



# Marlborough's Future is Durable

**A regional development case study on the potential for a durable hardwood industry**

**Friday 16th & Saturday 17<sup>th</sup> February 2024**  
**Marlborough Research Centre, 85 Budge Street, Blenheim**

**WORKSHOP and FIELD TRIP**  
**PROGRAMME and NOTES**

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## Welcome

Welcome to our workshop. We are very pleased to welcome a broad spectrum of the industry, especially those from outside of Marlborough. We hope you enjoy your visit to our region.

We want to provide all participants with an informative programme about the potential for the development of a regional hardwood industry in Marlborough and look forward to your questions, some open discussion and feedback.

We also acknowledge the support by the Ministry of Primary Industry's for funding this Marlborough case study project under its Sustainable Land Management and Climate Change (SLMACC) programme.

Under this two-year SLMACC project we are evaluating how new investment in planting naturally durable hardwood forests could contribute to sustainability and reduce greenhouse gas emissions in Marlborough's wine industry.

Contributors to the case study include the University of Canterbury School of Forestry, the NZ Bioenergy Association and the participating landowners to whom we are very grateful.

Our research is providing a market and science-based pathway for developing this novel land use and supply chain. Developing a regional plan for a new forestry and wood processing supply chain could improve long-term sustainability and resilience for Marlborough's wine industry and generate new investment and employment.

This workshop provides us with a welcome opportunity to showcase our research. The NZDFI is unique in New Zealand for its collaborative approach, engaging with people and organisations with links all along the supply chain. Our research programme is focused from tree breeding and propagation to wood processing and markets.

We extend our hospitality and hope you have all you an interesting and informative time.

Shaf van Ballekom, Chair NZDFI & CEO Proseed NZ

Gerald Hope, CE Marlborough Research Centre

Clemens Altaner, NZDFI Science team leader, Associate Professor, NZ School of Forestry

Euan Mason, SLMACC project science team lead, Professor, NZ School of Forestry

Paul Millen, NZDFI Research Manager



## Workshop attendees

Name	Organisation
Gerald Hope	Speaker - MRC Executive officer
Robert Holdaway	Speaker - Lowlands Wines & Wye forest
Euan Mason	Speaker - Professor Tree physiology and modelling, UC School of Forestry
Ning Ye	Speaker- PhD candidate, Remote sensing, UC School of Forestry
Clemens Altaner	Speaker - Assoc Professor Wood Science, UC School of Forestry/NZDFI Science leader
Paul Millen	Speaker - NZDFI Research Manager
James Gorrie	Speaker - Ministry of Primary Industries
Brian Cox	Brian Cox, Executive officer
Warwick Lissaman	Marlborough farmer/NZDFI trial site host
Belinda Miller	Ministry of Primary Industries
Susan Moore-Lavo	Ministry of Primary Industries
Shaf van Ballekom	Proseed
Matiu Wikaira	Proseed
Sam Keenan	Ministry of Primary Industries
Donna Robertson	Morgans Road Nursery
Grant Robertson	Morgans Road Nursery
Marco Lausberg	Forest Growers Research
Tim Hinton	PF Olsen
Colin Bradley	PF Olsen
Acacia Farmery	Rayonier Matariki Forests
Kevan Buck	Buck Forestry Services
Charles Etherington	Warren Forestry Ltd
Pat O'Sullivan	Warren Forestry Ltd
Chris Perry	PF Olsen
Eric Appleton	Appletons Tree Nursery Ltd
Mark Self	Ernslaw One Limited
Roger May	Tomorrows Forests/NZDFI GIS specialist
Steve Chandler	Tasman Pine Forests
Arabella Weaver	Ministry of Primary Industries
Chris Ensor	Mosaic Aotearoa Limited
Gerry Dysart	Mosaic Aotearoa Limited
Parnell Trost	Ministry of Primary Industries
Sebastian Klinger	PF Olsen
Nic Melvin	PF Olsen
Justin Wells	Logs 2 Lumber Ltd
Tim Anderson	
Simon Langley	Ministry of Primary Industries
Philip Woodward	M&R Forestland Management Ltd
Pete Anderson	
Rick Alexander	NZDFI trial site host
Nick Eade	
Ash Millen	Vineyard Timbers/NZDFI technician
Geoff Love	Geoff Love Contracting
Jo Barnett	Raydale Farming Ltd
Sonya Hunt	Ministry of Primary Industries
Penny Wardle	Marlborough Express

## Introduction to Marlborough Research Centre

[The Marlborough Research Centre Trust \(mrc.org.nz\)](http://mrc.org.nz) (MRC) is a charitable trust working with primary sector groups, research organisations, innovators, educators to improve Marlborough's regional economy. From its establishment in 1984, MRC has maintained strong links to Marlborough District Council, Crown research providers, primary sector producer groups and universities.

MRC's role is to facilitate, connect and seed fund locally based industry initiated and supported research. It brings together research, business and education under the recently opened NZ Wine Centre where an integrated hub has been established across a wide group of organisations.

The Trust provided early support for the potential use of naturally durable hardwood posts and took a leadership role in establishing the NZDFI in 2008. MRC continues to manage and administer NZDFI's diverse research projects in collaboration with many supporters in other regions.

85 Budge Street  
Blenheim 7201  
New Zealand

## Friday 16<sup>th</sup> February – Workshop Programme

<b>10.00am – 12.30pm</b>	<b>A durable eucalypt forestry and biomass industry for Marlborough: outcomes from our regional case study</b>	
10.00 – 10.10	Marlborough's Future is Durable: Welcome and introduction	Gerald Hope, Chief Executive, Marlborough Research Centre
10.10 - 10.20	Opportunities for a durable hardwood industry in Marlborough	Robert Holdaway – Marlborough vineyard and forest owner
10.20 – 10.40	Durable eucalypt forestry for heartwood, biomass and for carbon sequestration	Prof Euan Mason, University of Canterbury School of Forestry
10.40 – 10.55	Using UAVs with LiDAR to measure durable eucalypt biomass in Marlborough	Ning Ye, University of Canterbury School of Forestry
10.55 – 11.15	Durable hardwood processing, products and markets	Assoc Prof Clemens Altaner, University of Canterbury School of Forestry
11.15 – 11.45	NZDFI's vision and regional development case study for a future durable hardwood industry in Marlborough.	Paul Millen, Manager, NZDFI
11.45 – 12.00	MPI's Climate Emergency Response Fund (CERF) and research related to the Marlborough regional case study	James Gorrie, MPI
12.00 - 12.30	Discussion	
<b>12.30 – 1.15pm</b>	<b>Lunch - Marlborough Research Centre</b>	

## Health and Safety Information for field trip

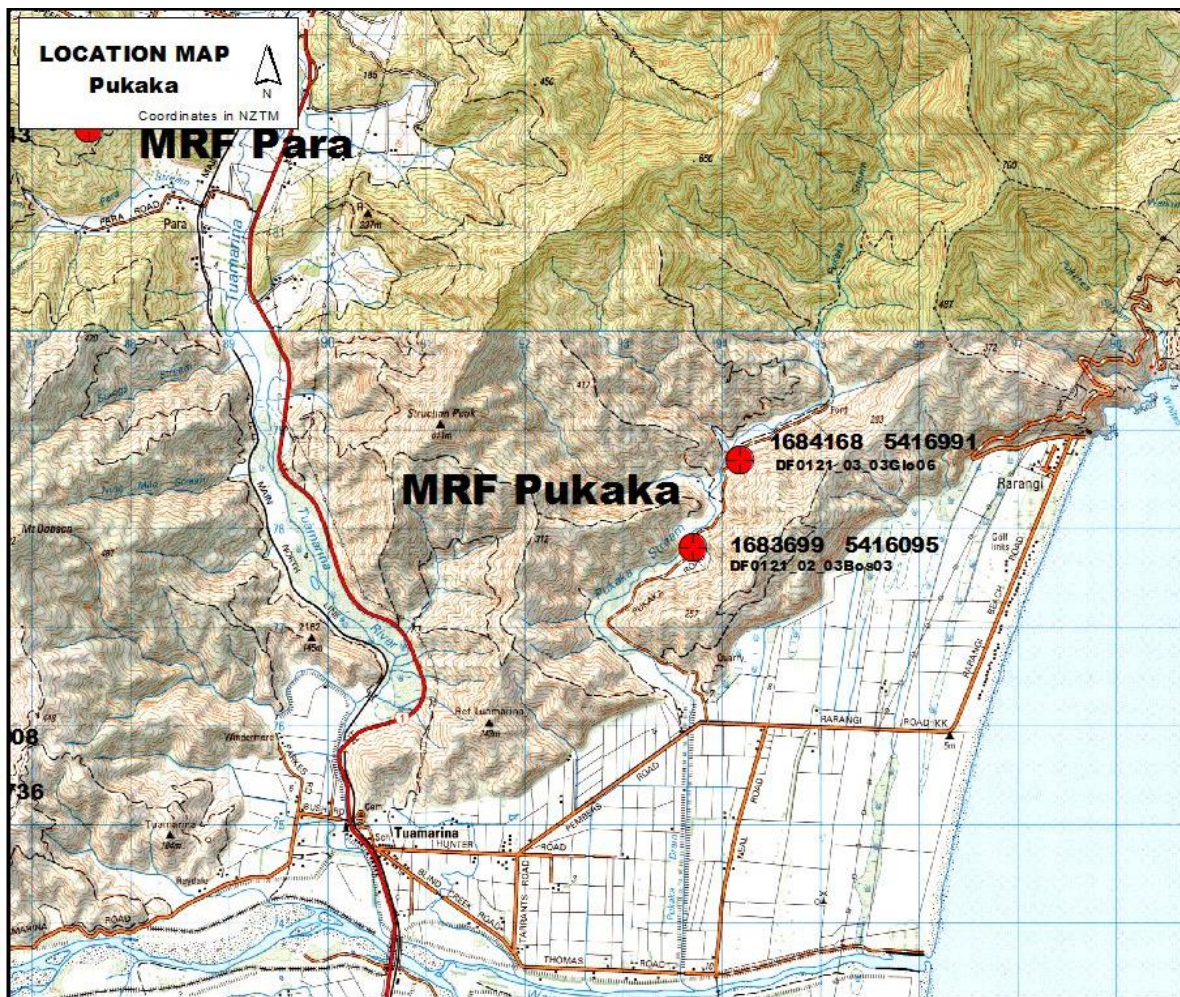
1. If you are feeling sick or have recently had Covid 19 please stay at home.
2. If you have any allergies or ailments, please ensure you carry appropriate medication and let us know.
3. All the field trip sites have parking and foot access from a public road (except Avery and Lissaman).
4. Please check for other vehicles/people when entering/exiting your vehicle.
5. A short safety briefing will be given to all field trip participants at each site. Please follow any instructions to ensure you own safety.
6. The weather forecast is excellent so bring a sunhat or wear sunscreen.
7. Attendees are encouraged to bring and wear a Hi-Viz vest.
8. Attendees must wear boots or sturdy walking shoes. If you are unstable on your feet please have a walking pole with you.
9. Be aware of rough ground conditions if entering any of the trials to avoid slips, trips, and falls.
10. **NO SMOKING** rule applies due to high fire risk.
11. **In a FIRE** all persons will quickly but orderly go to their vehicles on site for evacuation from the trial site. Paul Millen and Marco Lausberg will check all persons are accounted for prior to the vehicles leaving the site.
12. **In an EARTHQUAKE** drop, cover, & hold while the ground is shaking, then all persons will quickly but orderly go to their vehicles on site for evacuation from the forest site. Paul Millen and Marco Lausberg will check all persons are accounted for prior to the vehicles leaving the site.
13. A first aid kit will be carried by Paul Millen and Marco Lausberg who are the safety officers for the day.

## 1.15pm Depart MRC and travel to MRF Pukaka forest

Travel to the Pukaka Valley to view eucalypt trials planted in 2003 and 2006 by Marlborough Regional Forests in collaboration with NZDFI partners. These trial blocks are part of the early series of informal eucalypt trials planted to test the regional adaptability of a number of eucalypt species to pine cut-over sites that could produce durable hardwood suitable for vineyard posts.

Permanent Sample Plots were re measured for this project and the sites were flown for LiDAR imagery.

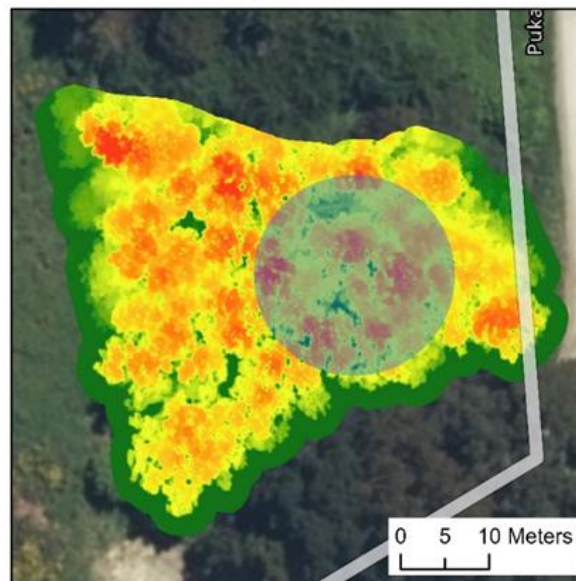
There were 24 individual eucalypt trees destructively sampled by the University of Canterbury summer student team to assess total above ground biomass under this SLMACC project.



## 1.45 – 2.30 pm MRF Pukaka 2003 *E. bosistoana* block and 2006 durable eucalypt species trials

The 2003 *E. bosistoana* stand is around 0.1 ha. This was planted with an unimproved native provenance seedlot collected in the Central Coast region of NSW. The stand was thinned about age 6 and all remaining trees were high pruned.

**MPI SLMACC 406896**  
Landowner Case Study Biomass Sampling Site 017 MRF Pukaka  
*E. bosistoana*, 2003, 0.04 ha PSP



In December 2002, a total of 7 trees were selectively felled for the project. The largest of these had a DBH of 32 cm and height of 25.9m. This was a single leader crop tree as were all of the trees removed. As these were some of the best trees in the stand there is a high percent of remaining trees of lower quality. These demonstrate the large variation in form exhibited by this species with the poor form in the upper crown despite pruning of the lower stem.

*Eucalyptus bosistoana* is highly regarded for the timber produced from natural Australian forests due to its class 1 durability and light-coloured brown/pink heartwood suitable for a wide range of applications. But there has been little research in Australia of this species.



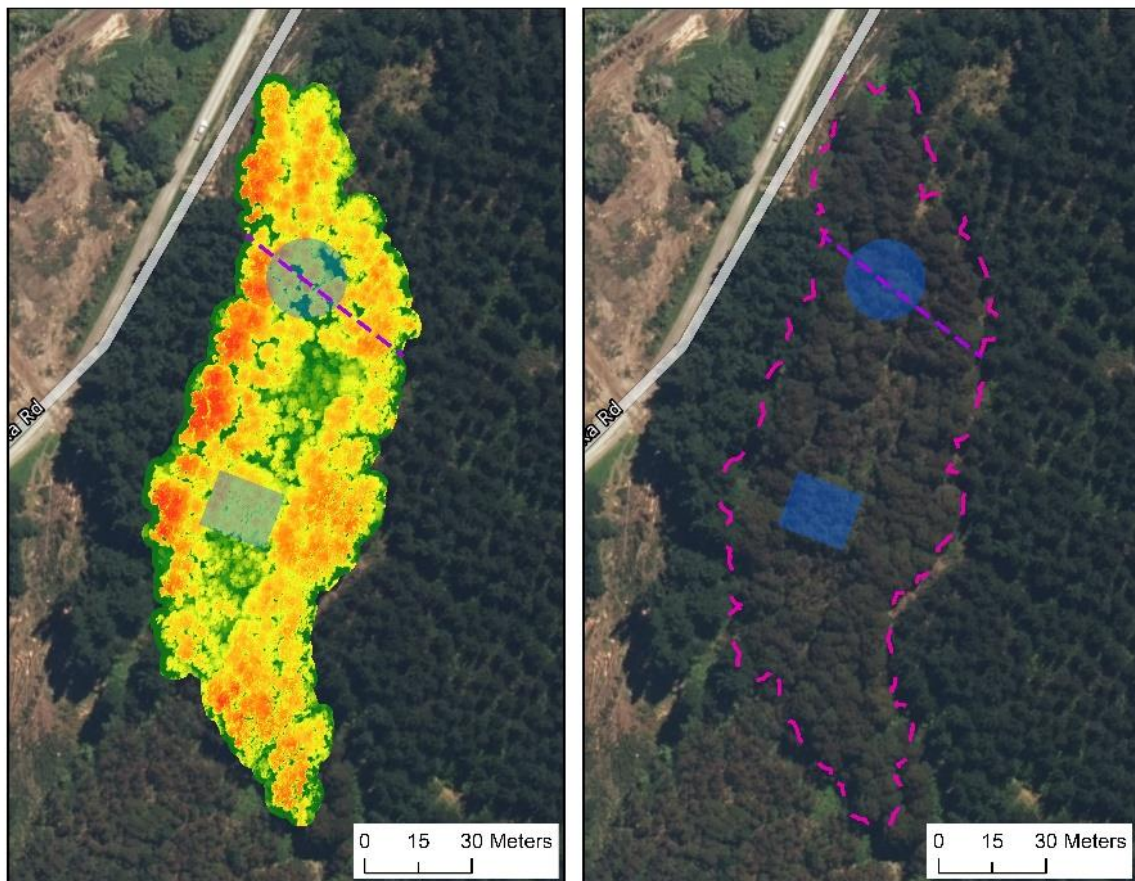
NZDFI progeny and demonstration trials confirm the species has high survival and is capable of productive growth rates on a range of sites. Notably it has proved to have high productivity on alluvial site, limestone derived soils and sites with higher rainfall. The species has attained moderate productivity on a variety of other sites and can survive and thrive in some wet sites with both light and heavy soils. It is not suited to drier exposed sites that reduce height growth and encourage poor form.

**The Pukaka 2006 durable eucalypt trial block** is around 0.8 ha. These were planted with a selection of durable eucalypt species including *E. globoidea* to test unimproved native provenance seedlots from southern NSW and SE Victoria. The stand was thinned about age 6 and remaining trees high pruned. The stand includes 2 PSPs and 0.17 ha area that were measured for the SLMACC project.

### MPI SLMACC 406896

Landowner Case Study Biomass Sampling Site 017 MRF Pukaka  
Eucalypt Species Trial

*E. globoidea*, 2006 measurement areas: 2 PSPs and 0.17 ha area north of line



In December 2002, a total of 14 trees were selectively felled for the project. The largest of these had a DBH of 50 cm and height of 26.6m. All sampled trees were single leader crop trees and while some of the best trees in the stand, there is a high percent of remaining single leader trees of good quality. These unimproved seedlots demonstrate good natural form can be exhibited by this species.

*Eucalyptus globoidea* is used in Australia for general construction due to its class 2 durable straight grained light brown occasionally light pink heartwood. *Eucalyptus globoidea* is found throughout

eastern New South Wales except the far north, and eastern Victoria. On optimal sites it can reach heights of 25 – 30m and 1m diameter.

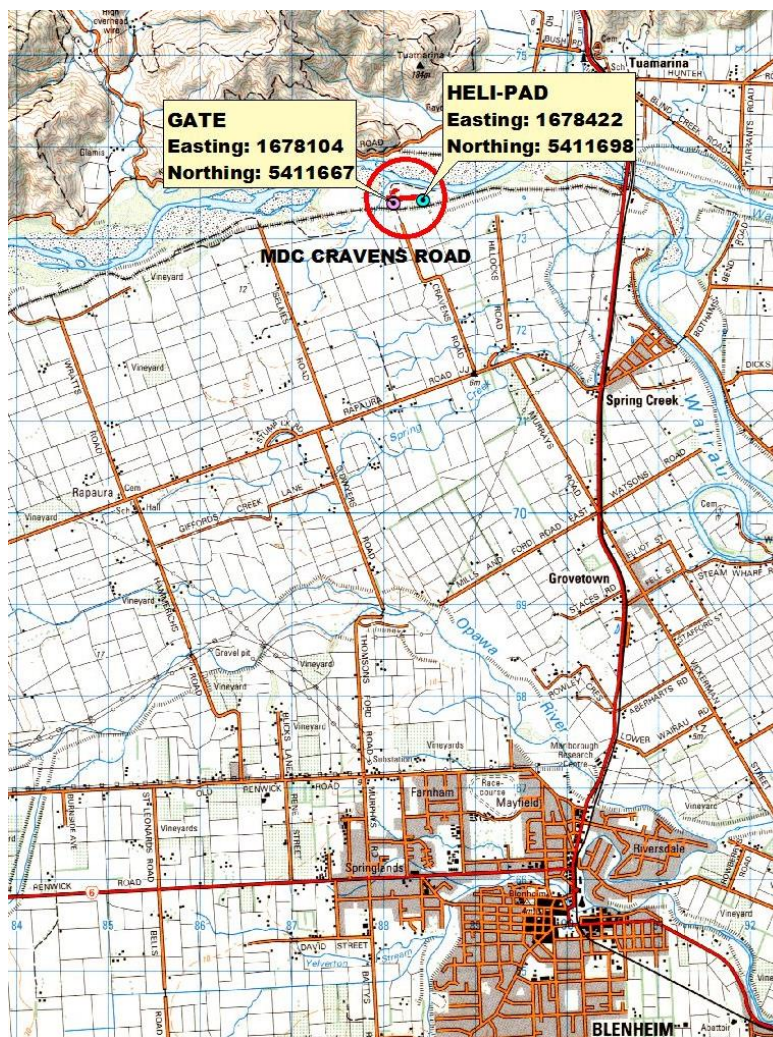
It was an early introduction to New Zealand with many older farm forestry plantings in Northern regions and an impressive stand at Little River on Banks Peninsula, Canterbury that is now over 100 years old. The former NZ Forest Service successfully planted several stands in their Bay of Plenty and Northland forests. It was popular with some farm foresters and was one of the eucalypt species recommended by Neil Barr.

Early assessments in both NZDFI progeny trials and demonstration trials recorded good survival, early growth and wide site adaptability. Seedlings have grown rapidly on sheltered, higher rainfall and fertile sites however moderate frosts and waterlogged soils resulted in total failure at one site.

### 3.00 – 4.00 pm MDC Cravens Road

#### NZDFI 2009/10 *E. bosistoana* breeding trial

Travel to 220 Cravens Road. Drive off the end of the road onto the stop bank and turn right onto the river stop bank. Drive 300 m along stop bank and drop down to park along the access track beside the trial.



## NZDFI species selection

In 2008, the selection of species for NZDFI's research programme was guided by:

- proven or potential adaptability of the species to New Zealand environments, as cited in New Zealand literature
- experience shared by many New Zealand durable eucalypt growers
- commercial use and proven durability of their hardwood in both Australian and New Zealand literature.

Selection criteria took into account species' potential for commercial plantation use and included:

- fast growth
- stem form (straightness)
- drought and frost tolerance
- pest tolerance
- early durable heartwood formation and timber colour
- vigorous coppice
- good nectar/pollen production for native biodiversity and bees.

A total of 11 species have been tested including several species that had not been previously tested in New Zealand but offered potential based on Australian experience.

It is commonly known that eucalypts can be site specific and perform very differently depending on site conditions. There can be large variation within a species, with some exhibiting highly productive growth on favourable sites and unproductive growth or total failure on other sites. Therefore, both NZDFI's breeding trials and demonstration trials are established with broad-based seedlots to test each specie's adaptability across a wide range of New Zealand environments.

NZDFI selected three key species as the main focus for tree improvement:

- *E. bosistoana*
- *E. globoidea*
- *E. quadrangulata*.

These five species were established in breeding populations and in NZDFI's network of demonstration trials planted from 2009-2021.

Two additional minor species were included in the breeding programme, *E. argophloia* and *E. tricarpa* and planted in some demonstration trials.

A further six species were selected for testing and evaluated in demonstration trials planted from 2011-2014. These included:

- *E. camaldulensis*
- *E. cladocalyx*
- *E. eugenioides*
- *E. longifolia*
- *E. macrorhyncha*
- *E. notabilis*.

A full report on all 11 species performance based on PSPs measured in NZDFI's 2011-2014 demonstration trials is available on Forest Growers Research's website. [Commercial in Confidence \(fgr.nz\)](https://www.fgr.nz/)

### 2009/10 *E. bosistoana* breeding trial

There are two of six *E. bosistoana* progeny trials established at this site in 2009 and 2010. The site is owned by the Marlborough District Council and is located within the floodway of the Wairau River. A total of 5,250 trees were planted representing 93 families. An early frost severely impacted on survival across 25% of the 2009 trial blocks. The surviving trial blocks were assessed for growth and form, low pruned and thinned in 2016. Also, 1000's of cores taken to sample wood properties. Another growth & form assessment was completed in September 2019 and both trials were thinned in January 2020. Several blocks are measured as PSPs.

These assessments have provided data for selection of the top 14 families with individual elite trees identified as ortets for scion collection and grafting by Proseed to establish a first generation 1 hectare seed orchard in Amberley that is now in production.

In July 2021 and August 2022 there were large rain events that resulted in the flood banks almost being exceeded and close to a 3m flow through the trial. While there was considerable woody debris deposited in some areas, there was less than 5% loss of the standing trees. See photo below.

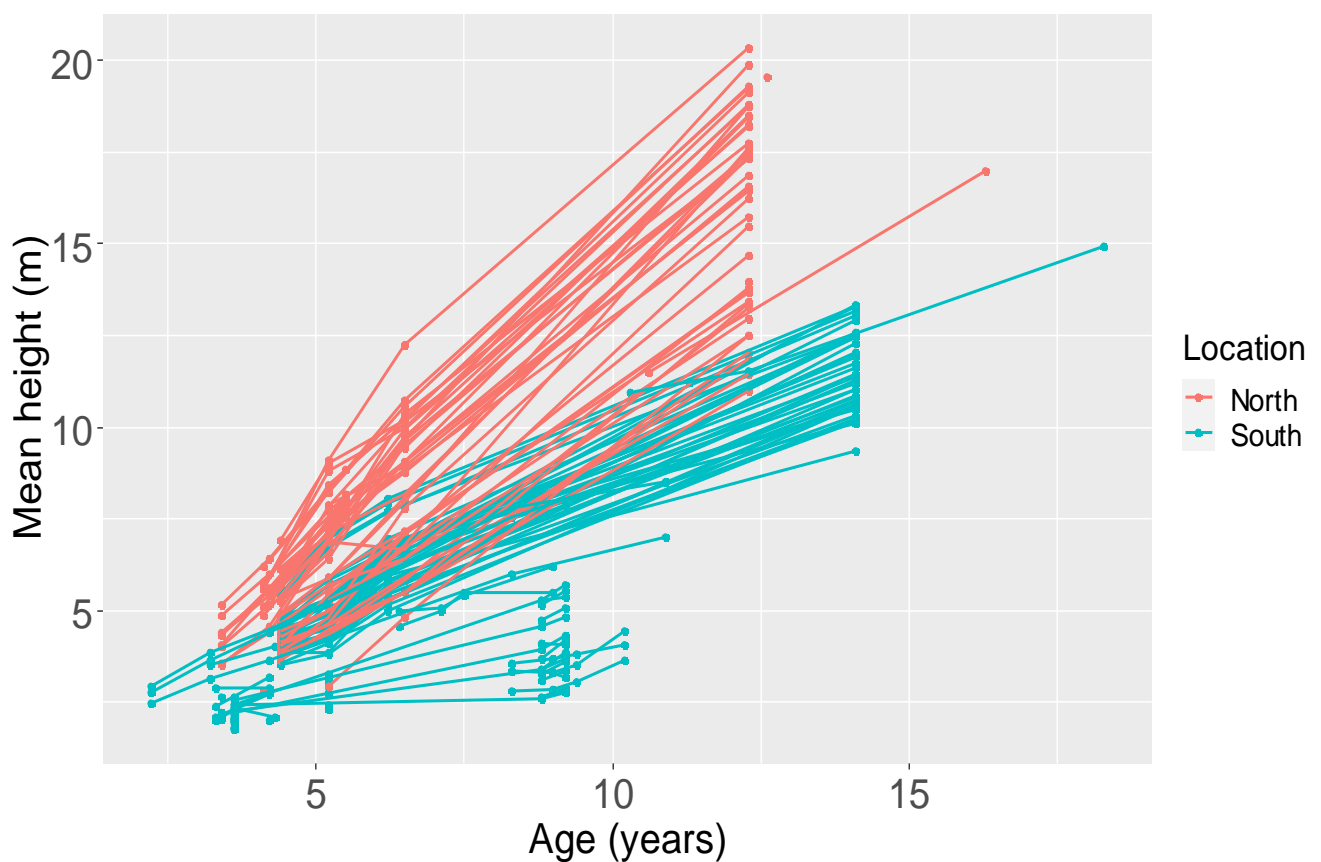


In January 2003, a total of 10 trees were selectively felled for the SLMACC project.

### *E. bosistoana* NZDFI PSP data reveals productivity variation in Marlborough

NZDFI have established a network of trials that provide the basis for measurement of over 700 permanent sample plots (PSPs). Our Katmandoo meta database is managed by UoC and hosted by the Radiata Pine Breeding Company. Regular PSP measurements started in 2014.

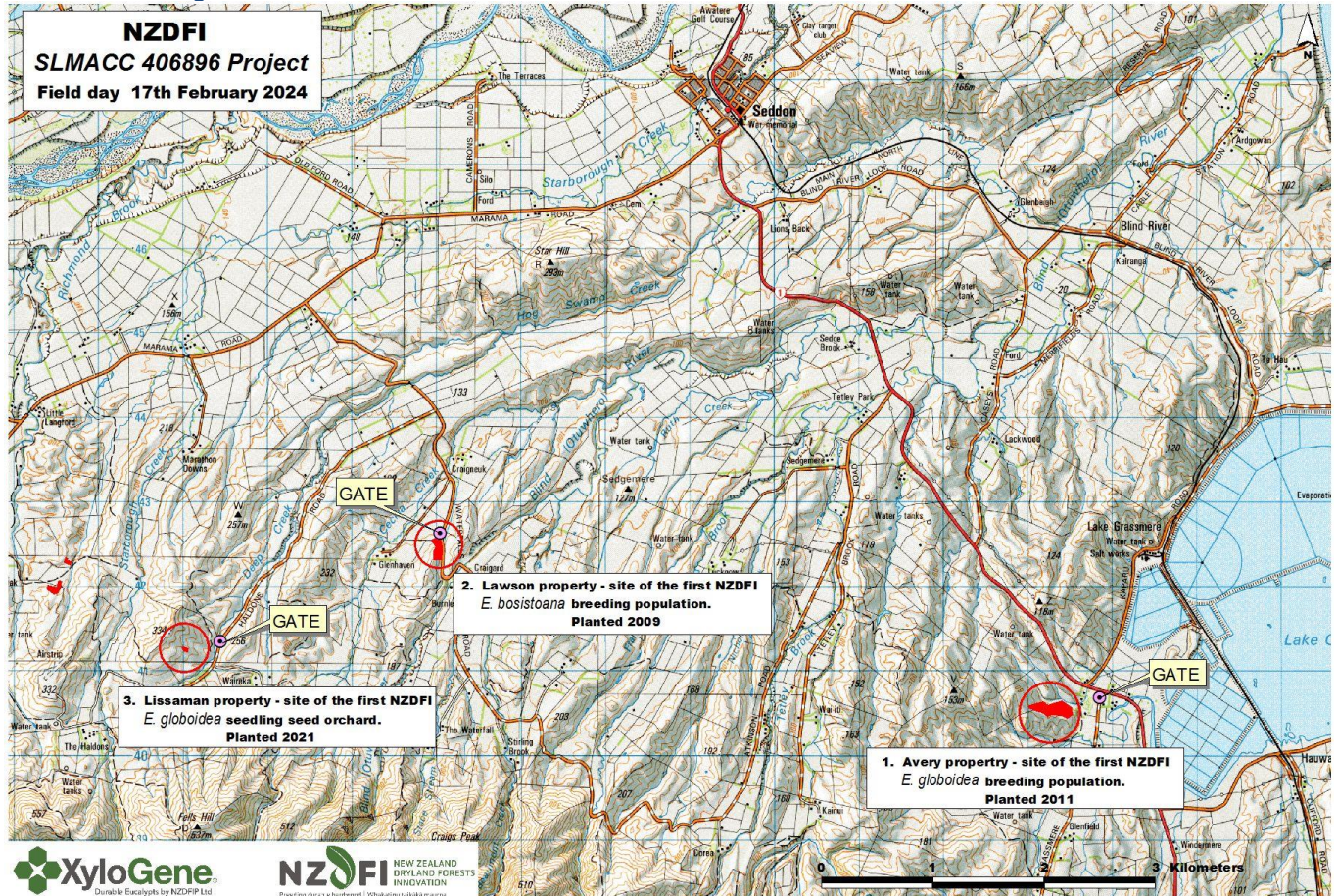
Using simple graphic analysis of PSP tree height/age data for NZDFI's *E. bosistoana* trials in Marlborough, the significant productivity variation is evident between the north and south Marlborough PSP sites in the graph below.



Saturday 17<sup>th</sup> March 2024

7.15am: Gather at Marlborough Research Centre carpark to car pool.

7.30am: Depart Blenheim



8.00 - 9.30am

Avery trial site, Bonavaree, Grassmere

Drive 9km south of Seddon turn right onto Grassmere Rd off SH 1.

NZDFI's breeding population of *E. globoidea* was established by NZDFI in 2011, testing 165 open-pollinated seedlots collected from across the native range of the species in Australia. There are 3 sites where progeny trials were planted with over 26,000 seedlings.

The Avery site is on a steep eroding ex-pasture hill slope characteristically named Poverty Knob by the landowner as it is drought prone and low fertility. A total of 10,728 trees were planted to test 161 open-pollinated family seedlots. This is NZDFI's largest collection of genetics of this species. A small progeny trial of *E. tricarpa* testing 17 families was also established on this site. In addition, there are small blocks in the trial surround along with a few *E. cladocalyx*.

There was a two-year drought following planting that resulted in many losses and 8% of trial blocks were subsequently abandoned with three groups of four trial blocks replanted in *E. tricarpa* in 2014.

The trial was assessed in 2020 for growth and form as well as 1,000's of cores taken to assess wood properties. It was thinned in 2021.

NZDFI have a small met station on this site. Rainfall data averages around 500mm however, there have been some years with rainfall below 400mm. These conditions have been severely testing both these species adaptability and drought tolerance. This is evident in the poor survival and stunted trees on the exposed ridges and upper slopes of Poverty knob.

In 2021, a full trait analysis was completed with the results showing a good correlation of family performance across all three *E. globoides* progeny trials. This analysis ranked all families and the top 20 were selected for the collection of seed. Elite trees from these top-ranked families were identified at each trial site including 124 at the Avery site and collections started in 2021. Since then, a total of 66 of these elite trees representing 23 families have produced seed.

In addition, these assessments identified individual elite trees as ortets for scion collection and grafting by Proseed to establish an early small 1<sup>st</sup> generation seed orchard in Amberley that is now in production. However, there have been difficulties with successfully grafting some of the families so further scion collection and grafting was undertaken in late January this year.

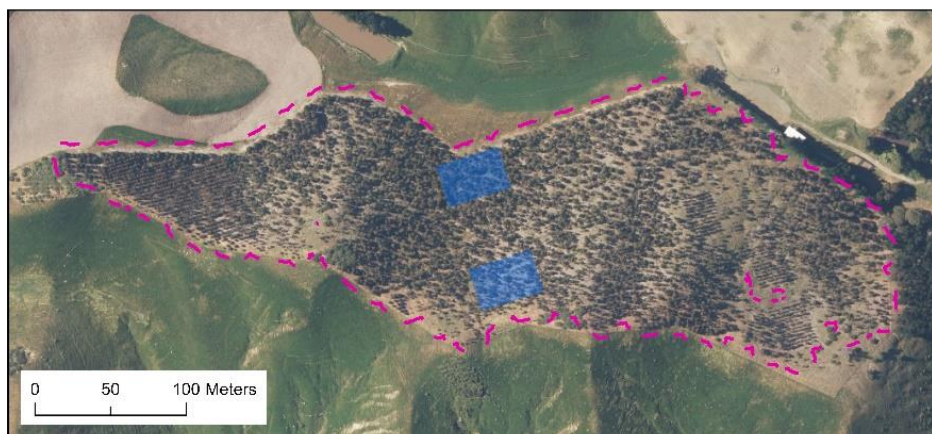
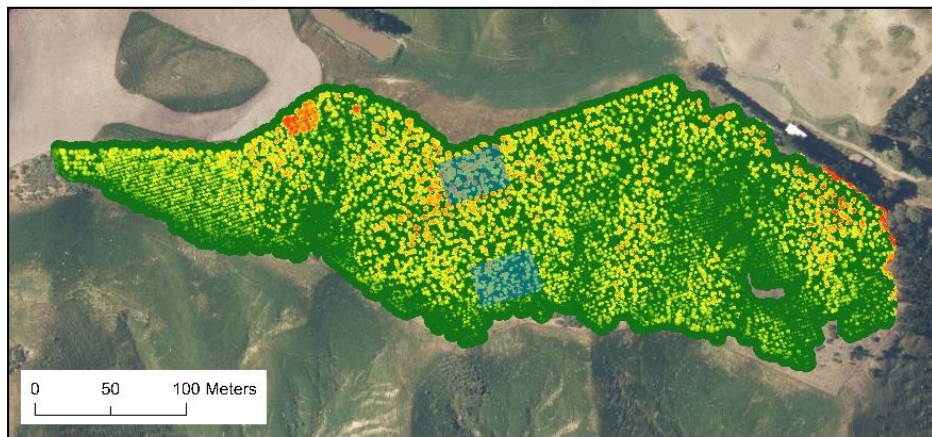
The site was flown for LiDAR and two permanent sample plots (PSP) were measured to collect data for the SLMACCC project with a number of trees then felled for biomass sampling.

**MPI SLMACC 406896**

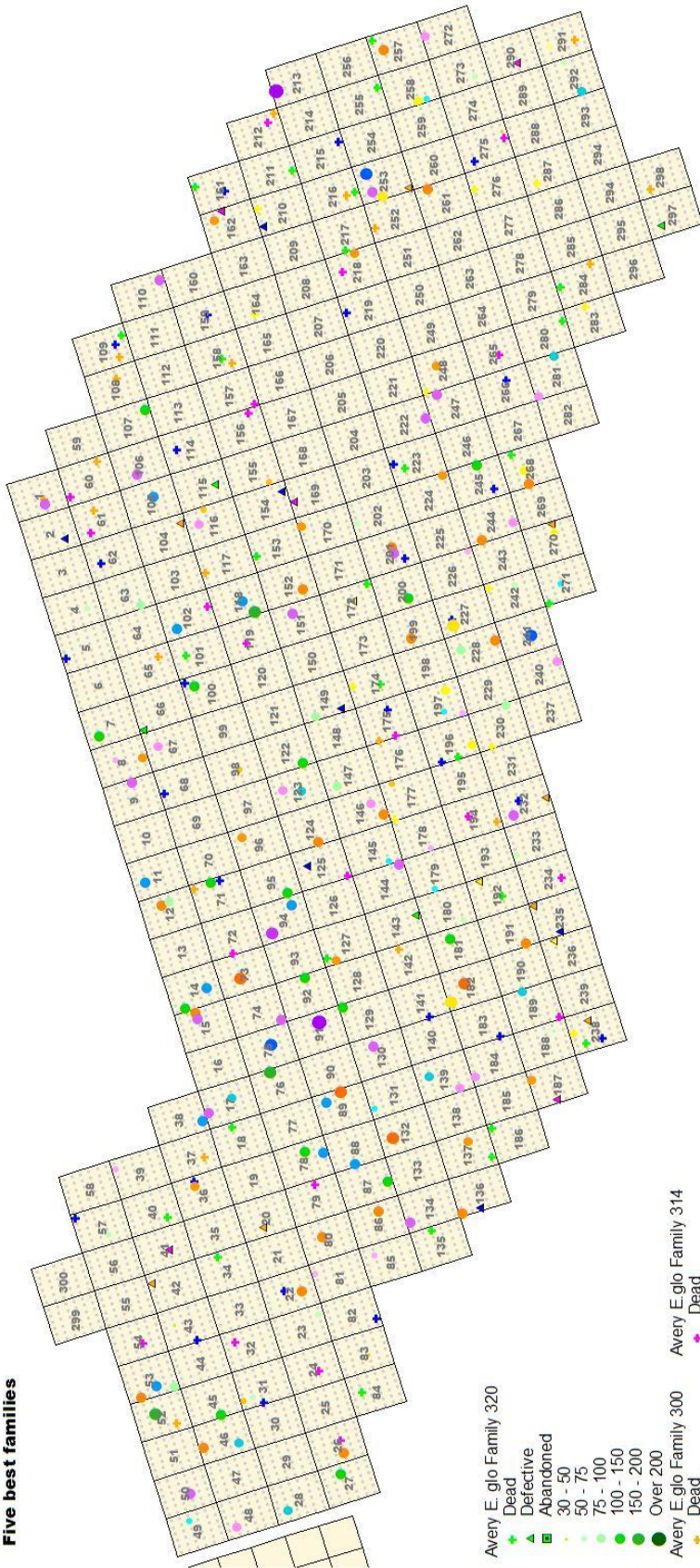
Landowner Case Study Biomass Sampling Site 053 Avery

2011 Eucalypt Breeding Trial

*E. globoides*, PSP's measured highlighted in blue



**AVERY 2011 *E. globoidea*  
2020 data  
Five best families**



- Avery E. glo Family 320**
- ▲ Dead
  - ▲ Defective
  - Abandoned
  - 30 - 50
  - 50 - 75
  - 75 - 100
  - 100 - 150
  - 150 - 200
  - Over 200

- Avery E. glo Family 300**
- ▲ Dead
  - ▲ Defective
  - Abandoned
  - 30 - 50
  - 50 - 75
  - 75 - 100
  - 100 - 150
  - 150 - 200
  - Over 200

- Avery E. glo Family 303**
- ▲ Dead
  - ▲ Defective
  - Abandoned
  - 30 - 50
  - 50 - 75
  - 75 - 100
  - 100 - 150
  - 150 - 200
  - Over 200

- Avery E. glo Family 314**
- ▲ Dead
  - ▲ Defective
  - Abandoned
  - 30 - 50
  - 50 - 75
  - 75 - 100
  - 100 - 150
  - 150 - 200
  - Over 200

- Avery E. glo Family 284**
- ▲ Dead
  - ▲ Defective
  - Abandoned
  - 30 - 50
  - 50 - 75
  - 75 - 100
  - 100 - 150
  - 150 - 200
  - Over 200



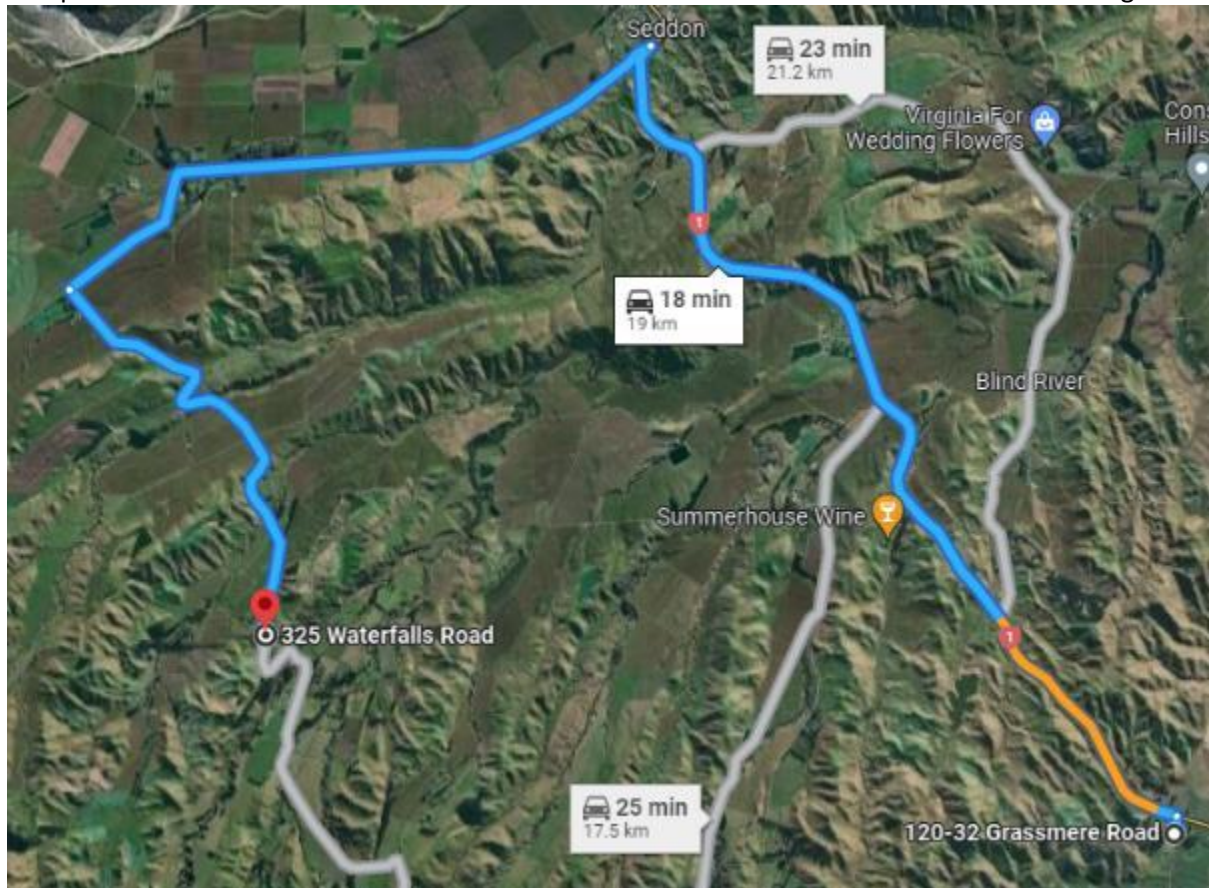
**10.00 - 10.30am**

## Lawson trial site, Waterfalls Road, Seddon

Travel to 325 Waterfalls Road, Seddon, Marlborough.

From Grassmere Rd turn left onto SH 1 – drive 8.9 km back to Seddon.

Sharp left onto Marama Rd – drive 5.8 km. Turn left onto Waterfalls Rd – drive 4.2 km to trial gate.



This *E. bosistoana* progeny trial was planted as the first of three replicate trials NZDFI established in 2009. MDC Cravens Road was another of these 2009 trials.

A total of 4,500 trees were planted to test 60 open-pollinated family seedlots collected across the natural range of *E. bosistoana* in Australia. There have been a succession of growth and form, and wood properties assessments. The trial has been thinned twice.

Four permanent sample plots (PSP) were re-measured for the SLMACC project and 11 trees were felled for biomass sampling.

There also six small blocks of other durable eucalypt species planted at this site. These are *E. globoidea*, *E. quadrangualta*, *E. argopholia*, *E. caldocalyx*, *E. macrorhyncha* and *E. sphaerocarpa*.

**10:45 – 11:45am**

## Lissaman trial site, Haldons Road- 2021 *E. globoidea* 2nd generation seedling seed orchard

Drive 2 kms back toward Seddon and turn left into Haldon Road. Drive 4 kms to Lissaman trial gate.

The official planting of the first of NZDFI's XyloGene improved durable eucalypt planting stock was held on 1<sup>st</sup> October at Warwick Lissaman's Breach Oak property in the Awatere Valley, Marlborough. The former Minister of Forestry, Stuart Nash attended the event to plant *Eucalyptus globoidea* XyloGene nursery stock in a new second generation seed orchard. This event was supported by the Te Uru Rākau – New Zealand Forest Service former One Billion Trees partnership programme.

Unlike *E. bosistoana*, the reproductive biology of *E.globoidea* has proven to be difficult due to grafting incompatibility between root stock and scion collected from elite trees. This means that a large scale clonal seed orchard has not yet been established with all elite families represented.

Therefore, in 2020 the best individuals of the top 26 families were identified for seed collection in the Avery 2011 *E. globoidea* as well as in the Atkinson trial located in southern Wairarapa. In total collections were made from 27 seed producing trees that represented 21 families.

This seed was deployed into establishing five seedling seed orchards in four different regions to ensure future production of commercial quantities of seed can scale up over the next 3-5 years. These are already demonstrating this species precocious flowering and seed production as this has commenced in some individuals on some sites. These pedigreed orchards retain the opportunity to remove (rogue) the lower performing families at a future date as additional family information is available to improve the genetic value of the seed produced.

Unlike NZDFI's progeny and demonstration trials, the seedling seed orchards are planted in an informal layout of approx. 2.8m x 2.8m spacing. An aluminum 'peg' with a tree code tag attached is located next to each seedling.

This orchard will produce improved seed that will be sold under the XyloGene brand.



This brand name arises from 'xylon' – the Greek word for wood, and 'genus' – the Greek word for 'generation'.

We have a nursery licensing system for production of certified XyloGene™ planting stock, and a royalty is charged on all seedling sales to fund ongoing research and development work.

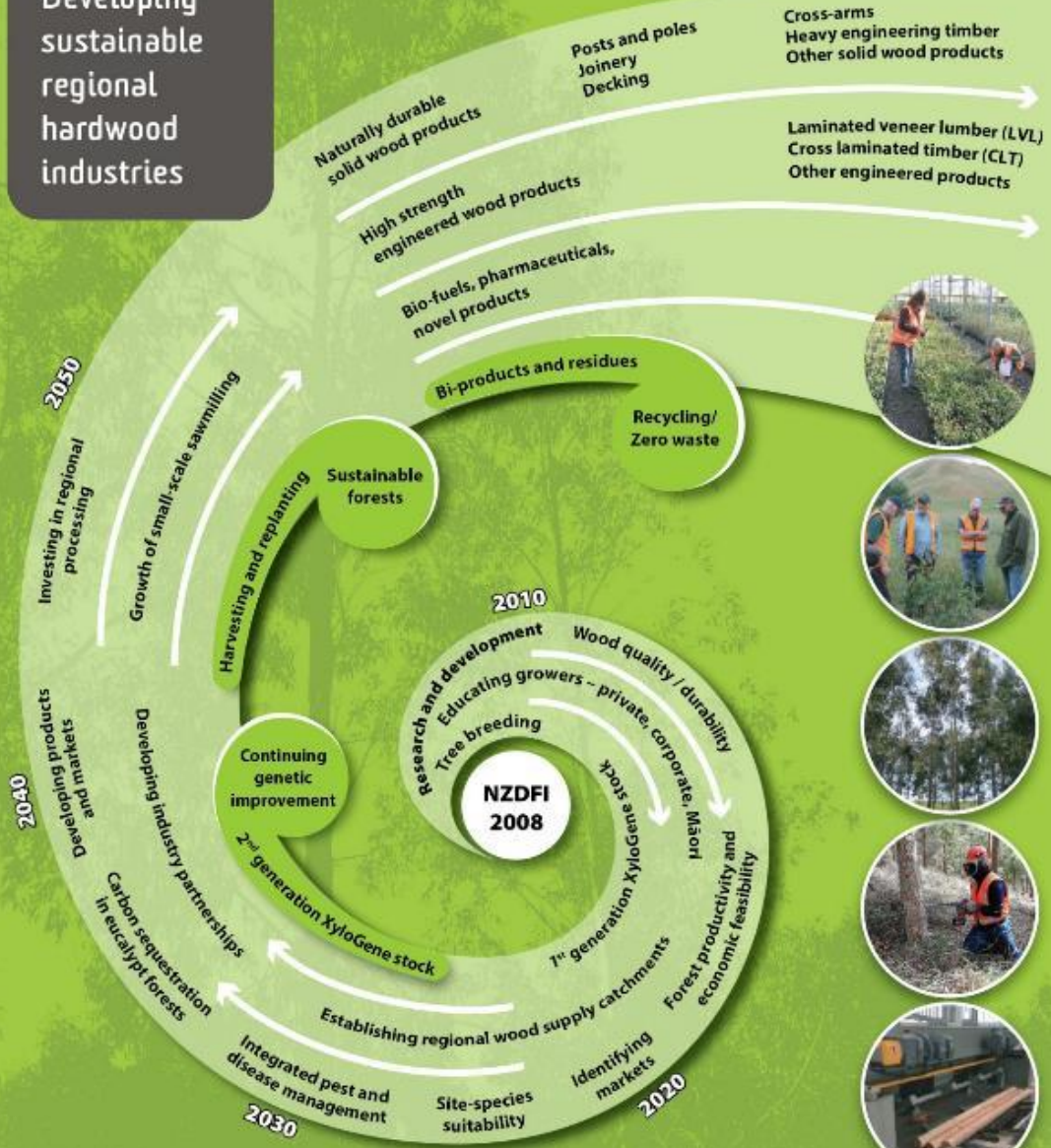
You can keep up with our latest R&D work by subscribing to our six-monthly Project Update.

[Project Update July - December 2023 - NZ Dryland Forests Innovation \(nzdfi.org.nz\)](https://nzdfi.org.nz)

**11:45am Field trip ends**

**Return trip to Blenheim approx. 45 mins**

# Developing sustainable regional hardwood industries



Our koru symbolises new life, strength and perpetual growth of NZDFI since its inception in 2008. Developing sustainable hardwood forests and industries will continue that growth and become part of a new multi-regional, circular bio-economy.



MARLBOROUGH RESEARCH CENTRE  
Te Wharekōwhiri o Whakatane





