Eucalypt forests that produce durable hardwood: a sustainable option for New Zealand drylands

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Farming for the future: Carterton
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Eucalypt forests that produce durable hardwood: a sustainable option for New Zealand drylands

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Heather Atkinson
• Fast-growing trees that produce ground-durable timber (15-25+ years)

• Suited to dry/unreliable rainfall areas (600-1000mm/yr)
Range of potential markets/end uses, on and off the farm
Environmental benefits – on and off farm
Ingredients for success

A market

Valuable products; competitively priced; environmentally friendly; sustainable

Trees that are adapted to grow productively in NZ conditions

Fast; straight; disease, drought, frost resistant...

Reliable performance on a range of sites

and produce high quality hardwood

Consistent properties; natural durability, low growth strain; high heartwood percentage; no collapse; high stiffness...

Interested growers / wood processors / end-users
Vision:

• New Zealand to be a world-leader in breeding ground-durable eucalypts

and

• to be home to a valuable sustainable hardwood industry by 2050 (100,000 hectares of eucalypt forests).
NZDFI – investment of $2.6 million 2003-2015 and more to come

• Proseed
• Juken New Zealand Ltd
• 26 landowners
• Five regional councils (GWRC, HBRC, Horizons, BoPRC, MDC)
• Marlborough Lines
• Marlborough Gold Honey
• School of Forestry (University of Canterbury)
• MPI Sustainable Farming Fund
• AGMARDT, NZFFA, NBFFF, Marlborough Research Centre
• MPI/FFR Specialty Wood Partnership (7-year, $7m project)
Vineyard posts – the start of the journey

- 500,000 replacement vineyard posts needed each year in South Island vineyards
- 150,000 in North Island vineyards
- CCA-treated radiata – lots of problems
- Home-grown durable hardwood an obvious alternative.
Hardwood Solution

- **High Strength**
- **Durable Eucalypt Timber Post**
- **Natural Durability** (No Treatment Costs)
- **Natural Residues** (Recycle or use as firewood)
Marlborough Lines: cross arms

Aussie hardwood’s have been the preferred timber for crossarms - now in short supply and expensive.
Hardwood decking & beams are used in modern city waterfronts

Imported Australian hardwood on Wellingtons waterfront

- **Karri** - $2,666 per cubic metre (1998)
- **Grey Ironbark** - $5,333 per cubic metre (1998)
Radio NZ reports ‘Rotting sleepers cause derailments’ 2nd August 2012. Cost $7M.

Blenheim Rail Bridge, Taylor River with SH 1 bridge behind.
High strength LVL beams and cross-laminated timber panels of eucalypt / pine
New Kaikoura District Council offices under construction
Emerging Asian markets

• 1500 million new middle-class Asians by 2050

• Tropical rainforest supplies are decreasing
Eucalypts support honey bees and native biodiversity

• Some durable eucalypts produce abundant nectar and pollen at various flowering times throughout the year.
Off-farm sustainability benefits

• Local processing:
  - no chemical treatment & minimal RMA issues
  - lower transport and processing costs (and carbon emissions)

• Future regional development in processing high value wood products – let’s hope!
Since 2003 NZDFI has invested $2.6m on R&D

Project has a clear development pathway:

• Selection of test species 2003-06

• Network of trial sites 2008 onwards
  - developing breeding populations
  - understanding site x species interactions
  - demonstrating ‘proof of concept’.

• Research into wood properties 2008 onwards (building on radiata wood quality research)
NZDFI project has a clear development pathway

1. **DURABLE EUCALYPT SEED COLLECTION.** 2003 - 2006
2. **ESTABLISH TRIALS TO TEST SPECIES** 2003 - 2006
3. **SELECT SPECIES for BREEDING & COMPLETE SINGLE TREE COLLECTIONS** started 2007
4. **PLANT BREEDING POPULATIONS & EXTENSION TO OTHER REGIONS** Started 2008
Species Selection Criteria

- High natural durability
- Fast growth, straight stems
- Rich diversity of colour
- Early heartwood formation
- Drought & frost tolerance
- Coppice vigorously
- Nectar/pollen for native biodiversity and beekeeping

Selected 5 species from 25 candidates
Durable *Eucalyptus* species selected for NZDFI breeding populations

- *E. bosistoana* (coastal grey box)
- *E. argopholia* (western white gum)
- *E. quadrangulata* (white topped box)
- *E. tricarpa* (red ironbark)
- *E. globoidea* (white stringy bark)

Highlighted species have no record of breeding for plantation use.
Next 7 years: NZDFI research under new $7m Specialty Wood Products partnership

- Selection and outcrossing to improve growth; form; wood quality; pest resistance
- Matching species and sites for optimal productivity
- Modelling, management and silviculture systems
- Regional development strategies.
Next 7 years: NZDFI research under new $7m Specialty Wood Products partnership
Who is doing the work?

- **UoC School of Forestry** - 6 PhD students and numerous staff
- **Scion** - growth modelling
- **Proseed** – propagation techniques
- **NZDFI** - trial site monitoring/breeding populations/demonstration/silviculture techniques
- And others
4.5 m tall *E. globoidea* @ 20 months and flowering in less than 3 years at Atkinsons in Wairarapa.
Wood quality

Only heartwood is naturally durable and has colour

Variation of heartwood in 4-yr *E. bosistoana*:

0-75 (mean 13) (D%)

Quick assessment with methyl bromide staining (pH indicator)
Heartwood assessments

Require a core sample of trees with heartwood.

Development of new coring tool with Callaghan Innovation underway.
Growth-strain

Restricts large scale plantation grown eucalypts being sawn for solid timber.
Growth-strain assessment

\[ \varepsilon = \frac{Y \times R}{0.87 \times L^2} \]

Assessment takes 1-2 minutes
→ large numbers can be screened
→ early screening at age 1-2
Woodville field test trial
February 2015

~200 families
  *E. bosistoana*
  *E. argophloia*
~50 replicates
→11,000+ trees

Will be assessed at age 1-2 for:
- Growth strain
- Stiffness
- Collapse
- Early growth
- Early form

Scale only manageable and affordable by early selection!
Disease resistance

Insect herbivores

- Continue to arrive from Australia
- All present in NZDFI sites, occasional severe outbreaks possible
Propagation: Proseed at Amberley
That’s the story so far...

- No hard-sell yet – taking their time and getting the ducks lined up first...

- But some landowners are taking the initiative – almost 900,000 seedlings planted since 2009, 90% independent of NZDFI trials.
Marginal land-use change: decision matrix

What land use?

- Site/scale
- Distance to markets
- Farmer’s preferences
- ‘Fit’ with existing enterprises
- $$$ Cost/benefit

Access
Information on how to grow durable eucalypts

- Check out NZDFI’s web site [www.nzdfi.org.nz](http://www.nzdfi.org.nz)
- Includes videos... [https://www.youtube.com/watch?v=5jvgiB1W9kU](https://www.youtube.com/watch?v=5jvgiB1W9kU)
- Visit a trial site – there will be one near you!
- NZDFI workshop, March 26th, North Canterbury
Where do durable eucalypts fit on farms?

<table>
<thead>
<tr>
<th>Land use</th>
<th>Features</th>
<th>Co-benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalypts</td>
<td>Small or large scale, 12-20 year rotation. Good access. On-farm use or off-farm markets.</td>
<td>Birds and bees, soil conservation, landscape, carbon, sustainable system (coppicing)</td>
</tr>
<tr>
<td>Radiata pine</td>
<td>Medium-large scale, &lt;100km to markets, good access. 25-30 year rotation, commodity crop</td>
<td>Soil conservation, carbon</td>
</tr>
<tr>
<td>Manuka</td>
<td>Large scale (&gt;100ha); tame beekeepers, not a ‘for-ever’ option on many sites</td>
<td>Soil conservation, biodiversity, carbon</td>
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<td>Reversion to native forest</td>
<td>Inaccessible sites Lowest cost/income option</td>
<td>Biodiversity, soil conservation, carbon</td>
</tr>
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Durable eucalypts vs. radiata pine

Relative growth rates/rotation length
Work required throughout life of crop
Pros and cons
? Possible returns??
Some options

1. Steep, erosion-prone land – large/small scale, can include riparian plantings
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Some options

2. Pine cut-over sites

Juken NZ Ltd - Ngamu

Tect Park, BoP
Lake Taupo Forest Trust
XyloGene is a trade mark to certify NZDFIP green diamond genetically improved durable eucalypt seed/germplasm to add value to future hardwood forests and timber products.

A royalty will be collected on sale of improved seed or plants to pay for ongoing research.