JULY 2024

NZDFI NEW ZEALAND DRYLAND FORESTS INNOVATION

Breeding durable hardwood | Whakatipu taikākā mauroa

XyloGene®

Durable Eucalypts by NZDFIP Ltd

OUR DURABLE EUCALYPT SPECIES

New Zealand Dryland Forests Innovation's tree breeding programme has genetically improved two durable eucalypt species:

> ***Eucalyptus globoidea*** **(White stringybark) –** a species which grows productively across a range of sites and produces class 2 durable timber (expected in-ground service life of 15-25 years) which is strong, versatile, easy to machine with attractive grain.

> ***Eucalyptus bosistoana*** **(Coast grey box) –** a species which grows best on fertile, sheltered sites and produces class 1 durable timber (expected in-ground service life of 25-plus years) which is very hard and strong.

These species provide landowners with the opportunity to start planting the 60,000 hectares of forest required over the next 30 years to establish a sustainable multi-regional hardwood industry in New Zealand.

New Zealand Dryland Forests Innovation's (NZDFI) breeding programme is producing the first generation of XyloGene-branded improved seed and seedlings of both species. XyloGene seedlots offer growers a range of genetic improvement in adaptability, growth, form, heartwood volume and durability.

To achieve genetic gains, elite trees have been selected for propagation. The trees have been tested in New Zealand environments with varying biotic and abiotic factors. NZDFI's seedling and clonal seed orchards are designed to ensure outcrossing between diverse genotypes to produce nursery stock adapted to New Zealand conditions.

XyloGene seed and seedlings are available to purchase and these offer superior performance to planting provenance collections imported from Australia or collected in New Zealand.

Further information about the seed and seedlings available can be found on the XyloGene website.

XyloGene.com

Choosing a forestry regime for growing durable eucalypts

Landowners wanting to diversify can plant NZDFI eucalypts to grow durable hardwood. These forests will deliver multiple benefits – hardwood, carbon sequestration, pollen and nectar, landscape enhancement and biodiversity.

There are two recommended forestry regimes, the choice of which will depend on site/land type, grower objectives, potential markets or plans to produce posts or timber for own use:

- **a 20-25 year rotation post regime:** this targets growing trees to maximise production of straight, class 1 & 2 durable roundwood for posts and poles, and possibly veneer for engineered wood products.

  This regime is suited to easy-to-medium contour land where small-to-medium scale ground-based harvesting is feasible and there is minimal requirement for internal access roads, landings and bridges. A high initial stocking (1600-2000 stems per hectare) is planted and there is no pruning. Production thinning for woody biomass at around 9-10 years may be feasible, otherwise early waste thinning is recommended to remove any poor stems and reduce competition. Following a clear-fell harvest, trees will coppice (grow back from the cut stump) and rapidly re-grow. Growers can prune the coppice back to a single stem to produce another straight single tree. Optimal sites are within economic transport distance to a post processing hub or alternatively a portable post-peeler can be used on-site to produce posts for own use or sale to a local market.

- **a 28-35 year rotation sawlog/peeler log regime:** this targets production of class 1 & 2 durable logs on steeper hill country (predominantly pine cut-over) either for peeling veneer or sawing to produce a range of high-value durable hardwood products. Silviculture and harvesting systems similar to those used for radiata pine can be applied.

Some landowners could combine the two regimes to develop a continuous cover forest. One or more production thinning operations could produce small logs for posts and firewood; the remaining trees can then grow on to produce sawlogs that are selectively harvested. Coppice regrowth could be managed to develop a multi-age forest.

Selecting a suitable site

New Zealand has a wide range of different site and environmental conditions: not all are suitable for growing durable eucalypts.

NZDFI's selected durable eucalypt species are adapted to a wide range of differing soils and climate found in New Zealand's northern coastal regions. Winter temperature extremes restrict planting in the central North Island and much of the southern South Island.

Key practical aspects to choosing a species and regime include:

- **Site location, soils and climate** combined with aspect and drainage need to be suitable for the species and regime selected. Frost and exposure are key climate criteria that impact seedling survival.
- **Site topography** needs to allow internal access for forest management and harvesting options.
- **Forestry scale and property location** must suit the planned regime. Distance to markets and economies of scale at harvest are key factors influencing returns to the grower. NZDFI are promoting regional collaboration to establish regional-scale wood supply catchments to support a future durable hardwood industry.

Species/site selection

Growers need to have a suitable site environment if planting is to be successful. Optimal sites are sheltered with low-to-moderate frost and good soil drainage.

- **Frost:** eucalypt species vary in their frost tolerance. No species are recommended for areas where minimum temperatures go below minus 6 degrees (-6°C). Avoid planting flat sites with high spring frost risk; planting on hill slopes can ensure good air drainage and warmer winter temperatures. Sites with warm winter temperatures have higher productivity. In cooler regions plant in late spring to avoid frosts on newly planted trees.
- **Wind:** eucalypt species are generally wind-firm, but severe exposure can impact growth and form. All species grow better on more sheltered sites.
- **Annual rainfall:** NZDFI eucalypts can tolerate dry conditions, i.e. less than 800 mm rainfall per year. Dry sites have lower productivity than sites with higher rainfall.
- **Soil depth, fertility and drainage:** some species can tolerate sites with dry, shallow and infertile soils. Other species need well drained soils with higher fertility to thrive.

Eucalyptus globoidea (White stringybark) - Site requirements

- Frost tolerance: minus 5 degrees (-5°C) - avoid very cold sites
- Rainfall min and max: 800 - 2500mm/year
- Soil type/drainage: suited to a wide range of soils except skeletal and stony soils
- Wind tolerance: one of the more wind-tolerant durable eucalypts
- On optimal sites the mean annual height growth can exceed two metres. Mature trees can reach heights of 25 – 30m and 1m diameter.

Eucalyptus globoidea has not been heavily browsed by insect pests at any trial sites and is reported to be one of the least impacted by seasonal browsing.

Eucalyptus bosistoana (Coast grey box) - Site requirements

- Frost tolerance: minus 6 degrees (-6°C) - avoid very cold sites
- Rainfall min and max: 600 - 2500 mm/year
- Soil type/drainage: prefers fertile, well-drained soils. Can tolerate periodic flooding
- Wind tolerance: moderate
- On optimal sites the mean annual height growth can reach two metres. Mature trees can reach heights of 30-40m and 1m diameter.

Several introduced insect pests can seasonally browse *E. bosistoana* foliage. These include leafroller (*Ctenopseustis obliquana*); eucalypt tortoise beetle (*Paropsis charybdis*) and the eucalypt variegated beetle, (*Paropsisterna variicollis*). Research by the University of Canterbury School of Forestry has identified genetic selection for browse tolerance is possible and that there are some New Zealand native predators of the eucalypt variegated beetle. Further work is required to develop and enhance these biological options.

XyloGene improved seed produced and supplied by Proseed NZ

As a founding partner of NZDFI, Proseed NZ (a Ngāi Tahu entity) holds an exclusive contract for propagation, collection, storage, sales and distribution of XyloGene seed. Proseed NZ's early investment in deploying clonal seed orchards ensures that there is a plentiful supply of the best *E. globoidea* and *E. bosistoana* genetics available.

XyloGene royalty system and available seedlots

A seed royalty and brand licensing system commenced in 2023. The XyloGene brand is registered with the Intellectual Property Office of New Zealand. This allows forest growers and nurseries to produce seedlings from XyloGene seed, and royalties are charged on seedling numbers dispatched.

- The seedlings cannot be used for production of cuttings or any other vegetative propagules.
- The seedlings cannot be used for breeding purposes.

Available Seedlots NZDFI seed origin	Seedlot Code	Ranking Genetic Quality	Seedling Royalty Cost (July 2024)
Proseed NZ 1st generation clonal seed orchard (CSO) XyloGene seedlot. Grafted seed orchard of best individuals from the top-ranked families selected for growth, stem form and low growth strain.	CSO	1	20c
NZDFI seedling orchard (SSO) XyloGene seedlot. Progeny trial collection from elite individuals of top-ranked families.	SSO	2	10c
NZDFI stand select (SS) XyloGene seedlot. Collection from stands of trees of known native provenances.	SS	3	5c

NZDFI's by-line is 'breeding durable hardwood' – *'Whakatipu taikākā mauroa'*.

This is reflected in the whakataukī – *'Ruia taitea, kia tū ko taikākā anake!'* 'Clear the sapwood, leave the heartwood standing!'

'XyloGene' arises from 'xylon' – the Greek word for wood, and 'genus' – the Greek word for generation. NZDFI chose XyloGene to brand genetically improved seed generated by selective tree breeding.

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PROSEED

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Supported by: Neil Barr FARM FORESTRY FOUNDATION Ko Te Manaaki Ngahere