

## **Tree Improvement and Cuttings production of Eucalyptus globulus at Albany Forestry Research Centre**

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### **Introduction**

The Albany Plantation Forest Company of Australia (APFL) began planting *Eucalyptus globulus* spp *globulus* in 1992. The majority shareholder of APFL is the Oji Paper Company. In 2001 Oji Paper began making phenotypic plus tree selections in the plantation estate of APFL which is all within 120km of Albany. The Albany Forestry Research centre was opened by Oji Paper in 2003 and began research on the propagation of *E.globulus* by stem cuttings. The first field trials were planted in 2004 and more trials and pilot plantations with clonal material totaling 100ha were planted in 2005, and 2006. A further 100ha will be planted in 2007.

### **Phenotypic tree selection**

Candidate plus trees are selected in plantations of 6-10 years. All plus trees must have living immediate neighbours and be straight and without forks. The height and diameter at breast height (DBH) of 25 trees around the candidate are measured. Plus trees must be at least 1.5 standard deviations of the plot mean DBH greater than the plot mean DBH.

### **Wood Sampling**

Plus trees are felled at full rotation of 9 or 10 years and whole tree wood samples taken made up of discs from 10, 30, 50, 70, and 90% of height to 5cm diameter over bark. A sample disc is measured for over and under bark diameter at each height. Composite wood samples are then chipped and tested for basic density, Kraft pulp yield, and alkali consumption. Core samples are also taken from each tree and measured for basic density and also for Kraft pulp yield by Near-Infra Red Analysis in conjunction with ENSIS.

### **Propagation of plus trees by cuttings**

Depending on the time of year of harvest coppice re-growth is collected from the plus trees 3-6 months later (September to May). Double node cuttings are rooted in a cocopeat/perlite (60/40) medium in a shaded propagation houses which maintain relative humidity at a minimum of 70% and temperature at 20-28 C. As found by many previous workers in this field the rooting ability of *E.globulus* is highly variable (figure 1).

In the second year clones that have given more than 20% rooting from coppice are re-tested for rooting from nursery grown stock-plants. These results usually correlate quite well with results from coppice but occasional clones do show significant improvement (figure 2).

fig 1 Distribution of rooting ability of E.globulus plus trees. Summary of data from 343 clones tested over 4 seasons.

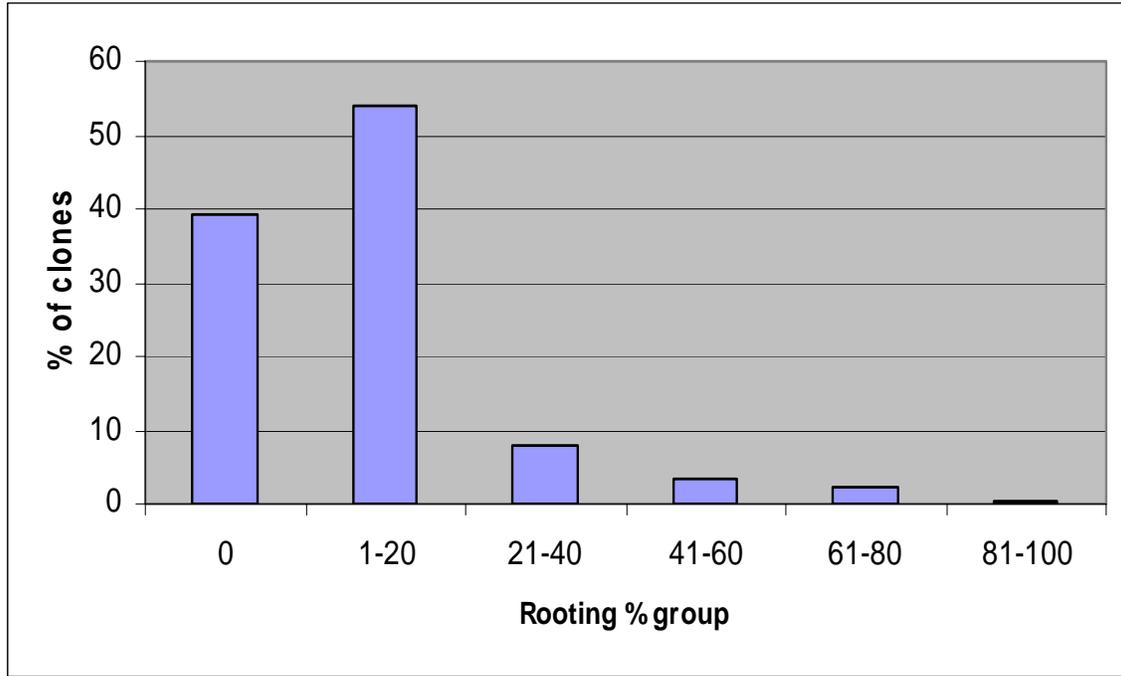
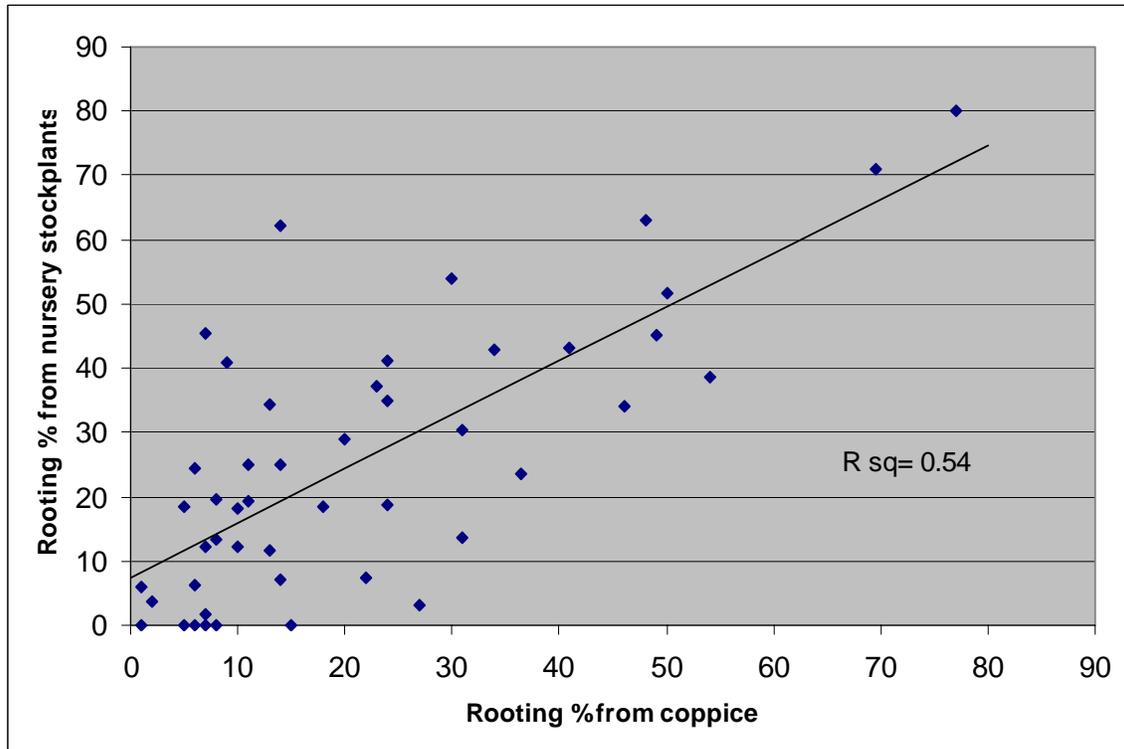


fig 2 Rooting ability of clones from coppice or nursery grown stock-plants.



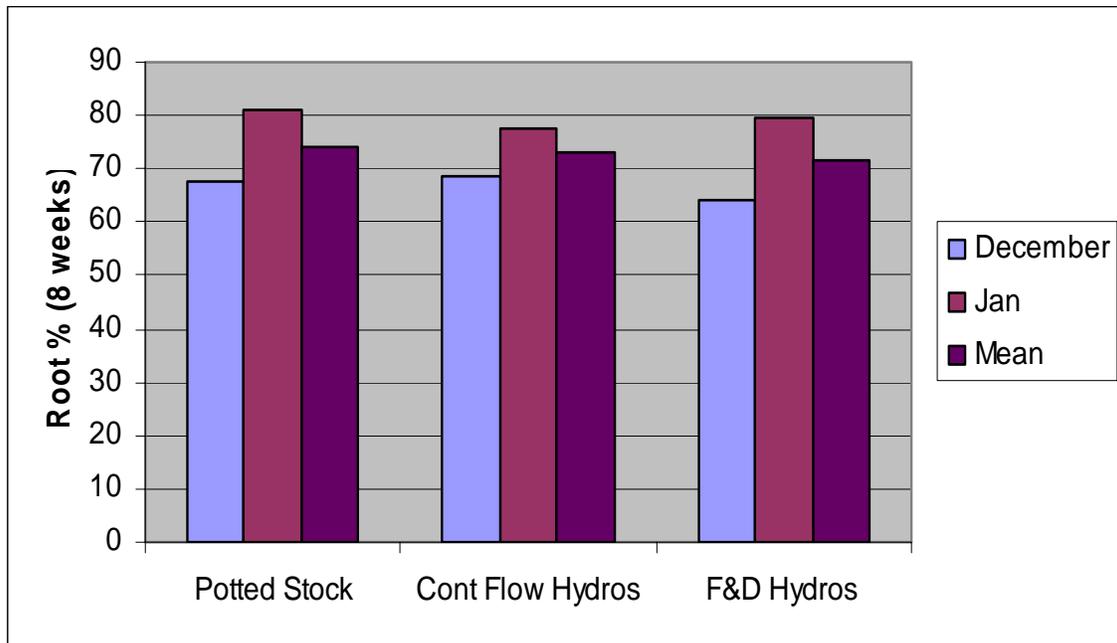
## Mother plant systems for cuttings

Following initial rooting from coppice material we have been using a variety of mother plant systems for the further propagation of planting stock:

1. Potted stock- cuttings are planted outside in July/ August in 4lt bags of commercial medium based on composted pine bark (Wombat mix, Albany Environmental Services) with 10g/l-1 Osmocote plus 8-9 month. Plants are drip irrigated as required and also given additional liquid fertiliser weekly from January.
2. Continuous flow (CF) hydroponics- cuttings are planted in a continuously flowing hydroponic solution (Growth Technology) in covered but open sided polythene tunnels.
3. Flood and drain (F&D) hydroponics- cuttings planted and flooded once every 24 hrs with nutrient solution and once with water.

Rooting results from the different systems have actually given very similar results in terms of rooting percentage (fig 3). Production of cuttings material per plant is highest for the CF hydroponics and probably highest per unit area from this system (visual observation only).

fig 3 Root strike of *E.globulus* cuttings from different mother plant systems. This data is the mean of 4 clones in December 2006 and 2 clones in January 2007 and based on a total of 37 000 cuttings set in those 2 months.



## Relationships between Rooting ability and Wood Properties

We have taken the opportunity of looking for any correlations which may exist between rooting ability and wood properties of our selected trees (figs 4-6).

fig 4 Rooting ability versus wood density for 68 plus trees of E.globulus

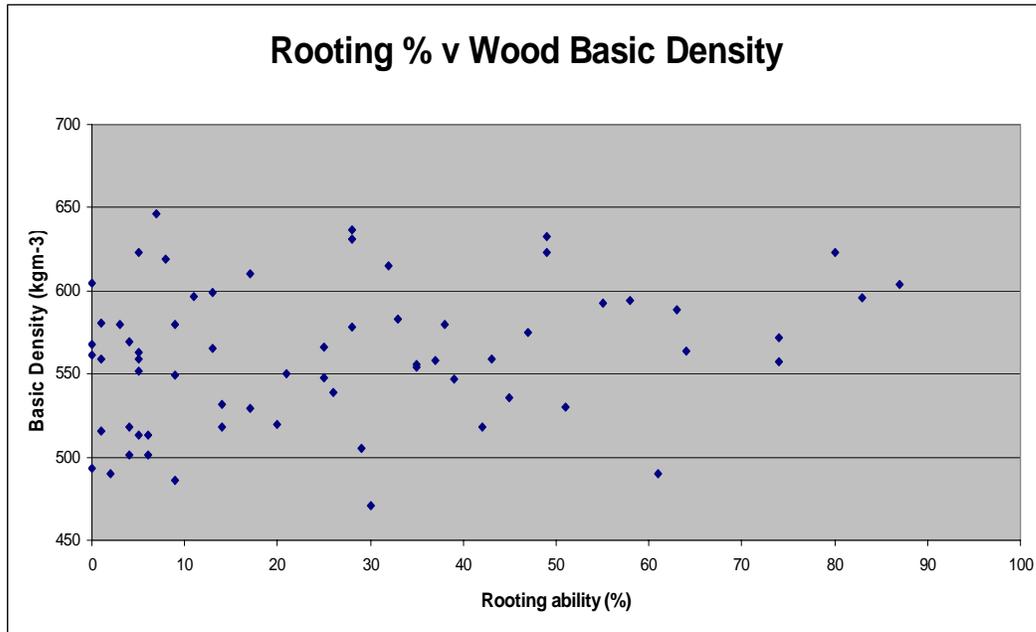
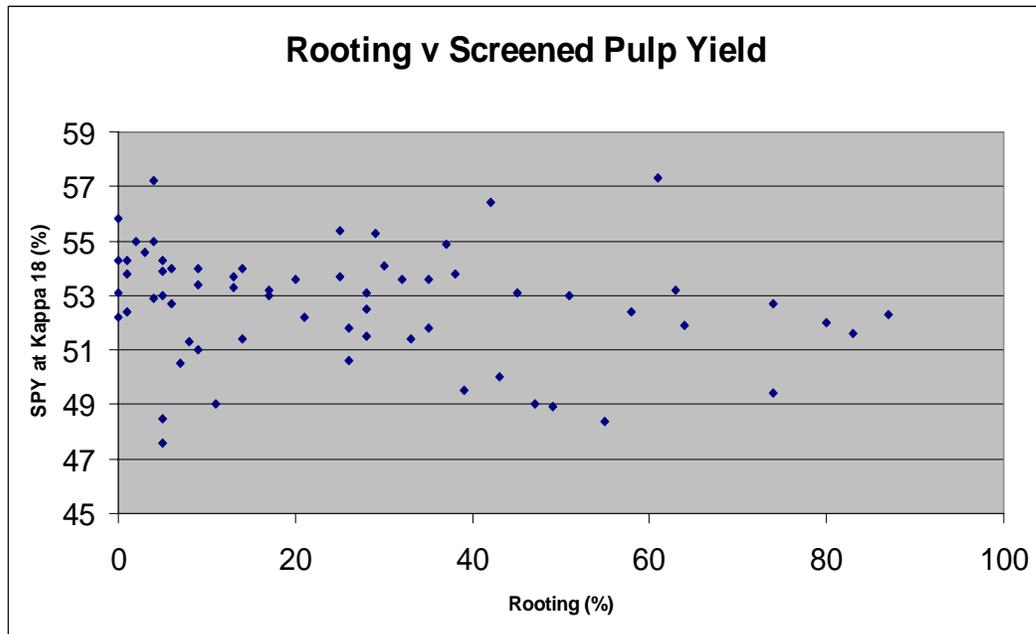
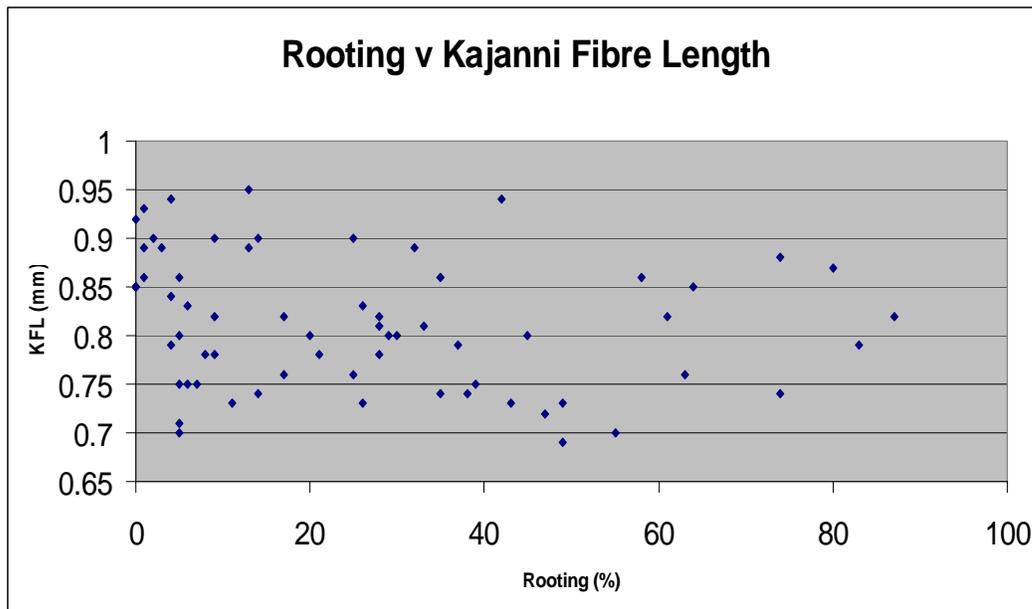


fig 5 Rooting ability versus Screened Pulp Yield adjusted to Kappa 18 for 68 plus trees of E.globulus.



Even though this data is collected from a range of sites we conclude that there are no significant correlations of rooting with the wood properties measured.

fig 6 Rooting ability versus Kajani Fiber length for 68 plus trees of E.globulus



## Clone Trials

Rooted cuttings are planted in field trials across the range of APFL sites and also in some areas not presently planted due to high soil conductivity (salt affected). Depending on the plants available trials are planted as either Single Tree Plots with 8 reps, 5 tree plots with 6 reps, or 72 tree plots with 4 reps. Seedlings of both improved and unimproved origins are planted in most trials and trials are connected with either control seedlings or clones. Over 60 clones have been planted in the last 3 seasons. Pilot plantation areas have also been planted with the best rooting clones. In total by end 2006 over 100ha had been planted with clones and this area is planned to double in 2007. Joint trials are now being developed on land managed by other companies to extend the range of our clonal information.

## Developing a Breeding Population

One ramet of all our clones is planted in a Breeding Arboretum. Zero rooting clones are grafted to achieve this. Flowering is promoted with paclobutrazol application. All clones are then controlled crossed with a pollen mix to produce outcrossed seed of each genotype. Progeny trials will be planted with this seed. As we gain information of the best performing clones in field trials then crosses are also being made of good growing with good rooting clones. We are also exchanging germplasm with other companies.

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