

Growing eucalyptus sawlogs – striking the right balance

One of the great challenges of growing eucalyptus sawlogs is getting the balance right between growth rates and wood quality.

Australia's hardwood plantation sector is dominated by eucalyptus species with rapid growth characteristics. This is because the primary market has been pulpwood and growth rates have a large impact on the returns. Species with rapid growth rates have reduced rotation lengths and decreased costs (e.g. less outlay for things like browsing control and weed control), providing a significant economic benefit. However, this has often proven to be a negative when attempts have been made to try and utilize the same species for sawlogs (solid wood products). The benefits of rapid growth are often offset by reductions in strength, density and durability in addition to poor recoveries created by high growth stresses and a large sapwood band.

In the same way that fast-grown eucalyptus species can significantly compromise wood quality, slow-grown eucalyptus species can be simply uneconomic as stand-alone forestry investments. Growth modeling by Heartwood Plantations over a period of 15 years on species such as sugar gum (*E. cladocalyx*) and red ironbark (*E. tricarpa* and *sideroxylon*) has not been complimentary. These assessments (on favourable sites with professional establishment and management) have demonstrated, that at best, mean annual increments (MAIs) of 5 to 10m³ ha⁻¹ yr⁻¹ can be expected over a 30-year rotation. It is true that far higher log prices will be realised for these species given their high durability, hardness and strength. Nevertheless, few organisations or individuals can economically justify or successfully market forestry investments with such slow rates of growth.

The selection process for eucalyptus sawlog species is complex. Striking the right balance between growth rates and wood quality is the key challenge. Foresters require a balanced set of objectives and research persistence to ensure that the best options aren't being overlooked. Too often, rate of growth has been put ahead of wood quality and sawing potential, when in reality, it is easier to genetically increase growth rates (within reason) than alter the physical characteristics of the wood.

Case Study 1 - Southern Mahogany

Southern mahogany (*Eucalyptus botryoides*) has highly desirable timber qualities. It has an attractive red to light red colour, a strength rating of F14-27 (green and dry) and is rated as class 2 for durability (15-40 years). It also boasts a wood density of 920 kg m⁻³ (at 12% moisture content) and its sapwood is rarely susceptible to Lyctid borers – meaning the sapwood can be used under most circumstances without treatment. However, years of historic plantings across Victoria have found that, despite coping with relatively low rainfall and coastal exposure, southern mahogany is notorious for poor form and heavy insect attack. In 2003, encouraged by its desirable wood characteristics and promising early growth rates, Heartwood Plantations set out a range of trials for southern mahogany to investigate its plantation potential. Various provenances and sites were trialed and eventually a

formula for success was identified. The results concluded that southern mahogany could be successfully grown for sawlog production with the right provenance and correct siting. The latter included the need for sheltered areas, adequate soil nutrition (does not like depleted sites) and rainfall in excess of 700 mm year⁻¹. Southern mahogany was found to be quite tolerant of frosts, making it ideal on lower slopes and sheltered aspects. In these environments it has behaved like a completely different tree. It is tall, straight and attractive with high rates of growth. Heartwood Plantations' assessments across 15 sites in southern Victoria (from Portland to Bairnsdale including some up to 17 years of age) have shown that on preferred sites, southern mahogany can consistently achieve MAI of between 15 and 25m³ ha⁻¹ yr⁻¹ over a 20-year rotation.

Case Study 2 – Yellow Stringybark

Yellow stringybark (*Eucalyptus muelleriana*), like southern mahogany, has highly desirable timber qualities. It has an attractive light brown wood with a pinkish tinge, a strength rating of F8-17 (green and dry) and is rated as class 2 for durability (15-40 years). It also boasts a wood density of 870 kg m⁻³ (at 12% moisture content), is stable during processing and its sapwood is not susceptible to Lyctid borers – meaning the sapwood can be used without treatment. However as a plantation species, yellow stringybark does not have rapid early growth. In its first few years it is not uncommon for this species to be half the size of a species such as blue gum (*E. globulus*) on the same site. Early trial results by Heartwood Plantations suggested this species would fall into the same category as sugar gum and red ironbark. With persistence however, it was soon discovered that yellow stringybark is able to accelerate its growth significantly, several years after establishment. It is also able to tolerate competition better than most other eucalypts, enabling higher stockings to be retained without hindering diameter growth. In fact, its growth acceleration is so impressive that on several high rainfall (1100 mm year⁻¹) sites in Gippsland it has matched blue gum by 9 or 10 years of age, achieving MAIs in excess of 20m³ ha⁻¹ yr⁻¹. Like southern mahogany, the selection of the right provenance and the correct siting of this species is important for the best growth to occur.

After many years of research and trials, Heartwood Plantations have settled on four key species that strike the right balance between growth and wood quality. These are spotted gum (*E. maculata*), yellow stringybark (*E. muelleriana*), southern mahogany (*E. botryoides*) and silvertop ash (*E. seiberi*). These species now form part of a durable timber estate in excess of 1000 hectares. Each of these eucalypts has key site criteria, which mean that most Heartwood Plantations' sites will have at least two species established on them depending on aspect, soils, rainfall and exposure – as it is for eucalypts in their natural environment.

Looking forward, the key question for Heartwood Plantations is whether fast-grown plantations of these species would retain the desirable wood qualities of slower grown native forest trees. Could the plantations be utilized in traditional markets without a significant compromise in wood quality? With this in mind, Heartwood Plantations thinned a small southern mahogany plantation

in South West Victoria in 2010. Planted in 1996, this plantation had been non-commercial thinned and pruned and was approaching an impressive 30 metres in height. Its MAI was $22\text{m}^3 \text{ha}^{-1} \text{yr}^{-1}$. During the thinning operation, a few small sawlogs were extracted. Log diameters ranged from 25 to 35cm diameter at the small end and up to 5 metres in length. Although relatively small for sawlogs, they were processed and dried at the Radial Timber Sawmill in Gippsland with a view to being assessed against native forest logs of the same species. The results were quite outstanding. Although there was a larger sapwood band, there were no notable differences in growth stress, hardness, colour or texture. Samples of this wood have since been sent to Innisfail, North Queensland for accelerated durability testing. After 2 years there have been no differences in deterioration in comparison to wood from native forest resources.

Heartwood Plantations and Radial Timber Sales are a strategic partnership working towards a plantation-grown durable hardwood industry. Plans are underway to trial small quantities of yellow stringybark, spotted gum and silvertop ash. These trials will further assist both organisations as they make ongoing refinements to management regimes and sawing strategies.

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