

# Stand Growth Modelling Cooperative

## NEWSLETTER

June 2005

An interesting question ... Do leaves grow trees, or do trees grow leaves?

Welcome to our June 2005 Newsletter. After each year (1 July to 30 June) for Members, we provide a detailed Annual Report, but for a wider audience, this Newsletter provides an abbreviated version of recent accomplishments.

Currently, we comprise:

**Chairman (Industry):** Peter Oliver, City Forests Ltd, Dunedin

**Programme Manager (ensis):** Bob Shula

**Secretary (ensis):** Judy Hayes

**Primary researchers (ensis):** Bob Shula, Jenny Grace, Judy Hayes

**Supporting researchers (ensis):** Dave Pont, Mina van der Colff, Rod Brownlie, Heidi Dungey

**Research links:** Radiata Pine Breeding Consortium, WQI Ltd

**Membership:** 2 large, 10 medium and 6 small companies, plus 4 consultants

### Cooperative Contact People

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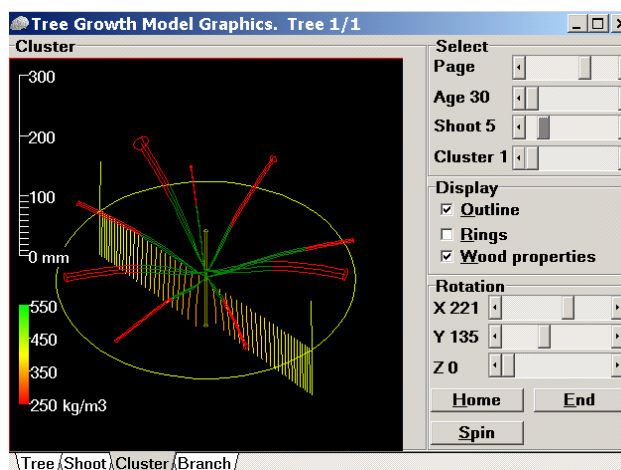
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### Mission Statement

The mission of the Cooperative is to develop growth and yield modelling technology to improve the predictions of stem volume and quality from radiata pine plantations through:

- obtaining appropriate data,
- conducting appropriate research, and
- transferring the resulting knowledge to members of the Cooperative.



## Overview of Current Projects

### 1. Data Provision

#### Long term trials

The annual measurement programme based on a two yearly remeasurement schedule is now at a manageable level of approximately 700 plots. Forest owners have been reminded of the importance of documenting their trial sites due to two trials being thinned without agreement during a stand operation. This has severely compromised the silvicultural treatments at these sites.

Permission was given to the Wood Quality Initiative (WQI) for use of the 1978 Genetic Gain Trials currently under the SGMC Long Term Trial programme in their Resource Characterisation Project. The project aims to create a new archive of major wood properties believed to influence the value of radiata pine wood products. In all studies the GF14 seedlot was used as the 'fixed' genotype as it is present at a wide range of sites and represents some genetic improvement.

Three studies have been completed and seven reports have been provided by agreement with the WQI:

- Pre-screening up to 17 Genetic Gain trials throughout the country for outer wood density and visual stem characteristics
- Benchmarking at five sites – collection of detailed wood properties (eg. density, shrinkage, spiral grain, internal checking and resinous features)
- Utilisation Study at two sites – to complement the benchmarking studies by providing regional stiffness, strength and stability characteristics of mature radiata pine

#### Next generation of genetic gain trials with clonal stock

Issues were discussed and debated with Industry representatives covering the following:

- Need for clonal trials; new trials vs old trials
- New trial design
- Need to validate family data in the models before clones
- Collaboration and IP

SGMC Report No.124 documents recommendations and future project proposals. The first priority was to carry out a GAP analysis to review and report on the existing clonal resources available. This project is currently underway.

#### Detailed comparison of tree growth

The 1975 final crop stocking trials and the 1978 genetic gain trials were analysed and the results (SGMC Report No.123) were used to set priorities in terms of which sites and treatments should be sampled at rotation age for the Internal Stem Modelling project.

### 2. External Stem Modelling

#### Development of tree- and stand-level models

A tree-level model has been developed by Bob Shula and Mina van der Colff, to predict tree growth during silvicultural years. This work includes tree-level diameter and height growth functions, as well as probability of survival models that incorporate thinning and pruning effects.

#### Implementation of tree-level models

Following agreement by Cooperative members, a demonstration version of Brian Rawley's (Silmetra) software package, YTGEN (Yield Table Generator) was produced, which included our fully functional individual-tree model (ITGM). There is a proviso that the 'demo' model is only able to be run a maximum of 15 times and consequently can be released to non-members for evaluation.

Any use of SGMC models in YTGEN by non-members will incur a royalty payment to the Cooperative equivalent to an SGMC annual membership fee. To-date, only the SGMC tree-level growth functions (not the branch functions) have been incorporated into YTGEN.

The tree growth functions during silvicultural years are currently being implemented into TreeBLOSSIM. Following this a sensitivity analysis will be carried out to determine if there is any discontinuity in the growth trajectory when shifting from the TreeBLOSSIM-Early to the later growth functions.

The screenshot shows the 'test\_marvl' software window. It has several input fields and a table. The 'Growth Region' is set to 'CNI', 'Breed' is 'Unimproved', 'Age (years)' is '15.00', and 'Mortality Adjust %' is '100'. The 'Branches' section has 'Random Seed' as '1234567', 'Height/Age Model' as '34', and 'Taper function' as '237'. Below this is a 'Silvicultural history' table with columns 'Thin Age', 'Stems/ha', 'Prune Age', and 'Lift (m)'. The table contains three rows of data: (0.00, 1200, 5.00, 3.00), (5.00, 600, 9.00, 6.00), and (9.00, 150, , ). At the bottom is a 'Dictionary' table with columns 'Code', 'MaxBr mm', and 'Description'. It lists seven codes (A through G) with their corresponding maximum branch lengths and descriptions of pruning and thinning treatments. For example, code 'A' has a MaxBr of 0 and description 'pruned sweep < D/4'. The interface includes 'OK', 'Print', and 'Cancel' buttons at the bottom.

Code	MaxBr mm	Description
A	0	pruned sweep < D/4
B	0	pruned sweep D/4 - D/2
C	0	pruned sweep D/2 - D
D	70	branch < 7 sweep < D/4
E	100	branch 7-10 sweep < D/4
G	150	branch 10-15 sweep < D/4

*The form for entering site and stand details*

### 3. Crown Modelling

#### TreeBLOSSIM function revision

Fourteen sites and 90 trees have been destructively measured between 1994 and 2003. To analyse the data between sites, it was essential to achieve a common data format that will enable analysis to be carried out much more easily with various combinations of datasets in the future. All the data from the '850' seedlots was pooled and analysed together. The functions fall into 4 categories:

- Functions at the tree level
- Functions at the annual shoot level
- Functions at the cluster level
- Functions at the branch level

Dave Pont revised the TreeBLOSSIM code in February 2005. The first branch model was only based on 3 regions, but now all growth modelling regions are represented and there has been a significant increase in the amount of data available. Of the 15 mathematical relationships seven have changed functional form and four have had the equation refitted. The changes have been documented in SGMC Report No.125. The following were identified during function revision:

- The functions for branch clusters in an annual shoot have been revised to include a maximum for number of clusters in an annual shoot for a region.
- A look-up table, common across all sites, will give the relative position of branch clusters in an annual shoot.
- Branches and cones in a cluster – there is a common distribution for all sites
- Branch diameter development – regional coefficients are required
- Branch angle – assumption that angle does not change with time
- There is regional variation with branch mortality
- Bark entrapment – there are common probabilities across sites
- The phyllotatic distribution for azimuth angle of branches will continue to be used.

Jenny Grace pointed out that the use of relative tree size and stocking within TreeBLOSSIM was a cleaner way of modelling and was more flexible for simulating branch growth in response to thinning.

#### PhotoMARVL Studies

Collecting and analysing photoMARVL data for testing the TreeBLOSSIM branch functions continues to be an important project for the Cooperative.

Over the past year, 6 of the Silviculture/Breed trials have been photoMARVLed to collect quantitative branch data from a range of seedlots and silvicultures. In addition to this the 'Response Surface Trial' in Hawkes Bay, with 32 plots covering a range of site quality, thinning and pruning regimes was also sampled.

### 4. Internal Stem Modelling

The initial aim of this project was to test the generality of a model to predict stem growth and wood density from crown structure that was developed by Dave Pont for his Masters Thesis.

A pilot study was designed to test an appropriate data collection strategy to be used in the SGMC trials as they reach rotation age/time of felling. Following this, in 2004 a destructive sampling project in a rotation-aged trial (age 26 years) was completed in the Golden Downs 1978 Genetic Gains Trial (NN530/2). This was a major task to organise as it involved 8 ensis staff members, for five days in the field, followed by several manweeks in the laboratory. The sampling scheme was based on 'paired' trees of similar DBH but different outer wood densities. Data collected at this site included:

- PhotoMARVL images giving stem form
- Foliage weight for selected branches
- Branch positions and diameters
- Disc images from the tree pairs giving wood colour distribution



*Preparing the discs and collecting data at NN530/2*

Wood samples have been analysed with SilviScan to give quantitative wood properties and the resulting data will be linked back to the disc images.



## Field Trip in February 2005

Weyerhaeuser hosted an excellent day around Blenheim, including a visit to:

- The Kaituna Sawmill that focuses on cutting pruned logs for export appearance grade timber.
- A Silviculture/Breed trial at Ditchlings where growth influenced by altitude and drought was discussed.
- A Plantation Management Cooperative stocking trial in Rai Valley, where the new Weyerhaeuser tool (based on Fakopp) for measuring tree stiffness of standing trees was demonstrated.

Weyerhaeuser provided summaries of inventories taken in these trials showing volume by branch size and grade, yield at harvest and net present value, for each seedlot/silviculture combination.

## Membership

Last year we lost the membership of the Regional Councils and Fletcher Challenge Forests Ltd. The land ownership of the latter company was transferred to three new owners with both Kaingaroa Timberlands and Hancock Forest Management transferring membership rights. The third owner, PruTimber, have not yet joined the Cooperative. Two new companies with no land ownership also joined – Tenon and Silmetra. This increased the number of member companies but overall there was a decrease in amount of area based contributions.



## How Much Do We Cost?

Currently, our annual membership fee is NZ\$3,100 per year, plus NZ\$0.18 per hectare (net stocked radiata pine, owned and/or managed). New members have to be approved by 90% of existing members, and a joining fee applies equivalent to an extra annual fee. Members are invoiced annually, and the 2004/05 industry contribution totals some NZ\$225,000.

Cooperative Membership 2004/05	
Carter Holt Harvey	Fred Schipper, Tokoroa
Chandler, Fraser, Keating	Mike Colley, Rotorua
City Forests	Peter Oliver, Dunedin
Corrland	Graham Hardisty, Turangi
Ernslaw One	Steve Dowman, Tauranga
Forest & Woodlot Mgmt (NZ)	Jim Shirley, Rotorua
Forestworks NZ	John Hornby, Nelson
Hancock Forest Mgmt (NZ)	Ian Jenkin, Rotorua
Hikurangi Forest Farms	Ross Wade, Gisborne
JP Management Consulting	Steve Croskery, Auckland
Kaingaroa Timberlands Mgmt	Simon Papps, Rotorua
Pan Pac Forest Products	Brian Garnett, Napier
Ministry of Agric & Forestry	Peter Gorman, Wellington
P.F. Olsen & Co	Jeff Schnell, Rotorua
Rayonier NZ	Julia Sinnock, Auckland
Selwyn Plantation Board	Hugh Stevenson, ChCh
Silmetra	Brian Rawley, Tokoroa
Tenon	Gareth Buchanan, Rotorua
Timberlands West Coast	Ross Jackson, Greymouth
Wenita Forest Products	James McEwan, Dunedin
Weyerhaeuser NZ Inc	Marion Hughes, Nelson
Wrightson Forestry Services	George Platts, Dunedin

## When and Where Is Our Next Meeting?

Our next meeting is on Thursday 28 July at Scion, Te Papa Tipu Innovation Park, Rotorua. This is the Annual Meeting where the new work programme and budget will be approved for the 2005/06 financial year. The following meeting and field trip will be held in February 2006.

