NZDFI: achievements, constraints and opportunities

Shaf van Ballekom

Proseed
The New Zealand Dryland Forests Initiative (NZDFI) is a commercially-oriented research and development project. It aims to develop genetically improved planting stock and management systems for ground-durable eucalypt species suited to New Zealand’s dryland regions.
NZDFI established at Marlborough Research Centre on 1st July 2008

- Official launch on 28th January 2009
- First planting at Lawson’s property, Waterfalls road on 7th October 2009
- January 2017
NZDFI Partners and Supporters

Founding Members

• Marlborough Research Centre Trust
• Proseed NZ Ltd
• New Zealand School of Forestry (University of Canterbury)
• Vineyard Timbers Ltd (Paul Millen – Programme Manager)
Supporters

- Juken NZ
- Nelson Pine Industries
- Sumitomo
- Ernslaw One
- Kaingaroa Timberlands
- NZ Farm Forestry Association
- Forest Growers Levy Trust
- Specialty Wood Partnership
- Regional Councils
- Marlborough Lines
- Marlborough Gold Honey
- Government (MPI, MBIE)
- 20+ landowners hosting trials
2008 NZDFI Vision

• Our vision is for New Zealand to be a world-leader in breeding ground-durable eucalypts,

• and to be home to a valuable sustainable hardwood industry based on 100,000 hectares of eucalypt forests, by 2050.
What is needed to achieve our vision?

To provide NZ forest growers the plants and knowledge to select and grow the species best suited to their site, which will economically produce a high quality durable wood product that meets the requirements of domestic and international markets.
Integrated Research programme

Marlborough Research Centre
- Trial Management, trial assessments & outreach programme

Proseed
- Propagation, Seed Orchard Management, seed collection

School of Forestry/University of Canterbury
- Site-species matching / Growth and yield modelling
- Tree Health
- Breeding (growth, health, wood quality)
- Wood Processing
Lost Opportunity

Stringybarks (Shelbourne 2001) proposed for solid wood uses. Seed collections – 12 species and 69 provenances never got off the ground (considered too expensive).

Partly covered by
1. Management Trials – 8 sets of 14 species…49 tree square plots of mixed provenance.
2. SFF Eucalypt Evaluation trials 15 tree row plots of 10-15 spp on 40 sites throughout NZ.

Well done with scarce resources but not suitable for serious breeding.
Eucalypt Breeding Overview – Eldridge 1996

Looked at why there are not more eucalypt plantations in NZ
Suggested a number of reasons including:

1. **Insufficient** continuity of funds and staff for research.

2. **Dominance and success of radiata pine** particularly its plasticity has made eucalypts (and other spp) of minor importance to the NZ forest industry.

3. **Potential** – reluctance of management to recognise that eucalypts might be as or more profitable than radiata.

4. **Site/Species Matching** – more important than with radiata pine. Site Preparation – Eldridge wasn’t impressed by what he saw.

5. **Pests and Diseases** – part of the problem is that species not well adapted to planting sites and integrated pest management is essential.

6. **Numerous species tested** but it’s a large genus and there is a case for renewed species and provenance testing

*the natural genetic resources of the eucalypts are still “A SACK OF UNCUT DIAMONDS”* Eldridge (1996)
Durable hardwood markets

- Vineyard posts
- Cross arms for NZ’s electricity networks
- Sleepers for NZ’s rail network
- Wharf timbers for NZ’s ports and marinas
- High strength LVL beams
- Decking and outdoor furniture

Current timber imports > $500M

Significant export potential
Post breakage in Marlborough’s vineyards

5% breakage per annum (due to mechanical pruning & harvesting) across 25,000 ha @ 600 posts per ha = 750,000
and cross arms.

- ‘Aussie hardwood’ cross arms in Marlborough
Emerging Asian markets are huge

• 1500 million new middle-class Asians by 2050.

• Asian demand for timber forecast to increase 400%.

• China accounts for 6% of the world’s consumer spending but 20% of global sales of luxury goods (Economist 23-29 June 2012, p74).

• Tropical rainforest supplies are decreasing: Asia produced 130M m³ of hardwood sawlogs in 1989, v 98M m³ in 2010 and is projected to fall to approx. 55M m³/annum by 2050.
Feeding on dreams.

NZ teak (*E. bosistoana*)
Colour, durability, figure and tradition. NZ rosewood (here, *E. camaldulensis*)
NZDFI Species Selection Criteria

Selection criteria for elite species & trees

- High natural durability
- Fast growth, straight stems
- Early heartwood formation & good colour
- Drought & frost tolerance
- Pest tolerance
- Coppice vigorously
- Nectar/pollen for native biodiversity & beekeeping
2003-7 trials to Field Test Candidate Species

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<thead>
<tr>
<th>Eucalyptus agglomerata</th>
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<td>Eucalyptus blaxandii</td>
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<td>Eucalyptus bosistoana</td>
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<td>Eucalyptus camaldulensis</td>
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<td>Eucalyptus wandoo</td>
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<td>Eucalyptus youmanii</td>
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- 5 Years of field trials
- Established 2003 - 2007
- 25 candidates reduced to 5
NZDFI species

Breeding species
- E. argophloia
- E. bosistoana
- E. globoidea
- E. quadrangulata
- E. tricarpa

Species of interest
- E. camaldulensis
- E. cladocalyx
- E. eugenioides
- E. longifolia
- E. macrorhyncha
- E. notabilis

P. radiata included at several sites as a control
Seed Collection

NZDFI’s first task (since 2003) was to identify our desired species and collect seed from individual trees throughout their whole natural range.

**Issues**

• Some candidate species survive today in fragmented remnant stands. Most are “unrecognized” in Oz.

• Poor flowering following droughts, good seed years are infrequent.
Seed collection

*E.bosistoana* Australian Seed Collection
30 NZDFI trial sites
150,000 seedlings planted on 70 ha from 2009-2016

Mean Annual Rainfall
E. bosistoana Seed Orchard (Amberley)
Propagation research

- Recent investment new propagation facility.
- Eucalypt propagation includes grafting, clonal production research; experimenting with hydroponics
Key Milestones (to date)

• 150,000+ individual trees from 5 species in 23 breeding trials at 10 properties in 4 regions.

• 40,000 trees with up to 11 species in demonstration trials on 25 sites in 7 regions.

• First seed from E. globoidea Waikakaho Seed stand available 2014.

• First selections of E. bosistoana for growth and form grafted for clonal seed orchard (2014). SSO’s of other species

• Propagation facility at Amberley (2014)
Health Risks

*Paropsisterna varicollis*, the Eucalyptus Variegated Beetle

*Uredo rangelii*, Myrtle Rust
Changing Emphasis

• 2007 Workshop – Growing Ground Durable Hardwood for Vineyard Posts
• 2017 -Durable Eucalypts on Drylands: Protecting and Enhancing Value

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<tr>
<th>Group</th>
<th>2007</th>
<th>2017</th>
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<td>U/C Researchers</td>
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<td>Private Foresters</td>
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<td>Corporate Farm</td>
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<td>Central Govt (MPI)</td>
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<td>Nurseries</td>
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<td>Bee Industry</td>
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<td>Private Farm</td>
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<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>56</strong></td>
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Interest in planting durable eucalypts is increasing
Branding Quality for traceability in future Markets

The XyloGene® Brand

- Seed
- Seedlings
- Forests
- Sawmills
- Posts/poles
- Timber
Key to A Successful (Breeding) Programme—Henson 2011

• Focus on the clients needs – as opposed to your 15 minutes of fame ✓
• It is a game of numbers! ✓
• Take opportunities ✓
• Look outside the designed trials for gain ✓
• Always think of how you are going to deploy the material at the start of any tree improvement program ✓
• Manage the risk ✓
• Always have a back up plan – or be quick and clever enough to respond to failure ✓
This is a transformational opportunity

The creation of a highly coloured, naturally-durable eucalypt resource suited to drylands that mimic in their qualities those of the most valuable tropical hardwoods—to compete on innovation and excellence rather than price, undergirded by scarcity and environmental constraints.

New Zealand should enjoy a comparative advantage in that low-value, marginal, pastoral dryland can be used to supply high-value timber.

With our elite breeding populations we will have first mover advantage. New Zealand will be the partner of choice for international dryland ventures.

We already have some low-cost, rapid tools and technologies to capture vastly improved wood quality attributes for very young eucalypts.
Acknowledgements

**Ian Nicholas** (1954-2013)
- Research Scientist and passionate eucalypt advocate
- Well known for his ability to deliver science to industry in a simple, but clear manner

**Emeritus Professor John Walker**
- Leading expert in wood processing, particularly mechanical properties, drying and preservation research in New Zealand.
- Visionary approach to wood research