASREML software for the analysis of their data, and ran a workshop which was well attended by industrial partners on breeding objective definition and breeding value calculation. The molecular genetics research groups in Hobart, Canberra and Lismore have regular phone link-ups to update each other on research and to discuss common problems and techniques. Project A1 links with projects A6 and A7 on problems associated

with eucalypt genetics and hybridisation, which are common to temperate and sub-tropical eucalypts. Project A1 is conducting research projects on the genetics of *E. globulus* across Australia in southern Tasmania (UT and NS) and northern Tasmania (GL), in Western Australia (WACAP and STBA), and in Victoria (APP). Project A2 has been working closely with STBA on the development of data management and analysis systems, as well as breeding and analysis strategies.

Project A5 has strong links with CSIRO scientists in Melbourne in research on Silviscan, cellulose content analysis and Near Infrared Reflectance Analysis, as well as with project A3 in Canberra. There are also strong links with FT and GFP with joint projects, and Peter Kube from FT is undertaking PhD studies with the Centre.

There is a strong link between projects A6 and A7 with frequent inter-site visits and meetings involving both research groups, such as the Biotechnology forum. Several projects involve collaboration between Genetic Improvement Program (GI) projects A1 and A3 and the Sustainable Management Program (SM), and there is increasing linkage between GI, SM and the Resource Protection Program (RP) on the genetics of pest and disease resistance.

- *effective mating, selection and deployment strategies in tree improvement programs*

Project A2 provides research results from the southern node projects for the breeding and deployment strategies of industry. It has strong links with most industrial partners and is closely integrated with STBA's *Eucalyptus* Breeding Program (enhanced by the co-location of STBA's Eucalypt Deployment Program Manager, Peter Gore, on the University of Tasmania campus). Greg Dutkowski is on the STBA Board, Technical Committee, and Quantitative Genetics, Data Management and Research subcommittees, as well as being involved in strategy reviews for the major STBA breeding programs. Six presentations were made to, or on behalf of, STBA by CRC staff. Project A1 interacts closely with STBA and its members in providing research to back new seed production systems being developed for *E. globulus*. It also collaborates with STBA on research into self-incompatibility and flowering time in arboreta and seed orchards across Australia.

- *pruning and thinning*

Dr Chris Beadle (CSIRO) and Andy Warner (PFT) organised a workshop to consider advances in blackwood silviculture in native forest, plantation and farm forestry contexts.

- *the dynamics and cycling of organic matter and nitrogen in soils in response to silvicultural treatments*

Close interaction continued between projects B1 and B2 concerning organic matter and nutrient cycling. In addition, two new activities were commenced: (i) the addition of Qeeensland soils in the base cation research of Dr Andrew Mitchell, and (ii) SIF funded collaboration between these two projects to investigate foliar C, N and water use by *E. nitens*. Improved guidelines for N management in eucalypt plantations in Tasmania, based on outcomes from Martin Moroni's PhD thesis, led to a fertiliser workshop in Hobart that reviewed the CRC's work in eucalypt plantations nationally.

- *key issues which affect landowners' decision-making*

Dr Digby Race (ANU) and other members of the B3 Farm Forestry project are organising a conference on Forestry Extension to be held in Victoria in November 2002. The CRC-SPF is one of the sponsors of this meeting.

- *prediction of productivity in response to environmental factors and management inputs*

In association with PFT and FT, the CRC has now developed version 3 of the Farm Forestry Toolbox CD. This incorporates a version of PROMOD for *E. nitens*. A dynamic version of PROMOD being developed has been used to examine the consequences on stand productivity of drought or fertilisers during a rotation.

- *investigation of pathogens of forest insect pests*

This research in Tasmania has essentially concluded following the retirement of Dr John Madden (now honorary CRC Fellow). Industry was satisfied with the progress that had been made and was keen for other areas to be pursued.

- *studies of the ecology and behaviour of insect herbivores in temperate Australia*

Dr Martin Steinbauer in Canberra has been collaborating with Dr Jane Elek at FT on facilitating the registration of Mimic for control of autumn gum moth. He is also establishing a major research project with Dr Geoff Allen in Hobart, developing pheromone traps for the monitoring and potential control of autumn gum moth.

Luke Rapley, Dr Geoff Allen and Dr Brad Potts (GI) in Hobart are working with Dr Martin Steinbauer in

Canberra on the chemical ecology of autumn gum moth in relation to tree defoliation.

Dr Mamoru Matsuki in Hobart is assisting APP in Victoria on various insect pest problems.

Dr Andrew Loch and John Matthiessen in Western Australia, and Dr Rob Floyd in Canberra, are collaborating with APT, WACAP and TC on insect pests in WA.

- *impact of insect pests at plantation establishment*

John Matthiessen (Western Australia) is collaborating with APT, WACAP, TC, and Dr David de Little of GFP (Tasmania) on insect pests of plantations at establishment.

Hilton Redgrove and Dr Geoff Allen are collaborating with Dr David de Little (GFP) and Dr Jane Elek (FT) on the biology of the establishment pests *Herteronyx crinitus* and *H. dimidiata*.

- *genetic and chemical basis of eucalypt resistance to browsing*

Dr Clare McArthur in Hobart is collaborating with Dr James Bulinski (TC) in Western Australia on describing and predicting browsing damage; with Andrew Walsh (FT) on nursery effects on browsing resistance; and with Richard Appleton and Anne Partridge (APP) on inter-provenance variation in browsing resistance of *E. nitens*, and effect of stem diameter on damage by rabbits.

Research and researchers

- *Papers in refereed journals*

In 2000/01 the Centre produced 103 publications in refereed journals, 132 unrefereed publications and 17 theses.

- *Book chapters covering the results of the Centre's research*

De Barro P, Floyd RB (2000). Biological control of *Essigella californica* (Hemiptera: Aphididae: Lachninae: Cinarini). In 'A review of the current status of the Monterey Pine Aphid *Essigella californica* (Essig.) in Australia'. (Eds NG Collett, J Simpson, C Schoenborn) pp. 68–75. (Centre for Forest Tree Technology: Melbourne, Victoria)

Fulton A, Clark R, Dargusch P, Tabart T (2001). Decision making in the farm family business: implications for the adoption of farm forestry. In 'Socio-economic research to support successful farm forestry'. (Ed D Race) pp. 79–80. (RIRDC: Canberra, ACT)

Jennings SM, Matysek AL (2001). Modelling non-industrial private forest timber supply: an economic approach. In 'Socio-economic research to support successful farm forestry'. (Ed D Race) pp. 66–75. (RIRDC: Canberra, ACT)

Potts BM, Pederick LA (2000). Morphology, phylogeny, origin, distribution and genetic diversity of the eucalypts. In 'Diseases and Pathogens of Eucalypts'. (Eds PJ Keane, GA Kile, FD Podger, BN Brown) pp. 11–34. (CSIRO Publishing: Collingwood, Victoria)

Race D (2001). Strategies for improving landholders' response to farm forestry development. In 'Socio-economic research to support successful farm forestry'. (Ed D Race) pp. 40–52. (RIRDC: Canberra, ACT)

Schirmer J (2001). It's not easy being green: perceptions of the 2020 Vision for plantation forestry in Australia. In 'Socio-economic research to support successful farm forestry'. (Ed D Race) pp. 22–39. (RIRDC: Canberra, ACT)

Simpson JA, Xu ZH, Smith T, Keay P, Osborne DO, Podberseck M (2000). Effect of site management in pine plantations on the coastal lowlands of subtropical Queensland, Australia. In 'Site Management and Productivity in Tropical Plantation Forests'. (Eds EKS Nambiar, A Tiark, C Cossalter, J Ranger) pp. 73–81. (Center for International Forestry Research: Bogor, Indonesia)

Tabart T, Fulton A, Clark R (2001). Farm forestry and regional development: communities making collaborative decisions. In 'Socio-economic research to support successful farm forestry'. (Ed D Race) pp. 53–65. (RIRDC: Canberra, ACT)

White DA, Beadle CL, Battaglia M, Benyon RG, Dunin FX, Medhurst JL (2001). Management of water use by tree crops: a physiological basis. In 'Plantations, Farm Forestry and Water'. (Eds EKS Nambiar, AG Brown) (Department of Primary Industry and Energy: Canberra, ACT)

- *Invitations to present keynote addresses and papers at conferences*

There were 13 invited presentations in 2000/01:

Genetic Improvement

Dr Brad Potts was invited to visit China to present an outline of current genetic research in Australia. The visit was funded by the Chinese Government through the Chinese State Foreign Expert Bureau (16 November–6 December 2000).

Dr Brad Potts, Dr René Vaillancourt, Greg Dutkowski and Dr Philip Smethurst were invited to visit China, to present an outline of their respective research areas. The visit was funded by the Chinese Government through the Agricultural Cooperation Agreement (25 May–6 June 2001).

Henry RJ (2000). Diversity of plant genomes revealed by analysis of gene sequences and microsatellites. Invited presentation at 'Integration of Biodiversity and Genome Technology for Crop Improvement' 27 November– 1 December, for National Institute of Agrobiological Resources. Tsukuba, Ibaraki Japan.

Jones T, Potts B, Vaillancourt R, Davies N (2001). Investigation into defense mechanisms of *Eucalyptus globulus* to AGM using clonally replicated F_2 families. Invited presentation by Luke Rapley at 'CRC-SPF workshop on "Autumn gum moth - host preference, selection and resistance"' 5–6 June, for CRC-SPF partners. Gunns Limited North-West Centre, Ridgley, Tasmania.

Potts BM (2000). Reproductive biology of *Eucalyptus* and applications to genetic improvement. Invited talk at the Symposium on 'Tecnologias emergentes en polinization controlada de *Eucalyptus* para la generacion de hibridos F_1' 22–23 August 2000. Bioforest SA, Concepcion, Chile.

Raymond C (2001). Genetics of *Eucalyptus* wood properties. Key note address at 'International Conference on "Wood, breeding and biotechnology and industrial expectations"' 11–14 June. Bordeaux, France.

Shepherd M (2001). Transpecific microsatellites in pines. Invited presentation 'Conifer microsatellite workshop' 4–7 June. Institute of Plant Genomics, Texas A&M University. Texas, USA.

Vaillancourt RE, Potts BM (2000). Genetic pollution – the risk of gene flow from plantations into natural forest communities. Invited presentation at 'RWG7 Workshop on "Breeding for resistance to pathogens and pests"' for RWG7 Forest Health, 16 November. Port Huon, Tasmania.

Sustainable Management

Battaglia M (2001). Stand age effects on productivity in forests: representations in models and influence on net ecosystem exchange. Invited presentation at 'Workshop on "Modelling net ecosystem carbon exchange for the Australian continent"' 18–20 April. Canberra, ACT.

Beadle CL (2001). Phenology and reproduction. Invited presentation at 'Workshop on "Modelling net ecosystem carbon exchange for the Australian continent"' 18–20 April 2001. Canberra, ACT.

Sands P (2000). Description of 3PG-pjs. Invited presentation at 'Workshop on "Model calibration and predictive analysis using PEST"' 25–27 July, Department of Natural Resources. Brisbane, Qld.

Sands P (2000). Description of 3PG-pjs. Invited presentation at 'Workshop on 'Model calibration and predictive analysis using PEST"' 25–27 July, Department of Natural Resources. Brisbane, Qld.

Resource Protection

McArthur C (2001). Research on managing browsing damage. Invited presentation at 'Workshop on "Browsing animal control"' 5 April. Hobart, Tasmania.
McArthur C (2001). Managing browsing damage in eucalypt plantations - alternatives to 1080? Invited presentation to Tasmanian Field Naturalists Association, 1 February. Hobart, Tasmania.

Rapley L, Allen G, Potts B (2001). Resistance of *Eucalyptus globulus* to autumn gum moth (AGM). Invited presentation at 'CRC-SPF workshop on "Autumn gum moth - host preference, selection and resistance"' 5–6 June, Gunns Limited North-West Centre. Ridgley, Tasmania.

- *Number and value of competitive grants awarded*

Seven nationally competitive grants were awarded to CRC staff during the last financial year, totalling $1 471 036.

- *Honours and awards*

Six awards were presented to staff and students of the CRC (see Grants and Awards).

Dr Martin Steinbauer received the Young Reseachers Award from the Australian Academy of Science, $600.

Dr Martin Steinbauer received support to conduct a Scientific Visit to Canada from the Australian Academy of Science, $7 850.

Dugald Close was awarded $1 500 by the Australian Academy of Science.

Helen Nahrung was awarded the Maxwell Ralph Jacobs Travel Grant, $1 221.

Fiona Poke received the J Malcom Gillies Honours Scholarship of $1 500.

Susan Foster received the HN Barber Honours Scholarship of $1 000.

Education and training

- *Time spent by researchers on research training*

We have 74 postgraduate and Honours students affiliated with the CRC. It is recognised that each student takes 5–10% of a researcher's time to supervise. This is equivalent to 3.7–7.4 person-years on research training.

- *Number of postgraduate students working in the Centre*

The Centre has 69 postgraduate students and 5 Honours students (see Table 4).

- *Number of postgraduate students trained in the areas specified*

Genetic Improvement	28
Sustainable Management	29
Resource Protection	17

- *Number of enrolments in special courses*

Forest Ecology, a special undergraduate course in Plant Science at the University of Tasmania, had six students enrolled. There were additional enrolments in a course on 'Breeding objective definition and breeding value prediction' run by project A2, seven workshops, and seven field days.

- *Quality and number of postdoctoral fellows attracted*

Twelve postdoctoral fellows worked with the Centre in 2000/01: Dr K Thamarus in molecular genetics (CSIRO FFP, Canberra), Dr M Steinbauer in entomology (CSIRO Ento), Dr M Shepherd in molecular biology (SCU), Dr H Dungey in forest genetics (QFRI), Dr N Prasolova on soil nutrition (GU), Dr D Steane and Dr B Patterson in molecular genetics (UT), Dr F Heńskens on canopy nitrogen dynamics (CSIRO FFP, Hobart), Dr A Loch on pest management of blue gums (CSIRO Ento), Dr S Resh on biomass partitioning to roots and root respiration (CSIRO FFP, Hobart), Dr A Mitchell (CSIRO FFP) on availability of base cations, and J Medhurst (UT) on blackwood physiology and silviculture.

- *Rate and percentage of completion of higher degrees*

Seventeen students completed Honours, MSc and PhD this year.

Honours: Georgina Brown, Hal Hancock, Rebecca Jones, Marian McGowan, Elizabeth Pietrzykowski, Sally Ward, Michelle Watson, Simon Whittock.
MSc: Amal Joseph, Keith Lamb, Doug Walsh.
PhD: Karen Barry, Dugald Close, Bradley Howlett, Jane Medhurst, Digby Race, Tara Simmul,.

- *Acceptance and employment by the forestry community of students on completion of their studies*

The success of our students in obtaining employment in the forest industry was demonstrated by recent appointments: Dr E Pinkard (Forest Management, FT), Dr M Hunt (Manager, Genetics Program, QFRI), Dr D Race (Research Associate in farm forestry, ANU), Dr J Medhurst (Postdoc, Swedish University of Agricultural Sciences, Uppsala, Sweden), K Barry (Research Assistant in RP, CRC-SPF), D Close (Research Assistant in SM, CRC-SPF), T Simmul (Technical Sales Support Officer, BASF Aust Ltd), R Jones (Research Officer, Centre for Plant Conservation Genetics, SCU), L Pietrzykowski (Technical Assistant in RP, CRC-SPF), Dr B Howlett (Research Assistant, GU).

Application of research

- *Degree of adoption of research results by industry*

Twenty-three items of CRC technology were taken up by industry this year (see Industry Uptake, in Utilisation and Application of Research).

- *Quality and relevance of technical publications targeted to user groups.*

Forty-four technical reports were produced by the Centre, 26 of which were in the CRC Technical Report series. In addition, 24 technical news sheets were released ('Hot off the Seed Bed', 'Beyond the Black Stump' and 'Pest Off'), and five articles appeared in newsletters of member organisations.

- *Extent of advice and consultancy services provided to industry and government*

Thirteen consultancies were conducted during 2000/01 (see Grants and Awards and Consultancies). Advice was also provided through participation on national committees. For example, Greg Dutkowski (GI) is on

the Technical Committee of STBA and three subcommittees of the STBA Technical Committee, and is also a member of Research Working Group 1 (RWG1, Forest Genetics). Dr Brad Potts (GI) is a member of RGW1, and is on the subcommittee for Forest Genetic Resources, on the Biodiversity Advisory Panel for the Tasmanian Government 'State of the Environment Report'. He was also invited by RIRDC to review the effect of genetic pollution from farm forestry activities in Australia. Dr Clare McArthur (RP) has close links with industry and government through the Browsing Damage Management Group (BDMG), as well as direct interaction with industry (see Grants and Awards). Dr Neil Davidson gave several presentations for Hydro Tasmania, describing the effects of the proposed Basslink Project on riparian vegetation.

- *Number of presentations to companies or user groups*

The CRC ran a wide range of technology transfer activities for partners during 2000/01. These included 153 public presentations which consisted of 78 seminars, seven CRC-run workshops and a total of 60 workshop presentations, one short course and seven field days.

- *Number and financial contribution of potential users*

The CRC-SPF has twenty members which include most of the major wood producing companies in Australia. Each partner commits cash and/or in-kind contributions to the Centre (see financial tables). In addition, partners may provide funds to support particular projects (see Grants and Awards). Private Forests Tasmania and other end users of our technology, e.g. Greening Australia, have given in-kind support in running technology transfer exercises to farmer groups.

- *Number of visitors from user groups*

As the partners in the Centre represent our main user group, many of the 508 person-days involved in within-CRC visits (see Performance Indicator 2 under Cooperative Arrangements) involve users of the technology we are developing.

- *Number of media or trade journal presentations*

In the last year, four articles appeared in newspapers and industry newsletters, and 8 items in the electronic media including four TV segments relating to Centre activities.

- *Number of seminars, workshops and field days organised to transfer results to industry and the public, including the level of response*

An Annual Meeting of the CRC-SPF was held in 2000/01, as well as 153 seminars/presentations, six other workshops run by the CRC, 60 workshop presentations, one short course and seven field days, organised to transfer results to industry and the public. An estimated 7 390 people attended these activities (see Technology Transfer Activities Table 6).

Management and budget

- *Establish procedures to report on progress and achievements*

Plans in place include a Strategic Plan and Business Plan, and a set of 'deliverables' agreed upon to meet industry expectations of progress in research areas. The quality and quantity of research is monitored and reviewed, and its value to industry assessed through Program Coordinating Committees, the Advisory Panel, the Board, and the Annual Report.

- *Timely and accurate reporting of progress*

The CRC reports in a timely and accurate manner against the 'deliverables' set for industry and the milestones set by each project and program. These are reported to the Program Coordinating Committees (quarterly report on research 'deliverables'), the Advisory Panel, the Board, and in the Annual Report.

- *Extent of staff turnover*

There were 24 changes to staffing in the CRC during 2000/01 (see Staffing and Administration).

- *Proportion of projects completing milestones within the planned time and budget*

All projects have completed milestones within the planned time and budget, with the exception of two that were agreed by industry as no longer relevant to their needs because they can be addressed through alternative strategies (deliverables).

- *Accurate recording and reporting of financial transactions*

The Centre has implemented the following management and budgetary systems: triennium budgeting, monthly reporting of financial accounts (to program managers and project leaders), quarterly reporting of in-kind contributions of partner organisations (to the Board), annual external audit of the financial accounts, and an Annual Report.

Auditor's Report

AUDITOR'S REPORT TO THE COOPERATIVE RESEARCH CENTRES PROGRAM, DEPARTMENT OF INDUSTRY, SCIENCE AND RESOURCES REPRESENTING THE COMMONWEALTH RESPECT OF COOPERATIVE RESEARCH CENTRE FOR SUSTAINABLE PRODUCTION FORESTRY.

Deloitte Touche Tohmatsu

FINANCIAL INFORMATION FOR THE YEAR ENDED 30 JUNE 2001.

SCOPE

We have audited the financial information of the Cooperative Research Centre for Sustainable Production Forestry as set out in Tables 1, 2, 3, and 4 of the Annual Report for the year ended 30 June 2001. The parties to the Cooperative Research Centre are responsible for the preparation and presentation of the financial information. We have conducted an independent audit of the financial information in order to express an opinion on it to the parties to the Cooperative Research Centre for Sustainable Production Forestry.

The financial information has been prepared for the parties to the Cooperative Research Centre for Sustainable Production Forestry for the purposes of fulfilling their annual reporting obligations under clause 14(1) (f) of the Commonwealth Agreement and for distribution to the Cooperative Research Centres Program, Department of Industry, Science and Resources, representing the Commonwealth of Australia. We disclaim any assumption of responsibility for any reliance on this report or on the financial information to which it relates to any person other than those mentioned above, or for any purpose other than that for which it was prepared.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial information is free of material misstatement. Our procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial information, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion whether, in all material respects, the financial information is presented fairly in accordance with Australian accounting concepts and standards and requirements of the Commonwealth Agreement in terms of Clauses 4(Contributions), 5(1), 5(2), 5(3) (Application of the Grant and Contributions), 9(1), 9(5) (Intellectual Property) and 12(2) (Financial Provisions), so as to present a view of the sources of funding and the application of funding of the Cooperative Research Centre for Sustainable Production Forestry and the application of which is consistent with our understanding of its financial activities during the year and its financial position.

While we have not performed any audit procedures upon the estimates for the next period and do not express any opinion thereon, we ascertained that they have been formally approved by the Board of Management as required under the Joint Venture Agreement.

The audit opinion expressed in this report has been formed on the above basis.

Audit opinion

1. The multipliers adopted by the Centre to value in-kind contributions other than salary costs have a sound and reasonable basis and each partner's component of the Researcher's Contributions for the year under report has been provided at least to the value for that year committed in the Budget as specified in the Agreement, with the following exceptions:

Organisation	Amount Committed	Amount Provided
	$	$
Australian Paper Plantations	206,000	186,600
Griffith University	242,900	192,300
Gunns Ltd	63,000	26,100
Private Forests Tasmania	24,400	5,500
The University of Queensland	72,000	71,600

   and the total value of all Contributions for the year under report equalled or exceeded the amount of grant paid during the year (not including advances). [Clause 4]

2. The Researcher has used the Grant and the Researcher's Contributions for the Activities of the Centre and in our professional opinion there appear to be no material reporting irregularities. [Clause 5(1)]

3. The Researcher's allocations of the budgetary resources between Heads of Expenditure has not been lower or higher than the allocation in the budget by $100,000 or 20% without prior approval by the Commonwealth. [Clause 5(2)]

4. Capital Items acquired from the Grant and Researcher's Contributions are vested as provided in the Joint Venture Agreement. [Clause 5(3)]

5. Intellectual Property in all Contract Material is vested as provided in the Joint Venture Agreement and no Intellectual Property has been assigned or licensed without the prior approval of the Commonwealth. [Clause 9(1), 9(5)]

6. Proper accounting standards and controls have been exercised in respect of the Grant and Researcher's Contributions and income and expenditure in relation to the Activites of the Centre have been recorded seperately from other transactions of the Researcher. [Clause 12(2)]

Deloitte Touche Tohmatsu

DELOITTE TOUCHE TOHMATSU

L.T. Cox
Partner
Chartered Accountants

Hobart, 20 September 2001

Budget Tables

Notes to and forming part of the accounts for 2000/01

Summary of significant accounting policies

All funds under the Cooperative Research Centre's control are administered through the University of Tasmania's Financial Management Information System (FMIS).

The principal accounting policies adopted in preparing the accounts of the unincorporated entity are detailed hereunder.

(a) Basis of accounting and principles of consolidation

The cash accounts have been prepared on the basis of historic costs. Cost in respect to the cash contributions and expenditure is the cash sum exchanged in the financial year determined from transactions recorded on the FMIS, excluding outstanding debtors at 30 June each year.

In-kind amounts are the economic values of goods and services declared by each of the joint venture partners and accepted by the entity as being valid.

(b) Interest

Interest is calculated and paid by the University based on the monthly cash balances being held on the FMIS on behalf of the entity.

(c) Assets and depreciation

Plant and equipment assets are recorded on the University's asset register in the name of the entity as they are acquired. Their entire cost is expensed in the year of purchase and depreciation is not provided for.

Capital expenditure relates to costs associated with buildings. These costs are also expensed and depreciation is not provided for.

(d) Employee entitlements

Provision has been made for pro-rata entitlements to annual and long service leave.

(e) Partner contributions

Budget estimates of contributions are taken from the original Commonwealth Agreement and actual figures are provided by the partners.

(f) Allocation from Commonwealth Grant

During 2000/01 the CRC received the usual four quarterly grant payments.

ATTACHMENT A

Co-operative Research Centre for Sustainable Production Forestry
Summary of Base Grant Funds 2000/2001

Opening Balance at 1/7/00	1,743,200
Add Income	2,849,721
Outstanding debtors at 1/7/00	53,250
Less Expenditure	
Salaries and associated costs	1,757,340
Consumables	875,283
Equipment	63,350
Total Expenditure	2,695,973
Balance at 30/6/01	1,950,198
Less outstanding debtors at 30/6/01	26,734
Closing Balance at 30/6/01	**1,923,464**

RESEARCH STAFF RESOURCES (2000/2001) ATTACHMENT B

Organisation	Main Activity	Total % Time	% Spent on Research Program GI	SM	RP	Total on Research	% Spent on Educ'n	% Spent on Comml'n Program	% Spent on CRC Admin
Australian Forest Growers									
P Clarke	E	1					1		
Total		1	0	0	0	0	1	0	0
Australian Paper Plantations									
M Krygsman	R	30	18	12		30			
R Appleton	R	29	12	17		29			
H Lieshout	R	7	3	4		7			
J Cameron	R	4	2		2	4			
Total		70	35	33	2	70	0	0	0
Australian Plantation Timber									
E Shedley	R	65	20	20	20	60			5
M Todd	R	30	10	10	10	30			
G Mansfield	R	15		15		15			
M Parker	R	5		5		5			
Total		115	30	50	30	110	0	0	5
CSIRO Entomology									
A Loch	R	100			100	100			
J Matthiessen	R	30			30	30			
R Floyd	R	25			25	25			
R Milner	R	20			20	20			
Total		175	0	0	175	175	0	0	0
CSIRO Forestry & Forest Products									
D Mummery	R	90		90		90			
M Battaglia	R	90		90		90			
C Beadle	R	80		80		80			
P Sands	R	80		80		80			
P Smethurst	R	72		72		72			
C Raymond	R	64	32	32		64			
G Moran	R	30	30			30			
B McCormack	R	10		10		10			
E Williams	R	10	10			10			
C Mohammed	R	10			10	10			
R Evans	R	5	5			5			
A Wallis	R	5	5			5			
S Nambiar	A	5							5
G Kile	A	5							5
S Midgley	A	2							2
R Lockwood	A	1							1
Total		559	82	454	10	546	0	0	13
Department Primary Industries Qld									
R Haines	A	40				0			40
Z Xu	R	69		69		69			
M Dieters	R	69	69			69			
K Bubb	R	68		68		68			
M Nester	R	51		51		51			
J Simpson	R	45		45		45			
M Lewty	R	15		10		10			5
K Harding	R	15	15			15			
M Hunt	R	5	3	1		5			
S Walker	R	3	1			1			2
P Ryan	R	10		10		10			
Total		389	88	254	0	342	0	0	47

RESEARCH STAFF RESOURCES (2000/2001) ATTACHMENT B

Organisation	Main Activity	Total % Time	% Spent on Research Program			Total on Research	% Spent on Educ'n	% Spent on Comml'n Program	% Spent on CRC Admin
			GI	*SM*	*RP*				
Forest Enterprises Australia									
L Ficca	R	2					2		
G Ogston	R	2					2		
D Barker	R	1					1		
T Cannon	A	1							1
Total		5	0	0	0	0	4	0	1
Forestry Tasmania									
J Elek	R	40			40	40			
A Walsh	R	40			40	40			
P Kube	R	30	28.5			28.5			1.5
L Pinkard	R	20		20		20			
H Elliott	R	10			4	4			6
S Candy	R	5			5	5			
B Neilsen	A	3							3
H Drielsma	A	3							3
Total		151	28.5	20	89	137.5	0	0	13.5
Griffith University									
R Braddock	R	15		15		15			
B Yu	R	15		15		15			
R Rickson	R	15		15		15			
J Hughes	R	10	10			10			
I Phillips	R	10		10		10			
W Hogarth	A	5							5
Total		70	10	55	0	65	0	0	5
Gunns Forest Products									
D de Little	R	64	1		41	42			22
G Holz	R	79		51		51			28
I Ravenwood	A	5							5
Total		148	1	51	41	93	0	0	55
Gunns Limited									
C Hawkins	R	25		25		25			
Total		25	0	25	0	25	0	0	0
Norske Skog Paper Mills									
S Hetherington	R	20	2	14	3	19			1
A Willems	A	2							2
Total		22	2	14	3	19	0	0	3
Private Forests Tasmania									
A Warner	R	4		4		4			
A Lyons	R	1		1		1			
G Clark	R	1		1		1			
G Campbell	R	1		1		1			
Total		7	0	7	0	7	0	0	0
Serve-Ag									
P Volker	R	5	5			5			
D Blaesing	R	1	1			1			
Total		6	6	0	0	6	0	0	0

RESEARCH STAFF RESOURCES (2000/2001)

ATTACHMENT B

Organisation	Main Activity	Total % Time	% Spent on Research Program GI	SM	RP	Total on Research	% Spent on Educ'n	% Spent on Commt'n Program	% Spent on CRC Admin
Southern Cross University									
R Henry	R	30	20			20	10		
T Codrington	R	20	20			20			
P Baverstock	A	5							5
Total		55	40	0	0	40	10	0	5
Southern Tree Breeding Association									
P Gore	R	12	12			12			
D Pilbeam	R	11	11			11			
T McRae	R	10	10			10			
Total		33	33	0	0	33	0	0	0
The Australian National University									
P Kanowski	R	30	10	20		30			
D Race	R	25					25		
S Mahendrarajah	R	10		10		10			
R James	R	10					10		
Total		75	10	30	0	40	35	0	0
The University of Queensland									
D Doley	R	25		25		25			
Total		25	0	25	0	25	0	0	0
Timbercorp									
I Bail	A	20		10		10			10
A Tys	R	18		18		18			
J Bulinski	R	18			18	18			
Q Clasen	R	15		15		15			
P Smale	R	10		10		10			
H O'Sullivan	R	10	10			10			
C O'Connor	A	2	1			1			1
Total		93	11	53	18	82	0	0	11
University of Tasmania									
J Reid	A	50	10			10	10		30
B Potts	R	50	50			50			
C McArthur	R	50			50	50			
G Allen	R	50			50	50			
R Vaillancourt	R	45	45			45			
R Wiltshire	R	30	15			15	15		
M Hurley	R	25			25	25			
P Brown	E	20					20		
P McQuillan	E	20					20		
S Jennings	R	15		15		15			
C Mohammed	R	15			15	15			
S Shabala	E	10					10		
E Bruce	E	10					10		
A Richardson	E	10					10		
J Kirkpatrick	E	5					5		
R Doyle	E	3					3		
N Mendham	E	5					5		
M Hovenden	E	5					5		
R Clark	A	15					5		10
G Hallegraeff	A	10							10
R Swain	A	10							10
A Glenn	A	2*							2
Total		455	120	15	140	275	118	0	62

RESEARCH STAFF RESOURCES (2000/2001)

ATTACHMENT B

Organisation		Main Activity	Total % Time	% Spent on Research Program GI	SM	RP	Total on Research	% Spent on Educ'n	% Spent on Comml'n Program	% Spent on CRC Admin
WACAP Treefarms										
C Shedley		R	30		30		30			
S Hunter		R	15	0	2	2	4			11
D Pilbeam		R	10	10			10			
R Breidahl		R	5	1	2		3			2
N Itakura		A	3							3
Total			63	11	34	2	47	0	0	16
CRC Funded										
A Mitchell	CSIRO FFP	R	100		100		100			
K Catchpoole	QFRI	R	100		100		100			
S Resh	CSIRO FFP	R	100		100		100			
M Steinbauer	CSIRO Ento	R	100			100	100			
H Dungey	QFRI	R	100	100			100			
K Thamarus/R Thumma	CSIRO FFP	R	100	100			100			
L Apiolaza	Utas	R	100	100			100			
M Shepherd	SCU	R	100	100			100			
G Pu	QFRI	R	100	100			100			
C McArthur	Utas	R	50			50	50			
B Potts	Utas	R	50	50			50			
D Steane	Utas	R	60	60			60			
B Patterson	Utas	R	50	50			50			
G Allen	Utas	R	50			50	50			
M Hurley	Utas	R	25			25	25			
P Smethurst	CSIRO FFP	R	28		28		28			
A Fulton	Utas	R	25		25		25			
D Race	ANU	R	25		25		25			
G Dutkowski	Utas	E	100					100		
N Davidson	Utas	E	100		50			50		
J Reid	Utas	A	20							20
Total			1483	660	428	225	1263	150	0	20

SUMMARY OF CONTRIBUTIONS IN PERSON YEARS

	Total Person Years	Person Years Spent on Research Program GI	SM	RP	Total on Research	Person Yrs Spent on Educ'n Program	Person Yrs Spent on Comml'n Program	Person Yrs Spent on CRC Admin
Total Contributed	25.4	5.1	11.2	5.1	21.4	1.7	0.0	2.4
Total funded by CRC	14.8	6.6	4.3	2.3	13.1	1.5	0.0	0.2
Grand total	40.2	11.7	15.5	7.3	34.5	3.2	0.0	2.6
Proportion of total professional (%) staff resources in each activity	100.0	29.0	38.5	18.3	85.7	7.9	0.0	6.4

SUPPORT STAFF

ATTACHMENT B cont'd.

Contributed	
Organisation	Number of Staff (Person Years)
CSIRO (FFP & Ento)	5.35
Department of Primary Industries Qld	1.94
Gunns Forest Products	1.79
Forestry Tasmania	1.75
University of Tasmania	0.70
WACAP Treefarms	0.60
Southern Cross University	0.30
Australian Plantation Timber	0.30
Timbercorp	0.22
Norske Skog Paper Mills	0.04
Private Forests Tasmania	0.02
Serve-Ag	0.01
Gunns Limited	0.01
Total	13.03

CRC Funded (by Employing Organisation)	
Organisation	Number of Staff (Person Years)
University of Tasmania	10.2
CSIRO (FFP & Ento)	2.8
Southern Cross University	1.0
Department of Primary Industries Qld	0.5
Total	14.5

IN-KIND CONTRIBUTIONS FROM PARTNERS ($'000)

ATTACHMENT C TABLE 1

PARTNER	EXPENDITURE					CUMULATIVE		PROJECTED EXPENDITURE						GRAND TOTAL		
	1997/98	1998/99	1999/00	2000/01	2000/01	Total to Date		2001/02	2001/02	2002/03	2002/03	2003/04	2003/04	Total	Agreement	Difference
	Actual	Actual	Actual	Actual	Agr'mt	Actual	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	7 Years	7 years	7 years
AUSTRALIAN FOREST GROWERS																
SALARIES	1.1	1.1	1.3	**1.2**	**0.0**	4.7	0.0	1.1	0.0	1.1	0.0	1.1	0.0	8.0	0.0	8.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.3	0.3	0.3	**0.3**	**1.0**	1.2	4.0	0.3	1.0	0.3	1.0	0.3	1.0	2.1	7.0	-4.9
TOTAL	1.4	1.4	1.6	**1.5**	**1.0**	5.9	4.0	1.4	1.0	1.4	1.0	1.4	1.0	10.1	7.0	3.1
AUSTRALIAN PAPER PLANTATIONS																
SALARIES	65.8	83.2	58.3	**66.6**	**85.0**	273.9	340.0	92.9	85.0	95.7	85.0	98.6	**85.0**	561.1	595.0	-33.9
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	135.5	124.9	108.4	**120.0**	**121.0**	488.8	484.0	132.3	121.0	136.2	121.0	140.3	**121.0**	897.6	847.0	50.6
TOTAL	201.3	208.1	166.7	**186.6**	**206.0**	762.7	824.0	225.2	206.0	231.9	206.0	238.9	**206.0**	1,458.7	1,442.0	16.7
AUSTRALIAN PLANTATION TIMBER																
SALARIES	0.0	0.0	0.0	**83.0**	**83.0**	83.0	83.0	83.0	83.0	83.0	83.0	83.0	83.0	332.0	332.0	0.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	0.0	**117.7**	**117.0**	117.7	117.0	117.0	117.0	117.0	117.0	117.0	117.0	468.7	468.0	0.7
TOTAL	0.0	0.0	0.0	**200.7**	**200.0**	200.7	200.0	200.0	200.0	200.0	200.0	200.0	200.0	800.7	800.0	0.7
CSIRO ENTOMOLOGY																
SALARIES	163.2	148.6	216.4	**212.6**	**152.0**	740.8	608.0	220.4	152.0	152.3	152.0	136.5	152.0	1,250.0	1,064.0	186.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	239.7	254.1	260.9	**250.7**	**273.0**	1,005.4	1,092.0	217.6	273.0	216.0	273.0	208.9	273.0	1,647.9	1,911.0	-263.1
TOTAL	402.9	402.7	477.3	**463.3**	**425.0**	1,746.2	1,700.0	438.0	425.0	368.3	425.0	345.4	425.0	2,897.9	2,975.0	-77.1
CSIRO FORESTRY and FOREST PRODUCTS																
SALARIES	652.6	691.1	679.7	**570.5**	**618.0**	2,593.9	2,560.0	712.1	618.0	729.9	618.0	748.2	618.0	4,784.1	4,414.0	370.1
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	1,410.0	1,495.8	1,460.3	**1,443.4**	**1,345.0**	5,809.5	5,545.0	1,527.8	1,345.0	1,560.8	1,345.0	1,594.6	1,345.0	10,492.7	9,580.0	912.7
TOTAL	2,062.6	2,186.9	2,140.0	**2,013.9**	**1,963.0**	8,403.4	8,105.0	2,239.9	1,963.0	2,290.7	1,963.0	2,342.8	1,963.0	15,276.8	13,994.0	1,282.8
DEPARTMENT OF PRIMARY INDUSTRIES QLD																
SALARIES	449.8	421.5	416.9	**460.2**	**322.0**	1,748.4	1,288.0	390.8	322.0	390.8	322.0	390.2	322.0	2,920.2	2,254.0	666.2
CAPITAL	28.4	0.0	0.0	**0.0**	**0.0**	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.4	0.0	28.4
OTHER	526.0	384.2	426.8	**382.5**	**380.0**	1,719.5	1,520.0	381.3	380.0	381.3	380.0	381.0	380.0	2,863.1	2,660.0	203.1
TOTAL	1,004.2	805.7	843.7	**842.7**	**702.0**	3,496.3	2,808.0	772.1	702.0	772.1	702.0	771.2	702.0	5,811.7	4,914.0	897.7
FOREST ENTERPRISES AUSTRALIA																
SALARIES	0.0	0.0	0.0	**5.0**	**0.0**	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	5.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	0.0	**1.0**	**2.0**	1.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	7.0	9.0	-2.0
TOTAL	0.0	0.0	0.0	**6.0**	**2.0**	6.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	12.0	9.0	3.0
FORESTRY TASMANIA																
SALARIES	137.0	157.0	188.0	**156.2**	**124.0**	638.2	431.0	171.8	136.0	189.0	149.0	207.9	164.0	1,206.9	880.0	326.9
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	179.1	168.6	239.7	**199.2**	**152.0**	786.6	532.0	219.1	168.0	241.1	185.0	265.2	203.0	1,512.0	1,088.0	424.0
TOTAL	316.1	325.6	427.7	**355.4**	**276.0**	1,424.8	963.0	390.9	304.0	430.1	334.0	473.1	367.0	2,718.9	1,968.0	750.9

IN-KIND CONTRIBUTIONS FROM PARTNERS ($'000)

ATTACHMENT C TABLE 1

PARTNER	EXPENDITURE					CUMULATIVE		PROJECTED EXPENDITURE						GRAND TOTAL		
	1997/98 Actual	1998/99 Actual	1999/00 Actual	**2000/01 Actual**	**2000/01 Agr'mt**	Total to Date Actual	Agr'mt	2001/02 Budget	2001/02 Agr'mt	2002/03 Budget	2002/03 Agr'mt	2003/04 Budget	2003/04 Agr'mt	Total 7 Years	Agreement 7 years	Difference 7 years
GRIFFITH UNIVERSITY																
SALARIES	163.7	108.8	109.8	**83.2**	**126.5**	465.5	516.0	106.7	126.5	106.7	126.5	106.7	126.5	785.6	895.5	-109.9
CAPITAL	0.0	20.0	20.0	**20.0**	**0.0**	60.0	0.0	20.0	0.0	20.0	0.0	20.0	0.0	120.0	0.0	120.0
OTHER	150.6	116.5	117.5	**89.1**	**116.4**	473.7	465.6	114.1	116.4	114.1	116.4	114.1	116.4	816.0	814.8	1.2
TOTAL	314.3	245.3	247.4	**192.3**	**242.9**	999.3	981.6	240.8	242.9	240.8	242.9	240.8	242.9	1,721.7	1,710.3	11.4
GUNNS FOREST PRODUCTS																
SALARIES	263.0	252.2	154.7	**217.7**	**100.0**	887.6	400.0	100.0	100.0	100.0	100.0	100.0	100.0	1,187.6	700.0	487.6
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	369.0	312.6	158.3	**127.7**	**216.0**	967.6	864.0	216.0	216.0	216.0	216.0	216.0	216.0	1,615.6	1,512.0	103.6
TOTAL	632.0	564.8	313.0	**345.4**	**316.0**	1,855.2	1,264.0	316.0	316.0	316.0	316.0	316.0	316.0	2,803.2	2,212.0	591.2
GUNNS LIMITED																
SALARIES	6.4	24.5	28.4	**15.1**	**28.0**	74.4	20.0	0.0	5.0	0.0	5.0	0.0	5.0	74.4	35.0	39.4
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	34.8	42.0	13.3	**11.0**	**35.0**	101.1	140.0	0.0	35.0	0.0	35.0	0.0	35.0	101.1	245.0	-143.9
TOTAL	41.2	66.5	41.7	**26.1**	**63.0**	175.5	160.0	0.0	40.0	0.0	40.0	0.0	40.0	175.5	280.0	-104.5
NORSKE SKOG PAPER MILLS																
SALARIES	34.0	21.1	23.7	**29.7**	**28.0**	108.5	109.0	26.4	28.0	25.1	28.0	25.1	28.0	185.1	193.0	-7.9
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	186.0	171.0	199.0	**188.0**	**161.0**	744.0	654.0	184.0	161.0	180.0	161.0	180.0	161.0	1,288.0	1,137.0	151.0
TOTAL	220.0	192.1	222.7	**217.7**	**189.0**	852.5	763.0	210.4	189.0	205.1	189.0	205.1	189.0	1,473.1	1,330.0	143.1
PRIVATE FORESTS TASMANIA																
SALARIES	0.0	0.0	10.2	**5.5**	**8.1**	15.7	12.2	8.1	8.1	8.1	8.1	8.1	8.1	40.1	36.6	3.5
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	17.2	**0.0**	**16.3**	17.2	24.4	16.3	16.3	16.3	16.3	16.3	16.3	65.9	73.2	-7.2
TOTAL	0.0	0.0	27.4	**5.5**	**24.4**	32.9	36.6	24.4	24.4	24.4	24.4	24.4	24.4	106.0	109.7	-3.7
SERVE-AG																
SALARIES	0.0	0.0	10.5	**8.5**	**7.5**	19.0	11.2	7.5	7.5	7.5	7.5	7.5	7.5	41.5	33.7	7.8
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	21.5	**12.0**	**11.3**	33.5	16.8	11.3	11.3	11.3	11.3	11.3	11.3	67.3	50.6	16.7
TOTAL	0.0	0.0	32.0	**20.5**	**18.8**	52.5	28.0	18.8	18.8	18.8	18.8	18.8	18.8	108.8	84.3	24.5
SOUTHERN CROSS UNIVERSITY																
SALARIES	62.9	68.0	70.2	**71.0**	**60.0**	272.1	240.0	75.2	60.0	78.4	60.0	81.8	60.0	507.5	420.0	87.5
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	189.7	287.8	300.5	**306.8**	**249.0**	1,084.8	996.0	321.7	249.0	336.3	249.0	239.7	249.0	1,982.5	1,743.0	239.5
TOTAL	252.6	355.8	370.7	**377.8**	**309.0**	1,356.9	1,236.0	396.9	309.0	414.7	309.0	321.5	309.0	2,490.0	2,163.0	327.0

IN-KIND CONTRIBUTIONS FROM PARTNERS ($'000)

ATTACHMENT C TABLE 1

PARTNER	EXPENDITURE					CUMULATIVE		PROJECTED EXPENDITURE						GRAND TOTAL		
	1997/98	1998/99	1999/00	2000/01	2000/01	Total to Date		2001/02	2001/02	2002/03	2002/03	2003/04	2003/04	Total	Agreement	Difference
	Actual	Actual	Actual	Actual	Agr'mt	Actual	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	7 Years	7 years	7 years
SOUTHERN TREE BREEDING ASS'N																
SALARIES	6.0	6.0	14.8	**25.7**	**0.0**	52.5	0.0	26.4	0.0	23.8	0.0	19.0	0.0	121.7	0.0	121.7
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	37.0	0.0	**0.0**	**5.0**	37.0	20.0	0.0	5.0	0.0	5.0	0.0	5.0	37.0	35.0	2.0
TOTAL	6.0	43.0	14.8	**25.7**	**5.0**	89.5	20.0	26.4	5.0	23.8	5.0	19.0	5.0	158.7	35.0	123.7
THE AUSTRALIAN NATIONAL UNIVERSITY																
SALARIES	59.2	59.2	62.6	**67.4**	**63.8**	248.4	255.2	67.4	63.8	67.4	63.8	67.4	63.8	450.6	446.6	4.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	177.7	177.7	187.8	**202.2**	**112.0**	745.4	448.0	202.2	112.0	202.2	112.0	202.2	112.0	1,352.0	784.0	568.0
TOTAL	236.9	236.9	250.4	**269.6**	**175.8**	993.8	703.2	269.6	175.8	269.6	175.8	269.6	175.8	1,802.6	1,230.6	572.0
THE UNIVERSITY OF QUEENSLAND																
SALARIES	8.6	23.6	24.3	**24.6**	**25.0**	81.1	75.0	24.8	25.0	25.0	25.0	25.0	25.0	155.9	150.0	5.9
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	10.0	47.0	47.0	**47.0**	**47.0**	151.0	141.0	47.0	47.0	47.0	47.0	47.0	47.0	292.0	282.0	10.0
TOTAL	18.6	70.6	71.3	**71.6**	**72.0**	232.1	216.0	71.8	72.0	72.0	72.0	72.0	72.0	447.9	432.0	15.9
TIMBERCORP																
SALARIES	0.0	0.0	20.6	**114.8**	**93.8**	135.4	117.3	93.8	93.8	93.8	93.8	93.8	93.8	416.8	398.7	18.1
CAPITAL	0.0	0.0	2.0	**0.0**	**0.0**	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0
OTHER	5.0	5.0	5.0	**272.8**	**220.5**	287.8	297.1	220.5	220.5	220.5	220.5	220.5	220.5	949.3	958.6	-9.3
TOTAL	5.0	5.0	27.6	**387.6**	**314.3**	425.2	414.4	314.3	314.3	314.3	314.3	314.3	314.3	1,368.1	1,357.3	10.8
UNIVERSITY OF TASMANIA																
SALARIES	385.4	402.7	410.5	**455.3**	**386.7**	1,653.9	1,546.8	466.7	386.7	479.2	386.7	492.1	386.7	3,091.9	2,706.9	385.0
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	703.1	825.3	792.4	**828.8**	**763.0**	3,149.6	2,990.0	842.5	763.0	854.3	763.0	866.4	763.0	5,712.8	5,279.0	433.8
TOTAL	1,088.5	1,228.0	1,202.9	**1,284.1**	**1,149.7**	4,803.5	4,536.8	1,309.2	1,149.7	1,333.5	1,149.7	1,358.5	1,149.7	8,804.7	7,985.9	818.8
WACAP TREEFARMS																
SALARIES	65.9	71.4	62.8	**55.7**	**55.0**	255.8	220.0	63.8	55.0	63.8	55.0	63.8	55.0	447.2	385.0	62.2
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	107.3	113.1	113.4	**116.0**	**115.0**	449.8	460.0	115.0	115.0	115.0	115.0	115.0	115.0	794.8	805.0	-10.2
TOTAL	173.2	184.5	176.2	**171.7**	**170.0**	705.6	680.0	178.8	170.0	178.8	170.0	178.8	170.0	1,242.0	1,190.0	52.0
TOTAL IN-KIND CONTRIBUTIONS																
SALARIES	2,524.6	2,540.0	2,563.7	**2,729.5**	**2,391.4**	10,357.8	8,832.7	2,738.9	2,355.4	2,720.6	2,368.4	2,755.8	2,383.4	18,573.2	15,940.0	2,633.2
CAPITAL	28.4	20.0	22.0	**20.0**	**0.0**	90.4	0.0	20.0	0.0	20.0	0.0	20.0	0.0	150.4	0.0	150.4
OTHER	4,423.8	4,562.9	4,469.3	**4,716.2**	**4,458.4**	18,172.2	16,813.9	4,887.9	4,474.4	4,967.6	4,491.4	4,937.7	4,509.4	32,965.4	30,289.1	2,676.3
GRAND TOTAL IN-KIND	6,976.8	7,122.9	7,055.0	**7,465.7**	**6,849.8**	28,620.4	25,646.6	7,646.8	6,829.8	7,708.2	6,859.8	7,713.5	6,892.8	51,689.0	46,229.1	5,459.9

CASH CONTRIBUTIONS ($'000)

ATTACHMENT C TABLE 2

PARTNERS	ACTUAL 1997/98 Actual	ACTUAL 1998/99 Actual	ACTUAL 1999/2000 Actual	ACTUAL 2000/01 Actual	ACTUAL 2000/01 Agr'mt	CUMULATIVE Total to Date Actual	CUMULATIVE Total to Date Agr'mt	PROJECTED 2001/02 Budget	PROJECTED 2001/02 Agr'mt	PROJECTED 2002/03 Budget	PROJECTED 2002/03 Agr'mt	PROJECTED 2003/04 Budget	PROJECTED 2003/04 Agr'mt	GRAND TOTAL Total 7 yrs	GRAND TOTAL Agr'mt 7 yrs	GRAND TOTAL Diff 7 yrs
Australian Forest Growers	1.0	1.0	1.0	**1.0**	**1.0**	4.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0	8.0	-1.0
Australian Paper Plantations	35.0	35.6	35.0	**35.0**	**35.0**	140.6	140.0	35.0	35.0	35.0	**35.0**	35.0	35.0	245.6	245.0	0.6
Australian Plantation Timber	0.0	0.0	0.0	**50.0**	**50.0**	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	200.0	200.0	0.0
Department Primary Industries Qld	25.0	50.3	0.0	**25.0**	**25.0**	100.3	100.0	25.0	25.0	25.0	25.0	25.0	25.0	175.3	175.0	0.3
Forest Enterprises Australia	0.0	0.0	0.0	**2.3**	**3.0**	2.3	4.5	3.7	3.0	3.0	3.0	3.0	3.0	12.0	13.5	-1.5
Forestry Tasmania	22.5	19.3	15.0	**11.6**	**15.0**	68.4	60.0	18.7	15.0	15.0	15.0	15.0	15.0	117.1	105.0	12.1
Griffith University	25.0	26.2	25.0	**18.7**	**25.0**	94.9	100.0	31.3	25.0	25.0	25.0	25.0	25.0	176.2	175.0	1.2
Gunns Forest Products	65.1	50.0	30.0	**20.0**	**25.0**	165.1	175.0	25.0	25.0	25.0	25.0	25.0	25.0	240.1	250.0	-9.9
Gunns Limited	0.0	2.2	0.0	**0.0**	**0.0**	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2
Norske Skog Paper Mills	22.4	20.8	20.0	**20.0**	**20.0**	83.2	80.0	20.0	20.0	20.0	20.0	20.0	20.0	143.2	140.0	3.2
Private Forests Tasmania	0.0	0.0	0.0	**17.5**	**20.0**	17.5	30.0	20.0	20.0	20.0	20.0	20.0	20.0	77.5	90.0	-12.5
Serve-Ag	0.0	0.0	0.0	**1.2**	**1.0**	1.2	1.5	1.0	1.0	1.0	1.0	1.0	1.0	4.2	4.5	-0.3
Southern Cross University	100.0	100.3	100.0	**100.0**	**100.0**	400.3	400.0	100.0	100.0	100.0	100.0	100.0	100.0	700.3	700.0	0.3
Timbercorp	0.0	0.0	0.0	**50.0**	**50.0**	50.0	62.5	62.5	50.0	50.0	50.0	50.0	50.0	212.5	212.5	0.0
University of Tasmania	0.0	0.3	0.0	**0.0**	**0.0**	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3
WACAP Treefarms	35.0	36.2	35.0	**35.0**	**35.0**	141.2	140.0	35.0	35.0	35.0	35.0	35.0	35.0	246.2	245.0	1.2
TOTAL CASH FROM PARTICIPANTS	331.0	342.2	261.0	**387.3**	**405.0**	1,321.5	1,347.5	428.2	405.0	405.0	405.0	405.0	405.0	2,559.7	2,563.5	-3.8
OTHER CASH																
Interest	20.4	67.5	67.9	**121.9**	**0.0**	277.7	0.0	45.0	0.0	45.0	0.0	45.0	0.0	412.7	0.0	412.7
Non-participants	7.8	23.4	11.0	**3.2**	**0.0**	45.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.4	0.0	45.4
Other external funds	0.0	0.0	214.6	**17.9**	**0.0**	232.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	232.5	0.0	232.5
CRC Grant	1,718.1	2,313.0	2,328.4	**2,346.9**	**2,300.0**	8,706.4	8,580.0	2,398.1	2,300.0	2,422.1	2,300.0	2,446.3	2,300.0	15,972.9	15,480.0	492.9
TOTAL CRC CASH CONTRIBUTIONS	2,077.3	2,746.1	2,882.9	**2,877.2**	**2,705.0**	10,583.5	9,927.5	2,871.3	2,705.0	2,872.1	2,705.0	2,896.3	2,705.0	19,223.2	18,043.5	1,179.7
Cash carried over from previous year	741.0	1,002.6	1,338.1	**1,743.2**				1,923.4		1,809.2		1,759.8				
Less unspent balance	1,002.6	1,338.1	1,743.2	**1,923.4**				1,809.2		1,759.8		1,915.3				
TOTAL CASH EXPENDITURE	1,815.7	2,410.7	2,477.8	**2,697.0**	**2,605.0**	9,401.2	10,355.0	2,985.5	2,606.0	2,921.5	2,607.0	2,740.8	2,603.0	18,049.0	18,171.0	-122.0
ALLOCATION OF CASH EXPENDITURE BETWEEN HEADS OF EXPENDITURE																
SALARIES	1,288.9	1,686.4	1,503.4	**1,757.3**	**1,700.0**	6,236.0	6,835.0	2,094.2	1,701.0	2,020.2	1,702.0	2,034.5	1,703.0	12,384.9	11,941.0	443.9
CAPITAL	0.0	0.0	0.0	**0.0**	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	526.8	724.3	974.3	**939.7**	**905.0**	3,165.1	3,520.0	891.3	905.0	901.3	905.0	706.3	900.0	5,664.0	6,230.0	-566.0

SUMMARY OF RESOURCES APPLIED TO ACTIVITIES OF CENTRE ($'000)

ATTACHMENT C TABLE 3

ALL PROGRAMS	ACTUAL					CUMULATIVE		PROJECTED						GRAND TOTAL		
	1997/98	1998/99	1999/00	2000/01	2000/01	Total to Date		2001/02	2001/02	2002/03	2002/03	2003/04	2003/04	Total	Agr'mt	Diff
	Actual	Actual	Actual	Actual	Agr'mt	Actual	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	7 yrs	7 yrs	7 yrs
GRAND TOTAL (IN-KIND)	6,976.8	7,122.9	7,055.0	7,465.7	6,849.8	28,620.4	25,646.6	7,646.8	6,829.8	7,708.2	6,859.8	7,713.5	6,892.8	51,688.9	46,229.1	5,459.8
GRAND TOTAL (CASH EXPENDITURE)	1,815.7	2,410.7	2,477.8	2,697.0	2,605.0	9,401.2	10,355.0	2,985.5	2,606.0	2,921.5	2,607.0	2,740.8	2,603.0	18,049.0	18,171.0	-122.0
TOTAL RESOURCES APPLIED TO ACTIVITIES OF CENTRE	8,792.5	9,533.6	9,532.8	10,162.7	9,454.8	38,021.6	36,001.6	10,632.3	9,435.8	10,629.7	9,466.8	10,454.3	9,495.8	69,737.9	64,400.1	5,337.8
ALLOCATION OF TOTAL RESOURCES APPLIED TO ACTIVITIES OF CENTRE BETWEEN HEADS OF EXPENDITURE																
TOTAL SALARIES (CASH AND IN-KIND)	3,813.5	4,226.4	4,067.1	4,486.8	4,091.4	16,593.8	15,667.7	4,833.1	4,056.4	4,740.8	4,070.4	4,790.3	4,086.4	30,958.1	27,881.0	3,077.1
TOTAL CAPITAL (CASH AND IN-KIND)	28.4	20.0	22.0	20.0	0.0	90.4	0.0	20.0	0.0	20.0	0.0	20.0	0.0	150.4	0.0	150.4
TOTAL OTHER (CASH AND IN-KIND)	4,950.6	5,287.2	5,443.6	5,655.9	5,363.4	21,337.3	20,333.9	5,779.2	5,379.4	5,868.9	5,396.4	5,644.0	5,409.4	38,629.4	36,519.1	2,110.3

ATTACHMENT C TABLE 4

ALLOCATION OF RESOURCES BETWEEN CATEGORIES OF ACTIVITIES 2000/2001

PROGRAM	RESOURCE USAGE			
	Cash (1) $'000	In-kind $'000	Contributed Staff (2)	Cash Funded Staff (CRC) (2)
Research	2,311.3	6,398.1	21.4	13.1
Education (3)	213.1	589.8	1.7	1.5
Administration	172.6	477.8	2.4	0.2
TOTAL	2,697.0	7,465.7	25.4	14.8

(1) Cash from all sources, including CRC Program
(2) Person years, Professional staff
(3) Includes External Communications & Tech Transfer

ATTACHMENT D

AUSTRALIAN FOREST GROWERS

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES		% time	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*		*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
D Geddes	Treasurer	)	.5								
F Clarke	President (2000)	)	.5								
G Wettenhall	Magazine Editor	)	.5								
L Day	Executive Officer	)	.5								
A Cummine	Executive Director	)	.5								
			Total Salary	1.0	1.0	1.2	**1.1**	1.0	1.0	1.0	7.3
	Direct On-Costs		*% of Total Salaries*								
	Productivity Benefit	)									
	Superannuation	)									
	Workers Comp	)	10				**0.1**				
	Leave Loading	)									
	Long Service Leave	)									
	Other	)									
			Total On-Costs	0.1	0.1	0.1	**0.1**	0.1	0.1	0.1	0.7
			Total Salaries & On-Costs	1.1	1.1	1.4	**1.2**	1.1	1.1	1.1	8.1
	CAPITAL										
			Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER		*% of Total Salaries & On -Costs*								
	Publicity			0.3	0.3	0.3	**0.3**	0.3	0.3	0.3	2.1
			Total Other	0.3	0.3	0.3	**0.3**	0.3	0.3	0.3	2.1
TOTAL IN-KIND CONTRIBUTION				**1.4**	**1.4**	**1.6**	**1.5**	**1.4**	**1.4**	**1.4**	**10.1**
ALL PROGRAMS CASH CONTRIBUTION				**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**7.0**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

AUSTRALIAN PAPER PLANTATIONS

	SALARIES	% time	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
M Krygsman	Research	30								
R Appleton	Research	29								
H Lieshout	Research	7								
J Cameron	Research	4								
		Total Salary	55.6	72.3	48.6	**54.1**	71.0	73.2	75.4	450.2
	Direct On-Costs									
		Total On-Costs	10.1	10.9	9.7	**12.5**	21.9	22.5	23.2	110.8
	Total Salaries & On-Costs		65.8	83.2	58.3	**66.6**	92.9	95.7	98.6	561.1
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER									
	Overheads		38.6	23.3	11.1	**23.9**	37.7	38.8	40.0	213.4
	Operating		96.9	101.6	97.3	**96.1**	94.6	97.4	100.3	684.2
		Total Other	135.5	124.9	108.4	**120.0**	132.3	136.2	140.3	897.6
TOTAL IN-KIND CONTRIBUTION			**201.3**	**208.1**	**166.7**	**186.6**	**225.2**	**231.9**	**238.9**	**1,458.7**
ALL PROGRAMS CASH CONTRIBUTIONS			**35.0**	**35.6**	**35.0**	**35.0**	**35.0**	**35.0**	**35.0**	**245.6**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

AUSTRALIAN PLANTATION TIMBER

Itemised List of Cash and In-Kind Contributions ($'000)

SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
E Shedley	65								
M Todd	30								
A Hartman	25								
G Mansfield	15								
I Knobel	5								
M Parker	5								
Total Salary					**70.6**				
Direct On-Costs									
Total On-Costs					**12.5**				
Total Salaries & On-Costs					**83.0**	83.0	83.0	83.0	332.0
CAPITAL									
Total Capital		0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
OTHER									
Field Equipment					**30.2**				
Maintenance/Trial Sites					**17.5**				
Hired Contractors					**20.0**				
Computer/Software					**20.0**				
Vehicles					**21.7**				
Fuel					**8.2**				
Total Other					**117.7**	117.0	117.0	117.0	468.7
TOTAL IN-KIND CONTRIBUTION					**200.7**	**200.0**	**200.0**	**200.0**	**800.7**
ALL PROGRAMS CASH CONTRIBUTIONS					**50.0**	**50.0**	**50.0**	**50.0**	**200.0**

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

CSIRO - ENTOMOLOGY

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
T Wharton	R	100								
A Loch	R	100								
J Matthiessen	R	30								
R Floyd	R	25								
R Milner	R	20								
G Farrell	T	30								
R Sutherland	T	30								
M Michie	T	30								
		Total Salary	130.5	118.3	172.3	**173.6**	179.7	124.4	108.7	1,007.5
	Direct On-Costs	*% of Total Salaries*								
	Superannuation	21	26.0	24.3	35.3	**31.2**	32.5	22.3	22.3	193.8
	Comcare	1	1.4	1.3	1.9	**1.7**	1.7	1.2	1.2	10.4
	Leave Loading	2	2.0	1.8	2.6	**2.2**	2.3	1.6	1.6	14.0
	Long Service Leave	3	3.3	3.0	4.3	**3.8**	4.0	2.7	2.7	23.7
		Total On-Costs	32.6	30.3	44.1	**38.9**	40.5	27.8	27.8	242.0
		Total Salaries & On-Costs	163.2	148.6	216.4	**212.6**	220.4	152.3	136.5	1,250.0
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER	*% of Total Salaries & On -Costs*								
	Divnl Other Support	156	190.8	198.8	296.7	**292.4**	261.9	175.6	151.0	1,567.2
	Corporate Support	32	48.9	55.2	77.7	**78.6**	80.5	62.9	57.8	461.6
	Less Industry Contributions				113.5	**120.3**	124.8	22.5		381.1
		Total Other	239.7	254.1	260.9	**250.7**	217.6	216.0	208.9	1,647.9
TOTAL IN-KIND CONTRIBUTION			**402.9**	**402.7**	**477.3**	**463.3**	**438.0**	**368.3**	**345.4**	**2,897.9**
ALL PROGRAMS CASH CONTRIBUTIONS			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

CSIRO - FORESTRY & FOREST PRODUCTS Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
C Baillie	Technical	100								
M Cherry	Technical	100								
D Mummery	Research	90								
M Battaglia	Research	90								
C Beadle	Research	80								
P Sands	Research	80								
P Smethurst	Research	72								
C Raymond	Research	64								
G Moran	Research	30								
C Mohammed	Research	10								
R Evans	Research	5								
A Wallis	Research	5								
K Churchill	Technical	60								
J Murrell	Technical	50								
D Worledge	Technical	30								
B McCormack	Research	10								
E Williams	Research	10								
B Denton	Technical	25								
J Owen	Technical	10								
J Sprent	Admin	50								
P Coles	Admin	25								
G MacGillivray	Admin	25								
G Kile	Admin	5								
S Nambiar	Admin	5								
S Midgley	Admin	2								
R Lockwood	Admin	1								
		Total Salary	515.5	545.9	537.0	**570.5**	562.5	576.6	591.0	3,898.9
	Direct On-Costs	*% of Total Salaries*								
	Productivity Benefit	3	15.5	16.4	16.1	**17.1**	16.9	17.3	17.7	117.0
	Superannuation	19	95.4	101.0	99.3	**105.5**	104.1	106.7	109.3	721.3
	Workers Compensation	1	5.7	6.0	5.9	**6.3**	6.2	6.3	6.5	42.9
	Leave Loading	2	7.7	8.2	8.1	**8.6**	8.4	8.6	8.9	58.5
	Long Service Leave	3	12.9	13.6	13.4	**14.3**	14.1	14.4	14.8	97.5
		Total On-Costs	137.1	145.2	142.8	**151.8**	149.6	153.4	157.2	1,037.1
		Total Salaries & On-Costs	652.6	691.1	679.8	**722.3**	712.1	729.9	748.2	4,936.1
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER	*% of Total Salaries & On-Costs*								
	Divnl Other Support	153	1,001.1	1,060.2	1042.9	**877.8**	1,092.4	1,119.7	1,147.7	7,341.8
	Corporate Support	32	208.8	221.2	217.5	**179.7**	227.9	233.6	239.4	1,528.1
	Imputed Rent		200.0	200.0	200.0	**200.0**	200.0	200.0	200.0	1,400.0
	Other Operating		0.0	14.5	0.0	**0.0**	7.5	7.5	7.5	37.0
	Adjt for 1999/00					**34.0**				34.0
		Total Other	1,410.0	1,495.8	1460.4	**1291.5**	1,527.8	1,560.8	1,594.6	10,340.9
TOTAL IN-KIND CONTRIBUTION			**2,062.6**	**2,186.9**	**2140.2**	**2013.8**	**2,239.9**	**2,290.7**	**2,342.8**	**15,276.8**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

DEPARTMENT PRIMARY INDUSTRIES QLD Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
R Haines	Research/Admin.	40								
Z Xu	Research	69								
M Dieters	Research	69								
K Bubb	Research	68								
M Nester	Research	51								
J Simpson	Research	45								
M Lewty	Research	15								
K Harding	Research	14								
P Ryan	Research	10								
M Hunt	Research	4								
S Walker	Research	1								
P Toon	Technician	63								
P Frayne	Technician	58								
C Raddatz	Technician	35								
J Huth	Technician	8								
M Podberscek	Technician	5								
T Wemmerslager	Administration	10								
M Robinson	Administration	8								
A Gardiner	Publicist	5								
		Total Salary	332.7	321.5	305.9	**337.8**	297.3	297.3	297.3	2,189.8
	Direct On-Costs	*% of Total Salaries*								
	Payroll Tax	6	19.0	19.9	18.8	**20.8**	18.4	18.4	18.4	133.8
	Superannuation	15	44.9	46.9	44.5	**49.0**	43.4	43.4	43.4	315.6
	Long Service Leave	2	6.0	9.6	6.1	**6.8**	8.9	8.9	8.9	55.3
	Leave Loading	9	27.6	4.8	27.5	**30.4**	4.5	4.5	4.5	103.7
	Enterprise Bargaining	3	13.3	12.9	8.3	**9.1**	11.9	11.9	11.9	79.2
	Salary Banding	2	5.7	6.1	5.8	**6.4**	5.6	5.6	5.1	40.3
	Workers Comp Premium		0.7	0.0	0.0	**0.0**	0.7	0.7	0.7	2.8
		Total On-Costs	117.1	100.3	111.0	**122.4**	93.5	93.5	92.9	730.6
	Total Salaries & On-Costs		449.8	421.8	416.9	**460.2**	390.8	390.8	390.2	2,920.2
	CAPITAL									
	Lab Modifications		3.0							3.0
	Gas Chromatograph/Mass Spectrometer		25.4							25.4
	Total Capital		28.4	0.0	0.0	**0.0**	0.0	0.0	0.0	28.4
	OTHER	*% of Total Salaries & On-Costs*								
	QFRI Technical Support	4		16.5	16.3	**17.9**	15.2	15.2	15.2	96.3
	QFRI Administrative Overhead	5	22.5	21.1	20.8	**23.0**	19.5	19.5	19.5	146.0
	Deptl Administrative Support	15	45.0	63.3	62.5	**69.0**	58.6	58.6	58.5	415.5
	Office Space	10	45.0	42.2	41.7	**46.0**	39.1	39.1	39.0	292.0
	Laboratory/Glasshouse Rent		45.0	0.0	0.0	**0.0**	39.1	39.1	39.0	162.2
	Travel & Accommodation			0.0	0.0	**0.0**	30.0	30.0	30.0	90.0
	Other Administrative Costs	6		26.6	26.3	**29.0**	24.6	24.6	24.6	155.7
	Field Trials		303.2	176.7	201.7	**156.1**	100.0	100.0	100.0	1,137.7
	Chemical Analysis		26.4	0.0	20.0	**0.0**	20.0	20.0	20.0	106.4
	Depreciation	9	39.0	38.0	37.5	**41.4**	35.2	35.2	35.1	261.3
		Total Other	526.0	384.2	426.8	**382.5**	381.3	381.3	381.0	2,863.1
TOTAL IN-KIND CONTRIBUTION			**1,004.2**	**805.7**	**843.7**	**842.7**	**772.1**	**772.1**	**771.2**	**5,811.7**
ALL PROGRAMS CASH CONTRIBUTIONS			**25.0**	**50.3**	**0.0**	**25.0**	**25.0**	**25.0**	**25.0**	**175.3**

ATTACHMENT D

FOREST ENTERPRISES AUSTRALIA

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

SALARIES		*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
L Ficca	Research	1.5								
G Ogston	Research	1.5								
D Barker	Research	1								
T Cannon	Admin	1								
		Total Salary				4.0				
	Direct On-Costs									
		Total On-Costs				1.0				
		Total Salaries & On-Costs				5.0				
CAPITAL										
		Total Capital				0.0				
OTHER										
Overheads						1.0				
		Total Other				1.0				
TOTAL IN-KIND CONTRIBUTION						6.0	2.0	2.0	2.0	12.0
ALL PROGRAMS CASH CONTRIBUTIONS						2.3	3.7	3.0	3.0	12.0

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

FORESTRY TASMANIA

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
H Elliott	Research/Admin	10								
H Drielsma	Research/Admin	3								
J Elek	Research	40								
A Walsh	Research	40								
P Kube	Research	30								
L Pinkard	Research	20								
S Candy	Research	5								
B Neilsen	Research	3								
J Lesek	Technician	65								
T Kincade	Technician	40								
N Ramsden	Technician	40								
C Ringrose	Technician	25								
R Bashford	Technician	5								
		Total Salary	109.4	125.4	150.6	**125.2**	137.7	151.4	166.6	966.3
	Direct On-Costs									
	Superannuation		13.0	14.9	17.9	**14.9**	16.4	18.0	19.8	114.9
	Workers Compensation		3.9	4.5	4.7	**3.9**	4.4	4.8	5.3	31.5
	Long Service Leave		2.7	3.1	3.7	**3.1**	3.4	3.8	4.2	24.0
	Payroll Tax		7.9	9.1	10.9	**9.1**	9.9	11.0	12.1	70.0
		Total On-Costs	27.5	31.7	37.4	**31.0**	34.1	37.6	41.4	240.5
		Total Salaries & On-Costs	137.0	157.0	188.0	**156.2**	171.8	189.0	208.0	1,207.0
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER									
	Head Office Overheads		57.0	55.4	74.9	**62.3**	68.5	75.4	82.9	476.4
	Office Support		30.5	26.4	29.4	**24.4**	26.9	29.6	32.5	199.7
	Corporate Overheads		24.9	28.6	34.2	**28.4**	31.3	34.4	37.9	219.7
	Operational		66.7	58.2	101.1	**84.0**	92.4	101.7	111.8	615.9
		Total Other	179.1	168.6	239.7	**199.2**	219.1	241.1	265.1	1,511.7
TOTAL IN-KIND CONTRIBUTION			**316.1**	**325.6**	**427.7**	**355.4**	**390.9**	**430.1**	**473.1**	**2,718.9**
ALL PROGRAMS CASH CONTRIBUTIONS			**22.5**	**19.3**	**15.0**	**11.6**	**18.7**	**15.0**	**15.0**	**117.1**

ATTACHMENT D

GRIFFITH UNIVERSITY

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

SALARIES		*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
R Braddock	Research	15								
B Yu	Research	15								
R Rickson	Research	15								
J Hughes	Research	10								
I Phillips	Research	10								
W Hogarth	Board	5								
		Total Salary			75.2	**57.0**				
		% of Total Salaries								
Direct On-Costs										
Superannuation		17			12.8	**9.7**				
Payroll Tax		5			3.8	**2.9**				
Workers Comp		1			0.6	**0.4**				
In-Direct On-Costs										
Outside Studies Program		19			14.3	**10.8**				
Long Service Leave		3			2.3	**1.7**				
Leave Loading		1			1.0	**0.7**				
		Total On-Costs			34.7	**26.2**				
	Total Salaries & On-Costs		163.7	108.8	109.9	**83.2**	106.7	106.7	106.7	785.7
CAPITAL										
	Total Capital		0.0	20.0	20.0	**20.0**	20.0	20.0	20.0	120.0
OTHER		*% of Total Salaries & On-Costs*								
Academic Services		28	32.7	30.5	30.8	**23.3**				
General University Services		49	67.1	53.3	53.8	**40.8**				
Deptl Other support		10	13.1	10.9	11.0	**8.3**				
Other Lab & Workshop Space		20	37.7	21.8	22.0	**16.7**				
	Total Other		150.6	116.5	117.6	**89.1**	114.1	114.1	114.1	816.1
TOTAL IN-KIND CONTRIBUTION			**314.3**	**245.3**	**247.4**	**192.3**	**240.8**	**240.8**	**240.8**	**1,721.7**
ALL PROGRAMS CASH CONTRIBUTIONS			**25.0**	**26.2**	**25.0**	**18.7**	**31.3**	**25.0**	**25.0**	**176.2**

ATTACHMENT D

GUNNS FOREST PRODUCTS

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

		% time CRC	97/98 Actual	98/99 Actual	99/2000 Actual	**2000/01 Actual**	2001/02 Budget	2002/03 Budget	2003/04 Budget	TOTAL
SALARIES										
Name	*Designation*									
D de Little	Scientist	64								
G Holz	Scientist	79								
T Hingston	Technician	73								
K Joyce	Technician	55								
T Williams	Technician	49								
I Ravenwood	Manager	5								
		Total Salary	198.0	169.0	103.6	**145.9**				
Direct On-Costs										
Other-Total										
		Total On-Costs	65.0	83.2	51.0	**71.8**				
		Total Salaries & On-Costs	263.0	252.2	154.7	**217.7**	100.0	100.0	100.0	1,187.6
CAPITAL										
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
OTHER										
Office Support			7.0							
Land Rent			87.0	87.0	37.5	**44.3**				
Trial Maintenance			8.0	9.0	3.0	**3.7**				
Other			267.0	217.0	117.8	**79.7**				
		Total Other	369.0	312.6	158.3	127.7	216.0	216.0	216.0	1,615.6
TOTAL IN-KIND CONTRIBUTION			**632.0**	**564.8**	**313.0**	**345.4**	**316.0**	**316.0**	**316.0**	**2,803.2**
ALL PROGRAMS CASH CONTRIBUTIONS			**65.1**	**50.0**	**30.0**	**20.0**	**25.0**	**25.0**	**25.0**	**240.1**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

GUNNS LIMITED

SALARIES		97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*% time CRC*	Actual	Actual	Actual	Budget	Budget	Budget	
C Hawkins	Research								0.0
M Bramich/M Rusk	Admin								0.0
		Total Salary	5.0	19.2	22.3	**11.9**	0.0	0.0	0.0	58.4
	Direct On-Costs	*% of Total Salaries*								
	Payroll Tax	7								
	Superannuation	6								
	Workers Compensation	5								
	Leave Loading	8								
	Long Service Leave	2								
		Total On-Costs	1.4	5.3	6.1	**3.2**	0.0	0.0	0.0	16.0
		Total Salaries & On-Costs	6.4	24.5	28.4	**15.1**	0.0	0.0	0.0	74.4
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER									
	Head Office Overheads		0.8	3.0	12.2	**3.0**				19.0
	Office Support		1.9	7.4	1.1	**1.0**				11.4
	Operational		1.9	7.4						9.3
	Amortised Vehicle Costs		0.3	1.7		**3.0**				5.0
	Land Rent		0.1	0.5						0.6
	Trial Maintenance		0.5	1.9						2.4
	Experiments		1.3	4.9						6.2
	Other		28.0	15.2		**4.0**				47.2
		Total Other	34.8	42.0	13.3	**11.0**	0.0	0.0	0.0	101.1
TOTAL IN-KIND CONTRIBUTION			**41.2**	**66.5**	**41.7**	**26.1**	**0.0**	**0.0**	**0.0**	**175.5**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**2.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.2**

ATTACHMENT D

NORSKE SKOG PAPER MILLS

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	% time	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
S Hetherington	Research	20								
A Willems	Administration	2								
M Rush	Technical	2								
G Kennedy	Technical	2								
	Total Salary		26.0	16.0	18.0	**22.5**	20.0	19.0	19.0	140.5
	Direct On-Costs	*% of Total Salaries*								
		32	8.0	5.1	5.7	**7.2**	6.4	6.1	6.1	44.5
	Total On-Costs		8.0	5.1	5.7	**7.2**	6.4	6.1	6.1	44.5
	Total Salaries & On-Costs		34.0	21.1	23.7	**29.7**	26.4	25.1	25.1	185.1
	CAPITAL									
	Total Capital		0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER									
	Office Support		10.0	8.0	8.0	**8.0**	8.0	8.0	8.0	58.0
	Land Rent		148.5	139.0	170.0	**161.0**	150.0	146.0	146.0	1,060.5
	Trial Maintenance		15.0	16.0	14.0	**10.0**	16.0	16.0	16.0	103.0
	Experiments		8.5	6.0	5.0	**6.0**	7.0	7.0	7.0	46.5
	Other (Vehicles)		4.0	2.0	2.0	**3.0**	3.0	3.0	3.0	20.0
	Total Other		186.0	171.0	199.0	**188.0**	184.0	180.0	180.0	1,288.0
TOTAL IN-KIND CONTRIBUTION			**220.0**	**192.1**	**222.7**	**217.7**	**210.4**	**205.1**	**205.1**	**1,473.1**
ALL PROGRAMS CASH CONTRIBUTIONS			**22.4**	**20.8**	**20.0**	**20.0**	**20.0**	**20.0**	**20.0**	**143.2**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

PRIVATE FORESTS TASMANIA

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
A Warner	Regional Private Forester	4								
C Wyly	Project Officer	1								
A Lyons	Farm Forestry Coordinator	1								
G Clark	Private Forest Advisor	1								
S Swanson	Planning Officer	1								
G Campbell	Private Forest Advisor	1								
		Total Salary	0.0	0.0	8.2	**4.4**	0.0	0.0	0.0	12.6
	Direct On-Costs									
	Superannuation									
	Workers Compensation									
	Long Service Leave									
	Payroll Tax									
		Total On-Costs	0.0	0.0	2.0	**1.1**	0.0	0.0	0.0	3.1
	Total Salaries & On-Costs		0.0	0.0	10.2	**5.5**	8.1	8.1	8.1	40.1
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER	*% of Total Salaries*								
		Total Other	0.0	0.0	17.2	**0.0**	16.3	16.3	16.3	66.0
TOTAL IN-KIND CONTRIBUTION			**0.0**	**0.0**	**27.4**	**5.5**	**24.4**	**24.4**	**24.4**	**106.1**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	17.5	**20.0**	**20.0**	**20.0**	**77.5**

ATTACHMENT D

SERVE-AG

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
P Volker	Forester	5								
D Blaesing	Research	1								
J Westbrook	Lab Manager	1								
		Total Salary								
	Direct On-Costs									
	Superannuation									
	Workers Compensation									
	Long Service Leave									
	Payroll Tax									
		Total On-Costs								
	Total Salaries & On-Costs		0.0	0.0	10.5	**8.5**	7.5	7.5	7.5	41.5
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
		% of Total Salaries								
	OTHER									
		Total Other	0.0	0.0	21.5	**12.0**	11.3	11.3	11.3	67.3
TOTAL IN-KIND CONTRIBUTION			**0.0**	**0.0**	**32.0**	**20.5**	**18.8**	**18.8**	**18.8**	**108.8**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**1.2**	**1.0**	**1.0**	**1.0**	**4.2**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

SOUTHERN CROSS UNIVERSITY

		% time	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
SALARIES		CRC	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
Name	*Designation*									
R Henry	Research	30								
T Codrington	Research	20								
E Evans	Administration	10								
V Watt	Administration	10								
D Scurr	Administration	10								
P Baverstock	Research	5								
		Total Salary	47.1	51.0	52.6	**54.0**	56.2	58.4	60.8	380.1
Direct On-Costs		*% of Total Salaries*								
Payroll Tax		8	3.6	3.9	4.1	**4.2**	4.3	4.5	4.7	29.3
Superannuation		15	7.8	8.5	8.7	**7.9**	8.2	8.5	8.9	58.5
Workers Compensation		2	0.7	0.8	0.8	**0.8**	0.8	0.9	0.9	5.7
Long Service Leave		3	1.4	1.5	1.6	**1.6**	1.7	1.8	1.8	11.4
Leave Loading		1	0.6	0.7	0.7	**0.7**	0.7	0.8	0.8	4.9
TESS		3	1.4	1.5	1.6	**1.6**	1.7	1.8	1.8	11.4
Other- Maternity Leave		0	0.2	0.2	0.2	**0.2**	0.2	0.2	0.2	1.5
		Total On-Costs	15.8	17.1	17.6	**17.0**	19.0	20.0	21.0	127.5
		Total Salaries & On-Costs	62.9	68.0	70.2	**71.0**	75.2	78.4	81.8	507.5
CAPITAL		***Total Capital***	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
OTHER		*% of Total Salaries & On-Costs*								
Academic Services		9	5.5	5.9	6.1	**6.2**	6.5	6.8	7.1	44.2
Academic Activities - Other		28	17.4	18.8	19.5	**19.7**	20.8	21.7	22.7	140.6
Libraries		15	9.7	10.5	10.8	**10.9**	11.6	12.1	12.6	78.2
Other Academic Support Services		16	9.7	10.5	10.9	**11.0**	11.7	12.2	12.7	78.7
Student Support Services		12	7.5	8.2	8.4	**8.5**	9.0	9.4	9.8	60.9
Public Services		1	0.1	0.7	0.7	**0.7**	0.8	0.8	0.8	4.5
Buildings & Grounds		17	10.6	11.4	11.8	**11.9**	12.6	13.2	13.7	85.3
Admin & General		38	23.6	25.6	26.4	**26.7**	28.3	29.5	30.8	190.8
Independent Operations		20	12.8	13.9	14.3	**14.5**	15.3	16.0	16.7	103.5
Other (Research)			89.2	177.3	187.9	**193.4**	201.2	209.2	108.8	1,167.0
Other (Admin)			3.0	3.6	3.7	**2.1**	3.9	4.0	4.0	24.3
Other			0.0	1.3	0.0	**1.2**	0.0	1.5		4.0
		Total Other	189.7	287.8	300.5	**306.8**	321.7	336.3	239.7	1,982.5
TOTAL IN-KIND CONTRIBUTION			**252.6**	**355.8**	**370.7**	**377.8**	**396.9**	**414.7**	**321.5**	**2,490.0**
ALL PROGRAMS CASH CONTRIBUTIONS			**100.0**	**100.3**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**700.3**

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

SOUTHERN TREE BREEDING ASSOCIATION

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
P Gore	Research	12								
T McRae	Research	10								
D Pilbeam	Research	11								
		Total Salary	0.0	0.0	10.2	**17.1**	17.6	14.7	12.2	71.8
	Direct On-Costs									
		Total On-Costs	0.0	0.0	4.6	**8.6**	8.8	9.1	6.8	37.9
		Total Salaries & On-Costs	6.0	6.0	14.8	**25.7**	26.4	23.8	19.0	121.7
	CAPITAL									
		Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER	*% of Total Salaries*								
	Data			37.0						
		Total Other	0.0	37.0	0.0	**0.0**	0.0	0.0	0.0	37.0
TOTAL IN-KIND CONTRIBUTION			**6.0**	**43.0**	**14.8**	**25.7**	**26.4**	**23.8**	**19.0**	**158.7**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

ATTACHMENT D

THE AUSTRALIAN NATIONAL UNIVERSITY

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

		% time	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
SALARIES		CRC	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
Name	*Designation*									
P Kanowski	Research	30								
D Race	Research	25								
S Mahendrarajah	Research	10								
R James	Research	10								
		Total Salary	48.5	48.6	49.7	**53.4**	53.4	53.4	53.4	360.4
	Direct On-Costs	*% of Total Salaries*								
	Payroll Tax									
	Superannuation									
	Workers Compensation									
	Leave Loading									
	Long Service Leave									
		Total On-Costs	10.7	10.7	12.9	**14.0**	14.0	14.0	14.0	90.3
		Total Salaries & On-Costs	59.2	59.3	62.6	**67.4**	67.4	67.4	67.4	450.7
CAPITAL		***Total Capital***	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
OTHER		*% of Total Salaries & On -Costs*								
	Head Office Support	300								
		Total Other	177.7	177.7	187.8	**202.2**	202.2	202.2	202.2	1,352.0
TOTAL IN-KIND CONTRIBUTION			**236.9**	**236.9**	**250.4**	**269.6**	**269.6**	**269.6**	**269.6**	**1,802.6**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

ATTACHMENT D

THE UNIVERSITY OF QUEENSLAND

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

SALARIES		*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
D Doley	Research	25								
		Total Salary		19.5	20.1	**20.3**	20.5	20.7	20.7	
	Direct On-Costs	*% of Total Salaries*								
	Payroll Tax)									
	Superannuation)									
	Workers Compensation)	21								
	Leave Loading)									
	Long Service Leave)									
		Total On-Costs		4.0	4.2	**4.3**	4.3	4.3	4.3	
	Total Salaries & On-Costs		8.6	23.6	24.3	**24.6**	24.8	25.0	25.0	155.9
CAPITAL										
	Total Capital		0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
OTHER										
Lab Space & Facilities			8.0							
Consumables			2.0							
	Total Other		10.0	47.0	47.0	**47.0**	47.0	47.0	47.0	292.0
TOTAL IN-KIND CONTRIBUTION			**18.6**	**70.6**	**71.3**	**71.6**	**71.8**	**72.0**	**72.0**	**447.9**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

ATTACHMENT D

TIMBERCORP

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
I Bail	Manager	20								
A Tys	Research	18								
J Bulinski	Research	18								
Q Clasen	Research	15								
P Smale	Research	10								
H O'Sullivan	Research	10								
I Smith	Operations	3								
S Guilfoyle	Operations	3								
C O'Connor	Manager	2								
M Clarke	Operations	2								
K Quach	Operations	2								
A Soanes	Operations	2								
K Mullan	Operations	2								
M Kerr	Operations	2								
C Anderson	Operations	2								
D Groom	Operations	2								
M Deidrichs	Operations	2								
Timbercorp Limited 1999/2000 *						**14.7**				
		Total Salary	0.0	0.0	19.0	**87.5**	71.5	71.5	71.5	321.0
	Direct On-Costs	*% of Total Salaries*								
	Total On-Costs	31	0.0	0.0	1.6	**27.3**	22.3	22.3	22.3	95.8
	Total Salaries & On-Costs		0.0	0.0	20.6	**114.8**	93.8	93.8	93.8	416.8
	CAPITAL									
	Total Capital		0.0	0.0	2.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER									
	Admin and Office Support					**206.6**				
	Travel and Accommodation					**7.0**				
	Trial Rent and Maintenance					**25.8**				
	SIF Projects					**9.5**				
	CRC Annual Workshop					**1.8**				
	Industry Pest Management Group					**20.7**				
	Timbercorp Limited 1999/2000 *					**1.4**				
	Total Other		5.0	5.0	5.0	**272.8**	220.5	220.5	220.5	949.3
TOTAL IN-KIND CONTRIBUTION			**5.0**	**5.0**	**27.6**	**387.6**	**314.3**	**314.3**	**314.3**	**1,368.1**
ALL PROGRAMS CASH CONTRIBUTIONS			**0.0**	**0.0**	**0.0**	**50.0**	**62.5**	**50.0**	**50.0**	**212.5**

NB: Figures provided in 1999/2000 related only to Silvagene. Timbercorp group had part-year Core Partner membership as well.

ATTACHMENT D

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

UNIVERSITY OF TASMANIA

SALARIES

Name	*Designation*	*% time CRC*	97/98 Actual	98/99 Actual	99/2000 Actual	**2000/01 Actual**	2001/02 Budget	2002/03 Budget	2003/04 Budget	TOTAL
J Reid	Administration/Researc	50								
G Allen	Research	50								
C McArthur	Research	50								
B Potts	Research	50								
R Vaillancourt	Research	45								
R Wiltshire	Research	30								
M Hurley	Research	25								
P Brown	Research	20								
P McQuillan	Research	20								
S Jennings	Research	15								
C Mohammed	Research	15								
S Shabala	Research	10								
E Bruce	Research	10								
A Richardson	Research	10								
J Kirkpatrick	Research	5								
R Doyle	Research	3								
N Mendham	Research	5								
M Hovenden	Research	5								
A Smolenski	Technical	20								
L Johnson	Technical	10								
T Jackson	Technical	5								
G Johnson	Administration	20								
R Clark	Administration/Researc	15								
G Hallegraeff	Administration	10								
R Swain	Administration	10								
C Phillips	Administration	5								
B Rumbold	Administration	5								
S Jones	Administration	5								
A Glenn	Administration	2								
	Total Salary		259.1	274.7	279.9	**323.1**	332.8	342.7	353.0	2165.3

Direct On-Costs	*% of Total Salaries*							
Payroll Tax	8	18.1	21.2	21.6	**24.7**	25.4	26.2	27.0	164.2
Superannuation	17	44.0	46.7	47.6	**54.9**	56.6	58.3	60.0	368.1
Workers Compensatior	1	2.6	1.4	1.4	**2.3**	1.7	1.7	1.8	12.8
Leave Loading-Academics		3.2	0.0	1.0	**0.0**	0.0	0.0	0.0	4.2
Long Service Leave	1	8.3	8.8	9.0	**0.3**	0.3	0.3	0.4	27.4
Outside Study Academics		20.0	20.0	20.0	**20.0**	20.0	20.0	20.0	140.0
HECS Student Costs		30.0	30.0	30.0	**30.0**	30.0	30.0	30.0	210.0
Other									
	Total On-Costs	126.3	128.0	130.5	**132.2**	134.0	136.5	139.1	926.6
	Total Salaries & On-Costs	385.4	402.7	410.4	**455.3**	466.8	479.2	492.1	3,091.9

CAPITAL

Total Capital	0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0

OTHER	*% of Total Salaries & On-Costs*							
Academic Services	25	96.3	100.7	102.6	**113.8**	116.7	119.8	123.0	773.0
General Uni Services	41	158.0	165.1	168.3	**168.3**	168.3	168.3	168.3	1164.5
Departmental Office Su	10	38.5	40.3	41.0	**45.5**	46.7	47.9	49.2	309.2
Laboratory Rent	32	123.3	128.9	131.3	**145.7**	149.4	153.3	157.5	989.4
Office Space	8	30.8	32.2	32.8	**36.4**	37.3	38.3	39.4	247.4
CSL		84.4	84.4	84.4	**84.4**	84.4	84.4	84.4	590.8
Centre Agency (10% grant)		171.8	231.9	231.9	**234.7**	239.8	242.2	244.6	1596.9
Other Research Quantum			41.9						
	Total Other	703.1	825.3	792.4	**829.8**	842.6	854.3	866.4	5,712.9

TOTAL IN-KIND CONTRIBUTION	**1,088.5**	**1,228.0**	**1,202.9**	**1,284.1**	**1,309.4**	**1,333.5**	**1,358.5**	**8,804.8**
ALL PROGRAMS CASH CONTRIBUTIONS	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**

ATTACHMENT D

WACAP TREEFARMS

CRC FOR SUSTAINABLE PRODUCTION FORESTRY - 2000/2001 Financial Tables

Itemised List of Cash and In-Kind Contributions ($'000)

	SALARIES	*% time*	97/98	98/99	99/2000	**2000/01**	2001/02	2002/03	2003/04	TOTAL
Name	*Designation*	*CRC*	Actual	Actual	Actual	**Actual**	Budget	Budget	Budget	
C Shedley	Research Forester (casual)	20								
V Sims	Technician	20								
Casual Staff	Technician	15								
S Hunter	Nursery/Research Manager	15								
D Pilbeam	Research Forester	10								
Nursery Staff	Technician	5								
M Vitlich/N Itakura	General Manager	3								
R Breidahl	Gen Manager Operations	5								
	Total Salary		54.4	58.4	51.4	**45.6**	52.2	52.2	52.2	366.4
	Direct On-Costs	*% of Total Salaries*								
	Payroll Tax	6	3.3	3.5	3.1	**2.7**	3.1	3.1	3.1	22.0
	Superannuation	7	3.3	4.1	3.6	**3.2**	3.7	3.7	3.7	25.1
	Workers Compensation	6	3.3	3.5	3.1	**2.7**	3.1	3.1	3.1	22.0
	Leave Loading	1	0.8	0.9	0.8	**0.7**	0.8	0.8	0.8	5.5
	Long Service Leave	2	0.9	1.0	0.9	**0.8**	0.9	0.9	0.9	6.2
	Total On-Costs		11.5	13.0	11.4	**10.1**	11.6	11.6	11.6	80.7
	Total Salaries & On-Costs		65.9	71.4	62.8	**55.7**	63.8	63.8	63.8	447.2
	CAPITAL									
	Total Capital		0.0	0.0	0.0	**0.0**	0.0	0.0	0.0	0.0
	OTHER	*% of Total Salaries & On -Costs*								
	Administration	43	31.3	21.6	21.3	**23.8**	32.0	32.0	32.0	194.0
	Office Support	6	1.7	2.6	2.6	**3.6**	2.0	2.0	2.0	16.4
	Corporate Overheads	12	6.0	6.5	6.5	**6.5**	6.5	6.5	6.5	45.0
	Operational	86	34.8	34.4	34.4	**48.2**	36.0	36.0	36.0	259.9
	Amortised Capital Costs	24	8.3	9.5	9.5	**13.3**	9.0	9.0	9.0	67.6
	Land Rent	7	2.1	4.0	4.0	**4.0**	2.5	2.5	2.5	21.6
	Trial Maintenance	1	6.7	7.4	7.4	**0.8**	7.0	7.0	7.0	43.2
	Consumables & Freight	4	1.1	2.0	2.0	**2.0**	1.5	1.5	1.5	11.6
	Library	1	0.8	0.9	0.9	**0.5**	1.0	1.0	1.0	6.0
	Computer Support	6	2.2	2.5	3.2	**3.3**	2.5	2.5	2.5	18.7
	Other - Meetings & Visits	11	11.0	18.0	18.0	**6.0**	13.0	13.0	13.0	92.0
	Other - Fertilizers	7		0.7	3.7	**4.0**	2.0	2.0	2.0	14.4
	Other - Wood Coring Trip			3.0	0.0	**0.0**				3.0
	Total Other		106.0	113.0	113.4	**116.0**	115.0	115.0	115.0	793.5
TOTAL IN-KIND CONTRIBUTION			**171.9**	**184.4**	**176.2**	**171.7**	**178.8**	**178.8**	**178.8**	**1,240.6**
ALL PROGRAMS CASH CONTRIBUTIONS			**35.0**	**35.0**	**35.0**	**35.0**	**35.0**	**35.0**	**35.0**	**245.0**

Abbreviations

AFG	Australian Forest Growers
AGBU	Animal Genetics and Breeding Unit
ANIC	Australian National Insect Collection
ANU	Australian National University
APP	Australian Paper Plantations Pty Ltd
APT	Australian Plantation Timber Ltd
CALM	Department of Conservation and Land Management
CFTT	Centre for Forest Tree Technology
CRC-SPF	Cooperative Research Centre for Sustainable Production Forestry
CSIRO SE	CSIRO Sustainable Ecosystems
CSIRO Ento	CSIRO Entomology
CSIRO FFP	CSIRO Forestry and Forest Products
DELM	Department of Environment and Land Management
DPIQ	Department of Primary Industries Queensland
DPIWE	Department of Primary Industries, Water and Environment
ETT	Education and Technology Transfer Program
FEA	Forest Enterprises Australia Pty Ltd
FFIC	Forests and Forest Industry Council
FNCRDC	Forest and Nature Conservation Research and Development Center, Indonesia
ForSA	Forestry South Australia
FRIM	Forest Research Institute Malaysia
FT	Forestry Tasmania
GFP	Gunns Forest Products Pty Ltd
GI	Genetic Improvement Program
GL	Gunns Limited
GMU	Gadjah Mada University, Indonesia
GU	Griffith University
HVP	Hancocks Victoria Plantation
ICFR	Institute for Commercial Forestry Research
INTA	Instituto Nacional de Tecnologia Agropecuaria, Argentina
NCSU	North Carolina State University, USA
MLURI	Macauley Land Use Research Institute, Scotland
NHT	Natural Heritage Trust
NS	Norske Skog Paper Mills (Australia) Limited
PFT	Private Forests Tasmania
QFRI	Queensland Forestry Research Institute
RDCBFTI	Research and Development Centre for Biotechnology and Forest Tree Improvement, Indonesia
RP	Resource Protection Program
S-Ag	Serve-Ag Pty Ltd
SCU	Southern Cross University
SF NSW	State Forests of New South Wales
SM	Sustainable Management Program
STBA	Southern Tree Breeding Association Inc
TC	Timbercorp Limited
TFGA	Tasmanian Farmers and Graziers Association
UA	University of Adelaide
UL	University of Louisiana, USA
UM	University of Melbourne
UNA	University of North Arizona, USA
UNE	University of New England
UQ	The University of Queensland
USC	University of the Sunshine Coast
UT	University of Tasmania
UWA	University of Western Australia
WACAP	WACAP Treefarms Pty Ltd

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