

# Department of Primary Industries and Fisheries

## Composite Research at DPI&F

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## DPI&F's R&D Strategy

### Vision:

Profitable primary industries  
for Queensland

### Mission:

Maximise the economic potential of Queensland's primary  
industries on a sustainable basis

### R&D Investment Platforms:

(Target % of \$100M/yr)

Evolutionary (continuous incremental improvement) 60-80%

Tactical (emergent issues, opportunities, impediments) 10-20%

Revolutionary (new technologies, new industries) 10-20%



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# Composite Research at DPI&F

## DPI&F's R&D Strategy

### Revolutionary Platform Priority Areas:

- Agricultural Biotechnology
- Food Futures
- Tropical Science
- **Advanced Biomaterials**

(integrate recent advances in engineering, product design and advanced biomaterials to develop hybrid products, bioactives and smart materials as opportunities for timber, cotton, sugarcane and other high biomass industries)



# Composite Research at DPI&F

## Forestry RD&E Program



### Aim:

To accelerate the growth of Queensland's emerging tropical and subtropical hardwoods plantation sector by R&D to increase:-

- plantation productivity,
- the potential area suitable for hardwood deployment, and
- the value of existing and new plantation products.

### 2008/09 Funding:

State Treasury (DPI&F appropriation): \$3.7M/yr

External co-investors in R&D projects: \$3.7M/yr

# Composite Research at DPI&F

## Forestry Science

(Dr Michael Kennedy)

### Forest Technologies:

- Forest Tree Improvement (Dr David Lee, Gympie)
- Forest Growth and Modelling (Dr Mark Hunt, Gympie)
- Forest Health (Dr Simon Lawson, Indooroopilly)

### Forest Products:

- Product Development (Dr Henri Bailleres, Indooroopilly)
- Process Development (Mr Rob McGavin, Salisbury)
- Product Performance (Mr Jack Norton, Indooroopilly)
- Product Quality (Dr Anton Zbonak, Indooroopilly)





## **Composite Research at DPI&F**

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**Recent project work involving composites**

**2004-2006 FWPRDC Project PN05.2022**

**Utilisation potential and market opportunities for plantation hardwood thinnings from Queensland and northern New South Wales**

**2006-2007 FWPRDC Project PN07.3022**

**Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita***

Full reports at [www.fwpa.org.au](http://www.fwpa.org.au)



# Composite Research at DPI&F

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## Recent project work involving composites

**2004-2006 FWPRDC Project PN05.2022**

**Utilisation potential and market opportunities for plantation hardwood thinnings from Queensland and northern New South Wales**

**Collaborators:** DPI&F, NRPFD, FPQ, FNSW, FEA, ATP, Richards, Perma-Log, Australian Hardboards, NSW TAFE, Hurfords, Hyne, Ausgum, Big River Timber, Palletmaster.

**Resource:** 8-9 year old Gympie messmate, blackbutt and red mahogany

### **Industry processing:**

- sawing, finger jointing, laminated beams, roof trusses, outdoor furniture
- natural rounds (landscaping)
- hardboard
- veneer & plywood

### **Lab tests:**

- clear wood wood density, heartwood proportion, hardness, strength, stability, shrinkage, unit shrinkage, extractive content
- full sawn section strength, stiffness, grade recovery (structural)
- round wood strength and stiffness
- veneer and plywood produced by BRT tested for glue bond, strength & stiffness

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## Recent project work involving composites

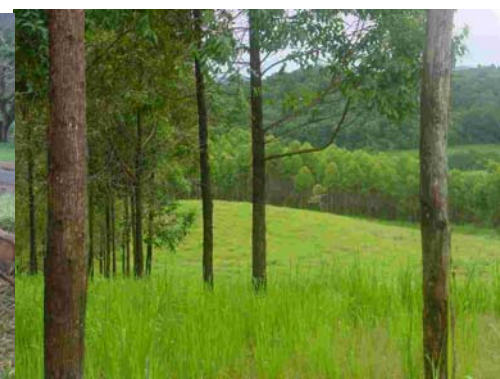
2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

### Resource:

Experimental plantings of hardwoods on the wet tropical coast around Innisfail

- 15 year red mahogany (*Eucalyptus pellita*) – Dillon's, 20 km N of Innisfail
- 19 year old Gympie messmate (*Eucalyptus cloeziana*) – near El Arish



# Composite Research at DPI&F

## Recent project work involving composites

2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

### Part A: Natural durability assessment

- Above-ground field testing (L-joints and ground proximity)
- In-ground field testing (stakes)
- Accelerated lab testing (soil jar bioassay and vermiculite burial)

Specimens installed Exposure continues Results pending



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## Recent project work involving composites

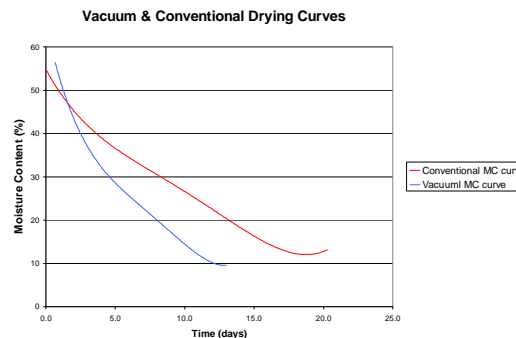
2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

**Part B: Accelerated seasoning of sawn timber using conventional and superheated steam vacuum kilns**

- 3 x conventional kiln trials (2 x Gympie messmate & 1 x red mahogany)
- 2 x superheated steam vacuum kiln trials (Gympie messmate only)

Some tuning required to determine optimal schedules however vacuum drying time was approximately 60% less than conventional.



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## Recent project work involving composites

2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

### Part C: Wood quality and structural properties

**Assessments:** (for inner-, mid- and outer-heartwood zones)

- Clearwood density, heartwood proportion, hardness, strength, stiffness, shrinkage, extractive content, nail & screw holding  
Full sawn section strength, stiffness, grade recovery (appearance and structural), acoustic grading

Properties of 19 y.o. Gympie messmate were similar to native forest sourced wood  
Properties of 15 y.o. red mahogany around 70% of that sourced from native forest

ITC Limited have since included Gympie messmate in their wet tropic coast planting program



# Composite Research at DPI&F

## Recent project work involving composites

2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

### Part D: Veneer and plywood potential

**Collaborators:** DPI&F, DTRDI, FWPA, ITC, Big River Timbers, Boral Hancock, Austral Plywood and EWPAAs.

### Assessments:

- 1.2m billets peeled and veneer dried at BRT
- Veneer graded with EWPAAs input
- Test panels manufactured at BRT (MUF)
- Test panels including hwd/swd mix manufactured at Boral Hancock (PF)
- Lab scale adhesive specimens tested
- Finished plywood strength and bond quality tested



# Composite Research at DPI&F

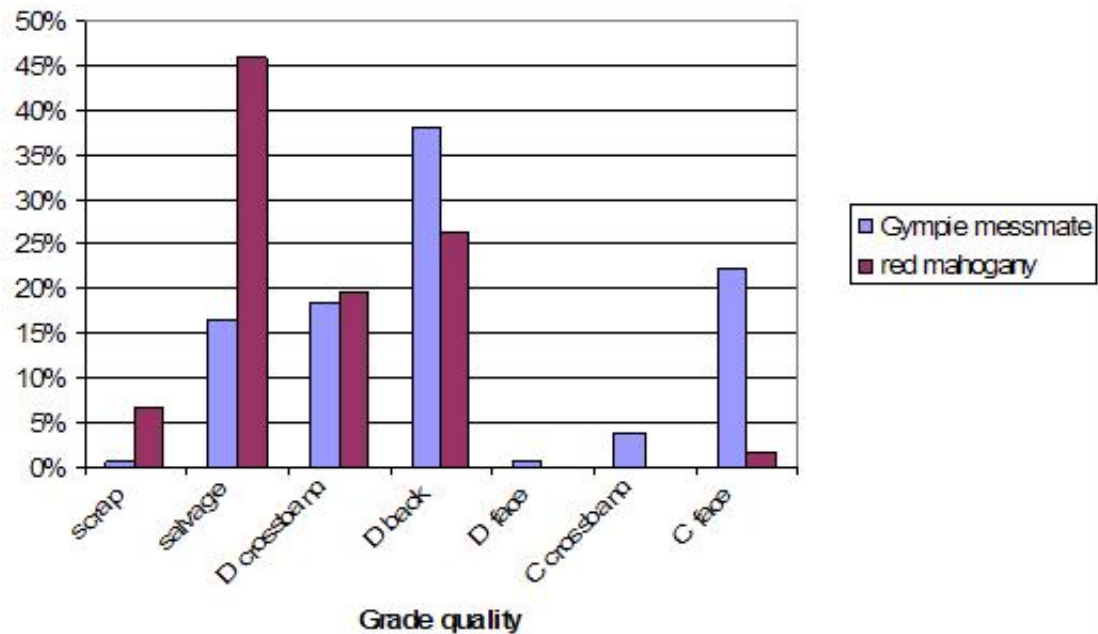
## Recent project work involving composites

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Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

Part D: Veneer and plywood potential

Results:





# Composite Research at DPI&F

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## Recent project work involving composites

2006-2007 FWPRDC Project PN07.3022

Evaluation of wood characteristics of tropical post-mid rotation plantation *E. cloeziana* and *E. pellita*

### Part D: Veneer and plywood potential

#### Results:

- Gympie messmate panels achieved F17 – F27
- Red mahogany panels achieved F11 – F14
- 100% of the commercially manufactured red mahogany and 90% of the lab produced specimens passed glue bond assessment for PF (Type A).
- 80% of the commercially manufactured Gympie messmate and 42% of the lab produced specimens passed glue bond assessment for PF (Type A)
- Neither commercially produced or lab produced specimens passed glue bond assessment for MUF (Type B). Lab work repeated with same outcome. Why???
- Outcomes sufficiently encouraging to justify further investment in this area of R&D



## Composite Research at DPI&F

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### **New Project – High Value Timber Composite Panels from Hardwood Plantation Thinnings**

**Collaborators:** DTRDI, FWPA, Austral Plywood, Boral Hancock, Big River Timbers, EWPA and FPQ

**Project Overview:**

- \$1.3M total project budget  
(DTRDI 33%, DPI&F 29.5%, Industry 30% and FWPA 7.5%)
- Start Jan 09, 2 year project
- Species of interest include Gympie messmate, spotted gum (& hybrids), western white gum, red mahogany, Dunn's white gum



# Composite Research at DPI&F

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## New Project – High Value Timber Composite Panels from Hardwood Plantation Thinnings

### Variables:

#### Peeling -

- billet pre treatment
- peeling technologies and setup (conventional rotary and spindleless)
- drying

#### Panel manufacture -

- adhesive (A and B bonds; MUF, PF, other)
- press conditions
- panel finishing

### Assessments:

- grade recovery
- bond quality
- mechanical properties (bending strength & stiffness, tensile & compression strength, shear)
- market acceptance



# Composite Research at DPI&F

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## Infrastructure at DPI&F Salisbury Research Centre (approx \$1.5M by February 09)

### Building –

- 720 m<sup>2</sup> new dedicated purpose built composite facility

### Equipment –

- new Omeco spindleless 1.3m lathe (installed)
- 36m variable speed lathe outfeed system (on order)
- veneer clippers and guillotines
- splicer and composer
- glue spreaders
- presses (industrial size cold and hot presses under multi-step programmable electronic control, + lab press)
- trim saws

# Composite Research at DPI&F



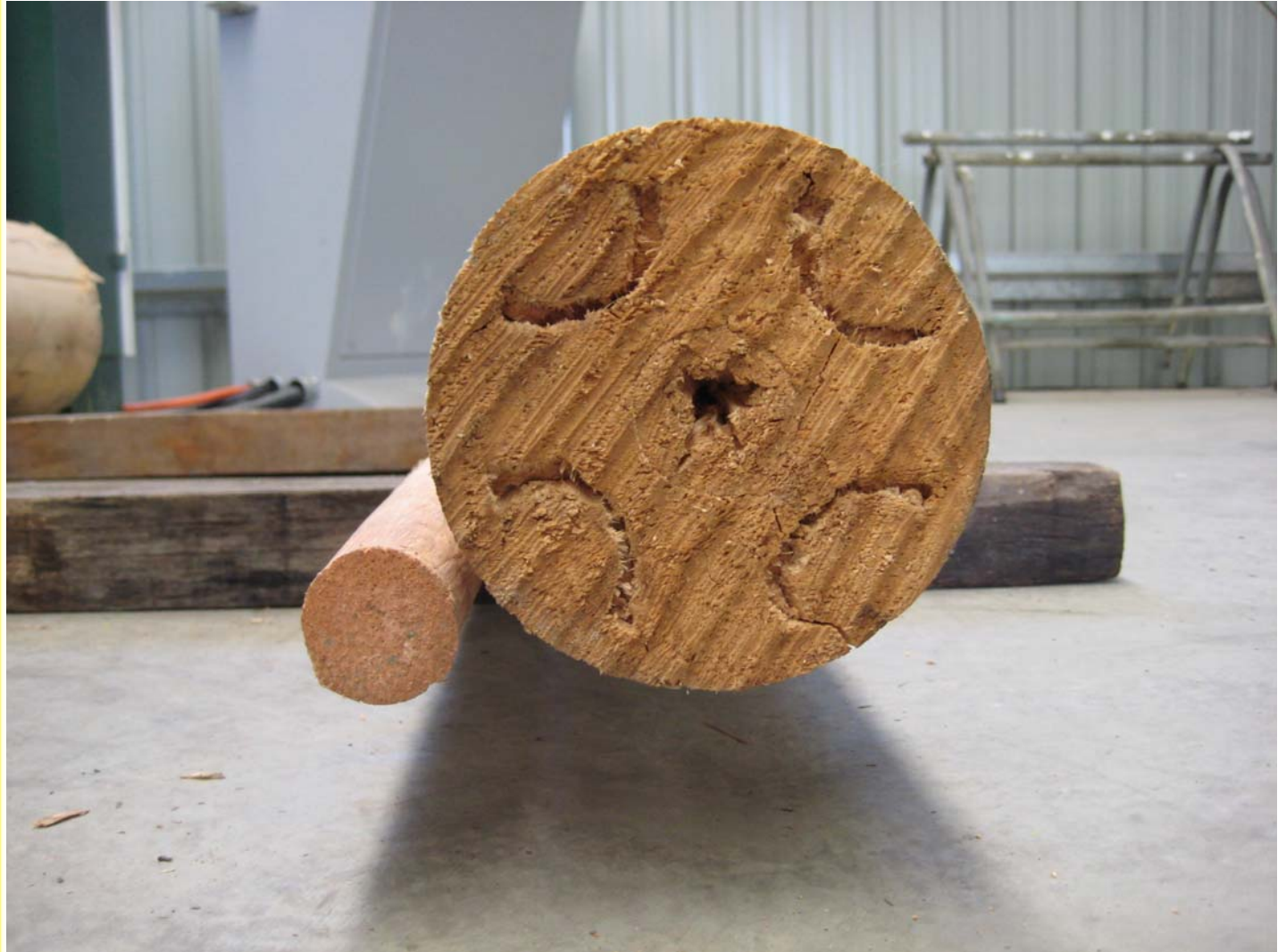
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