

The potential availability of plantation roundwood

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Summary

The history of plantation establishment in Australia is briefly reviewed, highlighting the rapid increase in establishment of hardwood plantations by the private sector over the past decade and the privatisation of some publicly owned softwood plantations. Data collected regionally for the National Plantation Inventory were used to prepare forecasts of future availability for two species groups (hardwood and softwood) and two product groups (pulpwood and sawlog), both groups being broadly defined. The paper draws on these detailed forecasts.

The forecasts represent an amalgam of grower-supplied forecasts of availability and estimates based on average yield tables applied to the annual areas planted for the remaining growers. Two alternative scenarios were used to model future planting. 'No New Planting' assumed no additional area was planted after 2001. 'New Planting' assumed that additional areas were planted on cleared agricultural land until 2019, but not thereafter. The latter forecasts were based on Bureau of Rural Sciences medium projections of future planting rates. An irregular pattern of availability resulted, due to the fluctuations in past planting rates, and required smoothing to achieve a practicable pattern over time. The forecasts of availability represent approximations of future supply, assuming that all costs and technologies remain unchanged and that all volumes available will be sold at that time.

Hardwood pulpwood availability will increase from 2.4 to 15.8 million m³ y⁻¹ by 2015. The 'New Planting' scenario will provide even larger impacts after 2015. Australian exports of pulpwood products are likely to increase substantially. Most of the hardwoods are fast-growing eucalypts established for pulpwood production under short rotations (12–15 y). There is increasing interest in their potential to produce sawlogs and other high value products, but considerable uncertainty as to the outcomes and economics.

While progressive modest increases in softwood sawlog availability will assist domestic industry to replace imports of sawn timber and ease the demands on native forests, they will not replace all imported and native appearance and specialty timbers,

nor will they supplant entirely those native timbers with geographic advantages relative to local and regional markets. Hence exports of softwood sawlogs and/or timber are expected to increase. Softwood pulpwood availability changes little, but domestic processing is likely to utilise some present exports.

Keywords: forest plantations; forest products industries; roundwood; supply; demand; Australia

Introduction

This paper draws on a detailed report by Ferguson *et al.* (2002) that supersedes previous wood flow forecasts provided in the Turner and James (1997) report; both were commissioned by the National Forest Inventory as part of its National Plantation Inventory. Its objectives are to outline the methods used to prepare new forecasts of plantation wood availability, to summarise key results, and then discuss their implications for Australia's future industry. Estimates of 'availabilities' are based on the area of industrial plantations to 2000, plus forecasts of plantation expansion to 2019. The term 'availabilities' is used in preference to wood flows because future markets and demand may change from those anticipated now. Technologies, production economics and supply may also change. Hence the forecasts simply represent the best estimate of the volumes that are likely to be available in the future, given current knowledge, technologies and markets, and assuming a continuation of past practices in growing and utilisation. The paper considers the effects of these and related changes on future plantation expansion and wood availability as reported in Ferguson *et al.* (2002). The new forecasts consider changes in the investment environment and the availability of new area statistics (Wood *et al.* 2001), and are intended to meet a growing need for information for strategic planning for industry, infrastructure, and community development purposes; and the preparation and evaluation of government policies.

History

Australia's plantations are widely distributed throughout the 15 regions demarcated for the 1997 National Plantation Inventory. The first plantations, mainly of softwoods, were established in the late 1800s. Because of the long period of production involved

for sawlogs, forecasts of wood availability to 2025 rest heavily on the history of plantation establishment. Beyond that time, they become increasingly dependent on forecasts of future rates of plantation establishment, of which more will be said later.

Gerrand *et al.* (2003) describe four phases of Australian plantation development since 1935. In the period to 1960, the rationale for plantation development was on the replacement of softwood imports, and plantings were at low levels. From 1960 to 1980, in the face of burgeoning imports and balance of payments issues, the rationale changed to one of self-sufficiency, assisted by low-interest loans from the Commonwealth to the States. This significantly expanded the planting rates to average over 30 000 ha y^{-1} during the late 1960s and early 1970s. A transitional phase from public softwood planting to private hardwood planting occurred from 1980 to 1990 after these loans ceased to be made available to the States. This was followed by rapid private expansion of hardwood plantations on cleared farmland after 1990, accompanied by privatisation of some previously publicly owned softwood plantations. In 1990 there were about 787 000 ha of plantations, but, by early 2000, this area had increased by 67% to 1 315 000 ha — about 30% of the area being hardwoods and 70% softwoods (Wood *et al.* 2001). There has been a rapid increase in plantation area and a shift in species from softwood to hardwood during the last 10 y. About 86% of new plantations established during 1995–1999 were of hardwood species. Annual new plantings have increased from 30 300 ha in 1995 to nearly 95 000 ha in 1999, and more than 125 000 ha in 2000, declining to 86 000 ha in 2001 (Wood *et al.* 2001) because of changes to taxation provisions that have recently been partly reversed.

Data

Data used in this study were provided by growers as part of the National Plantation Inventory's Plantations of Australia 2001 reporting process, which is described in detail in Wood *et al.* (2001).

The only product classes used are 'sawlog' (which includes logs used for ply, veneer and solid wood manufacture) and 'pulpwood' (which includes roundwood poles and posts, and logs used for reconstituted wood panel manufacture). Pulpwood includes only those sources coming direct from the forest — it does not take account of residues from processing plants. The data supplied were neither sufficiently consistent across growers nor comprehensive enough across Australia's 15 plantation-growing regions to enable other product sub-groups to be recognised.

Consistency demands that forecasts of future availabilities be tied to the same regions, time horizons, products and species groups. Hence the forecasts of plantation expansion prepared by Spencer *et al.* (2001) (hereafter called the 'Bureau of Rural Sciences' medium projections') were used as the benchmark. These forecasts consider only new planting on cleared agricultural land and assume no new planting after 2019. Two different sets of forecasts of availabilities were prepared, reflecting differing assumptions as to the extent of new planting beyond 2000 and the associated management regimes, namely:

- 'no new planting' beyond 2000, but continued replanting of existing plantation areas, with known or assumed management regimes (sawlog or pulpwood), and

- 'new planting' at the annual rates forecast in the Bureau of Rural Sciences' medium projections to 2019 (none thereafter), together with specified management regimes and continued replanting of existing plantation areas.

The underlying assumption in this study was that growers, especially large growers, were best equipped to estimate future availabilities for their plantations. Therefore, where growers provided estimates of future availability, they were incorporated into regional totals. Where growers failed to provide estimates of availability, yield predictions were calculated using the indicative yield tables described in the next section, and these were then incorporated directly into regional totals. Total regional availability estimates were thus an amalgam of growers' estimates and calculated estimates using the indicative yield tables (Ferguson *et al.* 2002) and the plantation areas for the remaining growers who had not provided estimates of availability, as collated and subsequently summarised for all growers by Wood *et al.* (2001).

Yield tables

A set of indicative yield tables was developed to apply to the remaining growers in each region who had not supplied estimates of wood availability. The remaining growers were generally smaller growers but included some larger growers as well. The indicative yield tables represent a professional judgement of the average yields for the particular set of remaining growers in each region. Details are given in Ferguson *et al.* (2002). In principle, these averages include allowance for losses due to fire, wind or hail, although it needs to be recognised that average losses are as yet poorly known for fast-grown hardwood species in a number of regions.

In all cases, application of the yield tables assumed that harvested areas would be replanted with the same species with a one-year period of fallow between the year of final felling and the year of replanting. No loss or gain of net productivity was assumed to occur between successive rotations.

Large fluctuations in the raw estimates of availability occurred in many regions, due to the mixtures of data from which they were derived, or the fact that growers had not regulated them into a practicable pattern over time. Therefore, spline functions with a weighting of 1000 were used to smooth the otherwise lumpy and sometimes erratic pattern of future availability. This resulted in forecasts that are consistent with the mean level of availability across the periods concerned, maintain the general trend inherent in the data, and generally confine fluctuations to less than 10% of the mean availability.

Regional forecasts

Details of the forecasts of availability for all 15 regions are provided in the Ferguson *et al.* (2002) report. We confine reporting in this paper to those regions and products for which the largest volumes or substantial changes in volumes are forecast from 2001 to 2044. Figure 1 is a map of the 15 National Plantation Inventory Regions of Australia. Figure 2 shows selected regional forecasts for hardwood pulpwood.

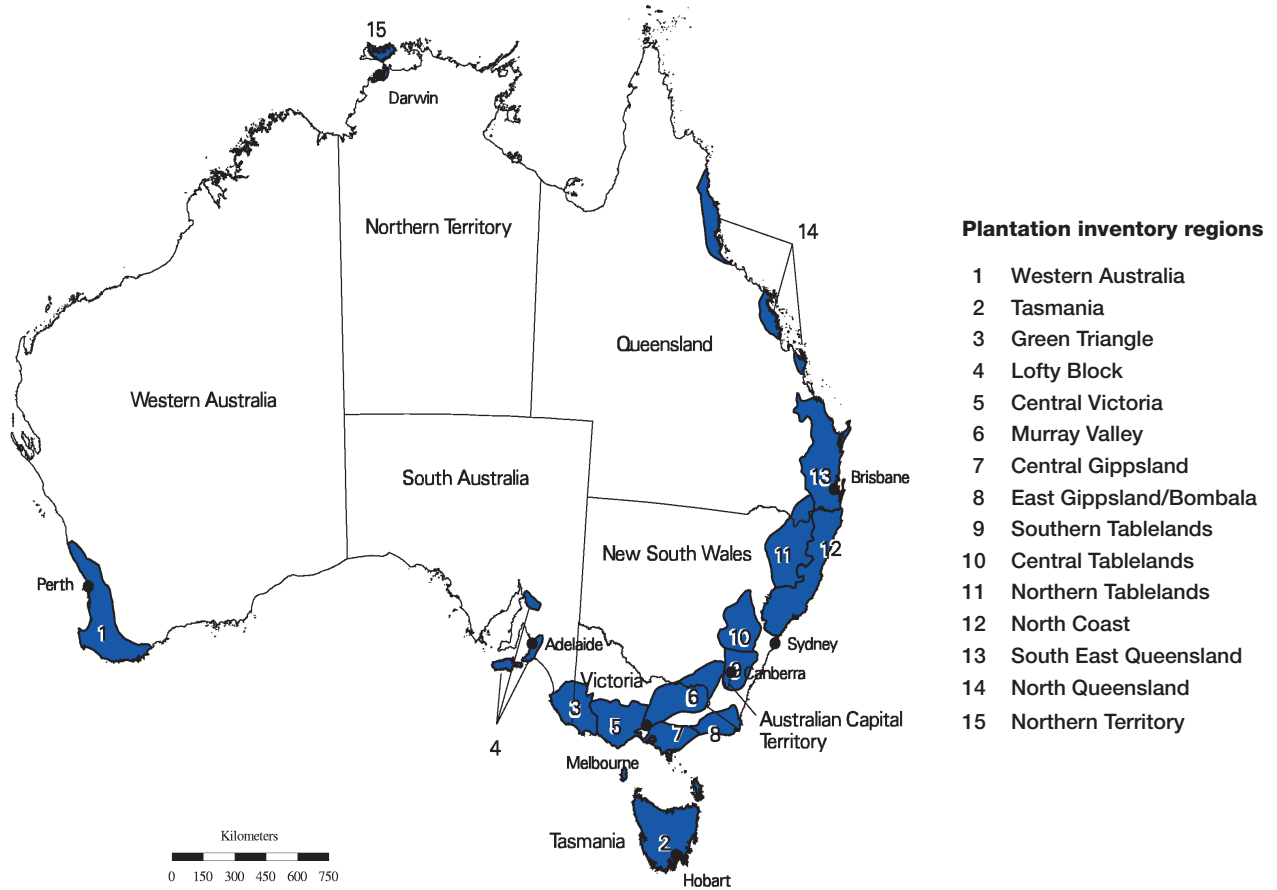
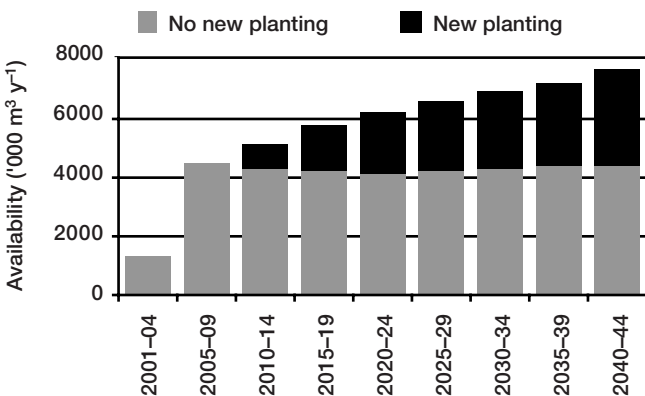


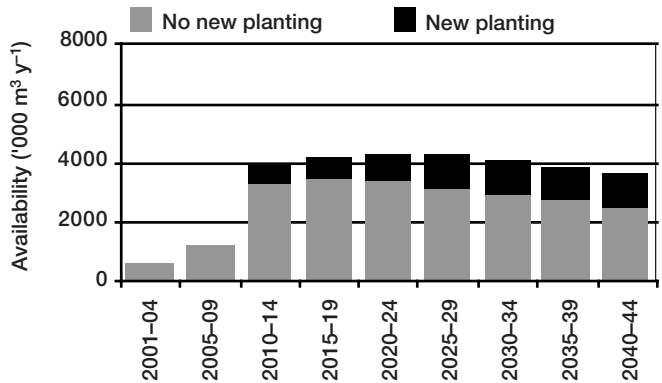
Figure 1. National Plantation Inventory regions of Australia (Wood *et al.* 2001)

As might be expected, the future levels of, and increases in, plantation-grown hardwood pulpwood shown in Figure 2 are greatest for Western Australia, the Green Triangle, and Tasmania. Several other regions that are not illustrated show substantial but much lower increases. Yields in Western Australia and the Green Triangle are based almost exclusively on bluegum plantations that, until recently, have been mainly grown for pulpwood. Tasmania, on the other hand, has had a greater mixture of species and management intentions, such that substantial volumes of sawlogs are intended to be grown for the late part of the period to 2044. This may result in a declining volume of pulpwood if new planting is not maintained beyond 2001, because trees are to be held to a much greater age.

(a) Western Australia



(b) Tasmania



(c) Green Triangle

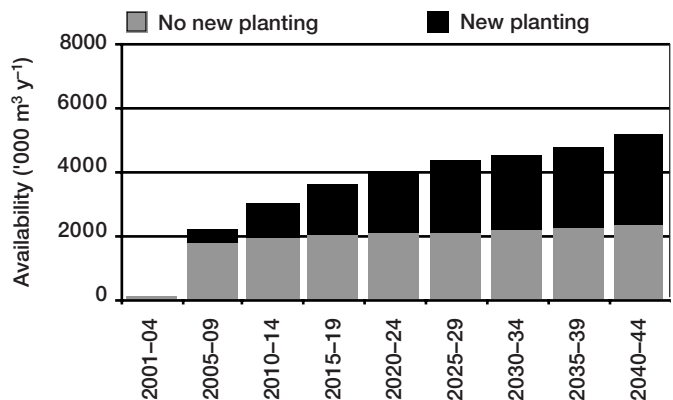


Figure 2. Hardwood pulpwood availability in three regions to year 2044

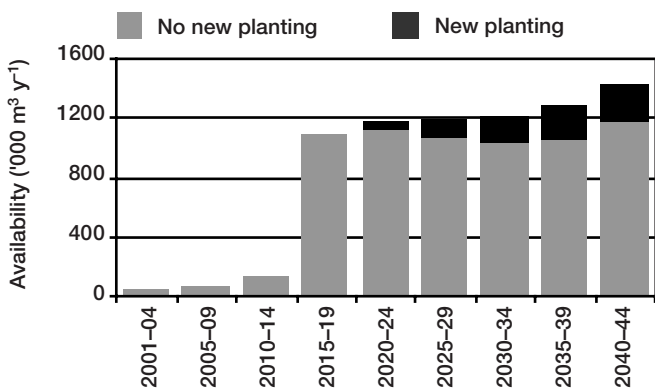
The increases from Western Australia, the Green Triangle and Tasmania are especially large in the next ten years and signal a major potential for expansions in pulp processing and/or woodchipping of hardwood plantation pulpwood, and the associated development of export markets.

Figure 3 shows selected regional forecasts for hardwood sawlogs. The levels of hardwood sawlog availability shown in Figure 3 are much less dramatic than those for pulpwood, and the rates of increase are generally quite low over the next 30 y. After this, regions such as the North Coast of New South Wales and South-East Queensland show rapid increases from recently-initiated planting programs. As noted earlier, until recently, bluegum plantations were largely planted on the presumption of a pulpwood market, not for sawlog production. Fast-grown hardwood plantations will need to be pruned and thinned at an early age, commencing at around three to four years, if the residual trees are to be grown on successfully to produce sawlogs in any

reasonable time (Gerrand *et al.* 1997). Little success is likely in carrying forward the entire stand of trees intended for pulpwood production (and thus lacking this treatment) to older ages, because of branch stubs and other defects. With some exceptions, substantial increases in sawlog production will therefore not be achieved until after 2025. The economics of investment in sawlog production are uncertain, given that some ‘new’ species from fast-grown plantations have not previously been processed extensively for sawn products.

Figure 4 shows selected regional forecasts for softwood pulpwood availability. Only modest increases are expected in softwood pulpwood availability in the regions shown, and still less, if any, in most regions that are not shown. Substantial volumes are already being exported. Much therefore depends on future

(a) Tasmania



(b) North Coast



(c) South-East Queensland

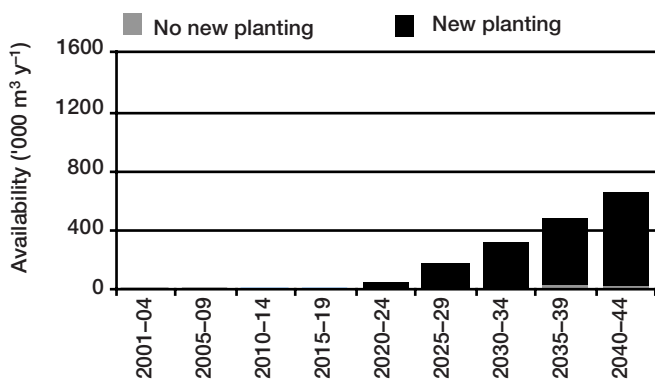
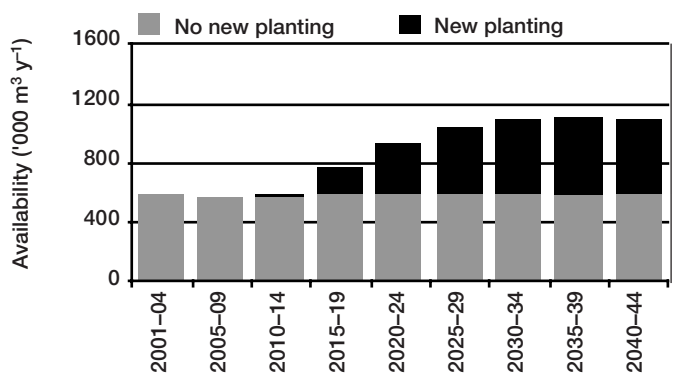
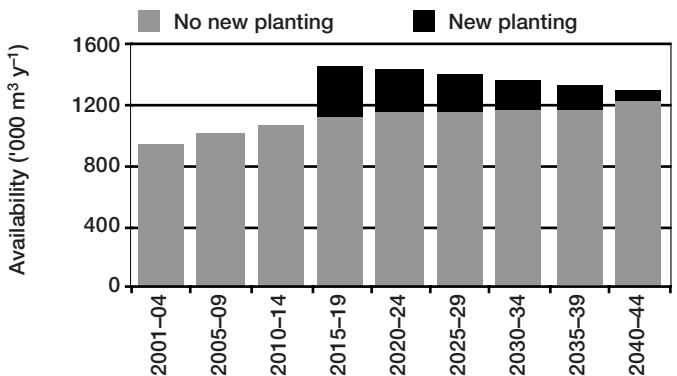


Figure 3. Hardwood sawlog availability in three regions to year 2044

(a) Western Australia



(b) Green Triangle



(c) Central Tablelands

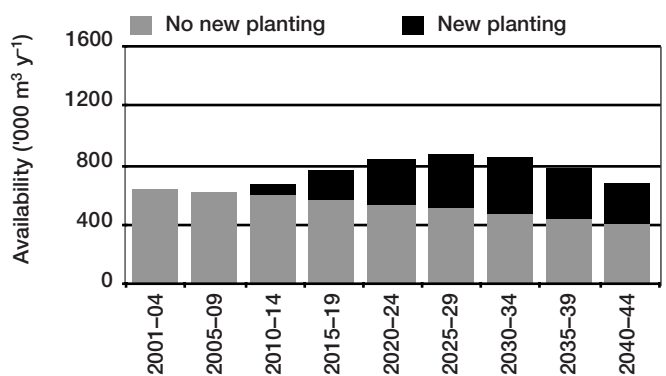
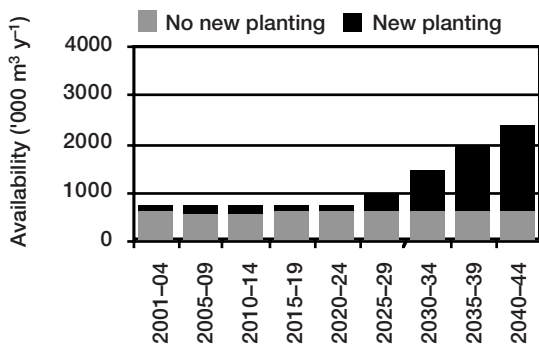


Figure 4. Softwood pulpwood availability in three regions to year 2044

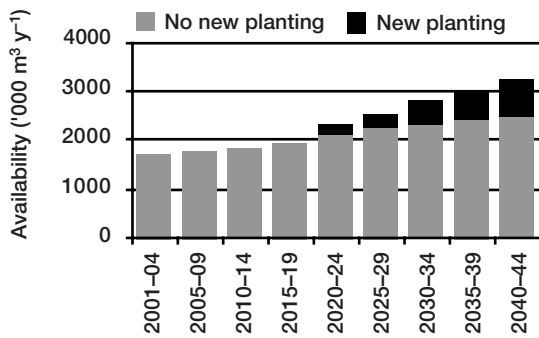
investment in pulp processing and the extent of use of softwood fibre either on its own or in mixture with hardwood fibre.

Under the ‘no new planting’ scenario, softwood pulpwood availability is almost static for Western Australia and the Murray Valley, increasing somewhat over the next 15 y for the Green Triangle, and generally static or decreasing elsewhere. Under the ‘new planting’ scenario, all regions show some increase from 2015, although the subsequent trend for the Green Triangle is downwards, which is an anomaly of the smoothing process which has been applied independently of the previous trend.

(a) Western Australia



(b) Green Triangle



(c) Murray Valley

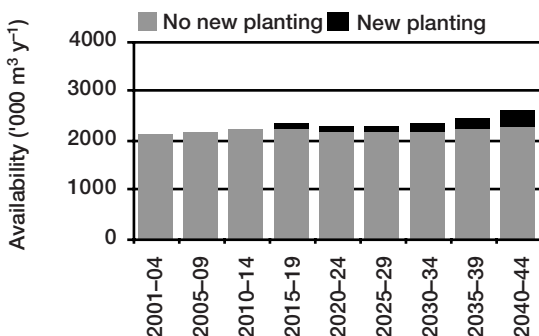


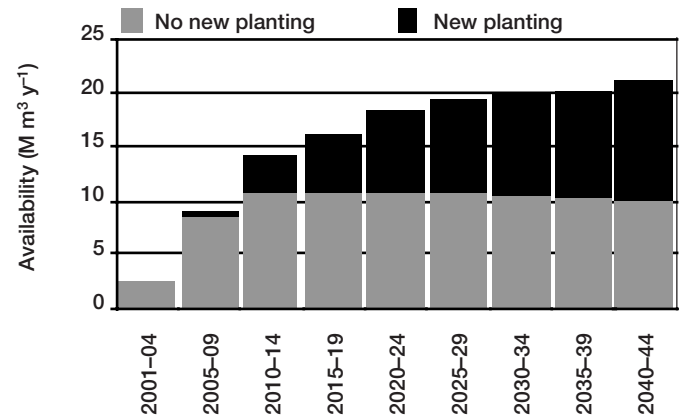
Figure 5. Softwood sawlog availability in three regions to year 2044

Figure 5 shows selected regional forecasts for softwood sawlog availability. The trends for future availability of softwood sawlog are varied and determined by the region and scenario. Under the ‘no new planting’ scenario, the future availability of softwood sawlog is almost static for Western Australia and the Murray Valley, but increases substantially for the Green Triangle and South-East Queensland (not shown). Most regional forecasts show increasing trends from about 2025 under the ‘new planting’ scenario.

National forecasts

Figures 6 and 7 show the national forecasts of availability of pulpwood and sawlog respectively, by species group.

(a) Hardwood

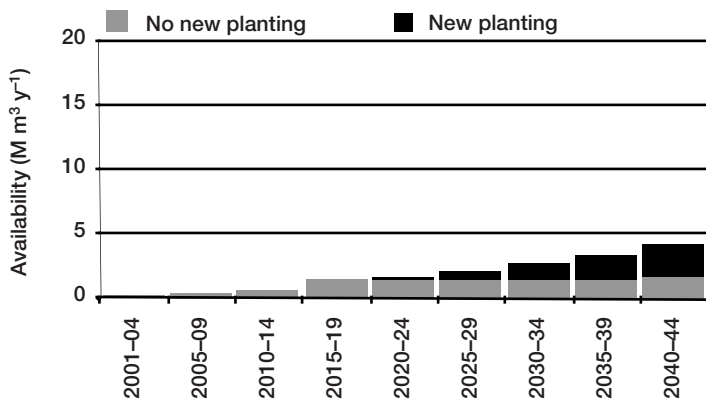


(b) Softwood



Figure 6. (a) Hardwood pulpwood, and (b) softwood pulpwood availability to year 2044

(a) Hardwood



(b) Softwood

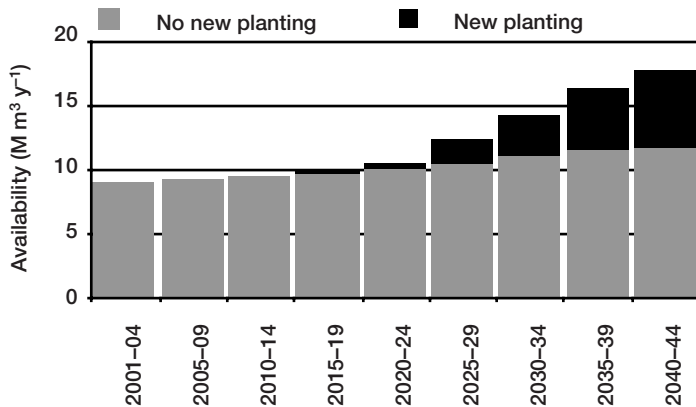


Figure 7. Sawlog availability nationally to year 2044

Figures 6 and 7 reflect the major changes already canvassed, as well as the generally more modest increases in availability shown in other regions. Hence the aggregate increases are more substantial than the preceding commentary on the major regions might suggest. With the exception of softwood sawlog, trends for other species and products groups are static after 2015 under the ‘no new planting’ scenario, highlighting the importance of a continuation of new planting after 2001 if growth in the wood resource and dependent industrial activity is to be maintained.

Future implications

Table 1 shows the current levels of Australian consumption of products as identified in this study, based on summaries of data from ABARE (2001). These statistics have been updated by ABARE recently (Yainset *et al.* 2002). Consumption is based on data for production less exports plus imports, all expressed in roundwood equivalent volumes. In these statistics, however, hardwood includes both plantation and native forest wood, because separate statistics were not available.

Table 1. Australian roundwood consumption excluding residuals from processing. Based on ABARE (2001)

Species and products	Roundwood equivalent consumption ('000 m³)					
	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000
Hardwood (including native forest)						
Pulpwood	3407	2944	3016	2282	2583	3432
Sawlog	4974	4412	4337	3933	4062	4076
Softwood						
Pulpwood	4765	4696	4182	4081	4032	4313
Sawlog	7354	6706	7508	8258	8031	9418

Comparison of the consumption data in Table 1 with Figure 6 shows that Australia has potential scope to increase exports of pulpwood products substantially (be they pulp, woodchips or other product). This is because the increase in hardwood pulpwood availability far exceeds likely future growth (Love *et al.* 1999) in domestic consumption of pulpwood-related products over the next 10–15 y. Hardwood pulpwood availability could increase from 2.4 to 15.8 million m³ y⁻¹ by 2015 — enough to supply an additional eight to 13 new world-scale pulp mills, depending on size. The ‘new planting’ scenario will provide even larger impacts after 2015.

Most of the hardwoods are fast-growing eucalypts recently established for pulpwood production under short rotations (12–15 y), but there is growing interest in their potential to produce sawlogs and other high-value products. However, the increase in softwood plus hardwood sawlog availability to 2015 barely keeps pace with the expected increase in Australian consumption (Love *et al.* 1999). After 2015 more sawlog is available than is needed for future consumption, but the quantities differ according to the scenario for new planting after 2019. Under the ‘no new planting’ scenario, the increases are largely in softwood sawlog, while under the ‘new planting’ scenario, they are shared (about one-third to two-thirds) between hardwood and softwood.

The increases in softwood sawlog and later increases in hardwood sawlog availability will progressively assist domestic industry to replace imports of sawn timber and ease the demands on native forests. However, they will not replace all imported and native appearance and specialty timbers, nor supplant entirely those native timbers with geographic advantages relative to local and regional markets. Thus, despite increasing import replacement, suitably located Australian softwood sawmillers and probably the yet-to-commence plantation hardwood sawmillers will increasingly need to seek export markets for at least a portion of their output.

The increases in hardwood sawlog availability have considerable uncertainty attached to them in terms of timing, magnitude and wood quality. Rotation lengths of 25 y assumed for many of the regions may be too optimistic in terms of the yields and, more importantly, the wood properties and consequent timber quality. Longer rotations may be required if wood properties cannot be ameliorated by other means. As noted earlier, increases in

hardwood sawlog availability are mainly of 'new' species, in the sense that they have not previously been grown so rapidly and used for sawn timber or solid wood products. While an encouraging start has been made on research into tending fast-grown hardwood plantations for this purpose, and into subsequent utilisation, much remains to be done to reduce this uncertainty, to pave the way for investment in processing of plantation-grown hardwood sawn timber and solid wood products.

These national comparisons are somewhat superficial and may be misleading for particular species groups, product types and regions. The utilisation of residues from sawmills, for example, plays an important role in the economics of many pulp and panelboard products. Future imports and exports need to be taken into account. Explicit recognition needs to be given to the sawn recovery from hardwood sawlog, which is likely to be less than that attained for softwood. Love *et al.* (1999) have prepared a model of future demand and supply that will enable these factors to be taken into account and more accurate comparisons to be made. Further research by them incorporating these forecasts of availability will provide a more comprehensive and accurate assessment of the future implications nationally. A preliminary paper (Yainset *et al.* 2002), giving projections to 2010, has recently been published.

Spatial considerations are also important, especially the location of plantations relative to major population centres and ports, and the associated transport and other infrastructure. Much of the anticipated increase in hardwood pulpwood availability is concentrated in three regions. It follows that most of the early investment in processing, be it for pulp, woodchips or other roundwood products, will be in those regions. The locations of these plantations already reflect an implicit acknowledgement of the importance of location relative to export ports, albeit with questionable fringes in some cases. Thus the scene is set for more detailed consideration of investment in processing, and some has already commenced. The financial success or otherwise of these investments will, in turn, determine the return on investment to growers, and condition the future rates of new planting.

Whilst there are many sources of uncertainty in these forecasts, they represent the most reliable information of its kind and provide a new baseline of national and regional statistics that should greatly assist forest policy and industry planning. Information on plantation expansion and the availability of wood products from Australia's plantation estate are required to generate and evaluate planning scenarios for the development of industries, infrastructure, and communities; and to prepare and monitor government policies.

Acknowledgements

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