Establishing a native production forest - Rewanui Forest Park, Wairarapa

Ian Campbell, Chair of Montfort Trimble Foundation, and Peter Berg, Deputy Chair of Tâne's Tree Trust, discuss the native species planting trials at Rewanui Forest Park.

INTRODUCTION

The Montfort Trimble Foundation is a Wairarapa-based trust dedicated to growing trees for the benefit of local people. It owes its existence to a legacy bequeathed by local identity Dr Montfort Trimble early last century. The Foundation has over the last five years established plantations of 15 native tree species at their Rewanui Forest Park located near Masterton. These include most of the common native conifer and hardwood trees. All species have timber potential and are highly prized for their timber quality and specialty uses.

In a joint project with Tãne's Tree Trust, the Foundation has been monitoring the early performance of these native trees, which are planted on pastoral hill country typical of the eastern North Island. This article firstly describes the origins of the Montfort Trimble Foundation, and secondly provides an insight into the planting, monitoring and early growth of the newly established native plantation resource at Rewanui Forest Park.

The Montfort Trimble Foundation and Rewanui

Dr Montfort Trimble was a Masterton lawyer, and was very concerned with environmental issues, particularly the rate at which the native forests were being depleted. In 1940 Dr Trimble left a bequest to the Masterton County Council for the purposes of public afforestation. This led to the purchase of 127 hectares of flat scrub-covered land north of Masterton (now known as Trimble Forest, Figure 1) which was planted in radiata pine (*Pinus radiata*). When the second crop of trees on this land was ready for harvest the County had merged with other local bodies to form the Masterton District Council. It was at this time that the Montfort Trimble Foundation was formed by an Act of Parliament to take over the forest and continue to manage the bequest on behalf of the trustees of the Trimble Estate.

The Montfort Trimble Foundation has a range of objectives to promote public afforestation including ...

"...the production and care of timber for economic purposes, the provision of a supply of timber for public wants, and the conservation of native and commercial forests".

In 2004 the Foundation bought a farm 'Rewanui' using the proceeds from harvests at their Trimble Forest. Rewanui was a typical hill country sheep and beef farm 23 kilometres east of Masterton (Figure 1). The 334-hectare property includes productive flats, hill grazing land (some reverting to scrub), young pine plantations and 70 hectares of native forest remnants.

When the Foundation bought Rewanui members debated what the best long-term land-use would be with a vision extending over 100 years. They concluded that the more productive areas would likely stay in pasture but that trees were an option for some of the poorer grazing land. Restoring the native bush was identified as a priority, so livestock were soon fenced out of the bush and an intensive animal pest control programme put in place.

The Foundation has now embarked on a programme to develop the farm as a trial and demonstration property with a focus on new ways of integrating trees into hill country livestock farming systems. Trials have been set up to evaluate a range of alternative tree species to radiata pine, including both native and exotic species. The property, now called Rewanui Forest Park, is open to the public all year.

The public and interest groups such as the NZ Farm Forestry Association are encouraged to use Rewanui Forest Park for recreation and education. Part of the vision of the Montfort Trimble Foundation is to share knowledge about growing trees, the production of timber and the many other benefits arising from trees on farms.

ESTABLISHMENT OF NATIVE TREES

Site characteristics

The area at Rewanui Forest Park planted with native trees is moderately steep and has two distinct soil types. The upper slopes are derived from decaying greywacke rock while the lower section comprises unstable mudstone. Small stands of each species were planted on both soil types. Livestock were fenced out of the trial area before planting. The trial area is a mosaic of open grassed areas and patches of regenerating kanuka (*Kunzea ericoides*)-dominated shrubland.

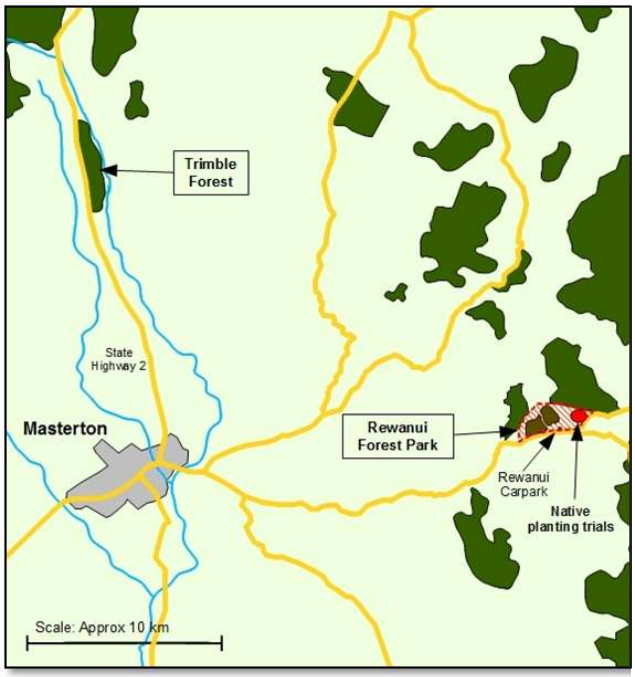

Figure 1: Location of Rewanui Forest Park east of Masterton, Wairarapa, where the Montfort Trimble Foundation is establishing plantations of native timber trees. The exotic production Trimble Forest to the north of Masterton is also shown.

Planting trial

In 2006, 15 species of native trees all with timber-producing potential were planted in 32 blocks of about 50 trees in each. Each species block comprises a single species.

Native trees were planted into one of three site types based on degree of shrubland cover:

(i) *open pasture* – trial trees planted a minimum of five metres from an existing established kanuka stand or tree;

(ii) *shade site* – trial trees planted along the edge of existing kanuka, and hence subject to at least partial shade; or

(iii) *canopy site* – trial trees planted within a stand of existing kanuka, but usually where the overstorey was light or where there was a small light well at time of planting.

Native trees were planted into one of three site types based on degree of shade and shelter provided by naturally regenerating kanuka. These were open pasture sites; semi sheltered sites along the edge of shrubland; and within small canopy gaps or light canopy cover of kanuka.

Site preparation

These grass-dominated planting spots were sprayed with herbicide using a knapsack before planting. The blocks are irregular in size and shape with trees planted a minimum of two metres apart ensuring suitable planting sites were selected, rather than planting in a rigid pattern.

Grassed sites were spot-sprayed before planting of good quality native tree seedlings such as these recently planted white maire (Nestegis lanceolata).

Species planted

Of the 15 native tree species planted, six were conifers and nine were hardwoods (Table 1). Some species were not native to the region such as kauri and puriri. Planting stock was obtained from a number of nurseries and was mostly raised as container stock in PB3 planter bags.

Location of the planted blocks is shown in Figure 2. Some species have been planted on all three site types (e.g. totara), while others may only be in one or two site types (e.g. rewarewa).

Maintenance

Trees have been kept free of competing vegetation by knapsack spraying with herbicide. This continues until the trees are above the height of competing vegetation. Trees are marked with a fibreglass pole to ensure they can be easily located during maintenance operations. Dead trees were replaced within the first two years of planting but there has been no further blanking since then.

Trees building resilience on hill country farms

From 2008 to 2011, Rewanui Forest Park hosted a Sustainable Farming Fund project. This project enabled the Montfort Trimble Foundation to lay the groundwork for long-term research into the role of trees in building resilience on hill country livestock farms. Intensive biodiversity monitoring formed a core component of the project, and the Foundation now has excellent baseline data for Rewanui's native flora, birds, invertebrates and reptiles, plus pest-animal data. Information about the economics of establishing trees and carbon farming opportunities was also produced. A series of information notes describing the outcomes of the SFF project is provided on the Foundation's website:

www.trimblefoundation.org.nz/resources

	Maori or common name	Botanical name
Conifers	Rimu	*Dacrydium cupressinum*
	Totara	*Podocarpus totara*
	Kahikatea	*Dacrycarpus dacrydioides*
	Kauri	*Agathis australis*
	Matai	*Prumnopitys taxifolia*
	Miro	*Prumnopitys ferruginea*
Hardwoods	Black beech	*Nothofagus solandri*
	Red beech	*Nothofagus fusca*
	Silver beech	*Nothofagus menziesii*
	Rata	*Metrosideros robusta*
	Tawa	*Belschmeidia tawa*
	Kowhai	*Sophora tetrapathea*
	White maire	*Nestegis lanceolata*
	Rewarewa	*Knightia excelsa*
	Puriri	*Vitex lucens*

Figure 2: Location of the 15 blocks of native timber tree species planted at Rewanui Forest Park. Native trees have been established on a range of hill country sites including in the open and within a light canopy of naturally regenerating kanuka.

MONITORING OF PLANTING TRIALS

A comprehensive trial monitoring system has been set up at Rewanui by the chairman of Montfort Trimble Foundation, Ian Campbell. Each tree is individually identified with a numbered plastic or aluminium tag attached to the fibreglass pole. In addition, the location of each tree has been recorded by taking a bearing from a permanent wooden peg placed in the centre of each plot.

Trees have been assessed annually for:

- survival;
- tree height;
- diameter of the stem at ground level (root collar diameter – RCD);
- diameter at breast height (DBH; 1.4 metres) once the tree is tall enough; and
- plant vigour (a subjective assessment on a scale of 1 to 5, where 1 is poor and 5 excellent).

The data gathered are entered into the database and analysed using software developed specifically for the Rewanui planting trial. A graphic of each planted block is generated that provides 'at-a-glance' information about the block and an indication of the performance of each planted tree (Figure 3). The software and plot graphics along with access to the growth data are available free on the Montfort Trimble Foundation website: www.trimblefoundation.org.nz.

The trials will continue to be regularly monitored for survival and growth. Observations indicate that open planted seedlings tend to have a greater proportion of plants with double leaders and coarse branching, particularly totara and the beeches. Form pruning of double leaders and steep angle branches to improve tree form has been started on the totara and will be undertaken on other species as necessary.

Annual assessment of planted native trees involves tallying the survival, measuring tree heights and stem diameters, and recording plant vigour for each species.

A plastic numbered tag attached to a fibreglass stake placed next to each tree allows for easy relocation for maintenance and monitoring.

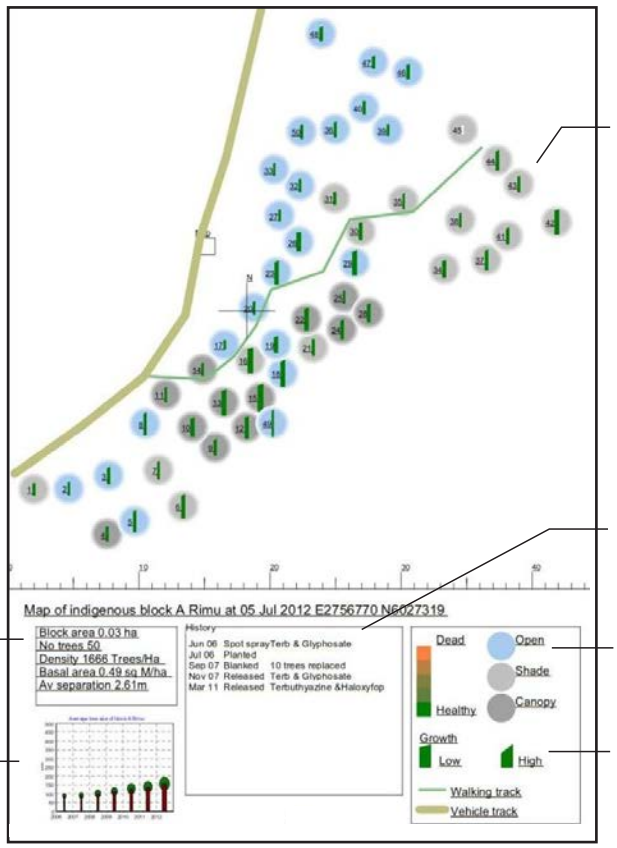

Figure 3: Graphical layout of each block of native tree species planted at Rewanui Forest Park along with growth performance by individual tree. This information is updated after each remeasurement and available on the Montfort Trimble Foundation website.

EARLY PEFORMANCE OF PLANTED NATIVES

A preliminary analysis of the first five years' performance of natives since establishment at Rewanui indicates most species have high survival and growth rates. Performance is similar to plantations assessed in the Tãne's Tree Trust Indigenous Plantation survey (refer to previous articles in Section 10 of the Tãne's Tree Trust Handbook).

Survival

Overall survival has been very high, ranging from 69% for tawa to 99% for totara. Species with less than 80% survival up to five years after planting included black beech, kahikatea, kauri, puriri, red beech and tawa. The high survivals of most of the major podocarp timber species (totara, rimu, matai, miro) is consistent with high survivals in many early forestry planting trials and operational plantings over the last several decades (e.g. Pardy et al. 1992; Beveridge and Bergin 1999).

Growth

The fastest growing native conifer was totara (Figure 4). Red beech had the fastest increment over the five years since planting at over 2 metres in height on average followed by kowhai (Figure 5). There was no appreciable increase in height of tawa. Red beech, silver beech, rewarewa and white maire have grown slowly, even though the latter species was planted as tall seedlings.

The fastest growing species, red beech and totara, reflect performance of these species in the recent Tãne's Tree Trust survey of indigenous plantations (refer Handbook Articles No's. 10.2 & 10.3), with annual increments of at least 30 cm in height and 5 mm in diameter.

The poor performance of some species is probably due to a range of factors. For example, some kahikatea planted on upper drought-prone slopes are unthrifty; the plant vigour of kowhai has been affected by insect attack and defoliation; as a late-successional species, tawa is performing poorly on open or partially sheltered sites; and growth of kauri is limited probably because Rewanui is well south of its natural range.

Site preferences

Even at this early stage, relative performance of species planted on the three site-types at Rewanui indicates the ecological preferences of some species. For instance, the light-demanding totara is growing best on the open sites compared to the shade and canopy site. Conversely, growth and vigour of both rimu and puriri reflect these species preference for some shade and shelter particularly as seedlings.

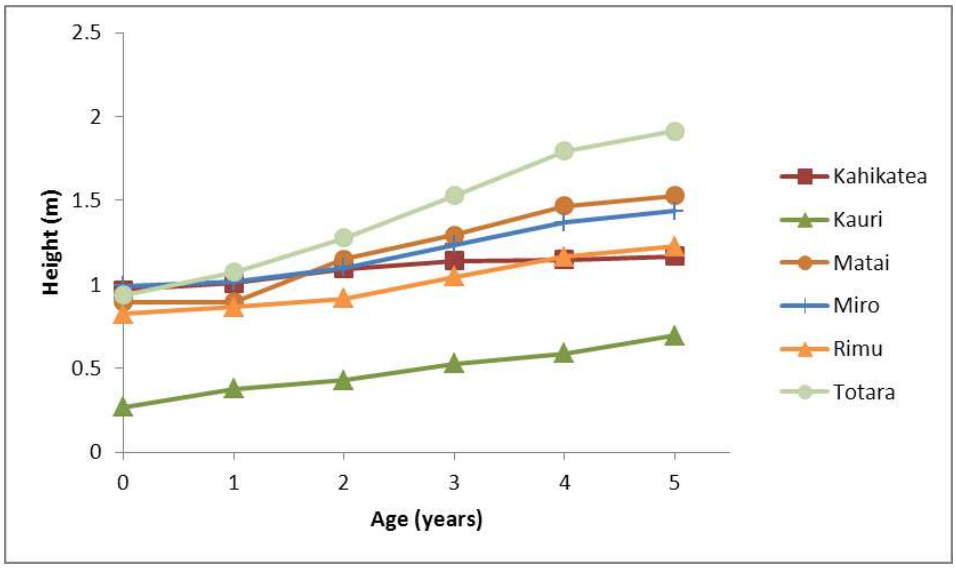

Figure 4: Mean height of conifer species planted for up to 5 years at the Rewanui Forest Park.

A puriri planted in a small gap in regenerating kanuka is growing well.

Performance of rimu is better where some side shelter is provided by regenerating kanuka shrubland.

Red beech planted at an average seedling height of 50 cm have grown the fastest with a mean height 5 years after planting of nearly 2.5 m.

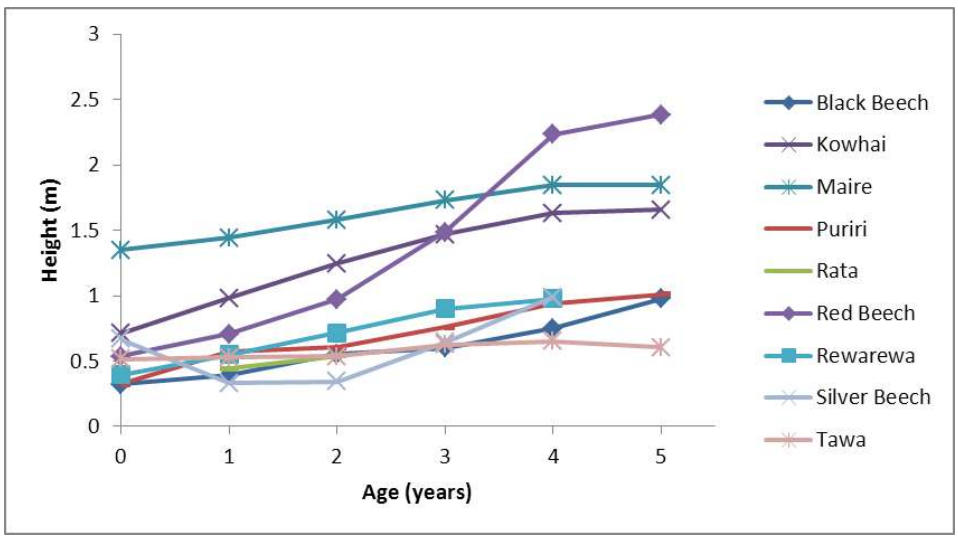

Figure 5: Mean height of native hardwood species planted for up to 5 years at the Rewanui Forest Park.

CONCLUSIONS – THE FIRST FIVE YEARS

The high overall survival and growth of most native species planted at Rewanui is due to the timely and thorough maintenance of the plantings. Poor weed control has been the single biggest killer of planted native trees and shrubs in planting programmes throughout the country over the last century (Bergin and Gea 2007). Early performance is generally high across both native conifer and hardwood plantings at Rewanui reflecting:

- matching of appropriate species and planting sites for most species;
- good site preparation;
- timely and consistent weed control; and
- ongoing pest animal control and exclusion of domestic stock.

Features of the native tree plantings at Rewanui are the intensive monitoring of seedling survival and growth, well-documented planting plans, and excellent data capture and collation. This detailed information is seldom available in plantings of native species. The native species trials at Rewanui are also included in the Tãne's Tree Trust national database.

These are early days for the native species trials at Rewanui but already there are some interesting results. As monitoring continues these trials will be of increasing benefit to others interested in establishing a native production forest. This is compatible with the long-term vision of the Monfort Trimble Foundation for the Rewanui Forest Park to expand the training, educational and research use of the farm and indeed meet the intent of the original benefactor…

"...for the purposes of public afforestation".

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Sustainable Farming Fund
www.maf.govt.nz/sff

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Tãne's Tree Trust
Native Trees for the Future

Tãne's Tree Trust promotes the successful planting and sustainable management of New Zealand native trees and shrubs for multiple uses.

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