



The trials feature a range of our selected species, and we are already carefully monitoring tree growth and performance, along with a range of other climate and site factors. Developing and testing different regimes for post and pole production is a priority at these trials. We will then develop guidelines and run workshops for growers. We will also develop productivity and growth models for the full range of selected eucalypt species and target site-types, using data from these trials.

Wood Quality Screening Research

As well as targeting genetic gains in growth, form, and site adaptability, the NZDFI is working on novel techniques to rapidly test wood samples from young trees for durability and other quality characteristics. If young individual trees in the trials can be identified with desired wood quality characteristics, then the potential gains from selection and genetic improvement can be further enhanced.

NZDFI Activities 2014-2016 and Beyond

Over \$2million has been invested in the NZDFI to date. In 2013, a \$216,000 MPI Sustainable Farming Fund grant was secured to underpin the next three-year phase of the project. While the underlying tree-improvement research will continue, over the next three years a big effort will be go into developing production regimes and extension resources for growers. We will also hold a series of grower-based workshops throughout our target eastern dryland region.

NZDFI People

The NZDFI is a collaborative cross-sector research and development project. Its progress relies on the work of closely integrated management, science, and extension teams. Key contributors to these teams include the Marlborough Research Centre, the University of Canterbury, Proseed, and a number of experienced independent consultants. Our teams work closely with landowners and other trial site managers. The NZDFI also works in partnership with many other organisations.



OUR VISION

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.

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 eucalypt forests, by 2050.

In practical terms, the NZDFI aims to develop a valuable, complementary land-use for farmers in the warmer parts of eastern New Zealand where rainfall is low and unreliable.

We Are:

- selecting elite trees from within our diverse genetic resource to provide growers with superior planting stock for NZ drylands
- researching and developing sustainable management systems for growing ground-durable eucalypts to produce high quality hardwood
- developing techniques to screen young trees for desirable wood quality characteristics, so that selection and breeding work can yield the greatest end-use benefits.

The NZDFI is a unique, exciting project with a strong focus on strategic research goals. It is backed by an effective scientific programme, extensive on-farm trials, and an expanding industry network. We have a clear vision to deliver sustainable benefits to New Zealand's dryland farmers.



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Ground Durable Eucalypts: The Potential

Much of eastern New Zealand has low rainfall (600–1000mm per year): rainfall which is likely to become less predictable in future. Landowners in these regions need sustainable, economically viable land-use alternatives to complement traditional enterprises.

The eucalypt species we are focusing on are renowned for their drought tolerance. They are fast-growing, and produce hard, strong timber. This timber is naturally ground-durable meaning that it will remain sound in outdoor conditions for several decades without chemical treatment.

We have identified a diverse range of potential markets for naturally durable eucalypt timber. We expect demand to develop both in New Zealand and overseas. A key market will be as posts and poles for vineyards, kiwifruit orchards, and organic farms. A minimum of 500,000 poles are needed each year on South Island vineyards alone.

Other potential markets include:

- power poles and cross arms for power poles, both in New Zealand and Australia
- indoor and outdoor flooring and decking
- railway sleepers and construction timber for bridges & wharfs
- as a component of laminated veneer lumber
- as a substitute for imported tropical hardwoods such as teak, used for very high-value decorative uses.

The NZDFI aims to support growers who are keen to grow and mill their own durable eucalypt timber for on-farm use. We want to ensure maximum returns for growers.



Woodlot-grown *E. cladocalyx* posts in a Wairarapa vineyard.

Research and Development Priorities

Our R & D priorities are in two key areas:

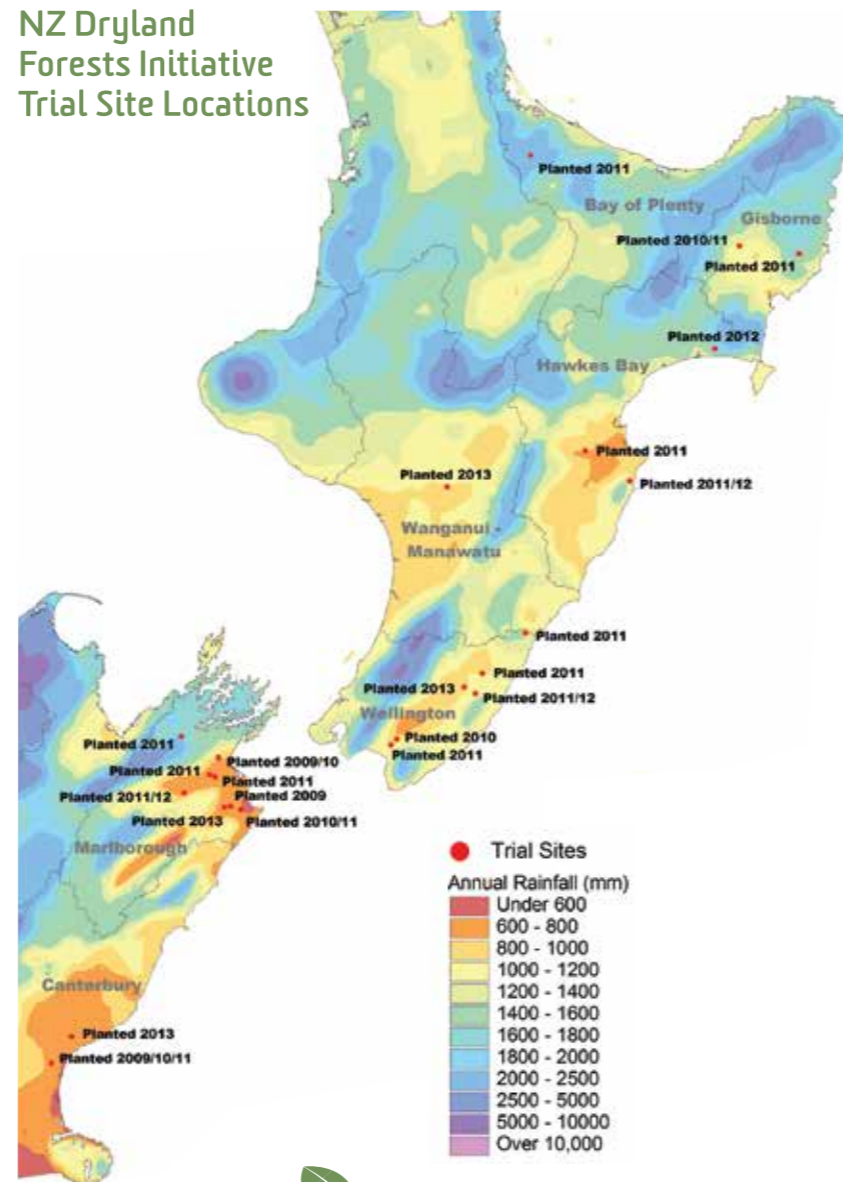
- producing high-performing planting stock of known genetic potential
- developing best-practice growing regimes and productivity models.

Work in both these areas relies on our network of on-farm trials, which are located throughout the target dryland region.

Genetics and Breeding Research

The NZDFI breeding programme is based on both proven and novel scientific approaches to tree improvement. Our aim is to build on techniques and knowledge developed over the past decades by international tree breeders working on radiata pine and other forestry species. This approach should allow us to make significant genetic gains over the next decade.

NZ Dryland Forests Initiative Trial Site Locations



Species Selected for Improvement

We have identified five species considered to have excellent potential in New Zealand's dryland regions. Retaining a choice of species reduces the risk from biotic (eg, pests and diseases) and abiotic (eg, cold, drought, soils etc) threats, increases the potential choice of suitable site types, and will enable hybridisation between some species, combining their best genetic traits

Our 'Top 5' Species:

- | | |
|---------------------------|----------------------|
| • <i>E. argophloia</i> | Western white gum |
| • <i>E. bosistoana</i> | Coast grey box |
| • <i>E. globoidea</i> | White stringybark |
| • <i>E. quadrangulata</i> | White-topped box gum |
| • <i>E. tricarpa</i> | Red iron bark |

We are also establishing resources of other species from Australian tree breeding programmes, including *E. camaldulensis* (Red river gum) and *E. cladocalyx* (Sugar gum).

Selection Criteria

We selected species on a range of criteria. Some have performed well in earlier New Zealand trials, others were chosen specifically for their heartwood colour and ability to hybridise. All species meet the following criteria:

- Class 1 or 2 durability (Australian standard)
- good growth
- good stiffness, strength and other timber properties
- drought resistant
- relatively good frost tolerance
- established timber potential from experience in Australian markets.

NZDFI Seed Collection Programme

Our wide-ranging seed collection programme, mainly in Australia, means we now have a large, broad-based tree breeding resource with excellent potential for genetic gain.

Seed Collection

Since 2008, Proseed (a Ngāi Tahu tree seed company and NZDFI partner) has coordinated seed collection of selected eucalypt species within Australia and New Zealand. Collections have ranged across Australia's eastern seaboard, and also included some New Zealand trees.

We now have a large collection (over 500 families) of provenances and families from our selected species, providing genetic variability at a scale which gives great scope for genetic improvement. Seedlings are grown from collected seed by Morgans Road Nursery, near Blenheim in Marlborough.

Our Trials



Measuring 20-month-old *E. globoidea* at a southern Wairarapa trial site.

(i) Breeding Trials of Selected Species

We established nine breeding trial sites containing base breeding populations between 2009 and 2012. These trials were planted with a total of over 100,000 trees. The large number of trees ensures that broad-based selection of elite trees is possible. We also plan to investigate the development of inter-specific hybrids.

The nine different sites will allow analysis of the stability of superior genotypes under contrasting environmental conditions, by identifying the relative contributions of genetic and environmental effects. Having nine sites also reduces risks associated with unfavourable natural events.

Initial Selection Traits

Initially we will select genotypes based on fast growth, good form, early heartwood formation and ability to coppice. Later we will focus on wood quality traits.

(ii) Demonstration Trials & Extension Work

We have established a second set of trials, our 'demonstration trials'. Thirteen of these trials have been established across our target area; a further four were planted in 2013 and another six will be established in 2014. The trials will be the main venues for our extension activities.