

**QUALITY NATIVE TIMBER FROM  
FUTURE MANAGED STANDS**

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**ABSTRACT**

Historically, many New Zealand native timbers both hardwood and softwood, established excellent reputations for a wide range of solid wood uses. Some species such as kauri and rimu catered for multiple uses while others such as puriri supplied limited niche markets. Many of the historical niche markets no longer exist, mainly due to replacement by other products and reduced availability of logs for processing. However, additional markets have evolved using both recycled native timbers plus additional material from managed stands, both natural and planted.

Historical use largely depended on availability and cost, but reputations for specific native timbers were a direct reflection of their wood properties. Significant wood properties included durability, stability, hardness, strength and stiffness for structural applications, machinability, non-tainting qualities and appearance. When harvesting mature stands, the age of the trees largely determined the quality of the logs available for processing and had a positive influence on many of the desirable properties of the timber produced.

Management of native trees can maintain quality with respect to log size and branching, however reputations of timber quality have largely been built up on utilisation of heartwood from old-growth stands. Heartwood and many other wood properties are largely age dependent and may be compromised if economic considerations dictate shorter rotations.

**KEYWORDS:** Indigenous species, wood properties, management

**INTRODUCTION**

The availability of timber from natural forests has become increasingly scarce over recent years and as a consequence, there has been increasing emphasis on both the sustainable management of natural forest and in the establishment of plantations with targeted native species (Herbert et al. 1997). Natural forest stands from which a wide range of our native species developed their reputations were mature with usually straight boles free of branching below crowns. Traditional use largely depended on availability and cost, and reputations were a direct reflection of wood properties. Various combinations of the following properties were important in the use of timber for a wide range of products including durability, stability, machinability, strength, stiffness, hardness, colour, appearance and non-tainting qualities.



*Natural mature stand of rimu showing the typically straight branch-free boles*

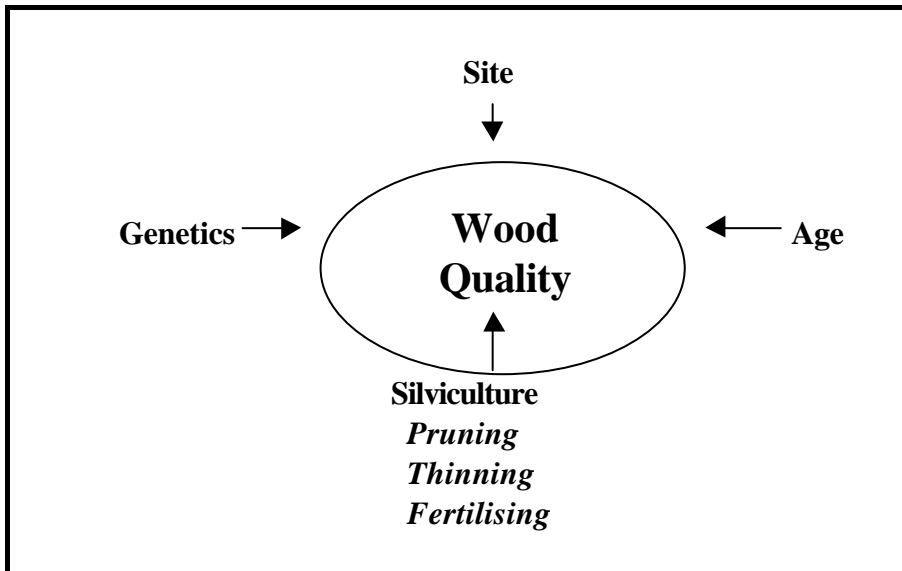
A wide range of native species, both softwoods (e.g. kauri, rimu, and totara) and hardwoods (e.g. beech and puriri) provided for multi-purpose and specialty products. Their specific properties and related uses have been well documented from early times by Kirk (1874) and Perceval (1895) and in more recent times by Hinds & Reid (1957). A comparison of the natural durability between untreated native species and exotic species grown in New Zealand are given in a *What's New* article (Forest Research Institute 1987). Clifton (1990) provides comprehensive coverage of New Zealand's native species linking their documented wood properties to associated uses. This recent publication coincides with the renewed interest in the planting and management of native timber trees as a long-term timber resource and requirements under the Forest Amendment Act (1993) for sustainable management of existing native forest.

Many traditional uses of native timber have been replaced by the more cost-effective use of exotic plantation grown timber. The availability of native timber from old-growth stands had diminished significantly in recent decades with some use of recycled timber. The future use of native timber must target high value niche markets, where the inherent wood properties of each species are recognised. Careful management of both natural forest stands and small plantations of targeted species (Pardy & Bergin 1989) should ensure the availability of quality native timber in the future and have the added benefits of satisfying cultural and environmental needs.

### **WOOD QUALITY - SUITABILITY FOR USE**

A comprehensive understanding of wood quality is required to enable the effective management of natural stands or small plantations and to ensure the optimum allocation from

this resource to products that will satisfy consumer requirements. Wood quality essentially includes log size and shape, branching characteristics and wood properties, all of which contribute to growing and allocation decisions and ultimately to a product range. The following diagram illustrates the major components influencing wood quality.



It is the influence and interaction of site factors, tree age, silvicultural practices and genetic characteristics of each species that will ultimately determine the quality of timber produced.

### POTENTIAL FROM NEW MANAGED STANDS

The *Forest Research* indigenous plantation research programme has identified a range of native softwood and hardwood timber species with potential for growing in plantations or small woodlots as a long term timber supply. Species have been selected on the basis of their timber properties, growth rates, breeding potential, site tolerance and public profile. They include the conifers totara (*Podocarpus totara*) and kauri (*Agathis australis*); a group of North Island and northern South Island lowland hardwood species with useful timber characteristics and apparently good growth rates including puriri (*Vitex lucens*), rewarewa (*Knightia excelsa*), kokekohe (*Dysoxylum spectabile*), mangeao (*Litsea calicaris*); and the beeches (*Nothofagus* spp.) (Pardy, Bergin & Kimberley, 1992; Bergin & Kimberley, 1992; Halkett, 1983, 1986; Beveridge, 1977; Franklin & Beveridge, 1977; Ecroyd *et al.*, 1993).

Most effort in recent years has been put into the softwoods totara and kauri, and into the hardwoods puriri, rewarewa and the beeches. However, with continued funding, research will be expanded into evaluating other species including rimu (*Dacrydium cupressinum*), kahikatea (*Dacrycarpus dacrydioides*), tanekaha (*Phyllocladus trichomanoides*) and kanuka (*Kunzea ericoides*).

For some species in appropriate locations, the management of naturally regenerating stands for long-term timber supply may be feasible. This includes management of second-growth totara-dominated stands currently occurring on farmland in many regions.

Other species which have proven wood characteristics from traditional uses but are proving to be difficult to manage include tawa (*Beilschmiedia tawa*) (Forest Research Institute 1987) or are slow growing such as matai (*Prymnoptus taxifolia*) (Forest Research Institute 1980).

### **WOOD PROPERTIES AND USES OF SELECTED SPECIES**

The timber properties and uses of the following species is based on Clifton (1990) and Hinds & Reid (1957) and provides examples of both softwood and hardwood species with multi-purpose, general purpose and or specialty attributes.

#### **Kauri**

Kauri was a truly multi-purpose softwood species, the largest and most widely renowned of our native timber trees. The wood properties of this species which include strength, durability and stability along with appearance qualities, excellent machining, drying and finishing and non-tainting properties, are directly reflected in the wide product range that kauri satisfied.



*Natural stand of mature kauri showing the potential for recovery of long and wide clear planks of timber, a feature that added to this species reputation*

In pre-European times totara was usually the tree of choice. However in the far north (within the natural range of the species) kauri was a rival and produced some magnificent canoes and elaborate carvings. Early European trade included masts and spars drawing on kauri's strength properties followed by its use for vats and tanks. Its finishing and non-tainting properties made it ideal for brewery vats and its acid resistance lead to uses in the tannery, dyeing and chemical industries. The particularly amenable properties extended the use of kauri to include boat

building, house construction, flooring, joinery, mouldings, panelling, furniture, veneers, doors, bridges, wharves, mine props, sleepers. Although many of these uses are now better served with alternative products they clearly indicate the tremendous attributes of this species and its multi-purpose role.

### **Rimu**

Rimu (*Dacrydium cupressinum*), most probably the best known of our native softwood species due to its wide availability throughout the country, is regarded as a general purpose species. The properties of this species include durable heartwood above ground and moderately durable below ground, timber that is stable, hard, stiff and strong with excellent machining properties, and a rich figure and silky texture. As for kauri these properties are reflected in the varied product range.

In pre-European times rimu was also used for canoes, but only in situations where totara and kauri were unavailable. It was also widely used by Maori for house planks. In European times, the durable and dimensionally stable heartwood allowed the production of high quality exterior joinery and combined with excellent machining properties was used on a large-scale for weatherboards. These properties, in addition to hardness and even wearing qualities, saw rimu as the most widely used flooring timber in New Zealand. Strength and stiffness extended the product range to structural applications where it was particularly suitable for long length, larger dimension situations. More recent years have seen the decorative qualities of rimu create demand for furniture and veneer.

### **Beech**

Several beech species have been used commercially throughout New Zealand to greater or lesser extent and are all regarded as specialty hardwood timbers. Their individual wood properties have largely determined their specific roles and product range, with silver beech by far the easiest to process. Hard, red and mountain beech have associated drying problems with varying levels of collapse and internal checking. However, once dry, red beech in particular, is regarded as extremely stable. Each of these three species is regarded as naturally durable and account for the range of uses in the mining and farming industries including bridges, mine props, fencing, stockyards and the like. Of these three species, hard beech produced the stronger, denser and harder timber. Mountain beech had the highest levels of silica and was least favoured by sawmillers and red beech contained extractives associated with corrosion of iron, which ended a short period in which this species was used for railway sleepers. The fine even texture of red beech extended its range of uses to include interior joinery and the production of attractive panelling and furniture.



*Natural durability and amenable grain characteristics of red beech allowed the splitting of fence battens*

As mentioned above, silver beech is the easiest of the native beech species to work with, containing no silica to blunten saws and the timber is easy to dry. It is regarded as perishable, has variable colour and density, exceptionally fine even grain with excellent steam bending and staple holding properties. Silver beech is regarded as one of the finest timbers in the world for brushware but is also an excellent furniture timber and for cabinet making, dowles, and flooring. It has also been used for painted weatherboards and in Southland, the dominant production region, it is regarded as a more general-purpose species. This species has also shown itself to respond well to management on a sustainable yield basis ensuring continuing supplies.



*An example of quality beech furniture*

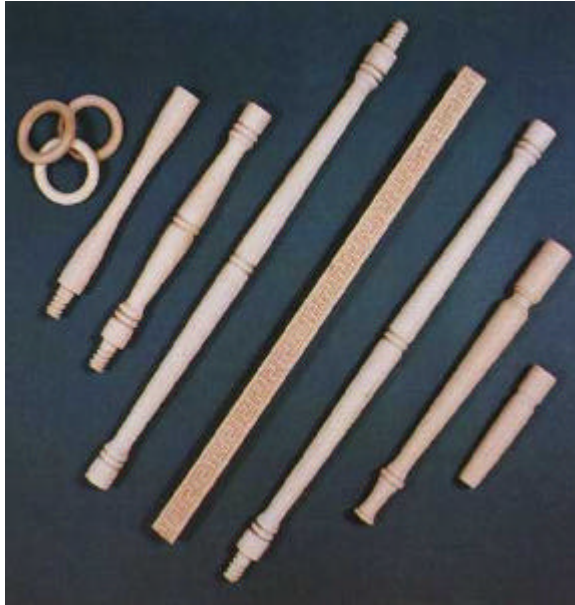
### **Puriri**

Puriri is one of the New Zealand hardwoods found in the lowland and coastal forests in the northern half of the North Island. It is in the same family as teak and although historically little timber has been produced it is regarded as one of our specialty timbers. The properties which give puriri specialty status are tremendous strength and durability in addition to the timber being hard, heavy, dense and stable.

In pre-European times, puriri was used by Maori for making weapons, implements and canoe paddles. Later use included house blocks, piles, sleepers, bridges, mine props, machine beds and bearings, culverts, stockyards and fence posts. Many of these uses have since been replaced by more readily available plantation species, with preservative treatment providing durability and non wood products used instead of puriri where strength, stability and hardness were requirements.

### **Tawa**

Tawa (*Beilschmiedia tawa*) is also regarded as a specialty timber and was one of the commercially important hardwood species found throughout the North Island and northern South Island. Tawa logs produced good recoveries of finishing grades when compared with other hardwoods but the timber was prone to growth stress. Other properties of importance are colour, (white heartwood with some logs containing dark brown to black pathological heart), excellent turning and finishing properties, strong, hard and dense timber with low moisture content and low stability. It is also regarded as perishable.



*The excellent turning properties of tawa are evident in this range of products displayed*

Pre-European use included long bird spears for which it was highly regarded, war canoe paddles and for roof and wall battens. Although the following list of later uses to which tawa has been associated suggest multi-purpose status, it was only ever available in small volumes and was highly sought after for a few specific uses. Initially it was used for butter churns in the dairy industry and in more recent times the floors of squash courts (tawa made an attractive hard wearing floor), handles, dowels and furniture. Further uses included veneer, cloths pegs, weather boards, framing and lower grades as dunnage. It was also a premium species for producing short fibre pulp for the production of fine writing and printing papers.

## CONCLUSIONS

Although management practices can maintain quality with respect to log size and branching characteristics, wood properties are largely dependent on age of the tree. Timber quality therefore, is likely to be compromised if economics dictate short rotations with many if not all native tree species. The level of impact will be species and property dependent.

The reputation of many native timber species is largely related to use of heartwood which was generally used from trees taken from old-growth natural forests. Planting trials have shown that kauri can achieve reasonable initial growth rates. Trees of merchantable size that have developed in a second-crop stand in Northland in an estimated 120-150 years after forest disturbance were evaluated for wood quality (Gibson 1983). In this study, nearly all boards that had been milled from logs, which had been extracted by helicopter, were graded as sapwood. A low proportion of heartwood in fast growing plantations of totara has also been observed (Bergin & Pardy 1987). Where the desirable characteristics of native timbers are based on the quality of heartwood, the relatively low proportion of heartwood in trees even around 100 years of age will mean longer rotations are likely if traditional uses of

the wood are the objective. The development of heartwood in other species such as the native hardwoods may, however, be somewhat faster than that in the native conifers.

In addition to both pre-European uses and those created since the arrival of Europeans, potential products from native trees should aim for high-value niche markets, optimising the natural qualities of individual species. Longer rotations for native timber species will inevitably mean that timber will need to be targeted to specialty high-value uses. Optimising utilisation opportunities for native timber and developing new processing options must be identified and developed. Hardness and durability, for example, linked with new and efficient processing technologies lend themselves to the production of parquet flooring.

Where long rotations are likely to be required for some of the native timber species in order to obtain age-dependent wood qualities, a range of non-timber benefits including cultural and environmental objectives will be important additional incentives for prospective landowners wanting to manage natives for timber. Along with the increasing interest in the establishment and management of natives for timber, there is a need for evaluation of wood properties from such stands. An ongoing comprehensive research programme that includes assessment of wood properties is essential to determine the relative potential of planted and managed young stands of the major native timber species for producing timber with desirable wood qualities for both traditional and possible new uses.

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