Eucalyptus nitens for solid timber – silk purse or sow's ear?

Dean Satchell

Abstract

Eucalyptus nitens is a cold hardy hardwood timber species with very fast growth and excellent form. In Canterbury, along with other cooler regions in New Zealand, *E. nitens* produces high volumes of sawlog-sized material in relatively short rotations. Some farm foresters have even pruned their trees in anticipation of sawn timber production. This case study assessed the profitability of growing *E. nitens* for sawn timber production from 15-year-old trees that were planted, pruned and thinned by farm forester Patrick Milne near Rangiora, Canterbury. The small stand contained 55 trees from which a sample of eight trees (32 logs) were harvested and milled to examine costs and revenues. Physical properties were also assessed from these young fast-grown trees and compared with imported Victorian ash.

The case study

Currently in Canterbury the only market option for *E. nitens* logs is for firewood. Logs on average gross $50/tonne delivered, from which harvesting and transport costs are deducted for a net return to the grower of between $0–$20/tonne (J. Fairweather, pers. comm). Although *E. nitens* is the preferred species in New Zealand for short-fibre pulpwood (Nicholas and Hall, 2011) there is no pulpwood industry in Canterbury, and thus no market, despite excellent growth rates in the region.

At age 15 this stand had a stocking of approximately 470 stems/ha, with all trees pruned to 6.5 m and an average diameter at breast height (DBH) of 43 cm. The average buttlog diameter was therefore within the optimal range for sawmilling on Woodmizer bandsaw machinery (Satchell and Turner, 2010).

The experience from New Zealand processors who have attempted to produce sawn timber is that the species is generally too difficult to saw and dry, primarily because of excessive degrade in drying. This has been confirmed by contemporary Australian research (Innes, Greaves, Nolan and Washusen, 2008; Washusen et al., 2008; Washusen, 2011). Consequently there is no current demand for sawlogs and sawn timber is not available in the market, despite the phenomenal productivity of the species.

Canterbury *E. nitens* timber is sufficiently hard for flooring (J. Fairweather, pers. comm.). It is strong, even as young trees (Gaunt et al.), and like other eucalypts has an attractive appearance. These properties offer opportunities to develop structural, flooring and appearance markets for the timber if the processing challenges could be overcome.

15-year-old pruned and thinned *E. nitens* in Canterbury

In order to estimate returns to the grower, both log volumes per hectare and log prices were required. Log and stem volumes were estimated from two plots in the case study stand with stem volumes averaging 700 m^3/ha at age 15. *E. nitens* appears to be highly productive when sited well and these 15-year-old trees were impressive to behold, with an implied mean annual

increment of 47 m³/ha/year. Because there was no market from which to derive price data, estimating log values was more challenging. The residual value approach offered a method commonly used for appraising log values, whereby processing costs and required profits are deducted from revenue to leave an estimate of the residual log value. This price represents the maximum amount the sawmill would pay for the log (Mbugua, 2003).

Because market prices for *E. nitens* sawn timber products were not available, a market survey of merchants, retailers and floor layers was undertaken to establish wholesale price estimates for these in September 2014. The market survey produced wholesale price estimates for each case study board based on its width, length and grade, and according to the physical and appearance characteristics of the 15-year-old case study *E. nitens* timber. Price estimates for boards were summed for an estimate of revenue from each log.

This case study focused on production of flooring products. It was assumed that solid timber appearance flooring was the most marketable and valuable product for sawing. The case study sawmill was John Fairweather's small commercial operation near Balcairn in Canterbury. This operation uses a Woodmizer LT 40 super hydraulic bandsaw and Woodmizer twin-blade edger. Other equipment included a drying shed, a Solarola solar kiln and a Logosol 4-side profiler. This equipment was specifically set up for small-scale eucalypt processing.

Estimating profitability

Eight sample trees were harvested in November 2012 from the case study stand, from which 32 logs were cross cut and sawn to examine grade recoveries. Logs with small-end diameters greater than 25 cm SED were deemed sawlogs and all sawlogs were cross cut to 3 m lengths. The volumes, sizes and quantities of sawlogs per hectare were estimated from two plots in the case study stand. Average sawlog small-end diameter was estimated to be 33 cm, with 311 tonnes of pruned buttlogs and 208 tonnes of unpruned headlogs at age 15. Figure 1 shows the volume of logs by small-end diameter class.

There is no question *E. nitens* is very productive on the right site, but crucial to profitability was the level of degrade revealed in the processed sawn timber products. Grade recoveries were measured for each board from each sample log. The costs incurred in producing the sawn product and the volume of sawn product recovered were also variables under study for the processing method used. Together these directly influenced profitability of the case study stand.

Sawn production

Headlogs produced 43% of sawn timber from sample trees, while buttlogs produced 57% of sawn timber. Nominal recovery of sawn timber averaged approximately 40% of log volume. Product recoveries were approximately 85% of sawn timber volume, with collapse and end splits the primary defects present in the sawn timber. End splits amounted to 3.6% of sawn timber, skip caused by excessive collapse was approximately 5% of sawn timber, defects docked because of excessive checking averaged 2.5% of sawn timber, and 3.7% of sawn timber was docked because of knots. In total, 15% of sawn timber was docked because of defects.

Branching pattern of headlogs in the case study stand

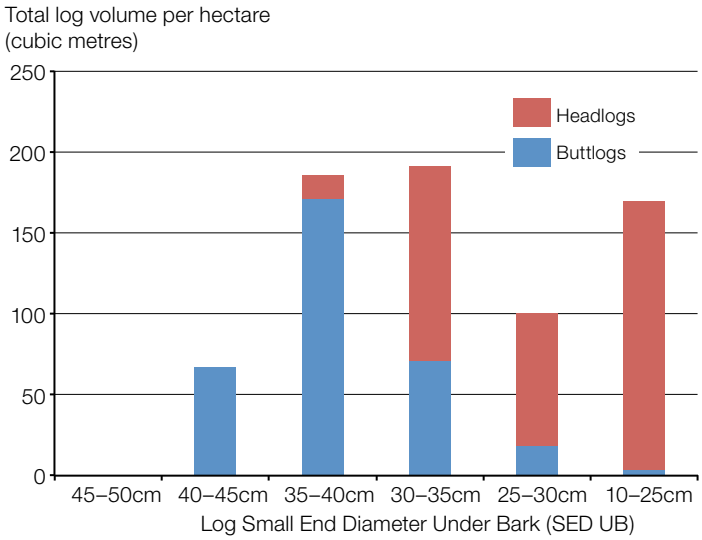

Figure 1: Estimated volume recoveries per hectare as diameter categories

Products

Approximately 70% of sawn timber was flooring product. The highest quality flooring product (clears/select grade in lengths greater than 1.2 m) was 50% of sawn timber.

Boards narrower than 100 mm comprised approximately 15% of sawn timber and these were graded as appearance panel laminating stock. Headlogs produced a surprisingly good quality product, however, average lengths were shorter because knots were often docked for higher-value short clear lengths.

Production costs

Sawmill costs at $90/hour of operation averaged $213 per nominal sawn cubic metre of production. Drying costs per nominal sawn cubic metre were estimated to be $202 and steam-reconditioning costs were an additional $30. Machining costs per nominal sawn cubic metre were estimated to be $201. Processing costs averaged $722 per nominal sawn cubic metre, including an 'overhead' cost for administration and management of $98. Total processing costs were $624 per nominal sawn cubic metre before accounting for sawmill overheads.

Price estimates for boards

Revenues were estimated for each log by summing prices for the products derived from that log.

The wholesale price estimated for profiled flooring product averaged $3.94/lm for select/clears grade 125 mm width boards greater than 1.2 m length. All boards from the sample logs were docked where necessary, then allocated into grade, width and length categories. Discounts and premiums were then applied to the levels of these categories. Over 50% of sawn timber was in the highest grade category (select/clears grade >1.2 m length).

The panel laminating stock was priced as residual product value by producing two grades of laminated panel and then selling these. Panel production costs were subtracted from sale prices.

Revenues

Average wholesale price for sawn timber was estimated to be $985 per nominal sawn cubic metre. Predicted nominal sawn timber volume produced per hectare was 221 cubic metres and sawn timber revenues were estimated to be $217,610/ha, from which log harvesting and transport costs of $23,530 and processing costs of $159,658 were deducted. Other products added $24,484 to revenue, primarily firewood ($17,950) as a by-product of the sawmill operation. Pulp logs contributed only $993/ha from 24.1% of merchantable log volume. After accounting for costs of production, log residual value was approximately $68,320/ha at year 16. Sawlog price as stumpage averaged $131 per log cubic metre. Average sawn timber value per log cubic metre was $419.

Discounted cash flows

The base scenario assumed a discount rate of 8.5%, a land price of $10,000/ha, with logging, loading and transport costs of $44/tonne and grower costs of

Above left: Clearwood boards from pruned logs
Above right: Ex 125 mm width floor laid from study boards – a light brown stain was applied

$7,507/ha. Under this scenario, assuming sawn timber was sold at year 16, net present value (NPV) for the grower was $260/ha. Therefore the rate of return for the grower was estimated to be just under 8.5% p.a.

The case study stand was on land not normally planted in forest. Land price is high because of lifestyle values and proximity to Christchurch. Clearly, if growers were to utilise equally productive land that was less expensive then profitability would improve. A sensitivity analysis compared the impact land prices had on profitability along with varying logging and transport costs. By reducing land price to $5,000/ha, NPV increased to $3,269/ha. However, a corresponding increase in logging and transport costs to $77/tonne significantly reduced NPV to –$6,494/ha.

Conclusions

This case study indicates that *E. nitens* may be an economically viable forestry plantation option for sawlog production. *E. nitens* is very easy to grow on the right site (cool climate with reasonable but not excessive soil moisture), it produces large volumes of sawlogs on a relatively short rotation, and appears to have the potential to be processed into products of sufficient quality and value to produce a profit to the grower. The benchmark set by this case study is not high. Although attention was given to applying best-practice processing methods, there is no doubt that improvements will be made to grade recoveries as more is learnt about processing the species. Furthermore, the high costs of production associated with this small-scale operation could be investigated with a view to reducing these.

By increasing the scale of the plantation resource, processing scale efficiencies would in theory improve returns to the grower. In practice, developing a resource of pruned and thinned *E. nitens* for solid timber production will no doubt have its challenges, but for the small grower having some degree of confidence that one's endeavours might actually lead to financial reward is surely half the battle won.

The full report *Eucalyptus nitens, Recovery and Economics of Processing 15-Year-Old Trees for Solid Timber* can be viewed on the NZFFA website: www.nzffa.org.nz/special-interest-groups/eucalypt-action-group/report-eucalyptus-nitens-for-solid-timber/.

References

Gaunt, D., Penellum, B. and McKenzie, H. 2002. *Eucalyptus nitens* Laminated Veneer Lumber Structural Properties. *New Zealand Journal of Forestry Science*, 33(1): 114–125.

Innes, T., Greaves, B. L., Nolan, G. and Washusen, R. 2008. *Determining the Economics of Processing Plantation Eucalypts for Solid Timber Products*. Melbourne, Australia: Forest and Wood Products Australia Limited. Retrieved from http://ecite.utas.edu.au/51770.

Mbugua, D.K. 2003. 3.1.1 *Residual Value Method* (No. Working paper: FSFM/WP/11). Forestry Policy and Planning Division, Rome, Italy: Food and Agriculture Organisation. Retrieved from ftp://ftp.fao.org/docrep/fao/008/af165e/af165e00.pdf.

Nicholas, I. and Hall, P. 2011. *Promising Resources and Systems for Producing Bioenergy Feedstocks – Eucalypts, New Zealand.* Paris, France: International Energy Agency. Retrieved from http://ieabioenergytask43.org/wpcontent/uploads/2013/09/IEA_Bioenergy_Task43_PR2011-01.pdf.

Satchell, D. and Turner, J. 2010. *Solid Timber Recovery and Economics of Short-Rotation Small-Diameter Eucalypt Forestry Using Novel Sawmilling Strategy Applied to Eucalyptus regnans*. Retrieved from www.nzffa.org.nz/farm-forestry-model/trees-for-timber/the-eucalypts/report2010/.

Washusen, R. 2011. *Processing Plantation Grown Eucalyptus globulus and Eucalyptus nitens for Solid Wood Products – Is it Viable?* Hobart, Australia: Cooperative Research Centre for Forestry. Retrieved from www.crcforestry.com.au/publications/downloads/TR209_Washusen_compiled-?for-?web.pdf.

Washusen, R., Harwood, C., Morrow, A., Northway, R., Valencia, J. C., Volker, P., ... Bodjadzic, M. 2008. *Eucalyptus nitens Thinning Trial: Solid Wood Quality and Processing Performance Using Conventional Processing Strategies*. Melbourne, Australia: Forest and Wood Products Australia Limited. Retrieved from www.fwpa.com.au/sites/default/files/PN07.3019.pdf.

Dean Satchell has an interest in eucalypt processing and is President of the NZ Farm Forestry Association. Email: dsatch@xtra.co.nz.