


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

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Heather Atkinson

Farming for the future: Carterton

March 8th 2016



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

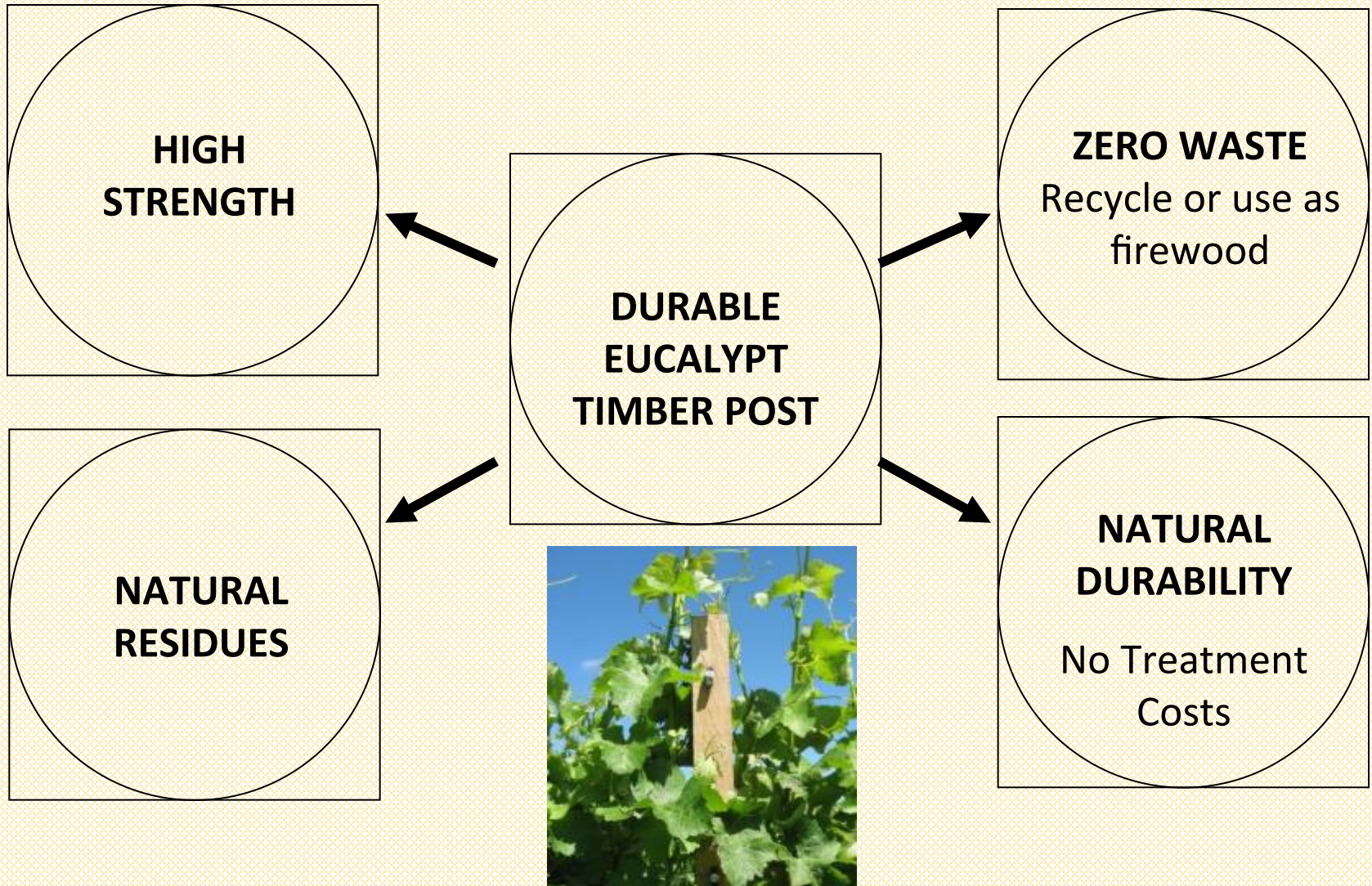
- Proseed
- Juken New Zealand Ltd
- 26 landowners
- Five regional councils (GWRC, HBRC, Horizons, BoPRC, MDC)
- Marlborough Lines
- Marlborough Gold Honey
- School of Forestry (University of Canterbury)
- MPI Sustainable Farming Fund
- AGMARDT, NZFFA, NBFFF, Marlborough Research Centre
- MPI/FFR Specialty 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







Marlborough Lines: cross arms

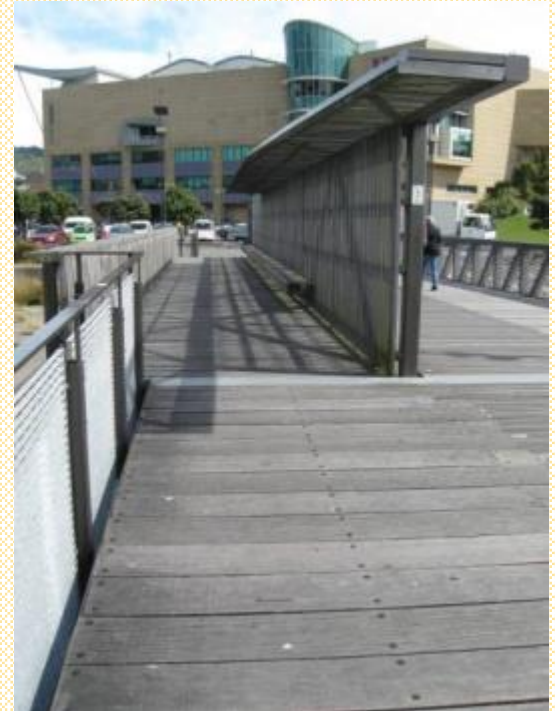
Aussie hardwood's have been the preferred timber for crossarms - now in short supply and expensive.



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)



Hardwood sleepers and poles for KiwiRail

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



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

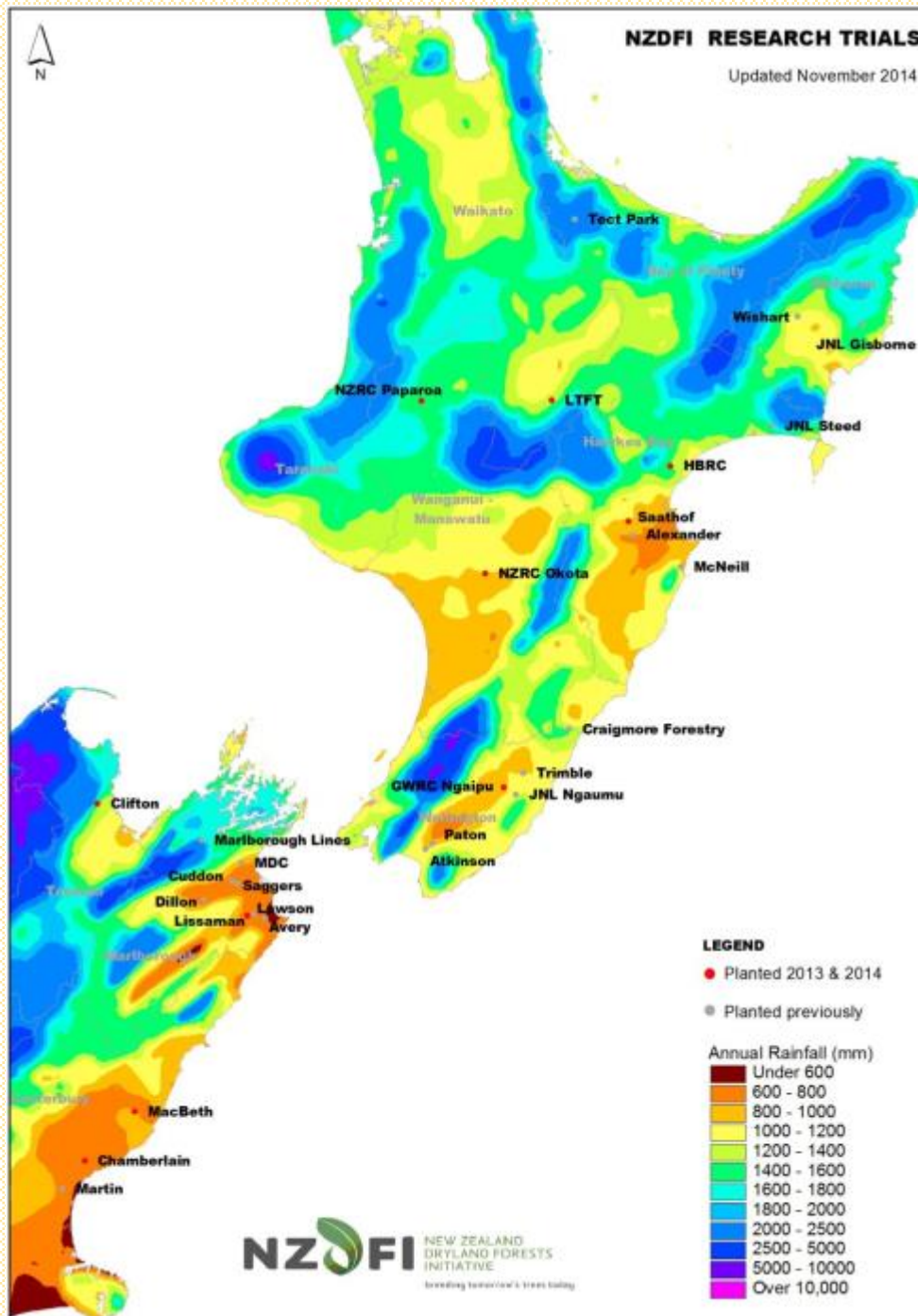
Selected 5 species from 25 candidates

Durable *Eucalyptus* species selected for NZDFI breeding populations



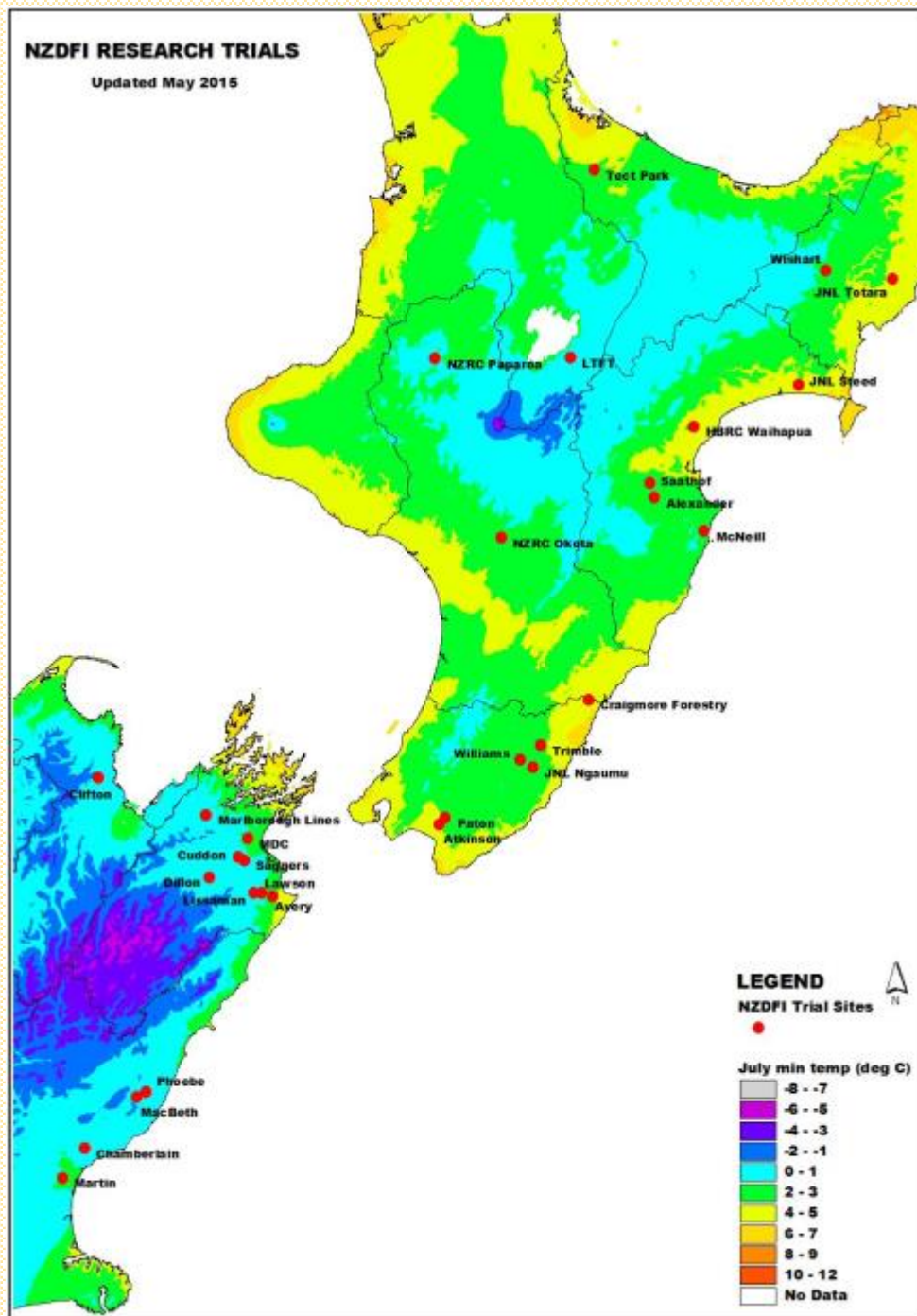
- *E. bosistoana* (coastal grey box)
- *E. argopholia* (western white gum)
- *E. quadrangulata* (white topped box)
- *E. tricarpa* (red ironbark)
- *E. globoidea* (white stringy bark)

Highlighted species have no record of breeding for plantation use.



NZDFI RESEARCH TRIALS

Updated May 2015



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.

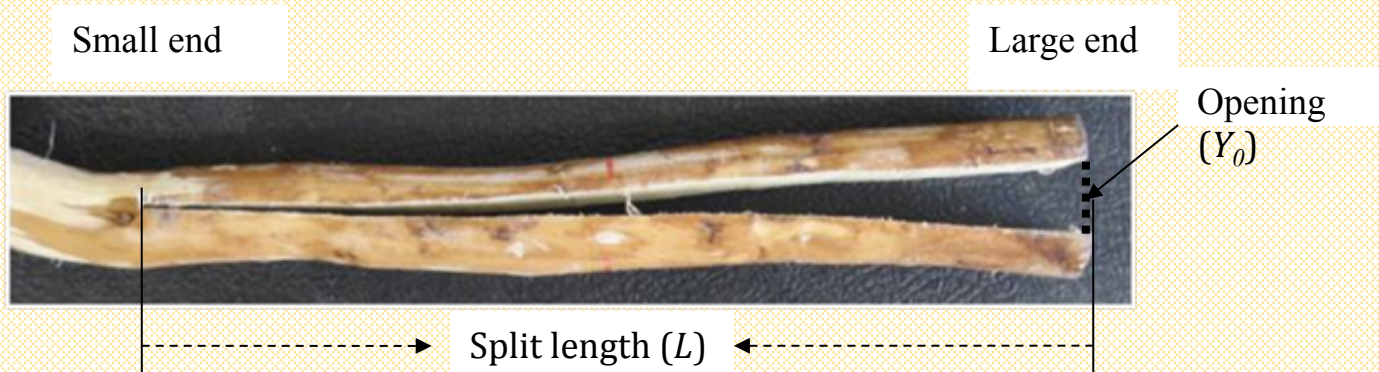


Growth-strain

Restricts large scale plantation grown eucalypts being sawn for solid timber.



Growth-strain assessment



Growth-strain ε

$$\varepsilon = Y * R / (0.87 * L^2)$$

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

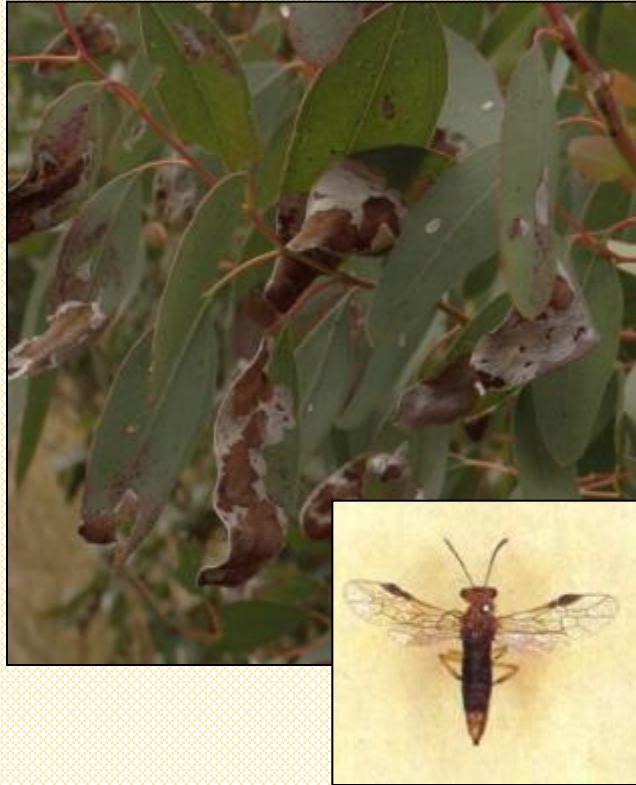
Will be assessed at
age 1-2 for:

- 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

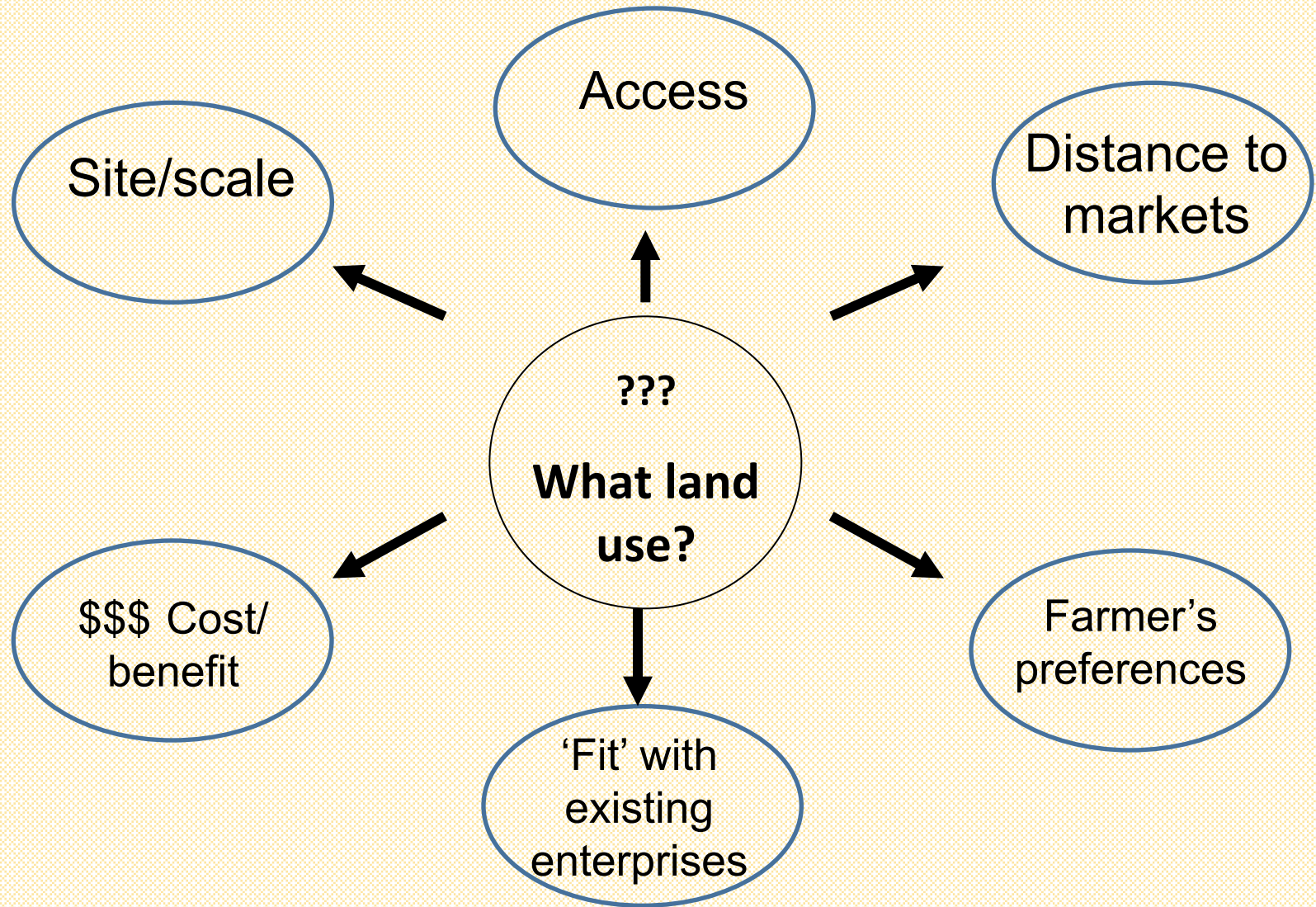
Propagation: Proseed at Amberley



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



Information on how to grow durable eucalypts

- Check out NZDFI's web site www.nzdfi.org.nz
- Includes videos...
<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?

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

Durable eucalypts vs. radiata pine

Relative growth rates/rotation length

Work required throughout life of crop

Pros and cons

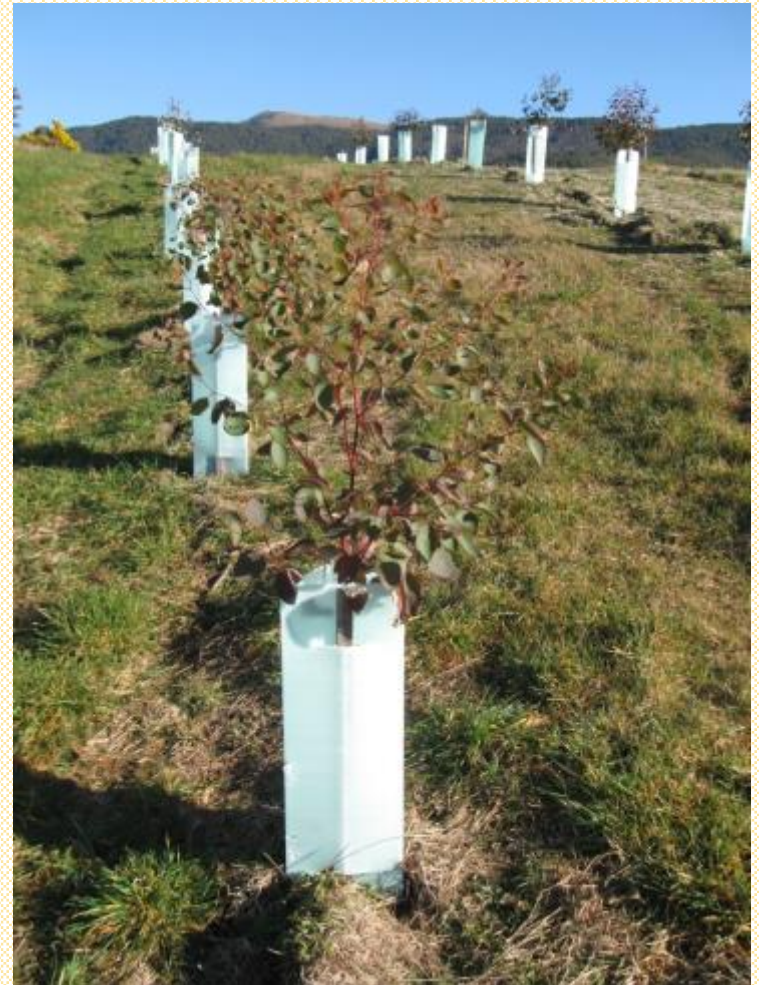
? Possible returns??

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.