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and Water Resources**

ABARES

Australia's plantation log supply 2015–2059

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Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)

Postal address GPO Box 858 Canberra ACT 2601

Switchboard +61 2 6272 3933

Email info.abares@agriculture.gov.au

Web agriculture.gov.au/abares

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About this report

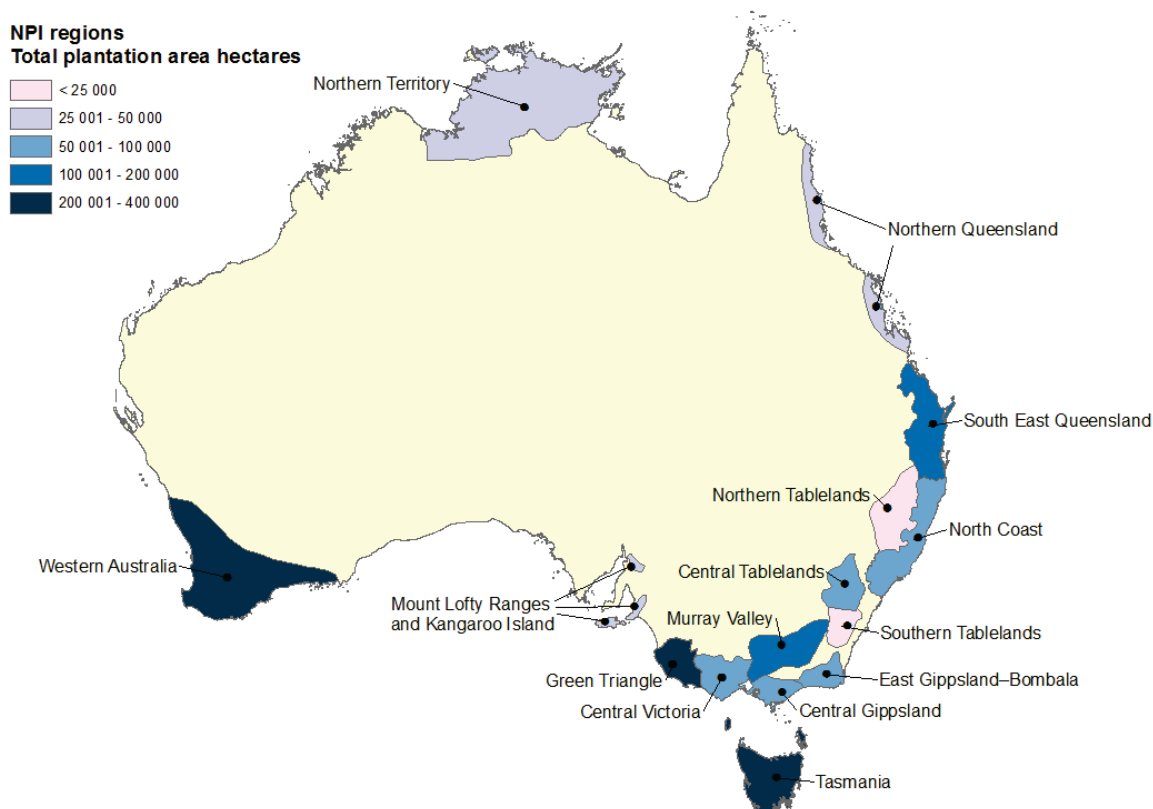
This report has been prepared by ABARES under the auspices of the National Plantation Inventory—a programme that has collected data and reported on plantations established primarily for wood production in Australia since 1993. Comprehensive plantation log availability forecast reports are published every five years and this is the fifth log supply report. The report includes updated data from plantation owners and managers, and plantations statistics from the ABARES report *Australian plantation statistics 2016*.

In this report, forecasts are presented for softwood and hardwood sawlog and pulplog volumes by National Plantation Inventory region (Map 1), based on the combination of forecasts supplied by plantation owners and managers through a survey and ABARES modelled forecasts. For the modelled forecasts, ABARES did not account for any future changes in social, economic or environmental parameters.

Changes in log availability have important implications for Australia's rural economies; the size, type and geographical location of wood and paper product manufacturing industries; the national supply of wood products; Australia's trade balance; and Australia's export income. Forecasts of the future availability of logs from plantations nationally and by region are provided in this report to help understand likely future changes and opportunities for investment.

This report complements two other information products produced by the National Plantation Inventory—annual plantation area statements and a five-yearly comprehensive spatial stocktake of Australia's commercial plantation estate.

Map 1 National Plantation Inventory region, 2014–15



Source: ABARES

Summary

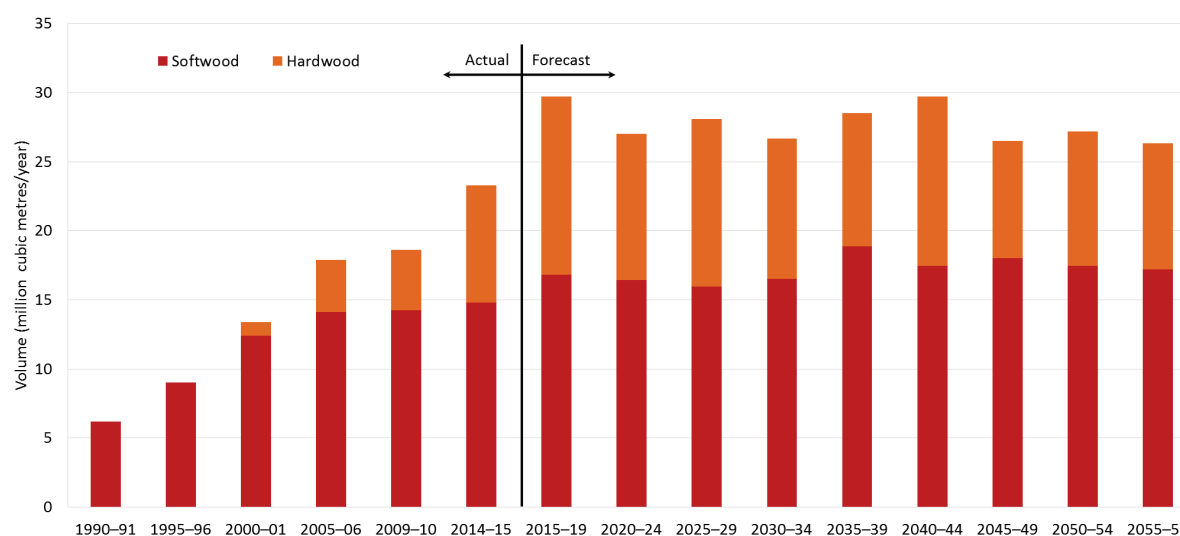
The national plantation log harvest in 2014–15 was around 23.3 million cubic metres, which was 25.2 per cent higher than the log harvest in 2009–10. This represented 85.1 per cent of the total plantation and native forest logs harvested in Australia in 2014–15.

Figure 1 presents actual data on national log harvests for the financial years 1990–91 to 2014–15 and forecast log availability starting with the five-year period from 2015–19. The forecast log availability from 2015–19 to 2054–59 is the annual average merchantable volume potentially available from Australia's commercial plantation estate for each five-year period.

Variations in the plantation area planted from year to year lead to peaks and troughs in the forecast of log availability. Market demand and supply for wood products influence the actual volumes that are harvested at a particular point in time, and plantation managers will periodically adjust silviculture, log harvest scheduling and operational management accordingly to meet market demand.

The potential log availability from Australia's commercial plantation estate is forecast to increase to an annual average of 29.7 million cubic metres in the 2015–19 period, followed by a decline to an annual average of 27.0 million cubic metres a year for the 2020–24 period (Figure 1). The majority of the decline in total log availability is because the expected yield from hardwood plantations is forecast to decline, as a result of low commerciality plantations not being replanted and some lease agreements with landholders not being renewed.

Figure 1 Actual and forecast annual average plantation log availability



Key points

Eighty-five per cent of the forecasted log availability volumes in this report were derived directly from data provided by the owners and managers of plantation estates. The remainder are ABARES yield estimates based on yield tables, age classes and expert knowledge.

ABARES estimates that the total commercial plantation estate may decrease by around 80 000 to 100 000 hectares over the next 10 to 15 years as new plantation establishment will not be sufficient to offset removals of low commerciality plantations unless there are new drivers to expand or maintain the current plantation estate. The log availability forecasts presented in this

report are based predominately on 2014–15 plantation areas and only partially includes some future plantation removals as indicated by plantation growers and managers.

Hardwood plantation forecasts

Hardwood plantation log availability in the 2015–19 period is forecast to average around 12.9 million cubic metres a year, around 4.4 million cubic metres more than the actual volume harvested in 2014–15.

Hardwood pulplog production was around 8.2 million cubic metres in 2014–15. Average annual pulplog availability is forecast to fluctuate between 12.5 million cubic metres a year in the 2015–19 period to 7.7 million cubic metres in the 2045–49 period.

Hardwood sawlog production was around 269 000 cubic metres in 2014–15. Hardwood sawlog availability is forecast to increase to 408 000 cubic metres per year for the 2015–19 period, peaking at around 994 000 cubic metres a year in the 2055–59 period.

For the 2015–19 period, the Tasmania, North Coast and Green Triangle regions are forecast to be the main areas of hardwood plantation sawlog availability, with annual averages of around 111 000, 58 000 and 120 000 cubic metres respectively available for log harvest. Sawlog estimates include peeler logs, high-grade and low-grade sawlogs and posts and poles.

Softwood plantation forecasts

Softwood plantation log availability in the 2015–19 period is forecast to average around 16.8 million cubic metres a year, around 2.0 million cubic metres more than the actual volume harvested in 2014–15.

Production of softwood sawlogs was around 9.8 million cubic metres in 2014–15. Softwood sawlog availability is forecast to increase to around 12.1 million cubic metres a year for 2015–19, and peak at around 14.3 million cubic metres a year in the 2035–39 period.

The major softwood sawlog producing regions are the Green Triangle with 27 per cent of forecast softwood sawlog availability for the 2015–19 period, the Murray Valley with 18 per cent of forecast softwood sawlog availability and South East Queensland with 14 per cent of forecast softwood sawlog availability.

Production of softwood pulplog was around 5.2 million cubic metres a year in 2014–15. Softwood pulplog availability is forecast to decline to around 4.7 million cubic metres per year for the 2015–19 period. Softwood pulplog availability is forecast to average around 4.4 million cubic metres per year over the remaining periods to 2054–59. The majority of plantation softwood pulplog is forecast to be available from the Green Triangle, Murray Valley and Tasmania regions.

1 Plantation log availability

Plantation estate

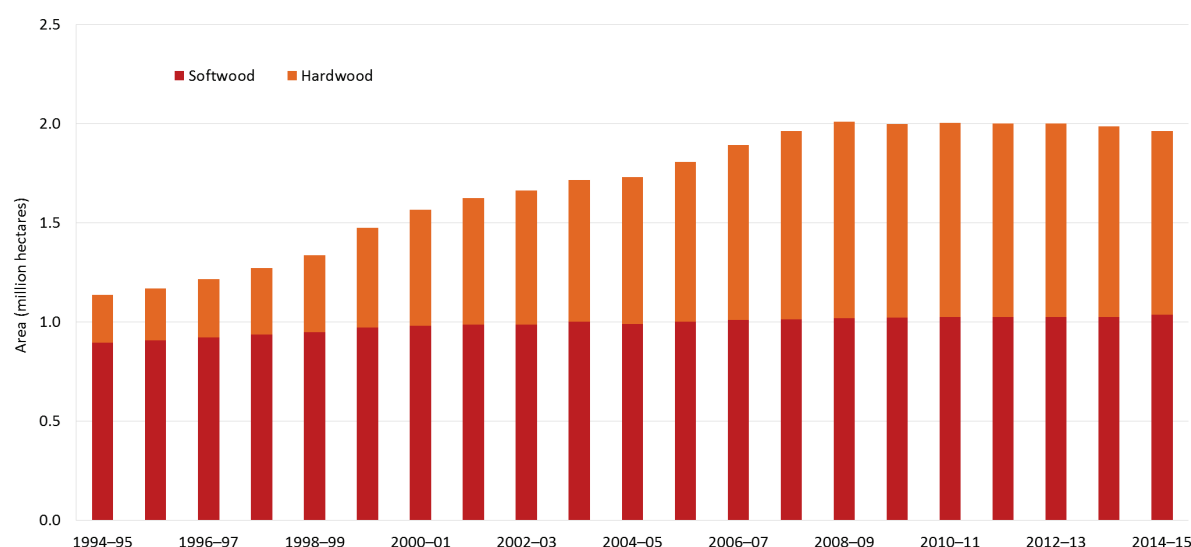
Total land area dedicated to commercial plantations in Australia has decreased over the past five years to a total of 1.97 million hectares (Figure 2). Although the softwood plantation area increased by around 11 200 hectares in 2014–15, this was predominately the result of some plantation managers revising their area figures and including fallow land area for the first time. The hardwood plantation estate decreased by around 34 800 hectares in 2014–15, driven by low commerciality plantations not being replanted and some land leases not being renewed for growing timber plantations. ABARES estimates that there will be further consolidation of the hardwood plantation estate because some of the previously managed investment scheme plantations established on leased land will not be replanted or will no longer be managed for wood production.

In 2014–15 around 600 hectares of new commercial plantations were established in Australia, compared with 23 500 hectares in 2009–10 (Figure 3). This trend is likely to continue based on figures supplied to ABARES by growers and managers. ABARES preliminary estimates for 2015–16 indicate that around 380 hectares of new commercial plantations were established. This may decrease further to around 130 hectares in the 2016–17.

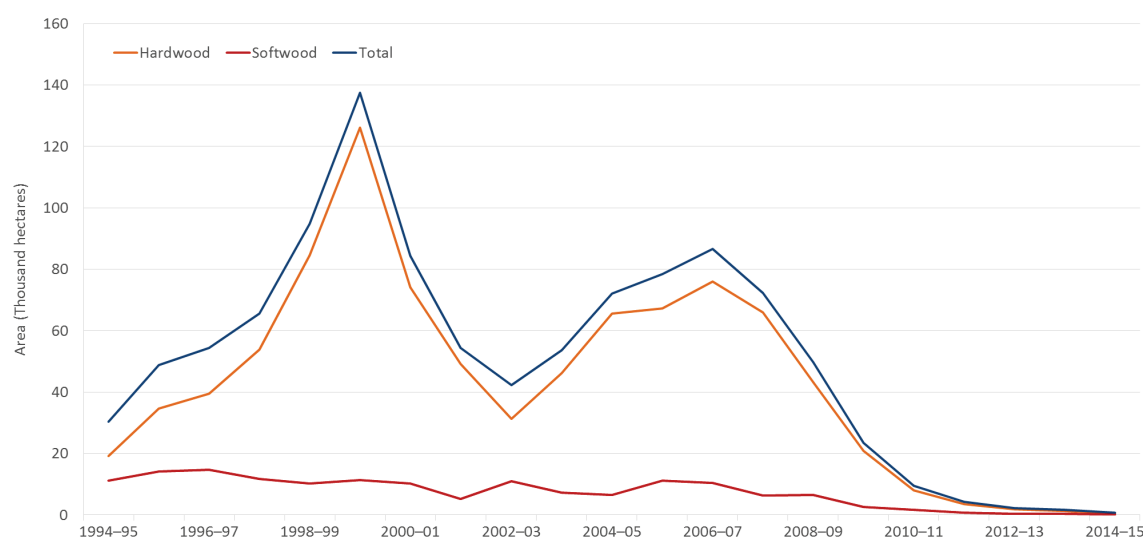
ABARES estimates that the total commercial plantation estate may decrease by around 80 000 to 100 000 hectares over the next 10 to 15 years as new plantation establishment will not be sufficient to offset removals of low commerciality plantations unless there are new drivers to expand or maintain the current plantation estate. The majority of the projected decrease will be hardwood plantations managed for pulplogs and to a lesser extent hardwood plantations managed for sawlogs. In addition, some current hardwood plantations may be replanted with softwood species in some regions.

Australia's average softwood log availability is forecast to remain above 15.9 million cubic metres per year over the reporting period to 2055–59. The forecast hardwood log availability is projected to decline from a peak of 12.9 million cubic metres per year in the 2015–19 period to a low of 8.5 million cubic metres per year in the 2045–49 period.

Figure 2 Area of timber plantations, 1994–95 to 2014–15



Note: Data for 1994–95 to 2004–05 are for calendar years 1994 to 2005; data for 2005–06 to 2014–15 are for financial years. 'Other' category plantations are not included.

Figure 3 New plantations, 1994–95 to 2014–15

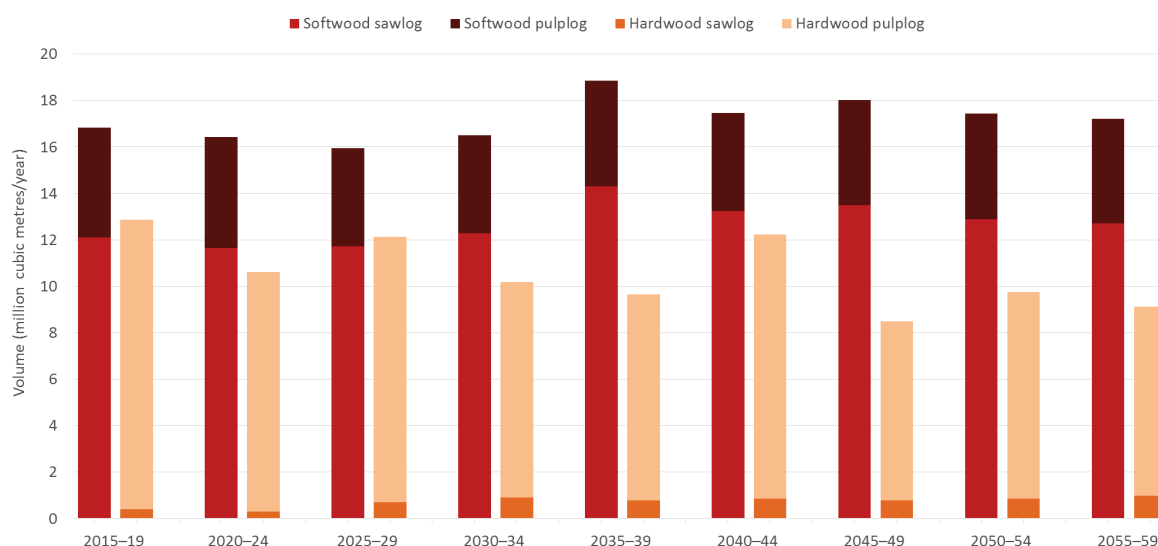
Note: Data for 1994–95 to 2004–05 are for calendar years 1994 to 2005; data for 2005–06 to 2014–15 are for financial years. 'Other' category plantations are not included.

Forecasts

The potential log availability from Australia's commercial plantation estate is forecast to increase to an annual average of 29.7 million cubic metres in the 2015–19 period, followed by a decline to an annual average of 27.0 million cubic metres a year for the 2020–24 period (Figure 4). The majority of the decline in total log availability is because the expected yield from hardwood plantations is forecast to decline as plantations of low commerciality are not replanted and some lease agreements with landholders are not renewed. The forecast assumptions are discussed in chapter 3 of the report.

Table 1 Forecast plantation log availability, average per year for each five-year period, Australia

'000 m ³									
Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	12 466	10 326	11 424	9 283	8 875	11 361	7 715	8 880	8 129
- sawlog	408	293	715	904	785	866	780	863	994
- total	12 874	10 619	12 139	10 186	9 659	12 227	8 496	9 743	9 123
Softwood									
- pulplog	4 726	4 759	4 215	4 228	4 540	4 224	4 520	4 563	4 509
- sawlog	12 099	11 662	11 731	12 278	14 316	13 249	13 491	12 877	12 709
- total	16 825	16 421	15 946	16 506	18 856	17 473	18 011	17 440	17 218
Overall total	29 699	27 040	28 085	26 692	28 515	29 699	26 507	27 183	26 342

Figure 4 Forecast plantation log availability, Australia

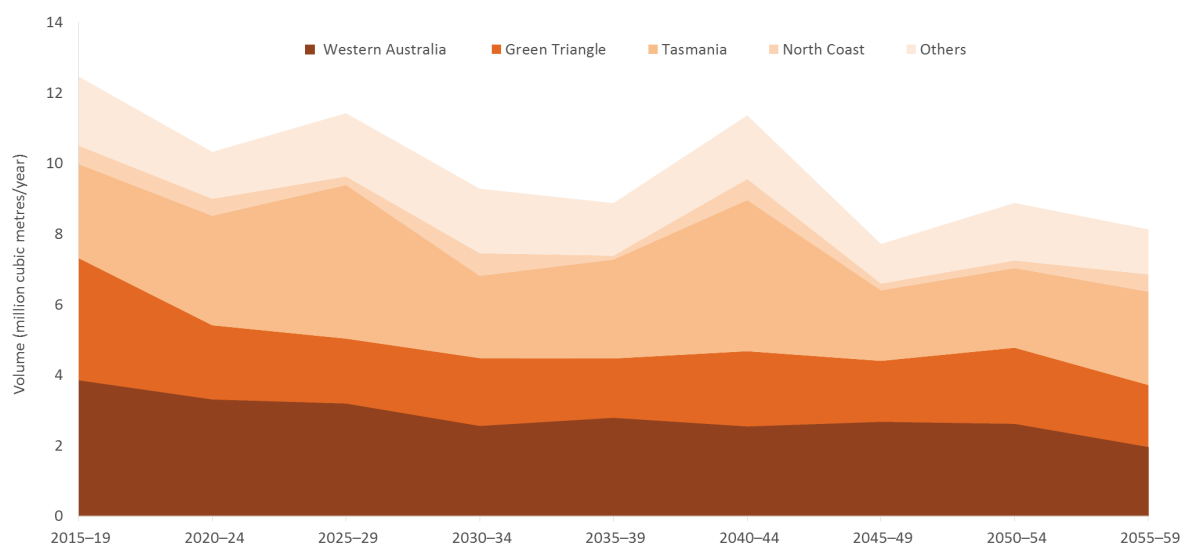
Hardwood plantation forecast

Hardwood plantation log availability for the 2015–19 period is forecast to be around 12.9 million cubic metres a year, around 4.7 million cubic metres more than the actual volume harvested in 2014–15. The increased hardwood log availability in the 2015–19 period is because plantation growers and owners are bringing harvesting forward and some plantations are being harvested for the first time.

Hardwood pulplog production was 8.2 million cubic metres in 2014–15 and pulplog availability is forecast to peak at an annual average of 12.5 million cubic metres in the 2015–19 period. Average hardwood pulplog availability is forecast to fluctuate between 12.5 million cubic metres a year in the 2015–19 period and 7.7 million cubic metres in the 2045–49 period. Hardwood sawlog production was 269 000 cubic metres in 2014–15 and sawlog availability is forecast at 408 000 cubic metres per year for the 2015–19 period, increasing to around 994 000 cubic metres on average over the 2055–59 period (Table 1, Figure 5).

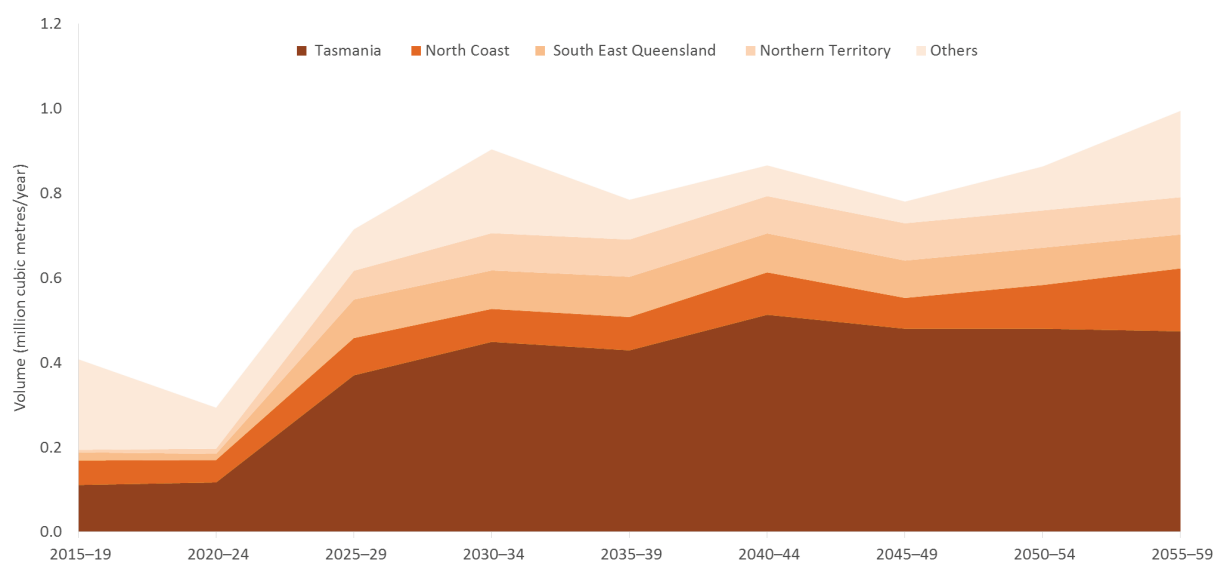
In the 2015–19 period three regions—Western Australia, the Green Triangle and Tasmania—are forecast to have between 2.7 and 3.9 million cubic metres a year of hardwood pulplog available (Figure 5). The Green Triangle hardwood pulplog availability is forecast to decline to around 2.1 million cubic metres per year in the 2020–24 period, then decline further to a low of 1.7 million cubic metres per year in 2035–39 period.

Western Australia's hardwood pulplog availability is forecast to decline to around 2.6 million cubic metres per year in the 2030–34 period, then decline further to around 2.0 million cubic metres per year in the 2055–59 period. Tasmania's hardwood pulplog availability is forecast to peak at over 4.3 million cubic metres per year for the 2025–29 and 2040–44 periods.

Figure 5 Forecast plantation hardwood pulplog availability, by region

Total national hardwood plantation sawlogs availability is a small proportion (9 per cent) of the forecast total hardwood plantation log availability. Hardwood sawlog availability is forecast to be around 408 000 cubic metres a year in the 2015–19 period, peaking at around 994 000 cubic metres a year in the 2055–59 period. By comparison, total hardwood sawlog production from native forests in 2014–15 was around 1.8 million cubic metres. Sawlog estimates include peeler logs, high-grade and low-grade sawlogs and posts and poles.

Most of the hardwood plantations managed for sawlogs are in Tasmania and the North Coast region (Figure 6), and were predominantly established by state governments. For the 2015–19 period Tasmania, the North Coast and Green Triangle regions are forecast to be the main areas of hardwood plantation sawlog availability, with an annual average of around 111 000, 58 000 and 120 000 cubic metres, respectively, available for log harvest (Figure 6).

Figure 6 Forecast plantation hardwood sawlog availability, by region

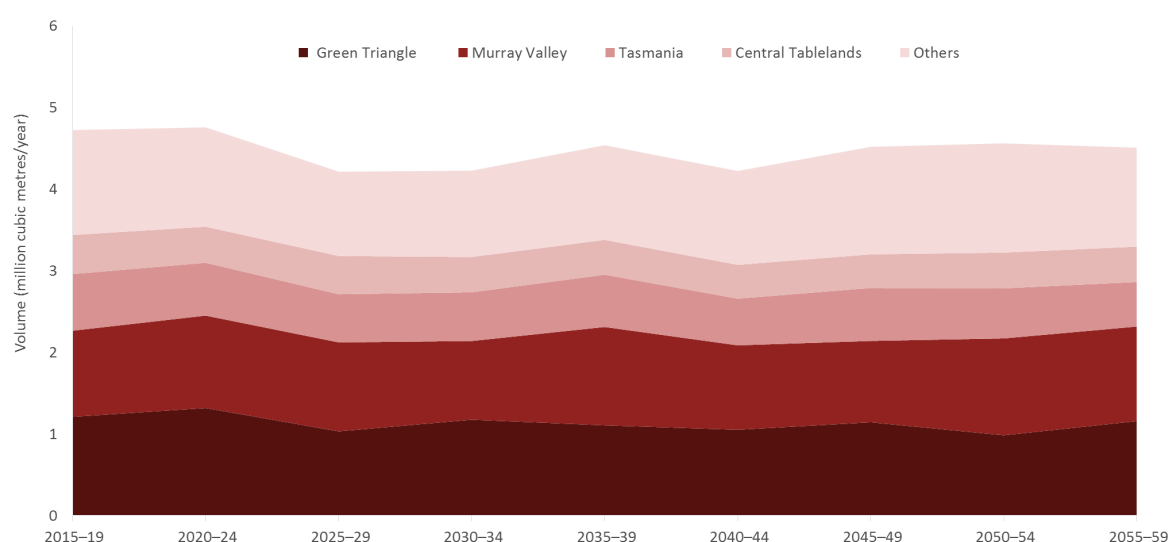
Softwood plantation forecast

Softwood plantation log availability in the 2015–19 period is forecast to average around 16.8 million cubic metres a year, around 2.0 million cubic metres more than the actual volume harvested in 2014–15.

Production of softwood pulplog was around 5.2 million cubic metres a year in 2014–15. Softwood pulplog availability is forecast to decline to around 4.7 million cubic metres per year for the 2015–19 period. The softwood pulplog availability is forecast to average around 4.4 million cubic metres per year over the remaining periods to 2055–59 (Figure 7). The decline in softwood pulplog availability is partly because some companies have found new markets for their lower grade logs.

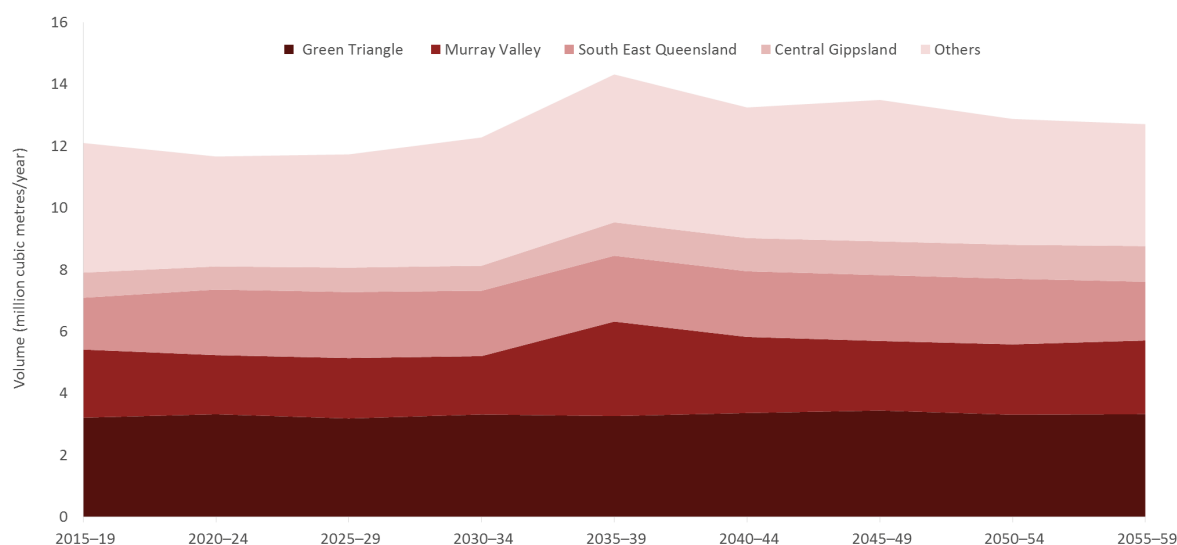
Most plantation softwood pulplog availability is forecast to be produced in the Green Triangle, Murray Valley and Tasmania regions. In the 2015–19 period the Green Triangle and the Murray Valley will have around 26 per cent and 22 per cent, respectively, of the total national softwood pulplog availability and Tasmania around 15 per cent.

Figure 7 Forecast plantation softwood pulplog availability, by region



Production of softwood sawlogs was around 9.8 million cubic metres in 2014–15. Softwood sawlog availability is forecast to increase to around 12.1 million cubic metres a year for 2015–19, and peak at around 14.3 million cubic metres a year in the 2035–39 period (Table 1, Figure 8).

The major softwood sawlog-producing regions are the Green Triangle, with 27 per cent of forecast softwood sawlog availability for the 2015–19 period; the Murray Valley, with 18 per cent of forecast softwood sawlog availability; and South East Queensland, with 14 per cent of forecast softwood sawlog availability (Figure 8).

Figure 8 Forecast plantation softwood sawlog availability, by region

2016 forecast compared with 2012 forecast

The previous Australian plantation log availability forecast was based on plantation areas recorded by the National Plantation Inventory as at 2009–10. The present forecast is based on areas as at 2014–15.

The 2015 to 2059 average total plantation log availability forecast is 10 per cent lower in this report, compared with the 2012 report; the average hardwood log availability forecast is 21 per cent lower and the average softwood log availability forecast is 2 per cent lower.

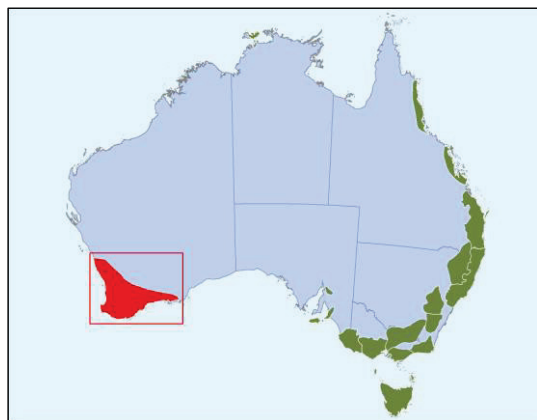
Hardwood pulplog availability for the same period declined by 21 per cent and hardwood sawlog availability declined by 20.6 per cent. These declines are a result of plantation growers and managers revising their yield estimates (including future plantation removals) and the removal of 34 800 hectares of hardwood plantation area that were assessed as unproductive and not considered for replanting or leases were not renewed.

The softwood sawlog availability for the same period increased by around 7 per cent and the softwood pulplog availability decreased by around 21 per cent when compared with the 2012 report. The decline in softwood pulplog availability and increase in softwood sawlog are partly because some companies have found new markets for their lower grade softwood logs.

2 Regional log availability forecasts

Western Australia

Map 2 Western Australia plantation region



Plantations in Western Australia are located across an arc from the north of Perth to the east of Esperance (Map 2). Major plantation timber processing industries are located at Neerabup, Dardanup, Manjimup, Collie and Albany. Woodchips are exported from ports at Bunbury and Albany. The majority of the hardwood plantations were planted from 1996 onwards (Figure 9).

The total plantation area in Western Australia has declined by 41 700 hectares from 2009–10 to 384 300 hectares in 2014–15. Hardwood plantations declined by 35 400 hectares and softwood plantations declined by 3 070 hectares. The majority of the decline was from Tasmanian blue gum (*Eucalyptus globulus*) planted for pulplog production. Over the past decade, since the collapse of the managed investment schemes, the plantation estate has been consolidated. This has led to the removal of hardwood plantations deemed to be non-commercial. From 2013–14 to 2014–15 another 8 100 hectares of plantation was removed. This trend is expected to continue for the next 5 to 10 years as some plantations are harvested and not replanted for a second rotation. This is reflected in the hardwood log availability forecasts.

The major hardwood plantation species in Western Australia is Tasmanian blue gum, which is grown mainly for pulplog production. Around 91 per cent of the hardwood plantation area is managed for pulplog production. The other 9 per cent is managed for sawlog production.

Around 3.4 million cubic metres of logs were harvested from hardwood plantations in Western Australia in 2014–15. This level of production can be sustained for the 2015–19 forecast period only, after that forecast log availability is projected to decline to around 2.5 to 3.3 million cubic metres to 2050–54, to a low of around 2.0 million cubic metres over the 2055–59 period (Table 2, Figure 10). This decline is due to the hardwood plantation area declining and expectations of further declines. In addition, plantations managers have revised their expected mean annual increments (growth rates) for hardwood plantations from those reported 5 and 10 years ago.

In this report, 60 per cent of the data on forecast hardwood plantation log availability were provided by growers, compared with 70 per cent provided for the 2012 log supply report. This decline is because not all former managed investment scheme hardwood plantations were purchased by large plantation managers so limited information is available for these plantations. Instead, ABARES estimated the future log availability for these plantations.

Radiata pine (*Pinus radiata*) and maritime pine (*P. pinaster*) are the main softwood species planted in Western Australia managed for sawlog production. The total softwood area in Western Australia

in 2014–15 was 97 900 hectares, reflecting a 2.3 per cent decline in area since 2009–10. This decline was mainly the result of groundwater recharge areas not being replanted.

The softwood plantation pulplog availability forecast has declined since the 2012 report because the softwood plantation estate has decreased, reducing potential total yields. The main difference between reporting periods is that the peak yields previously reported in 2012 for the 2030–34 and 2035–39 periods have declined by around 290 000 cubic metres per year.

Total log harvest from softwood plantations in Western Australia was around 969 000 cubic metres in 2014–15. The total softwood log availability is forecast to be around 1 million cubic metres a year over the forecast period, providing a stable supply of softwood logs for the domestic industry.

Softwood sawlog availability is forecast at 824 000 cubic metres a year in the 2015–19 period, peaking in the 2040–44 period at 921 000 cubic metres a year (Table 2, Figure 11).

Softwood pulplog availability is forecast at 215 000 cubic metres a year in the 2015–19 period, declining to around 186 000 cubic metres a year over the 2055–59 period.

Plantation owners and managers provided 98 per cent of the forecasts of softwood log availability.

Figure 9 Age class by five-year period, Western Australia

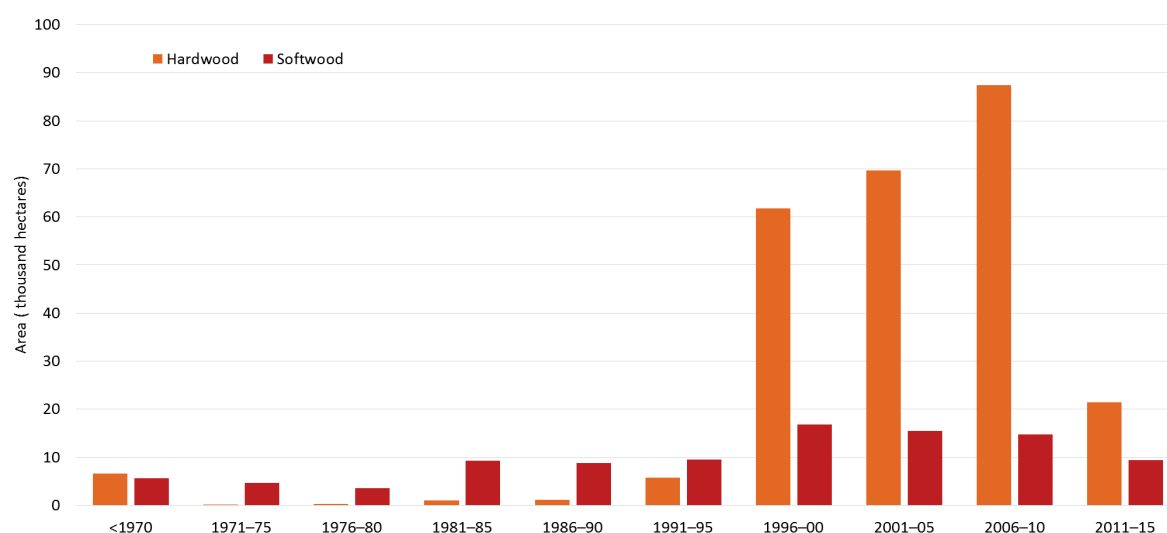


Table 2 Forecast plantation log availability, average per year for each five-year period, Western Australia

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	3 852	3 308	3 193	2 557	2 789	2 543	2 674	2 617	1 960
- sawlog	42	7	58	154	38	32	6	45	154
Softwood									
- pulplog	215	211	214	224	205	202	202	199	186
- sawlog	824	800	823	902	911	921	920	917	877
Overall total	4 933	4 326	4 288	3 837	3 943	3 698	3 802	3 778	3 177

Figure 10 Forecast hardwood plantation log availability, Western Australia

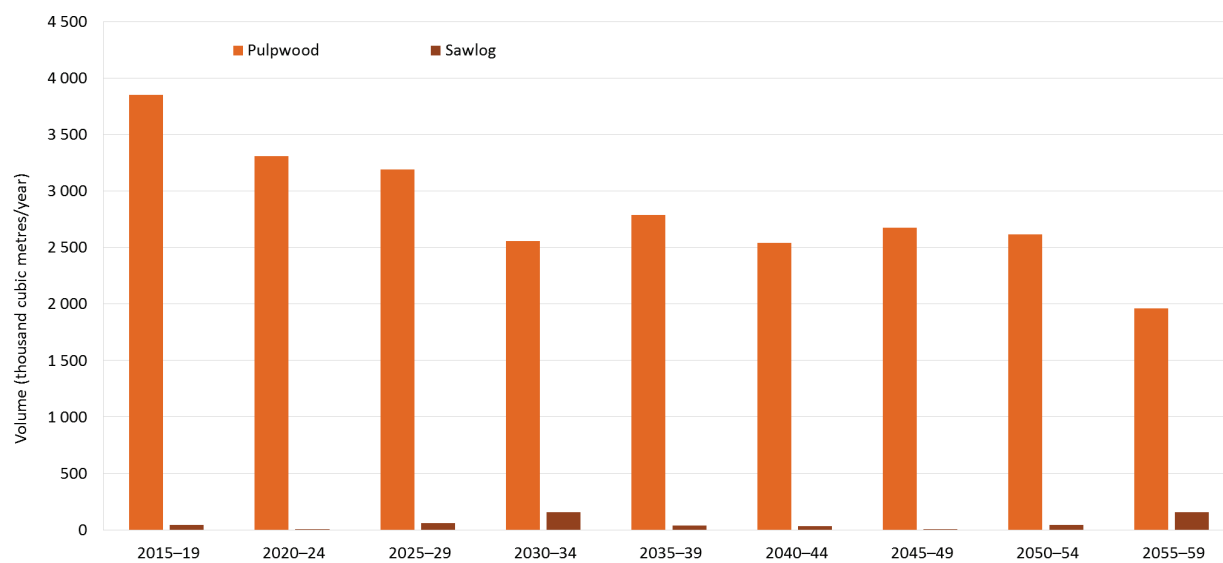
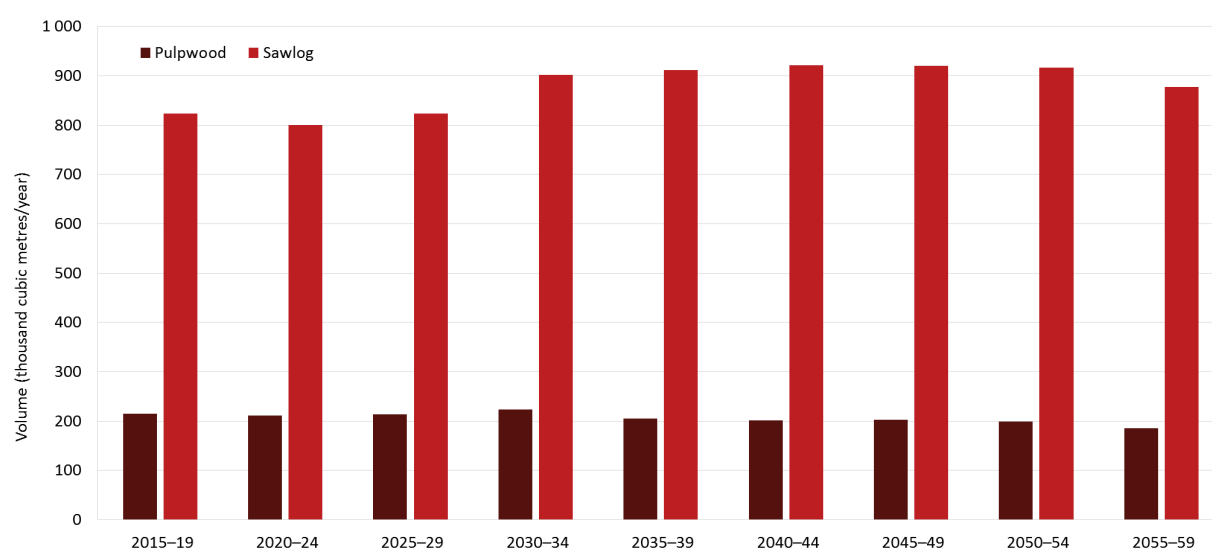
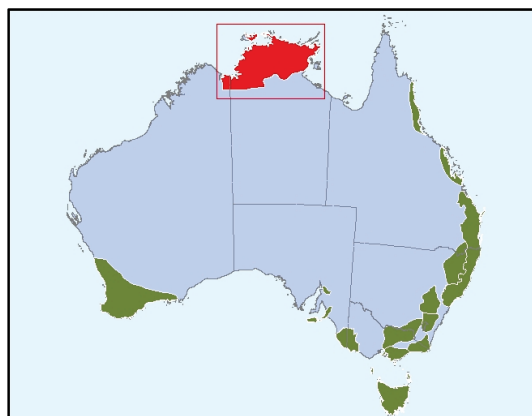


Figure 11 Forecast softwood plantation log availability, Western Australia



Northern Territory

Map 3 Northern Territory plantation region



Plantations in the Northern Territory are located on Melville Island and some northern parts of the mainland (Map 3). The hardwood plantation area in the Northern Territory region, grown for pulplog and sawlog production, increased by 9 500 hectares between 2009–10 and 2014–15 to 47 600 hectares. The majority of this increase was African mahogany. In comparison, the softwood plantation area declined by 500 hectares from 2009–10, to 1 900 hectares in 2014–15. The majority of the hardwood plantations were planted from 2001 onwards (Figure 12).

Pulplogs are exported from the recently developed Pularumpi pulplog export facility on the western side of Melville Island.

Hardwood log availability is forecast to be around 325 000 cubic metres a year in the 2015–19 and 2020–24 periods, then to increase to around 638 000 cubic metres a year to 2054–59 (Table 3, Figure 13). In the 2012 log supply report, the peak log availability forecast for the hardwood plantations was around 1 052 000 cubic metres for the 2020–24 period, compared with 638 000 cubic metres a year for the 2030–34 period and beyond for this report. The decline in log availability is due to the expected yields from the hardwood plantations being revised.

From the mid 1970s to the early 1990s Caribbean pine (*Pinus caribaea*) was the main softwood species planted on Melville Island. Following its harvest, the sites are proposed to be replanted with *Acacia mangium* or eucalyptus species grown for pulpwood. The softwood plantation yields are not reported for this region.

Plantation owners and managers provided 80 per cent of the forecasts of African mahogany (*Khaya senegalensis*) sawlog availability. The hardwood pulplog plantation area was modelled using information provided by plantation managers. The volumes reported in Figure 13 have been smoothed by ABARES.

Figure 12 Age class by five-year period, Northern Territory

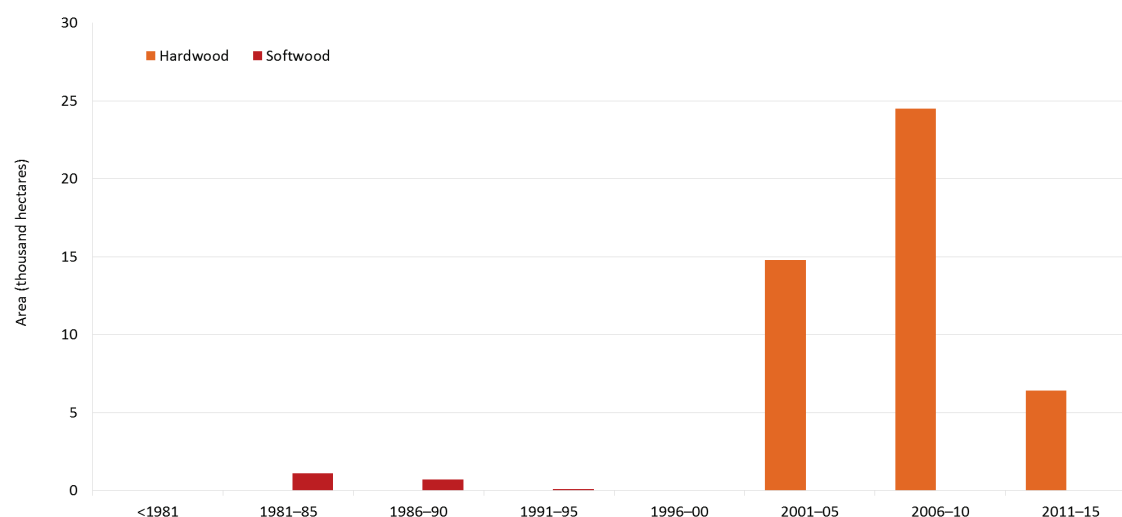
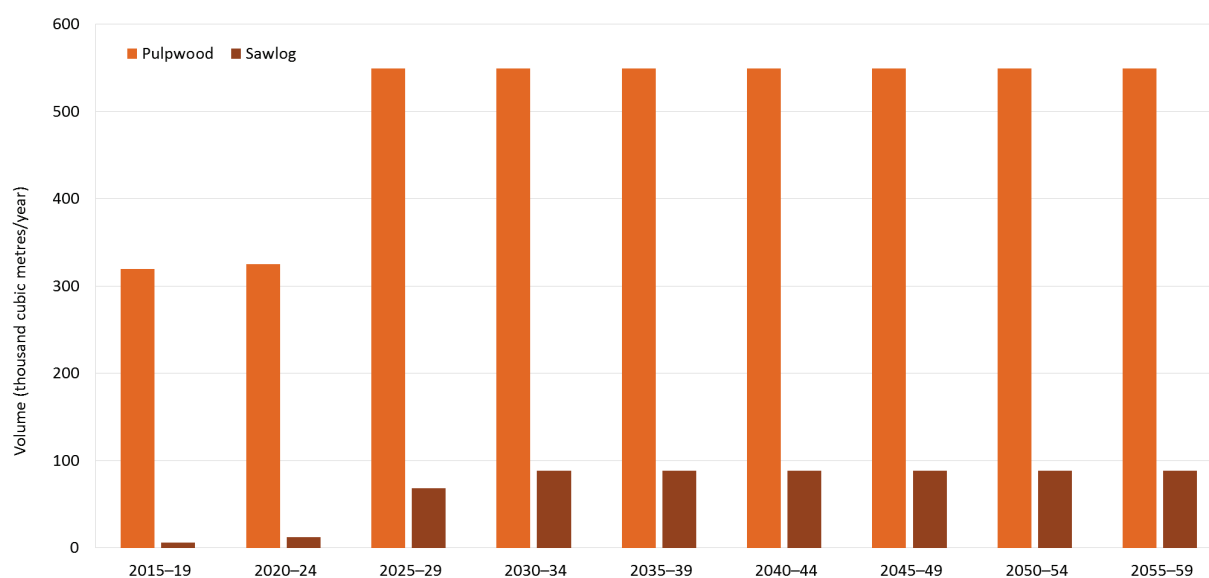


Table 3 Forecast plantation log availability, average per year for each five-year period, Northern Territory

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	319	325	550	550	550	550	550	550	550
- sawlog	6	12	68	88	88	88	88	88	88
Overall total	325	337	618	638	638	638	638	638	638

Figure 13 Forecast hardwood plantation log availability, Northern Territory



Mount Lofty Ranges and Kangaroo Island

Map 4 Mount Lofty Ranges and Kangaroo Island plantation region



The Mount Lofty Ranges and Kangaroo Island plantation inventory region extends to the north and east of Port Pirie, and includes Kangaroo Island and the Fleurieu Peninsula south of Adelaide (Map 4). The majority of the hardwood plantations were planted from 2001 onwards (Figure 14).

The softwood plantations in this region supply sawlogs and pulplogs to wood processing industries near Adelaide at Wingfield, Nuriootpa and Jamestown. Logs can be exported from the Port of Adelaide. A multi-use export facility is proposed at Smith Bay on the northern shore of Kangaroo Island.

The plantation area in the Mount Lofty Ranges and Kangaroo Island declined by around 900 hectares from 2009–10, to a total plantation estate of 33 400 hectares in 2014–15. The decline reflects plantations being written off, harvested plantations not being replanted following a change of ownership and others not being replanted after the 2013 fires.

Hardwood pulplog availability is forecast to be 455 000 cubic metres a year in the 2015–19 period, declining to 87 000 cubic metres a year in the 2020–24 period (Table 4, Figure 15). Forecast hardwood pulplog availability varies widely because no smoothing has been applied (Table 4).

The small areas of hardwood plantations managed for sawlog production are forecast to produce only a few thousand cubic metres and, as a result, no forecasts are presented in this report.

The total area of softwood plantations, comprising mainly radiata pine (*P. radiata*), has declined by around 6.5 per cent since 2009–10 to around 18 700 hectares in 2014–15. Softwood sawlog availability is forecast at 235 000 cubic metres a year in the 2015–19 period, declining to around 200 000 cubic metres from 2020–24 onwards with a further reduction for the 2035–39 and 2040–44 periods before increasing back to around 200 000 cubic metres per year from 2050–54 onwards (Table 4, Figure 16).

Plantation owners and managers provided 30 per cent of the forecasts of hardwood plantation log availability and 81 per cent of the forecasts of softwood plantation log availability.

Figure 14 Age class by five-year period, Mount Lofty Ranges and Kangaroo Island

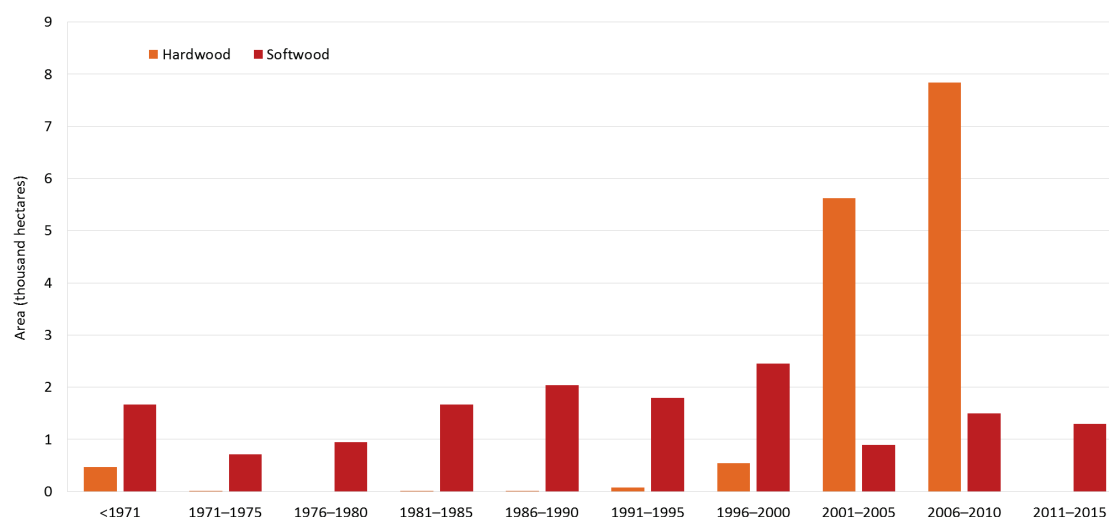


Table 4 Forecast Plantation log availability, average per year for each five-year period, Mount Lofty Ranges and Kangaroo Island

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	455	87	216	333	57	498	42	314	216
Softwood									
- pulplog	99	76	71	80	67	71	79	77	75
- sawlog	235	201	197	211	154	156	184	199	192
Overall total	788	364	483	624	278	725	305	590	482

Figure 15 Forecast hardwood plantation log availability, Mount Lofty Ranges and Kangaroo Island

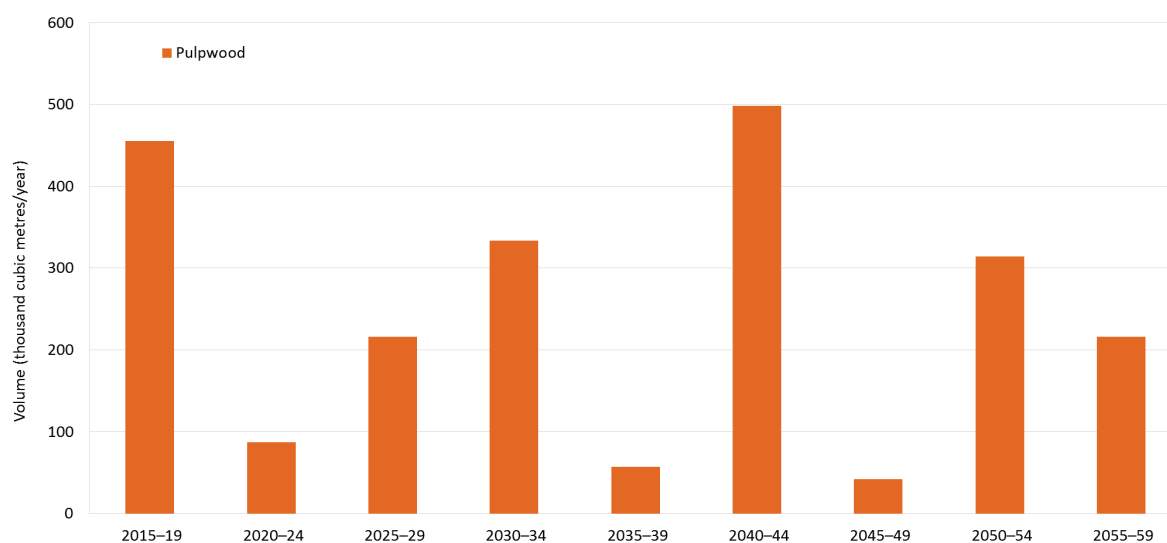
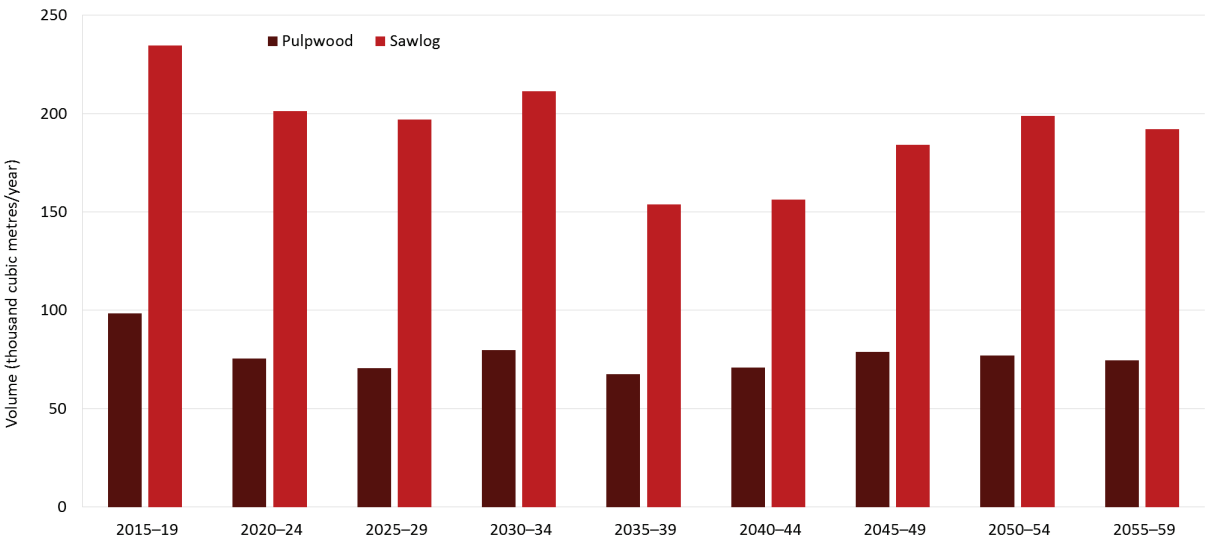
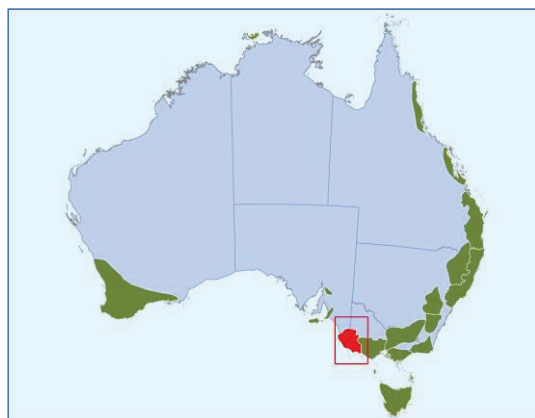


Figure 16 Forecast softwood plantation log availability, Mount Lofty Ranges and Kangaroo Island



Green Triangle

Map 5 Green Triangle plantation region



The Green Triangle straddles the border between south-east South Australia and south-west Victoria (Map 5). Most of the softwood plantations in the Green Triangle region are radiata pine (*P. radiata*) and Tasmanian blue gum (*Eucalyptus globulus*) is the main hardwood species. These provide a steady supply of sawlogs, veneer logs and pulplog to large-scale integrated processing industries at Mount Gambier, Tarpeena, Millicent, Myamyn and other locations. These industries produce sawnwood, laminated veneer lumber, particleboard, treated posts and poles, and pulp for tissue manufacture. Sawlogs and woodchips are exported from the port of Portland. The majority of the hardwood plantations were planted from 1996 onwards (Figure 17).

The plantation area in the Green Triangle region has declined by around 11 000 hectares over the past five years to a total plantation estate of 336 600 hectares in 2014–15. The majority of the decline was from hardwood plantations managed for pulplog production.

Hardwood pulplog availability is forecast to be 3.5 million cubic metres a year in the 2015–19 period and to decline to average around 1.9 million cubic metres a year from the 2020–24 period onwards (Table 5, Figure 18). The forecast hardwood log availability estimates have declined since the 2012 report and mainly reflect revised yield estimates supplied by plantation owners and managers and the decrease in the hardwood plantation estate in the Green Triangle.

The hardwood sawlog plantations in the Green Triangle have not been modelled because the total planted area is less than 1 000 hectares and comprises a range of hardwood species with varying growth rates.

Softwood sawlog availability is forecast to be 3.2 million cubic metres a year in the 2015–19 period and to peak in the 2045–49 period at 3.4 million cubic metres a year (Table 5, Figure 19). Softwood sawlog availability is forecast to increase on average by around 780 000 cubic metres per year compared with the 2012 report.

Softwood pulplog availability is forecast at 1.2 million cubic metres in the 2015–19 period, declining to a low of 1 million cubic metres over the 2050–54 period.

The forecast softwood sawlog availability increased from the 2012 report and the softwood pulplog availability forecasts have declined, reflecting the revised yield estimates supplied by plantation owners and managers and new markets being established for lower value logs, mainly for export.

Plantation owners and managers provided 90 per cent of the forecasts of hardwood plantation log availability and 95 per cent of the forecasts of softwood plantation log availability.

Figure 17 Age class by five-year period, Green Triangle

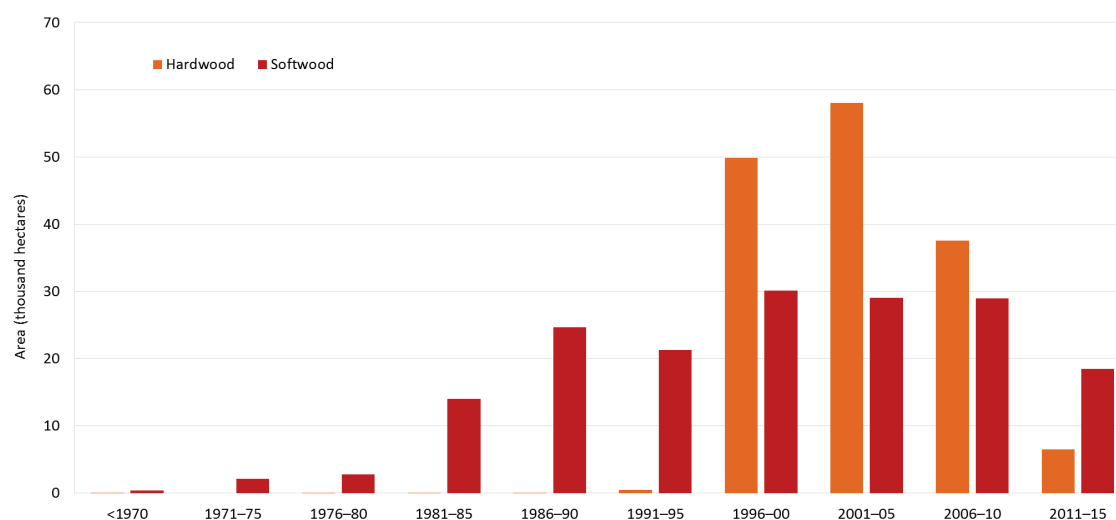


Table 5 Forecast plantation log availability, average per year for each five-year period, Green Triangle

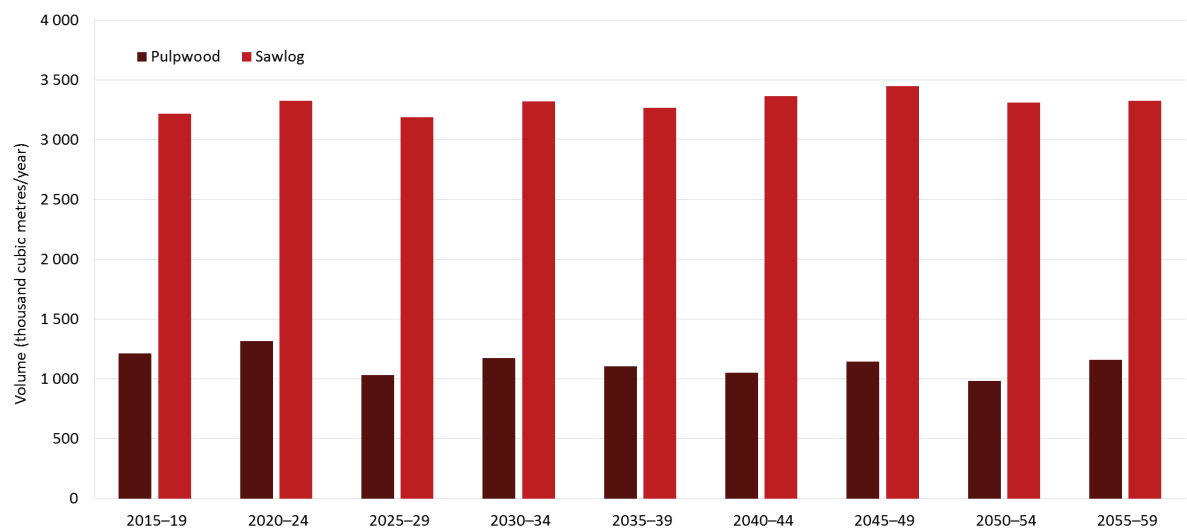
'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	3 466	2 104	1 842	1 923	1 681	2 134	1 729	2 158	1 757
Softwood									
- pulplog	1 211	1 318	1 033	1 175	1 107	1 052	1 143	985	1 158
- sawlog	3 214	3 324	3 187	3 318	3 265	3 364	3 444	3 308	3 326
Overall total	7 890	6 746	6 061	6 416	6 052	6 550	6 317	6 451	6 241

Figure 18 Forecast hardwood plantation log availability, Green Triangle

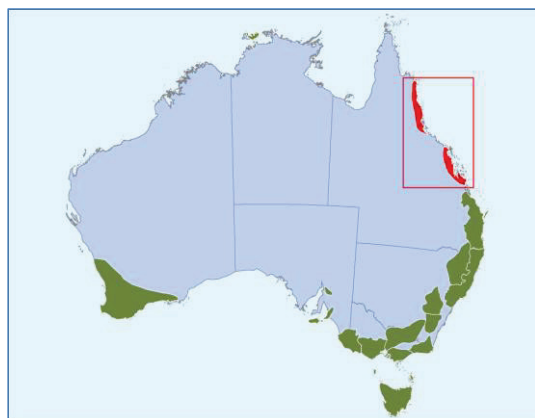


Figure 19 Forecast softwood plantation log availability, Green Triangle



North Queensland

Map 6 North Queensland plantation region



The North Queensland plantation region lies in a strip along the coast north of Gladstone to Cooktown (Map 6). The softwood plantations are concentrated between Ingham and Tully, near Yeppoon, and on the Atherton Tablelands. They mostly comprise exotic Caribbean pine (*Pinus caribaea*) and have been established for many years. Small areas of hardwood plantations are located between Townsville and Cooktown. The softwood plantation area planted peaked in 2006–10 (Figure 20).

Major industries are located at Mareeba and Ravenshoe with export capability at Mourilyan, Gladstone and Mackay harbours.

The North Queensland total plantation area remained relatively stable at 36 600 hectares in 2014–15 but the proportions of hardwood and softwood have changed. The softwood plantation area has increased from 25 300 hectares in the 2012 report to 31 800 hectares in 2014–15. However, severe tropical cyclone Yasi in 2011 and tropical cyclone Marcia in 2015 have affected around 20 000 hectares of softwood plantations across both North Queensland plantation regions. Although significant areas have been re-established over the past few years, re-establishment of the softwood plantation estate will continue for at least another six years. This is evidenced by the increased log availability volumes that become available from 2040 onwards.

The hardwood plantation area decreased from 10 200 hectares in 2009–10 to 4 900 hectares in 2014–15. The decline in hardwood plantations has occurred as plantations established using managed investment schemes to fund plantation investment and management went into receivership and these plantations were returned to agriculture or were assessed as not commercially viable to be managed for log production. This is additional to the substantial area of hardwood plantations that were written off in 2011 because of cyclone damage and recurring disease outbreaks.

Hardwood log availability is forecast to be 28 500 cubic metres a year in the 2015–19 period and to peak at 54 500 cubic metres a year in the 2055–59 period (Table 6, Figure 21). On average around 70 per cent of the hardwood log availability forecast is managed for sawlog production.

Softwood sawlog availability is forecast to average around 176 000 cubic metres a year over the 2015–19 period. Most of this will be harvested in the first few years of this period as salvage harvesting from cyclone damage continues. Softwood sawlog availability is forecast to peak at 857 000 cubic metres a year in the 2045–49 period (Table 6, Figure 22) as the softwood plantation estate matures from the impact of severe tropical cyclone Yasi in 2011 and tropical cyclone Marcia in 2015. Softwood pulplog availability is forecast at 68 000 cubic metres per year in the 2015–19 period, peaking at 94 000 cubic metres per year in the 2045–49 period.

Plantation owners and managers provided 45 per cent of the forecasts of hardwood plantation log availability and 97 per cent of the forecasts of softwood plantation log availability. The majority of the hardwood plantations in this region have reverted to farm forestry after the collapse of managed investment scheme plantations.

Figure 20 Age class by five-year period, North Queensland



Table 6 Forecast plantation log availability, average per year for each five-year period, North Queensland

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	3	6	21	21	13	4	10	17	9
- sawlog	26	26	19	28	18	22	26	31	45
Softwood									
- pulplog	68	9	5	6	9	31	94	33	12
- sawlog	176	87	56	45	174	360	857	401	189
Overall total	273	128	101	101	214	417	987	482	256

Figure 21 Forecast hardwood plantation log availability, North Queensland

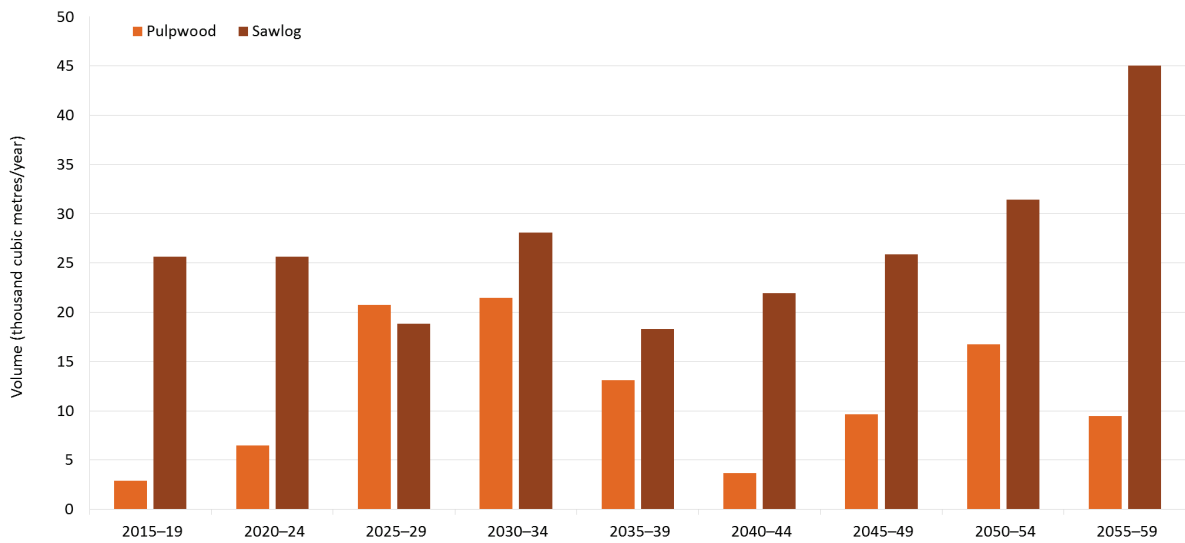
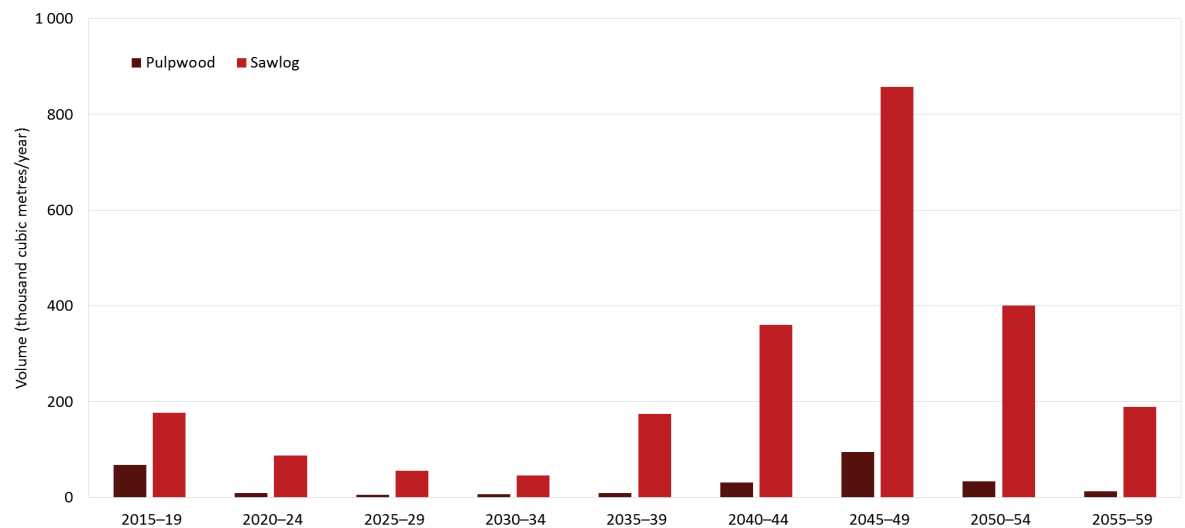
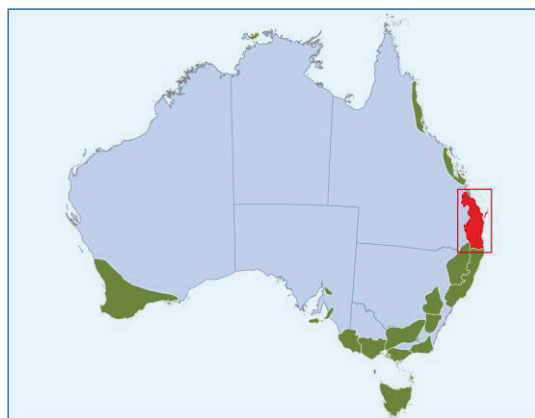


Figure 22 Forecast softwood plantation log availability, North Queensland



South East Queensland

Map 7 South East Queensland plantation region



The South East Queensland plantation region extends north from the New South Wales border to Gladstone and west past Toowoomba and Kingaroy (Map 7). Many sawmills process softwood plantation logs in this region, with the largest located at Caboolture, Tuan, Imbil and Yarraman. Woodchips are exported from the port of Brisbane. The main softwood species planted are southern pines and hoop pine (*Araucaria cunninghamii*), and the main hardwood species are Dunn's white gum (*Eucalyptus dunnii*) and lemon-scented gum (*Corymbia citriodora*). The softwood plantation age class area peaked in 2006–10 (Figure 23).

The plantation area in the South East Queensland region has remained relatively stable at 191 700 hectares in 2014–15. Fifty-eight per cent of the South East Queensland hardwood plantations are managed for sawlog production; the remainder are managed for pulplog production.

Hardwood pulplog availability is forecast at 161 000 cubic metres a year and hardwood sawlog availability is forecast at 19 000 cubic metres a year in the 2015–19 period (Table 7, Figure 24). Hardwood sawlog production is forecast to peak at 95 000 cubic metres a year in the 2035–39 period, with significant plantation log availability coming on from 2025 to supplement sawlogs from native forest.

Softwood sawlog availability is forecast at 1.7 million cubic metres a year in the 2015–19 period, increasing to over 2.1 million cubic metres per year from 2020 onwards before declining to 1.9 million cubic metres per year in the 2055–59 period (Table 7, Figure 25). The proportion of softwood sawlog availability has increased in this report compared with the 2012 report figures as small diameter logs are utilised for other products and not pulplogs.

Plantation owners and managers provided 40 per cent of the forecasts of hardwood plantation log availability and 100 per cent of the data on forecast for softwood plantation log availability. The majority of the hardwood plantations in this region have reverted to farm forestry after the collapse of managed investment scheme plantations. The status of these plantations will be revised periodically.

Figure 23 Age class by five-year period, South East Queensland

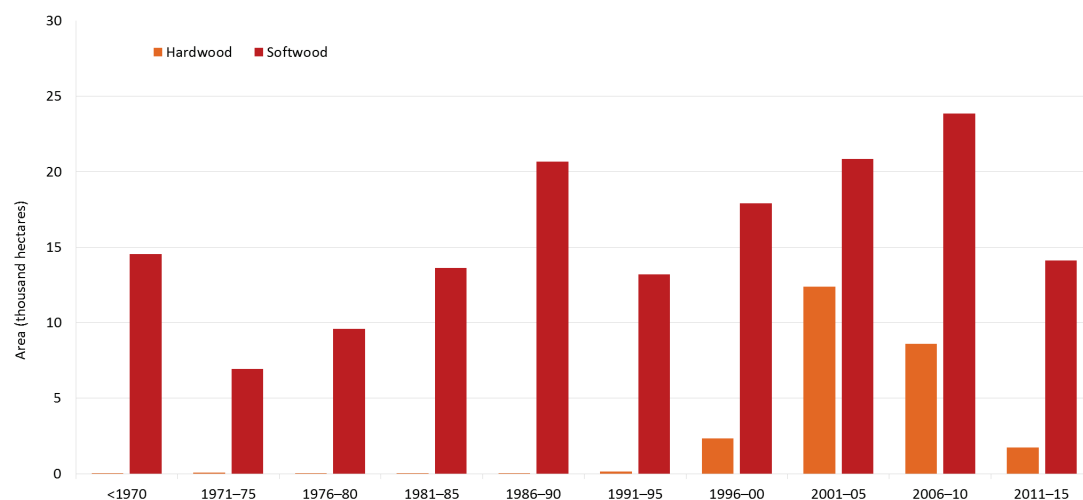


Table 7 Forecast plantation log availability, average per year for each five-year period, South East Queensland

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	161	6	168	53	76	100	37	138	21
- sawlog	19	15	91	91	95	92	88	88	80
Softwood									
- pulplog	105	84	78	81	79	78	81	75	61
- sawlog	1 675	2 120	2 134	2 114	2 130	2 124	2 131	2 123	1 900
Overall total	1 961	2 224	2 471	2 339	2 381	2 394	2 338	2 425	2 062

Figure 24 Forecast hardwood plantation log availability, South East Queensland

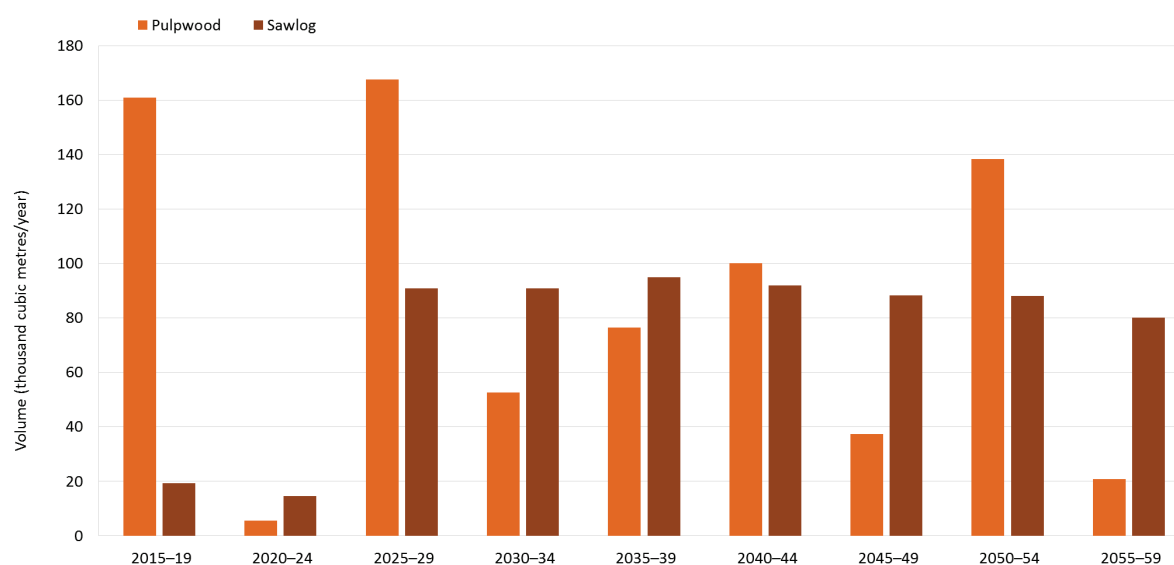
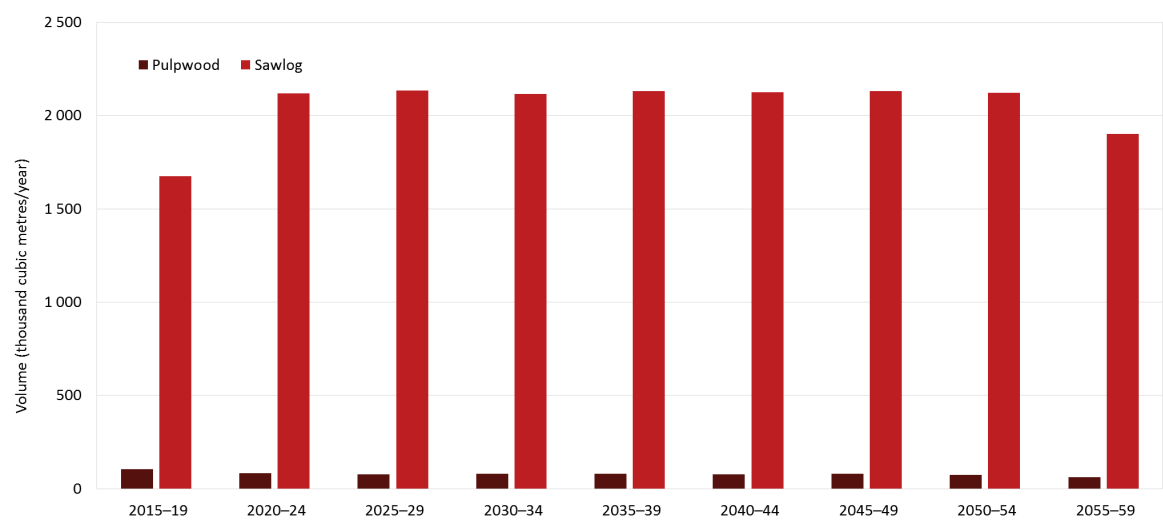
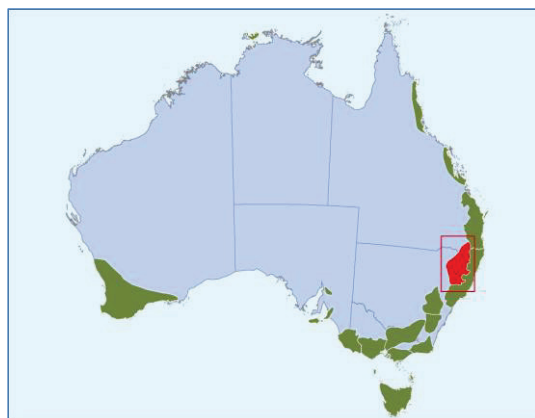


Figure 25 Forecast softwood plantation log availability, South East Queensland



Northern Tablelands

Map 8 Northern Tablelands plantation region



The Northern Tablelands region encompasses an elevated area, generally 1 000 metres or higher in altitude, inland of Wauchope in northern New South Wales and north toward Warwick in south-east Queensland (Map 8). The region's softwood plantations supply sawmills at Glen Innes, Nundle and Quirindi. The softwood plantations area has been steadily established since the 1971–75 period, with a peak in planting in the 1976–80 period. Most of the hardwood plantations were established in the 2006–10 period (Figure 26). The main softwood species planted is radiata pine (*P. radiata*) and the main hardwood species is shining gum (*E. nitens*).

The hardwood plantation area in the Northern Tablelands has declined substantially to a total of 2 300 hectares as plantations established by companies under managed investment schemes collapsed and the land reverted back to agriculture. The small areas of hardwood plantations managed for sawlog production amount to only a few thousand cubic metres a year and, as a result, no forecasts are presented in this report.

The forecast of softwood sawlog availability has more than doubled for the 2015–19 period compared with the 2012 log availability report, to around 509 000 cubic metres per year, before averaging around 242 000 cubic metres per year from 2020 onwards (Table 8, Figure 27). The forecast softwood pulplog availability has declined substantially compared with the 2012 log availability report, from around 85 000 cubic metres per year for the 2015–19 period to around 19 500 cubic metres per year for the same period.

Plantation owners and managers provided 95 per cent of the forecasts of softwood plantation log availability.

Figure 26 Age class by five-year period, Northern Tablelands

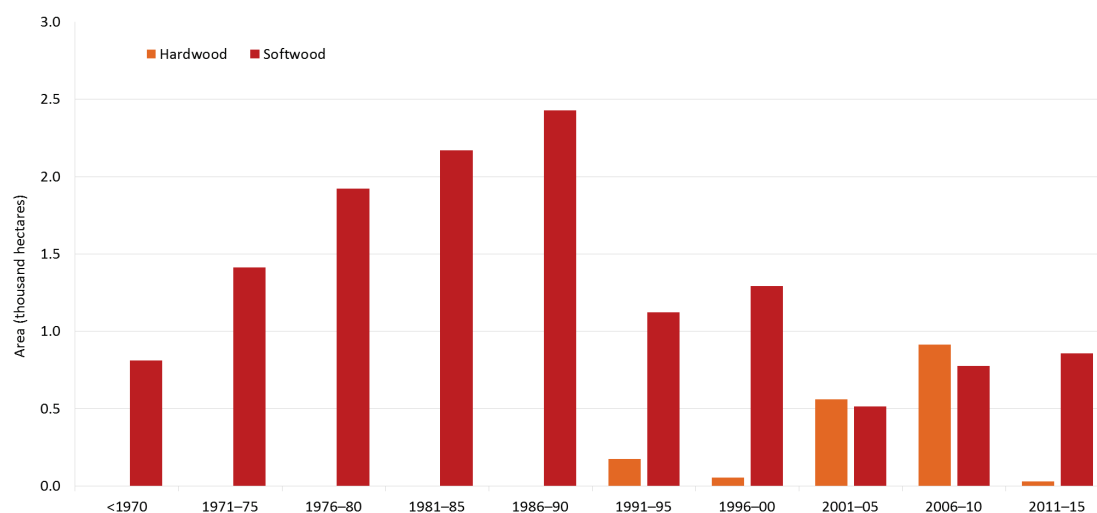
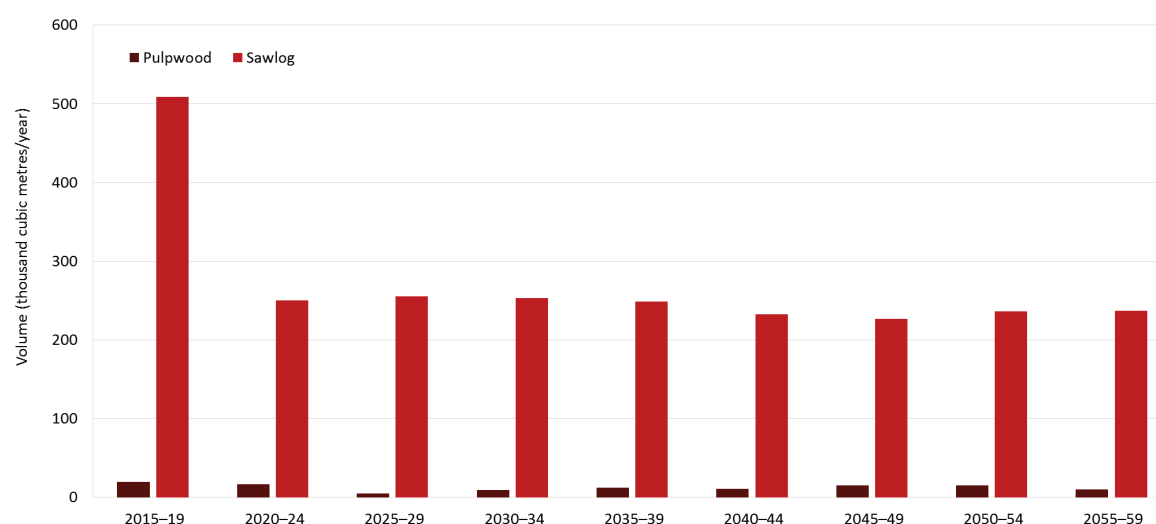


Table 8 Forecast plantation log availability, average per year for each five-year period, Northern Tablelands

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Softwood									
-pulplog	20	17	5	9	12	11	15	15	10
-sawlog	509	250	255	253	249	233	227	236	237
Overall total	529	267	260	262	261	243	242	251	247

Figure 27 Forecast softwood plantation log availability, Northern Tablelands



North Coast

Map 9 North Coast plantation region



The North Coast region in New South Wales extends west from the northern New South Wales coast to the escarpment of the Northern Tablelands and north from near Newcastle to the Queensland border (Map 9). Hardwood plantations are dispersed throughout the region. Softwood plantations tend to be concentrated in larger blocks, mostly north of Grafton. The majority of the hardwood plantations have been planted from 1996–00 onwards (Figure 28).

The main softwood species planted are slash pine (*Pinus elliottii*), Caribbean pine (*P. caribaea*) and hybrids of these species. The main hardwood species are Dunn's white gum (*Eucalyptus dunnii*), blackbutt (*E. pilularis*), flooded gum (*E. grandis*) and *Corymbia* species.

Softwood and hardwood sawlogs and veneer logs are supplied to sawmills and plymills at Grafton, Casino, Lismore, Herons Creek and Wyan. Smaller diameter logs are supplied to pole and girder markets. Woodchips from harvesting and sawmilling residues are exported from the port at Brisbane.

The plantation area in the North Coast region decreased by 6.5 per cent from 2009–10, to a total area of 94 500 hectares. Of the total decrease in plantation area, around 10 000 hectares was Dunn's white gum (hardwood) planted for pulplogs. Around 47 000 hectares of eucalypt (hardwood) plantations are being managed for sawlogs to supplement sawlogs harvested from native forests.

The hardwood pulplog volume is forecast at 520 000 cubic metres a year in the 2015–19 period and forecast to peak at 639 000 cubic metres a year in the 2030–34 period. Hardwood sawlog availability is forecast at 58 000 cubic metres a year in the 2015–19 period and forecast to peak at 149 000 cubic metres a year in the 2055–59 period (Table 9, Figure 29).

The 2016 forecast hardwood sawlog and pulplog volumes are lower than those projected in the 2012 log availability report because the hardwood plantation area decreased and growers and plantation managers revised their log availability yields based on updated information.

The softwood plantation area has decreased slightly to 14 400 hectares since 2009–10. The main softwood species planted is the southern pine hybrid. The forecast softwood sawlog availability for the 2015–19 period is 196 000 cubic metres a year, declining to an average of around 126 000 cubic metres per year from 2020 onwards (Table 9, Figure 30). A small amount of softwood pulplog is forecast for this region.

Plantation owners and managers provided 55 per cent of the forecasts of hardwood plantation log availability and 98 per cent of the forecasts of softwood plantation log availability.

Figure 28 Age class by five-year period, North Coast

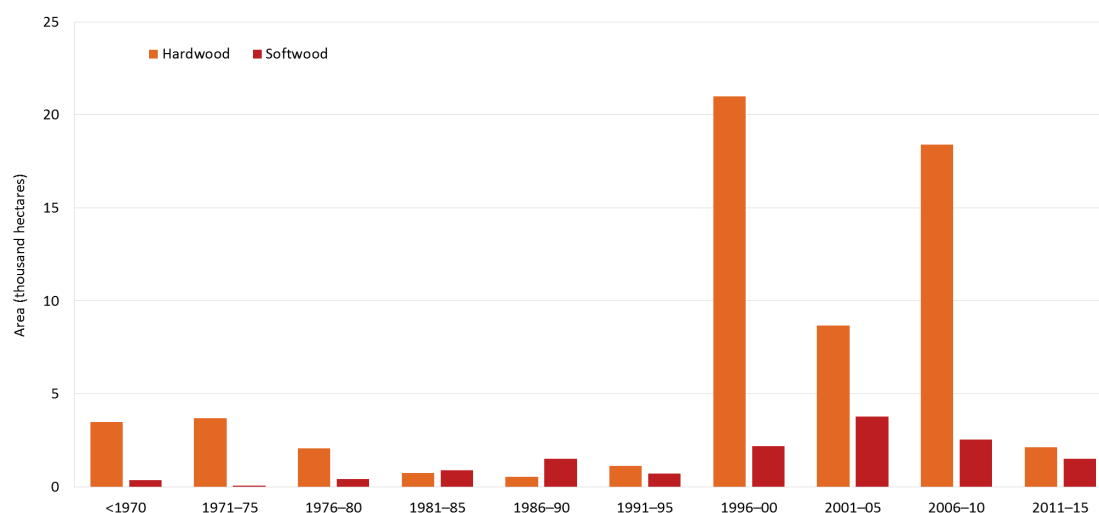


Table 9 Forecast plantation log availability, average per year for each five-year period, North Coast

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	520	481	240	639	108	596	191	213	490
- sawlog	58	53	88	78	79	100	73	103	149
Softwood									
- pulplog	0	0	0	1	2	1	0	0	0
- sawlog	196	123	118	128	143	139	128	109	117
Overall total	774	658	446	846	331	837	391	426	756

Figure 29 Forecast hardwood plantation log availability, North Coast

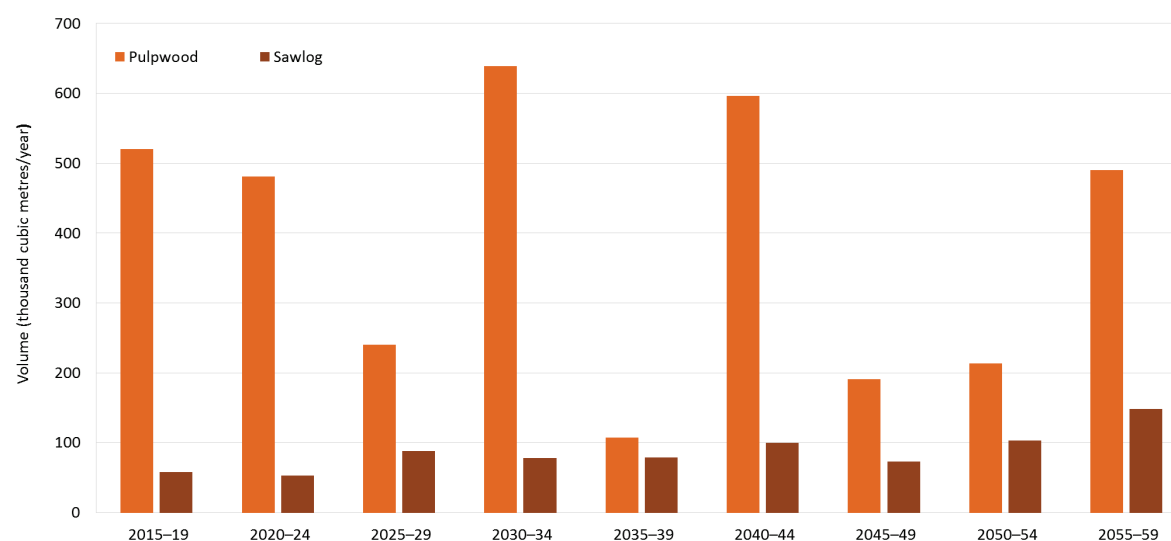
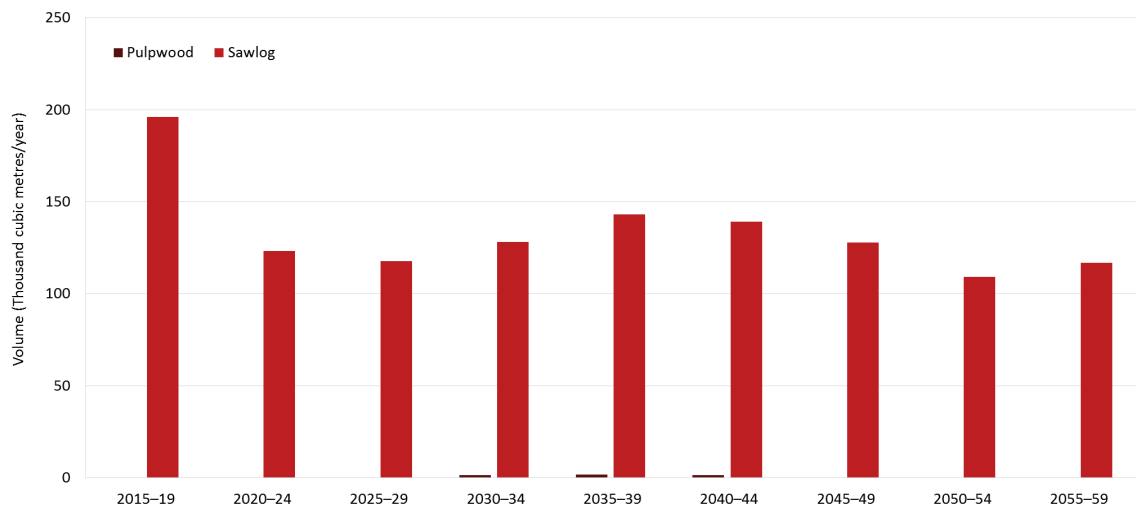
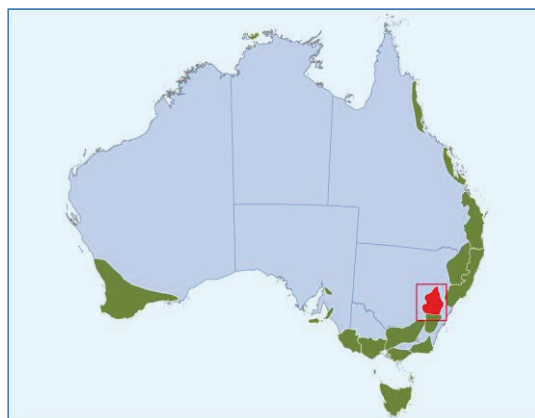


Figure 30 Forecast softwood plantation log availability, North Coast



Central Tablelands

Map 10 Central Tablelands plantation region



The Central Tablelands region in New South Wales is west of the Blue Mountains and stretches south from Wellington, Dunedoo and Mudgee to Boorowa, where it adjoins the Southern Tablelands (Map 10). The softwood plantations are located around Oberon, the Mount Canobolas State Forest (south of Orange), the Mullion Range State Forest (north of Orange) and the Sunny Corner State Forest (between Bathurst and Lithgow). The softwood plantation area has been steadily planted since the 1976–80 planting period, with a peak in the 2006–10 planting period (Figure 31).

Softwood logs are processed in a large sawmill, a particleboard and medium-density fibreboard facility in Oberon, as well as sawmills in Bathurst and Burruga. Softwood sawlogs and pulplogs are exported from Port Botany.

The plantation area in the Central Tablelands region increased by around 7 000 hectares from 2009–10, to around 87 000 hectares in 2014–15 based on improved mapping of plantations. Although the softwood plantation area increased, softwood log availability decreased compared with the 2012 log availability report as expected yields were revised down by growers and managers. These current yield estimates were used to estimate log availability for softwood plantations where yield information was not provided.

The main species planted is radiata pine (*P. radiata*). Softwood sawlog availability is forecast to be around 789 000 cubic metres a year in the 2015–19 period, and to peak in the 2040–44 period at 895 000 cubic metres a year (Table 10, Figure 32). Softwood pulplog availability is forecast to average around 439 000 cubic metres per year over the reporting period.

Plantation owners and managers provided 95 per cent of the forecasts of softwood plantation log availability.

Figure 31 Age class by five-year period, Central Tablelands

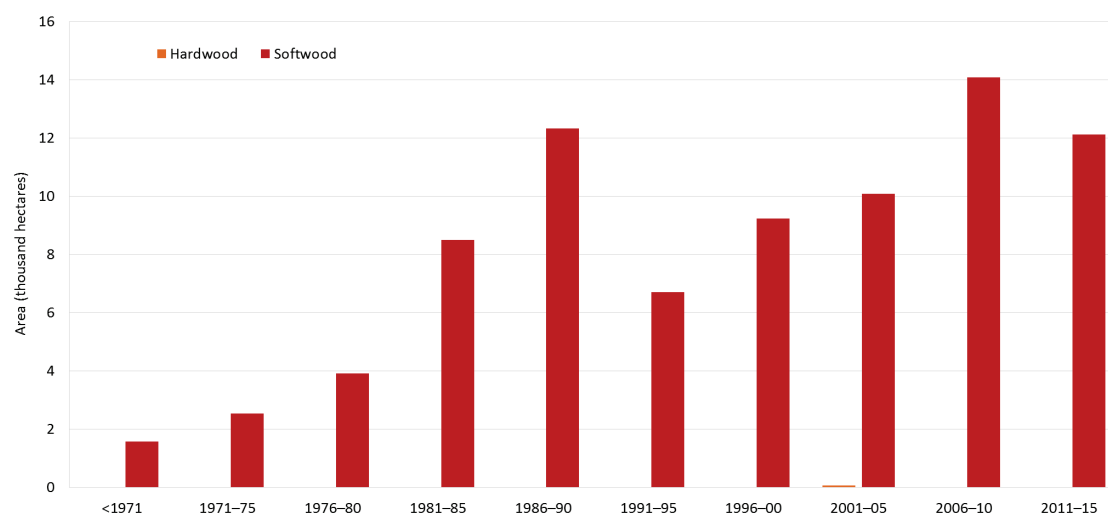
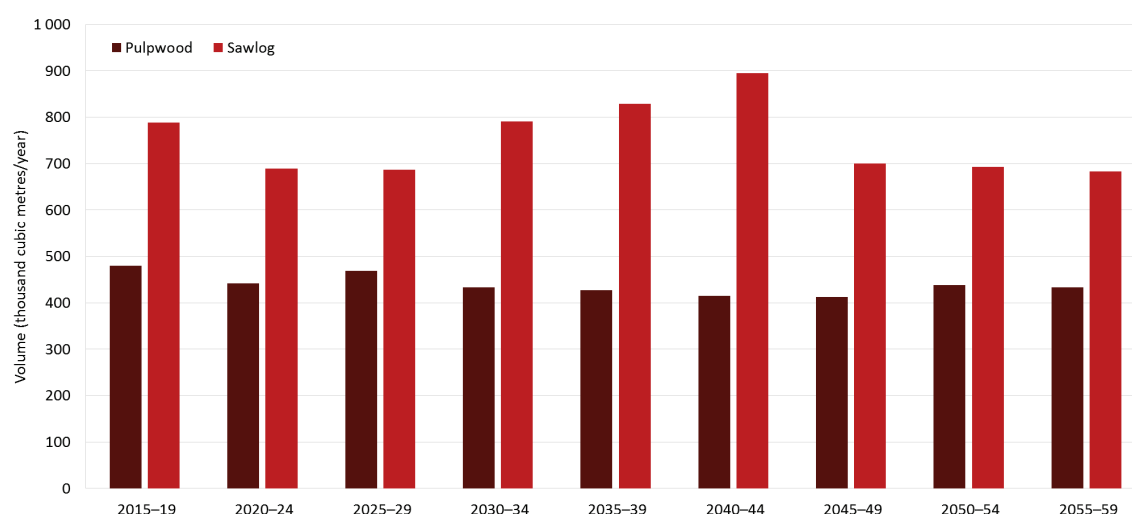


Table 10 Forecast plantation log availability, average per year for each five-year period, Central Tablelands

'000 m³

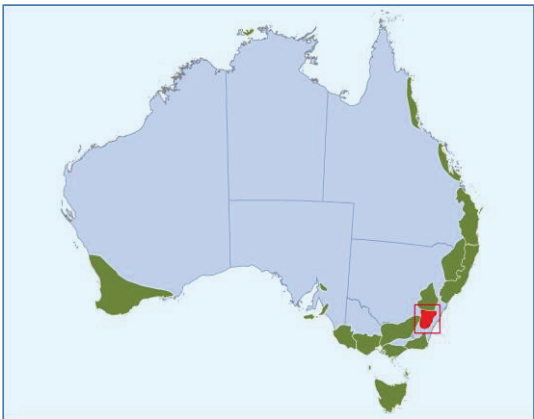
Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Softwood									
-pulplog	479	442	469	433	427	415	412	438	434
-sawlog	789	689	686	791	829	895	700	693	683
Overall total	1 268	1 131	1 155	1 224	1 256	1 309	1 112	1 131	1 116

Figure 32 Forecast softwood plantation log availability, Central Tablelands



Southern Tablelands

Map 11 Southern Tablelands plantation region



The Southern Tablelands region in New South Wales extends from Boorowa to the Moss Vale/Braidwood escarpment and south to include the Australian Capital Territory (Map 11). Softwood logs are processed at sawmills in Canberra, Penrose and Tumut. The softwood plantation area has been relatively stable since the 1971–75 period, with a peak in the 2006–10 period. The hardwood plantations were established from 1991–95 onwards (Figure 33).

The plantation area in the Southern Tablelands region has remained steady at around 22 000 hectares over the past five years. The main species planted is radiata pine (*P. radiata*). The small areas of hardwood plantations in the Southern Tablelands region were established only recently and potential log availability from these plantations will only be a few thousand cubic metres a year and, as a result, no forecasts are presented in this report.

Softwood sawlog availability is forecast to be around 99 000 cubic metres a year in the 2015–19 period and to peak in the 2035–39 period at 255 000 cubic metres a year (Table 11, Figure 34). Softwood pulplog availability is forecast at over 118 000 cubic metres per year for the 2020–24 and 2050–54 periods and is forecast to average around 70 000 cubic metres per year for the other periods.

Plantation owners and managers provided 65 per cent of the log forecasts of softwood plantation log availability.

Figure 33 Age class by five-year period, Southern Tablelands

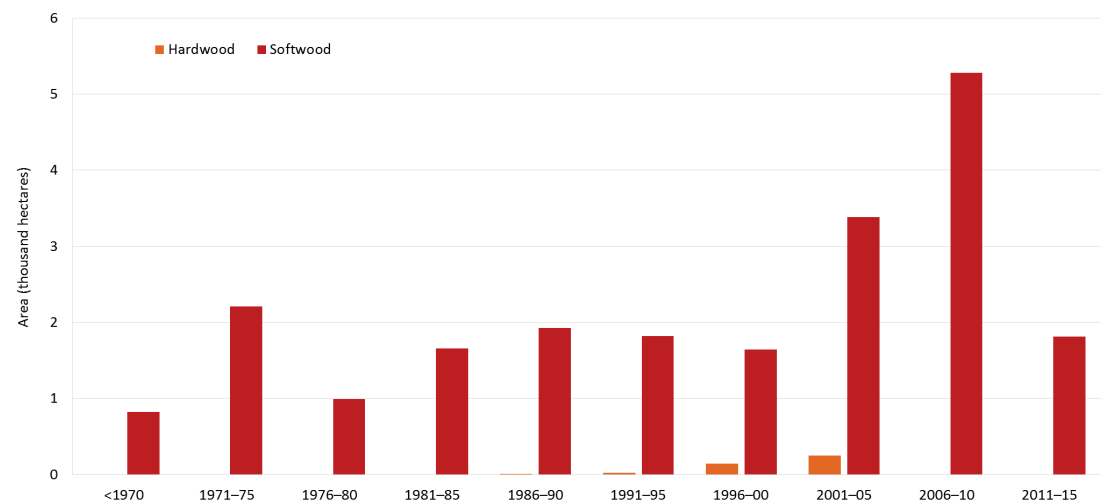
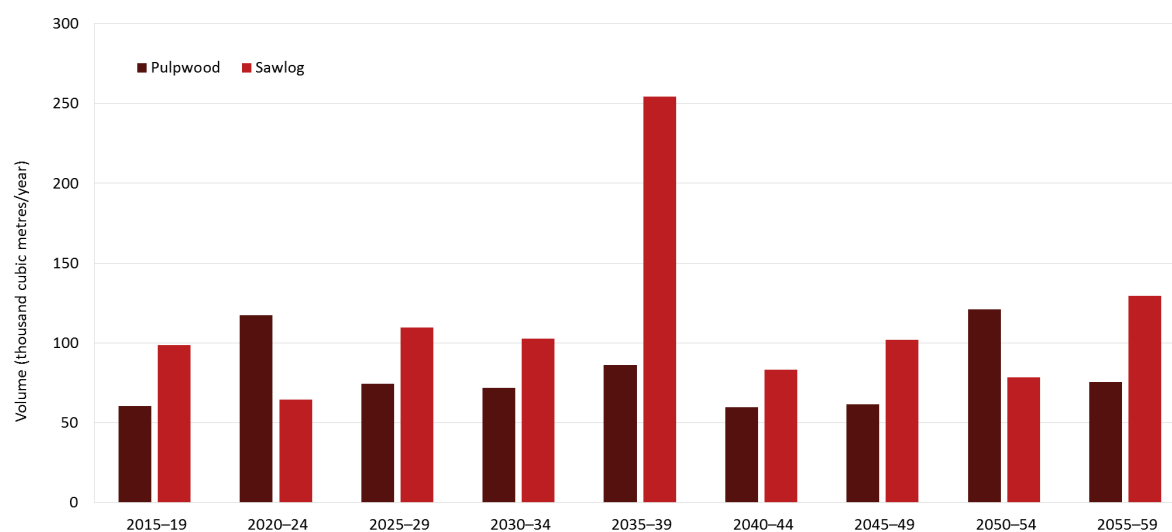


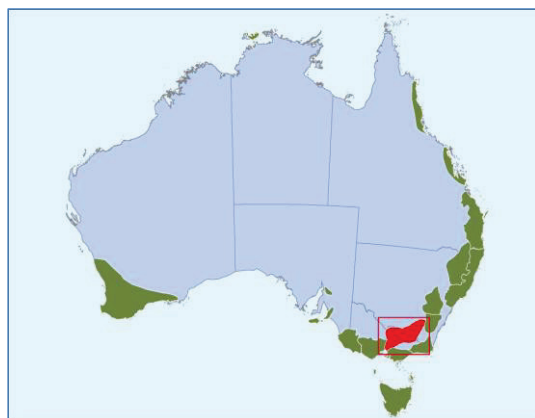
Table 11 Forecast plantation log availability, average per year for each five-year period, Southern Tablelands'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Softwood									
- pulplog	60	118	74	72	86	60	61	121	76
- sawlog	99	64	110	102	255	83	102	78	129
Overall total	159	182	184	174	341	143	163	199	205

Figure 34 Forecast softwood plantation log availability, Southern Tablelands

Murray Valley

Map 12 Murray Valley plantation region



The Murray Valley region stretches from Gundagai to Melbourne (Map 12). Most of the plantations are located in the foothills of the Great Dividing Range; some farm forests are located in the agricultural regions of north-east Victoria and central-western New South Wales. The softwood plantations area has been steadily planted since the 1981–85 period, with a peak in planting in the 2006–10 period. The hardwood plantations were mostly established from 1996–00 onwards (Figure 35).

The Murray Valley plantations supply sawlogs, veneer and pulplogs to industries dispersed throughout the region. Major processing facilities for the logs are located at Tumut, Tumbarumba, Wagga Wagga, Albury, Wangaratta, Myrtleford and Benalla. The main softwood species planted is radiata pine (*P. radiata*) for sawlog production, and the main hardwood species is Tasmanian blue gum (*E. globulus*) primarily grown for pulplogs.

The plantation area in the Murray Valley region increased by 0.5 per cent from 2009–10 to 196 500 hectares in 2014–15, of which 189 000 hectares are softwood plantations and 7 300 hectares are hardwood plantations.

Softwood sawlog availability is forecast at 2.2 million cubic metres a year in the 2015–19 period, peaking in the 2035–39 period at 3.1 million cubic metres a year (Table 12, Figure 37). Softwood pulplog availability is forecast to peak at 1.2 million cubic metres per year in the 2035–39 period (Table 12). The majority of current and forecast log availability for softwood logs in this region will be utilised by existing wood processing infrastructure.

Hardwood pulplog availability is forecast to be 39 000 cubic metres a year in the 2015–19 period and to peak in the 2045–49 period at 71 000 cubic metres a year (Table 12, Figure 36). Hardwood sawlog availability varies from a peak of 34 000 cubic metres per year in the 2020–24 period to less than 1 500 cubic metres per year in the 2055–59 period.

Plantation owners and managers provided 70 per cent of the forecasts of hardwood plantation log availability and 95 per cent of the forecasts of softwood plantation log availability.

Figure 35 Age class by five-year period, Murray Valley

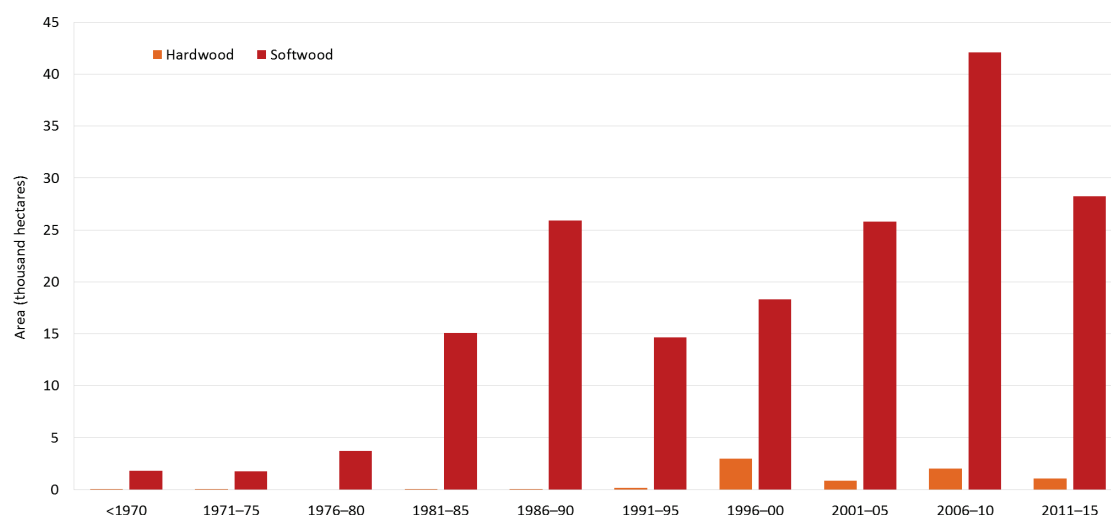


Table 12 Forecast plantation log availability, average per year for each five-year period, Murray Valley

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	39	63	57	61	54	37	71	46	59
- sawlog	5	34	7	2	25	7	15	14	1
Softwood									
- pulplog	1 056	1 133	1 091	965	1 206	1 035	998	1 187	1 159
- sawlog	2 204	1 914	1 955	1 888	3 058	2 461	2 251	2 277	2 385
Overall total	3 304	3 144	3 111	2 916	4 342	3 541	3 334	3 524	3 605

Figure 36 Forecast hardwood plantation log availability, Murray Valley

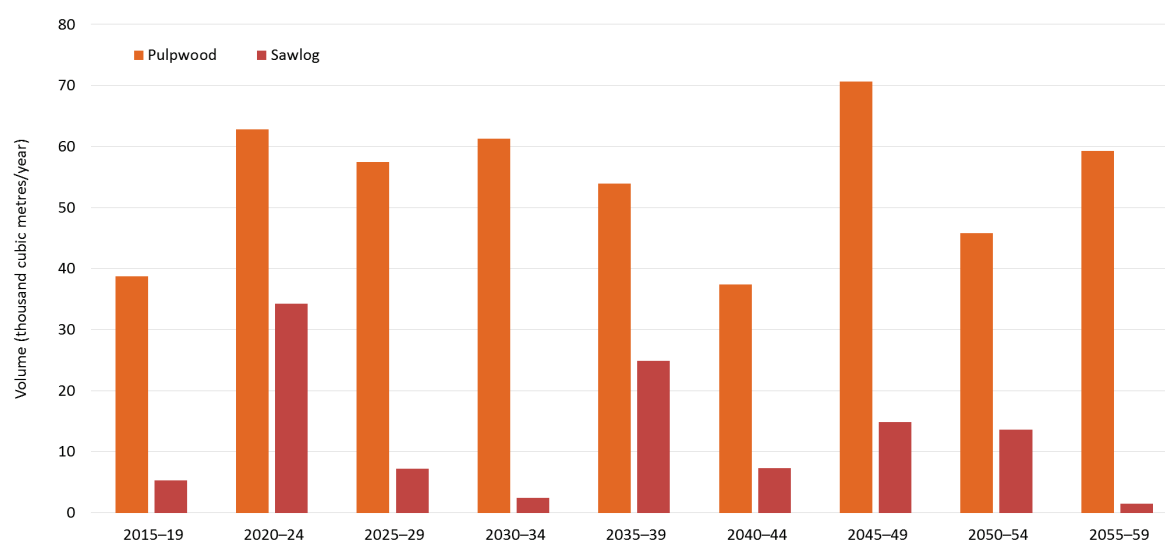
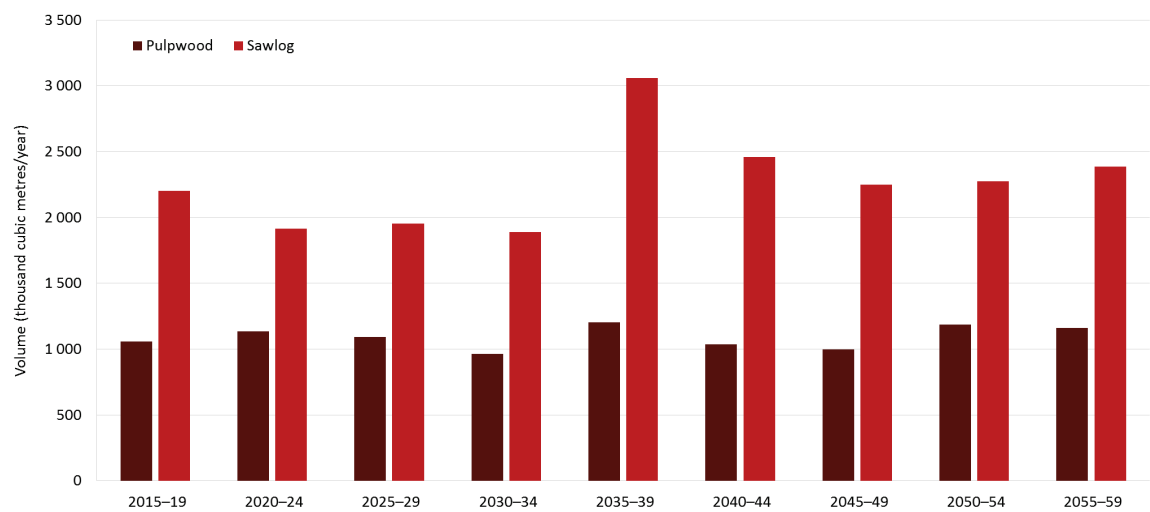
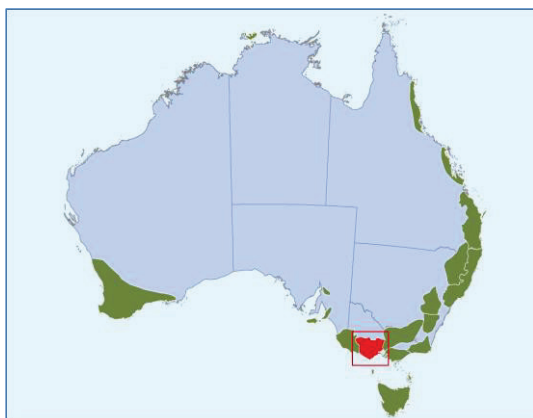


Figure 37 Forecast softwood plantation log availability, Murray Valley



Central Victoria

Map 13 Central Victoria plantation region



The Central Victoria region is located west of Melbourne, stretching north from the Otway Ranges to Castlemaine and to the west of the Grampians (Map 13). Ballarat is located centrally in a large area of softwood plantations. The softwood plantations area has been steadily planted since the 1976–80 period, with a peak in planting in the 2006–10 period. Most of the hardwood plantations were established from 1996–00 onwards (Figure 38).

The plantations supply softwood logs to wood processing industries at Ballarat, Beaufort, Colac and around Geelong. Softwood sawlogs and softwood and hardwood woodchips are exported from the port of Geelong. The main softwood species planted is radiata pine (*P. radiata*), and the main hardwood species is Tasmanian blue gum (*E. globulus*).

The plantation area in the Central Victoria region decreased by around 2 per cent from 2009–10 to 67 800 hectares in 2014–15, of which 37 700 hectares were hardwood plantation and around 30 000 hectares were softwood plantation.

Hardwood pulplog availability is forecast to peak at 416 000 cubic metres a year in the 2015–19 period (Table 13, Figure 39), a decline of 291 000 cubic metres a year from the 2012 log availability report for the same period. The forecast of hardwood sawlog availability is on average around 1 700 cubic metres per year over the reporting period.

Softwood sawlog availability is forecast at 484 000 cubic metres a year in the 2015–19 period and to peak at 534 000 cubic metres a year in the 2045–49 period (Table 13, Figure 40). Softwood pulplog availability is forecast at around 64 000 cubic metres a year for the 2015–19 period and is estimated to remain around that volume up to 2050–54. The forecast softwood pulplog availability has declined on average by 172 000 cubic metres per year over the reporting period compared with the 2012 log availability report, while the forecast of sawlog availability over the same period has remained relatively unchanged from the previous report.

Plantation owners and managers provided 80 per cent of the forecasts of hardwood plantation log availability and 75 per cent of the forecasts of softwood plantation log availability.

Figure 38 Age class by five-year period, Central Victoria

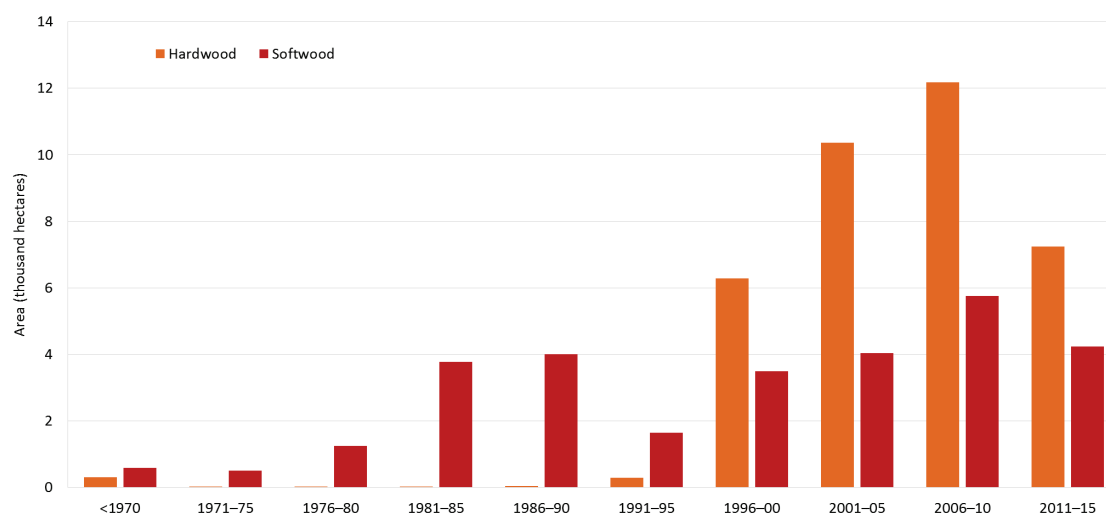


Table 13 Forecast plantation log availability, average per year for each five-year period, Central Victoria

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	416	311	320	279	293	372	283	352	247
- sawlog	0	2	3	4	2	0	0	2	2
Softwood									
- pulplog	64	57	72	71	68	66	63	60	47
- sawlog	484	430	432	471	531	531	534	498	404
Overall total	964	800	827	825	895	969	880	911	699

Figure 39 Forecast hardwood plantation log availability, Central Victoria

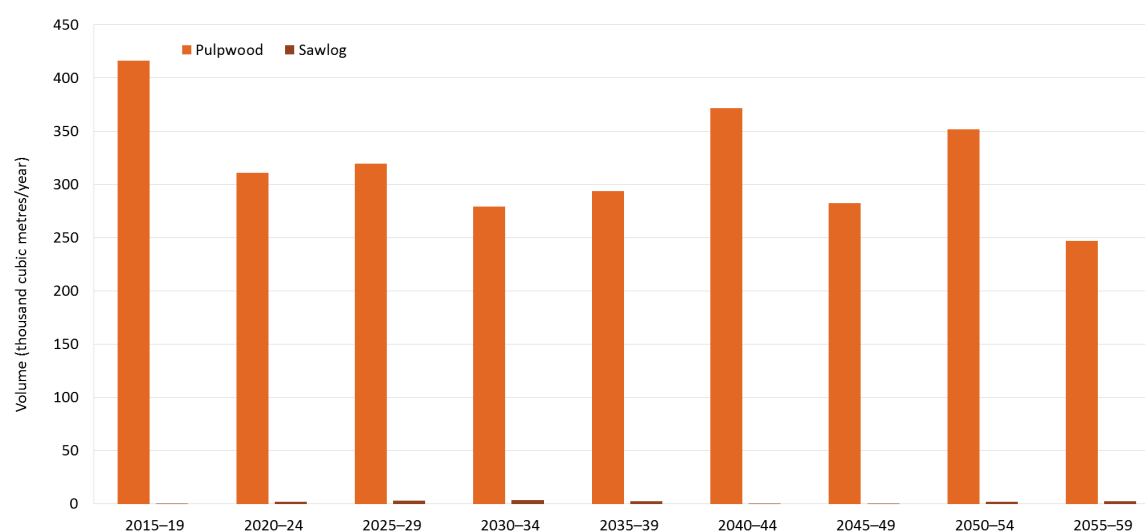
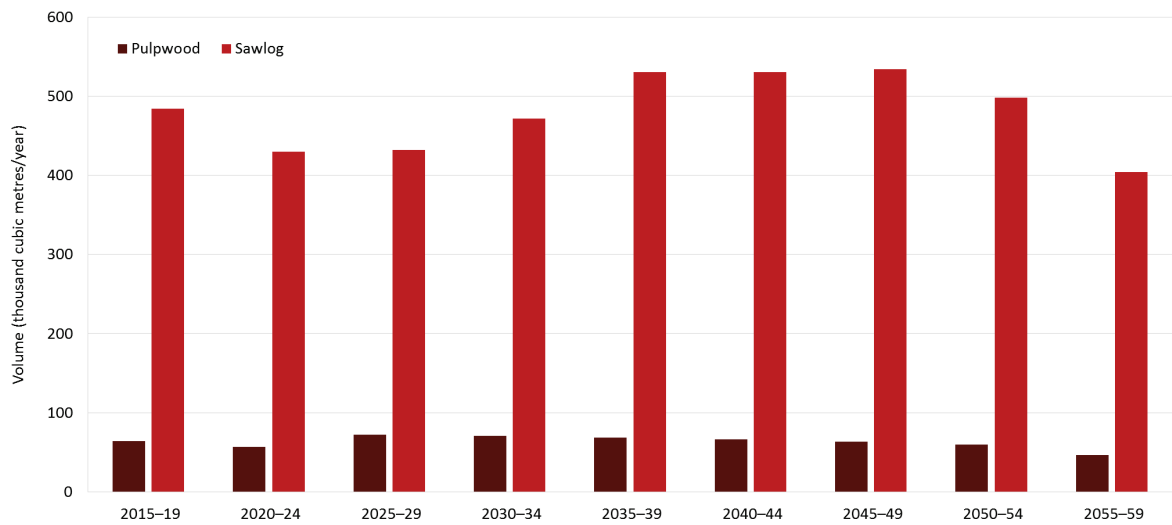
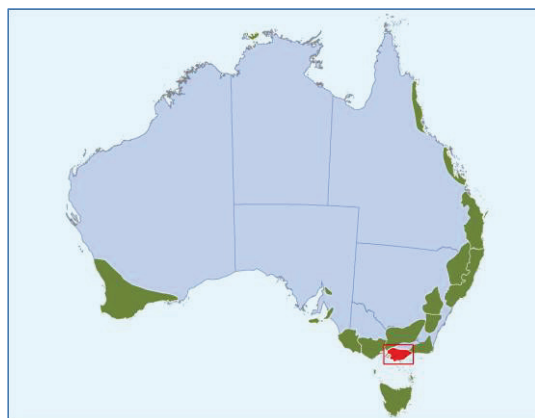


Figure 40 Forecast softwood plantation log availability, Central Victoria



Central Gippsland

Map 14 Central Gippsland plantation region



The Central Gippsland region extends east from Melbourne to Bairnsdale and south to the Great Dividing Range (Map 14). The softwood plantations supply several sawmills, the largest of which are at Morwell and Yarram. The hardwood logs are milled at Morwell and other locations within and outside the region. Figure 44 shows the softwood plantations area has been steadily planted since 1986–90, with a peak of planting in the 2011–15 period. The hardwood plantation planted area peaked in the 2006–10 period (Figure 41). The main softwood species planted is radiata pine (*P. radiata*) and the main hardwood species planted are Tasmanian blue gum (*E. globulus*) and shining gum (*E. nitens*).

The total plantation area decreased by around 4.7 per cent from 2009–10 to 91 700 hectares in 2014–15. The softwood plantation area decreased slightly since 2009–10 by around 1 000 hectares to 61 300 hectares in 2014–15. The hardwood plantation area decreased by 3 400 hectares to 29 800 hectares in 2014–15. Eighty-three per cent of the hardwood plantations are managed for pulplog production and 17 per cent are managed for pulplog and sawlog production.

Hardwood pulplog availability is based on the current plantation estate and is forecast to peak at 498 000 cubic metres a year in the 2015–19 period and to decrease to around 52 000 cubic metres a year in the 2055–59 period. Hardwood sawlog availability is also forecast to decline from a peak of 24 000 cubic metres per year in the 2020–25 period, declining to around 200 cubic metres per year in 2055–59 period (Table 14, Figure 42).

Softwood sawlog availability is forecast to be around 813 000 cubic metres a year in the 2015–19 period and to further increase to over 1 million cubic metres a year from the 2035–39 to 2055–59 periods (Table 14, Figure 43). Softwood pulplog availability is forecast to average around 307 000 cubic metres per year over the reporting period.

Plantation owners and managers provided 94 per cent of the forecasts of hardwood plantation log availability and 96 per cent of the forecasts of softwood plantation log availability.

Figure 41 Age class by five-year period, Central Gippsland

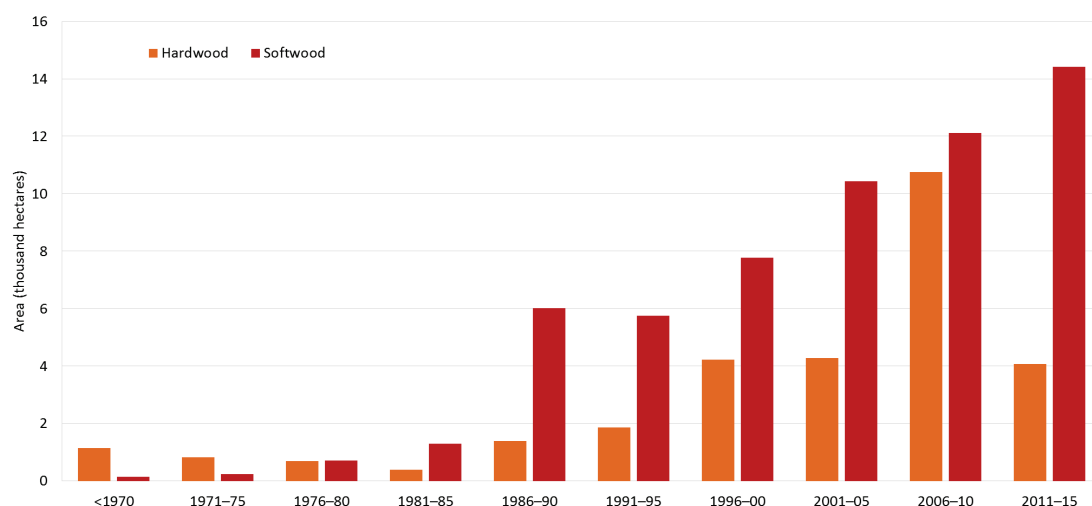


Table 14 Forecast plantation log availability, average per year for each five-year period, Central Gippsland

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	498	403	377	441	315	176	2	135	52
- sawlog	20	24	8	7	8	5	0	6	0
Softwood									
- pulplog	300	305	255	249	298	307	326	351	373
- sawlog	813	749	792	808	1 079	1 074	1 090	1 099	1 154
Overall total	1 631	1 480	1 432	1 506	1 701	1 561	1 419	1 591	1 579

Figure 42 Forecast hardwood plantation log availability, Central Gippsland

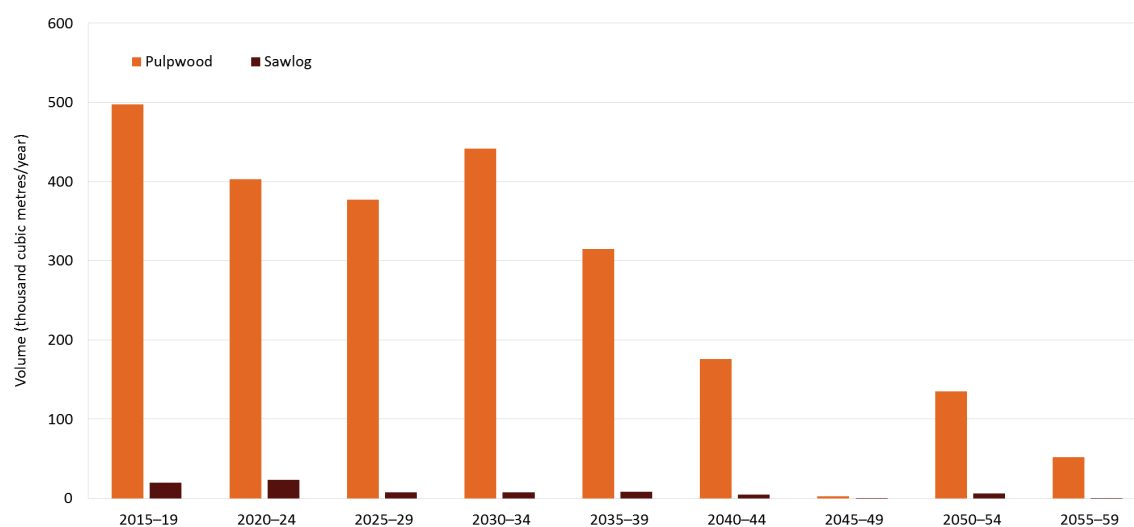
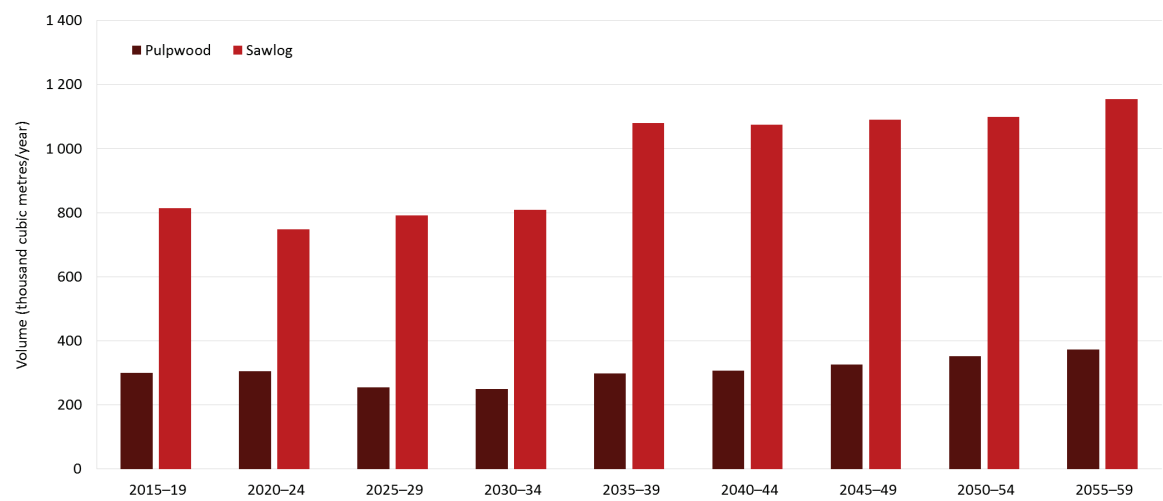
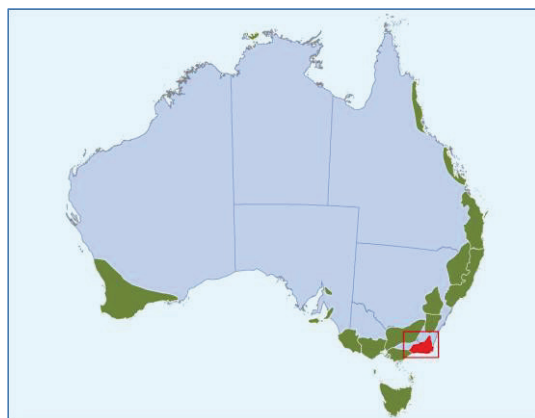


Figure 43 Forecast softwood plantation log availability, Central Gippsland



East Gippsland–Bombala

Map 15 East Gippsland–Bombala plantation region



The East Gippsland–Bombala plantation region is centred near Bombala, near the southern border of New South Wales, and extends to adjacent areas of Victoria's East Gippsland (Map 15). The region includes Eden on the far south coast of New South Wales, from which logs, wood products and woodchips are exported. Wood processing industries are located at Bombala and Eden. The softwood plantations area has been steadily planted since the 1976–80 period, with a peak in planting in the 1981–85 period. Most of the hardwood plantations were established from 1991–95 onwards (Figure 44).

The plantation area in the East Gippsland–Bombala region increased by around 11 per cent from 2009–10 to 2014–15. The softwood plantation area increased slightly to 48 600 hectares in 2014–15, with radiata pine (*P. radiata*) the main species planted.

The hardwood plantation area has increased slightly to 8 700 hectares and the main species planted is shining gum (*E. nitens*). Hardwood pulplog availability is forecast to be around 64 000 cubic metres a year in 2015–19 and to increase to a peak of 129 000 cubic metres a year in the 2035–39 period (Table 15, Figure 45).

The small areas of hardwood plantations managed for sawlog production will amount to only a few thousand cubic metres of sawlogs a year being available and, as a result, no forecasts are presented in this report.

The softwood sawlog volume is forecast to be around 282 000 cubic metres a year in the 2015–19 period, and to peak in the 2030–34 period at 565 000 cubic metres a year (Table 15, Figure 46). Softwood pulplog volumes vary from 259 000 to 408 000 cubic metres a year over the projection period.

Plantation owners and managers provided 74 per cent of the forecasts of hardwood plantation log availability and 99 per cent of the forecasts of softwood plantation log availability.

Figure 44 Age class by five-year period, East Gippsland–Bombala

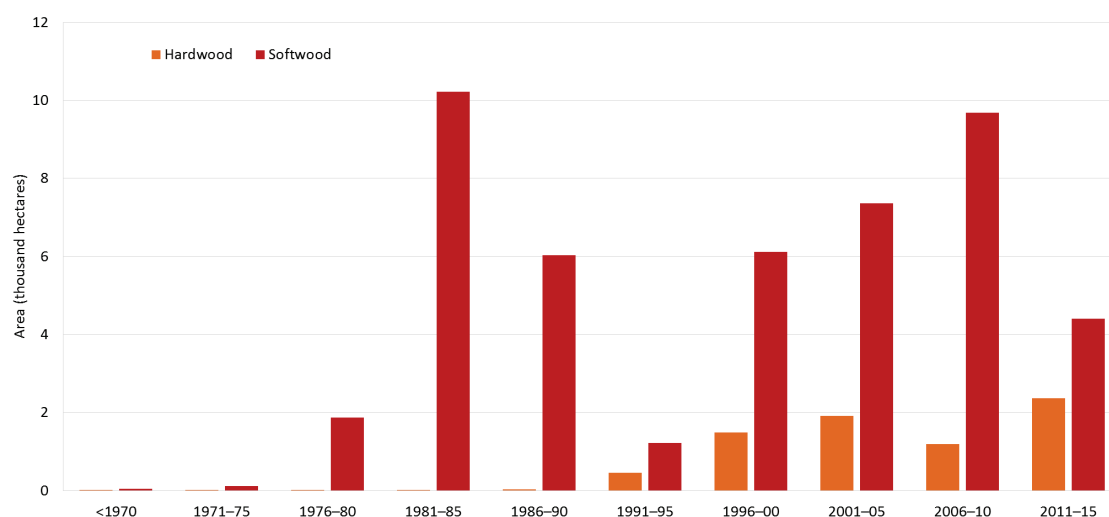


Table 15 Forecast plantation log availability, average per year for each five-year period, East Gippsland–Bombala

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	64	105	81	71	129	62	108	76	101
Softwood									
- pulplog	355	343	259	266	333	323	396	408	375
- sawlog	282	331	334	565	517	286	298	345	491
Overall total	702	783	675	902	979	671	801	833	968

Figure 45 Forecast hardwood plantation log availability, East Gippsland–Bombala

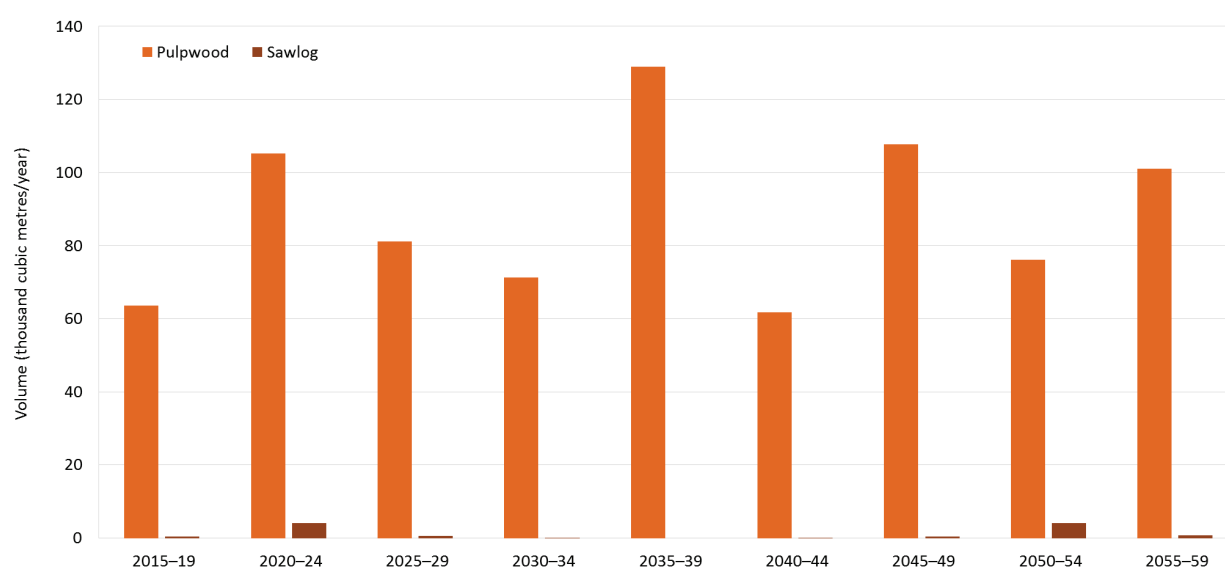
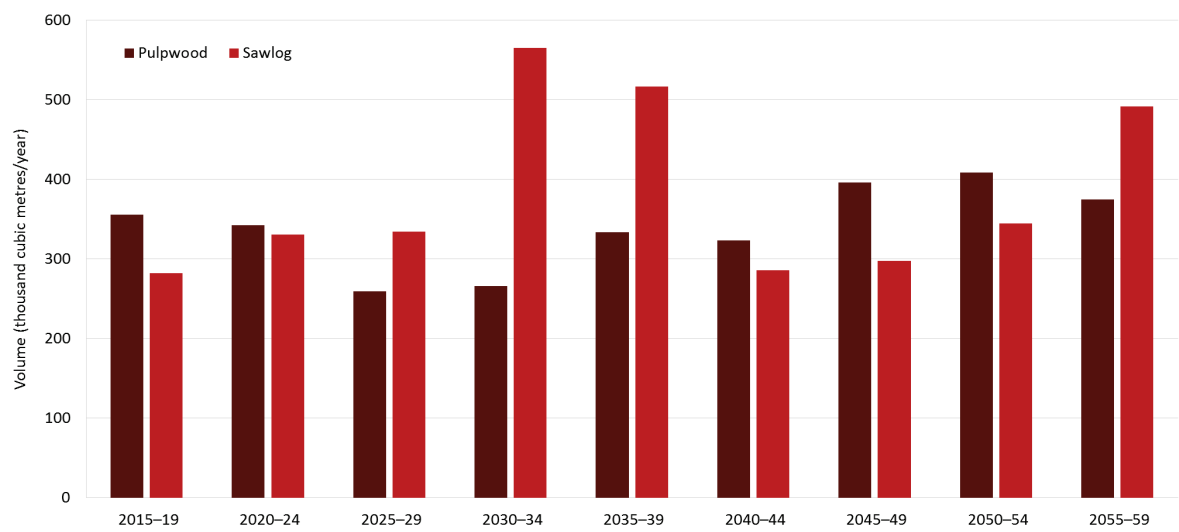
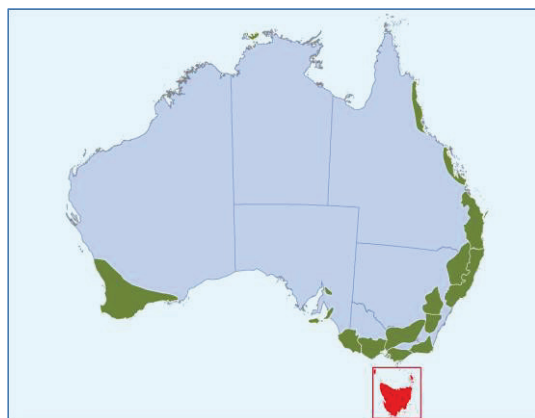


Figure 46 Forecast softwood plantation log availability, East Gippsland–Bombala



Tasmania

Map 16 Tasmania plantation region



The state of Tasmania is considered as one region in this report (Map 16). Tasmania's plantations are concentrated in the north of the state and in the south-east corner inland from Hobart. The softwood plantations area has been steadily planted since the 1991–95 planting period, and most of the hardwood plantations were established from 1996–00 onwards (Figure 47).

The state's softwood plantations supply a pulp mill at Boyer and several sawmills. Most of the hardwood plantations were established to supply the export woodchip market via ports at Burnie and Bell Bay. The main softwood species planted is radiata pine (*P. radiata*), and the main hardwood species are shining gum (*E. nitens*) and Tasmanian blue gum (*E. globulus*).

The total plantation area in Tasmanian remained steady at around 310 000 hectares in 2014–15. The softwood plantation area increased by around 100 hectares from 2009–10 to 75 900 hectares in 2014–15, and the hardwood plantation area decreased by around 1 000 hectares to 234 000 hectares.

Hardwood plantations managed for sawlog production are forecast to have available around 111 000 cubic metres of high-quality and low-quality sawlog over the 2015–19 period and to peak at around 513 000 cubic metres a year over the 2040–44 period. Hardwood plantations managed for sawlog production will supplement the supply of sawlogs from native forests.

The plantation hardwood pulplog availability is forecast to be around 2.7 million cubic metres a year for the 2015–19 period and to peak in the 2025–29 period at around 4.4 million cubic metres a year (Table 16, Figure 48).

The softwood sawlog availability is forecast at around 599 000 cubic metres a year in the 2015–19 period, peaking in the 2035–39 period at around 1 million cubic metres a year. Softwood pulplog availability is forecast to vary from 694 000 cubic metres a year in the 2015–19 period to 546 000 cubic metres a year in the 2055–59 period (Table 16, Figure 49).

Plantation owners and managers provided 86 per cent of the forecasts of hardwood plantation log availability and 87 per cent of the forecasts of softwood plantation log availability.

Figure 47 Age class by five-year period, Tasmania

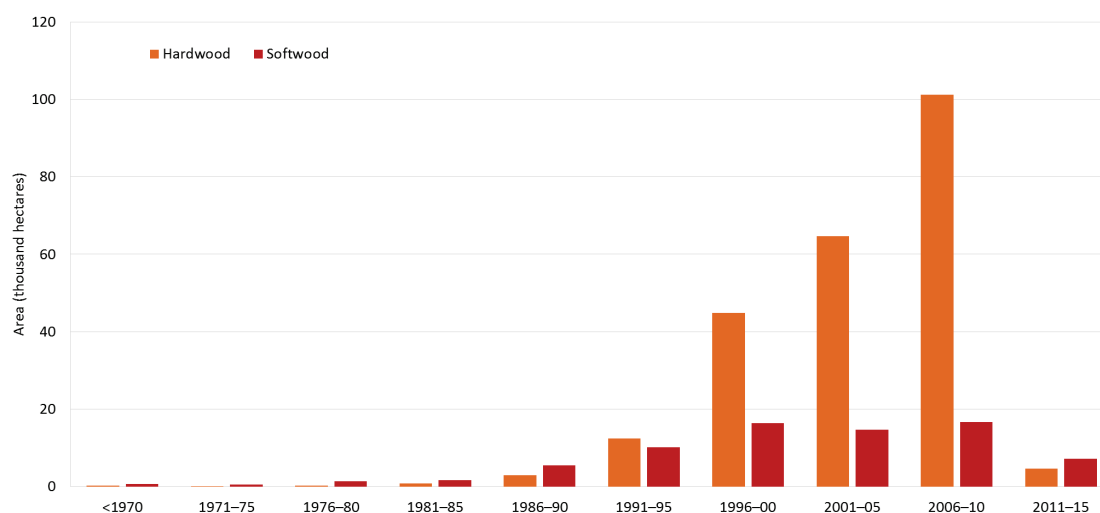


Table 16 Forecast plantation log availability, average per year for each five-year period, Tasmania

'000 m³

Category	2015–19	2020–24	2025–29	2030–34	2035–39	2040–44	2045–49	2050–54	2055–59
Hardwood									
- pulplog	2 668	3 106	4 357	2 335	2 808	4 287	2 002	2 261	2 648
- sawlog	111	117	370	449	429	513	480	480	474
Softwood									
- pulplog	694	647	590	597	640	572	649	614	546
- sawlog	599	580	651	681	1023	623	625	595	625
Overall total	4 072	4 450	5 968	4 062	4 900	5 995	3 756	3 949	4 293

Figure 48 Forecast hardwood plantation log availability, Tasmania

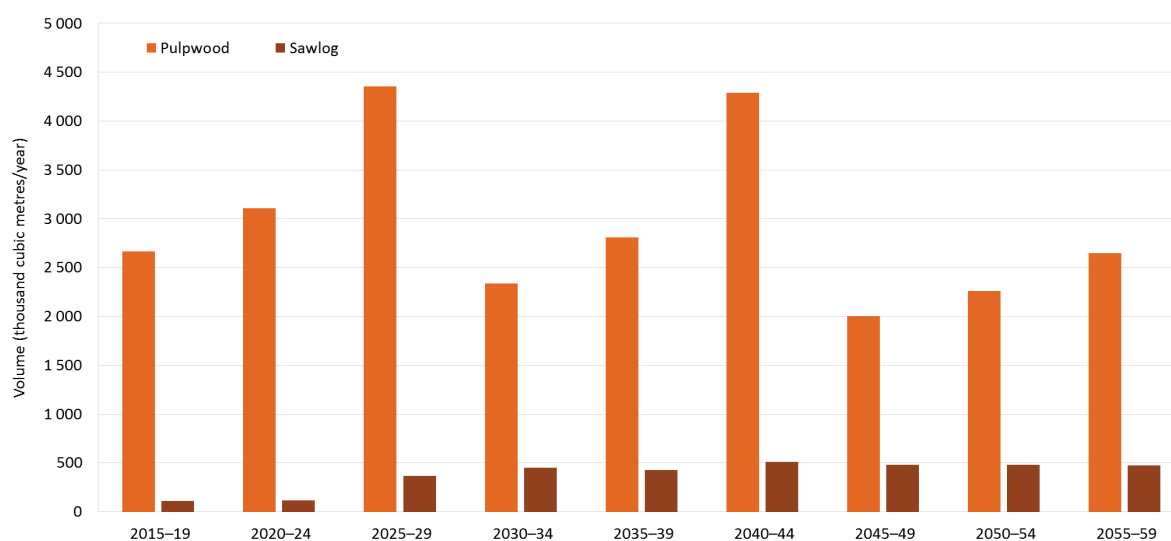
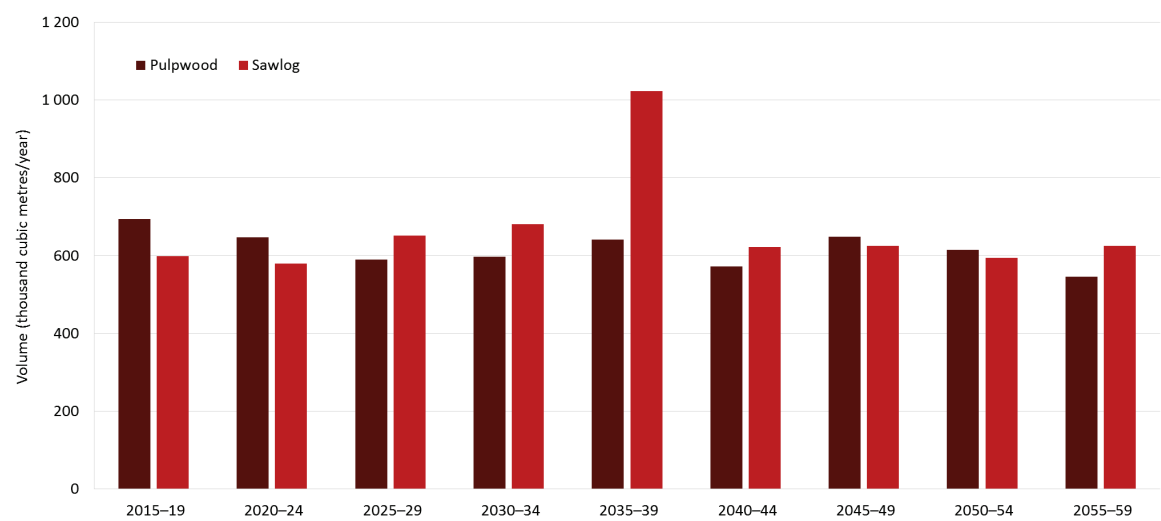


Figure 49 Forecast softwood plantation log availability, Tasmania



3 Sources and assumptions

Around 85 per cent of the forecasts in this report were derived directly from data provided by the owners and managers of large plantation estates. Where plantation owners and managers did not provide log availability forecasts, the estimates are based on yield models that were revised in 2016. More than 70 yield tables were provided by growers and managers as part of the 2016 plantation survey.

Plantation log availability forecasts were compiled and summarised from a series of surveys completed by plantation owners and managers, which were provided to ABARES under confidentiality agreements. The survey comprised two sections: one for owners or managers to complete if they could provide log availability forecasts for each species over the forecast period; and the other for owners or managers who could not provide log availability forecasts but were able to provide management objectives, planting year, species, mean annual increment, site index and National Plantation Inventory (NPI) region. This information was used by ABARES to model log availability forecasts.

Discrepancies and anomalies were clarified with the owner or manager. Where data provided by plantation owners or managers were incomplete for later periods, either the NPI yield model was used to extrapolate for the remaining yield based on the supplied age class distribution, or a three-year moving average was used to estimate future log availability.

The forecasts are based on the assumption that harvested areas will usually be replanted with the same type of plantation species. Log availability forecasts take into account the area of plantations by year of establishment as well as the assumed production period and growth rate for a given type of plantation. The areas planted in each five-year period are shown in graphs accompanying the regional forecasts. Variations in the area planted from year to year lead to peaks and troughs in forecast log availability. Market demand and supply will influence the actual volumes that are harvested at a particular time, and plantation managers will adjust silviculture, scheduling and operational management accordingly to meet market demand.

Some plantation owners and managers provided smoothed forecasts. For the modelled forecasts, ABARES did not undertake smoothing. In most cases the forecasts developed by the NPI reflect current plantation age and the associated growth rates.

Softwood plantations in Australia are managed primarily to produce sawlogs and veneer logs. Pulplog, posts, poles and low-quality sawlogs are harvested from thinning operations that aim to remove suppressed and poorly formed trees and provide more space for the remaining trees. Hardwood plantations are managed primarily for pulplog production, with a small proportion managed for sawlog and veneer log production. Sawlog estimates include peeler logs, high-grade and low-grade sawlogs and posts and poles.

Hardwood plantations must be thinned and pruned and grown for longer periods if they are to produce substantial volumes of sawlogs. The forecasts in this report assume that such thinning and pruning will be undertaken at an optimal level. If this does not happen, future sawlog yields will be substantially lower than forecast. Hardwood plantations managed for sawlog production may also produce some pulplog from thinning, defective stems and unpruned upper sections of stems. This pulplog is included in the forecasts.

Potential changes in the productivity of future rotations have not been considered in the ABARES forecasts produced by the NPI. Productivity will be increased by ongoing tree breeding and the introduction of improved silvicultural techniques, and it may be reduced by factors such as increased pest damage, reduced water availability and climate change.

These limitations apply to all forecasts in this report.

- Volumes given for sawlogs include logs suitable for veneer and plywood manufacture. It was not feasible to provide forecasts for individual sawlog quality classes because sawlog quality varies widely.
- Volumes shown for pulplog include logs suitable for pulp, paper, particleboard, fibreboard and other reconstituted fibre products. Pulplog volumes do not account for sawmilling and other residues that are used for woodchips, pulp, paper, particleboard and other reconstituted fibre products.
- The volumes shown are gross harvestable volumes and do not take into account any losses during harvesting.
- Future pest, disease, fire and cyclone damage to plantations are not incorporated into the forecast log availability figures.

Appendix A: Regional yield tables

Table A1 Regional yields

Category	Clear-fall	Sawlog yield	Pulplog yield	Third thinning age	Sawlog yield	Pulplog yield	Second thinning age	Sawlog yield	Pulplog yield	First thinning age	Sawlog yield	Pulplog yield	Mean annual increment
	Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare		cubic metres per hectare per year
Western Australia													
Eucalypt sawlog	25	150	170	0	0	0	15	0	100	9	0	80	20
Eucalypt pulplog	12	0	204	0	0	0	0	0	0	0	0	0	17
Pinus radiata	30	270	50	24	60	40	18	60	40	12	0	80	20
P. pinaster	40	110	60	35	90	20	25	40	20	18	0	90	11
Northern Territory													
Acacia mangium	8	0	250	0	0	0	0	0	0	0	0	0	31
Mahogany	20	137	0	0	0	0	0	0	0	13	173	0	16
P. caribaea	30	270	30	0	0	0	0	0	0	18	35	35	12
Mt Lofty Ranges and Kangaroo Island													
Eucalypt sawlog	25	150	170	0	0	0	15	0	100	9	0	80	20
Eucalypt pulplog	12	0	204	0	0	0	0	0	0	0	0	0	17
P. radiata	30	350	20	23	55	25	18	15	50	13	0	110	21
Green Triangle													
Eucalypt pulplog	12	0	204	0	0	0	0	0	0	0	0	0	17
P. radiata	30	350	20	23	55	25	18	15	50	13	0	110	21
North Queensland													
Hardwood sawlog	45	340	40	0	0	0	35	170	40	20	50	190	18
Hardwood pulplog	12	0	216	0	0	0	0	0	0	0	0	0	18
Hoop pine	50	600	0	0	0	0	0	0	0	25	70	0	13
Eucalypt pulplog	20	140	0	0	0	0	14	70	0	9	70	0	14
Southern pines	30	270	30	0	0	0	0	0	0	18	35	35	12
South East Queensland and North Coast													
Eucalypt pulplog	12	0	216	0	0	0	0	0	0	0	0	0	18
Eucalypt sawlog	45	340	40	0	0	0	0	170	40	20	50	190	18
Eucalypt sawlog	34	350	10	0	0	0	0	30	30	14	20	85	13
Araucaria spp.	50	600	0	0	0	0	0	0	0	25	70	0	15

Category	Clear-fall	Sawlog yield	Pulplog yield	Third thinning age	Sawlog yield	Pulplog yield	Second thinning age	Sawlog yield	Pulplog yield	First thinning age	Sawlog yield	Pulplog yield	Mean annual increment
	Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare	cubic metres per hectare per year	
Southern pines	30	270	20	0	0	0	0	100	20	14	5	40	18
Northern Tablelands													
Eucalypt pulplog	14	0	224	0	0	0	0	0	0	0	0	0	16
P. radiata	30	300	70	0	0	0	0	0	0	18	40	70	16
P. radiata-un-thinned	30	137	168	0	0	0	0	0	0	0	0	0	10
Central Tablelands													
Eucalypt sawlog	45	300	40	0	0	0	35	100	40	20	0	170	14
Eucalypt pulplog	14	0	224	0	0	0	0	0	0	0	0	0	16
P. radiata	30	300	70	0	0	0	0	0	0	18	40	70	16
P. radiata-unthinned	30	137	168	0	0	0	0	0	0	0	0	0	10
Southern Tablelands													
Eucalypt sawlog	45	300	40	0	0	0	35	100	40	20	0	170	14
P. radiata	30	220	30	0	0	0	24	70	40	16	0	110	16
Murray Valley													
Eucalypt sawlog	27	140	160	0	0	0	16	0	100	10	0	80	18
Eucalypt pulplog	13	0	203	0	0	0	0	0	0	0	0	0	16
P. radiata	30	380	30	0	0	0	21	60	60	14	0	100	21
P. radiata-unthinned	30	180	220	0	0	0	0	0	0	0	0	0	13
Central Victoria													
Eucalypt pulplog	12	0	210	0	0	0	0	0	0	0	0	0	18
Eucalypt sawlog	27	140	160	0	0	0	16	0	100	10	0	80	18
P. radiata	30	300	30	0	0	0	21	50	60	14	0	100	18
Central Gippsland													
Eucalypt sawlog	40	200	450	0	0	0	0	0	0	20	0	150	20
Eucalypt pulplog	12	0	216	0	0	0	0	0	0	0	0	0	18
P. radiata	30	240	170	0	0	0	20	0	110	15	0	80	20
East Gippsland–Bombala													
Eucalypt sawlog	27	112	128	0	0	0	16	0	80	10	0	64	14
Eucalypt pulplog	12	0	228	0	0	0	0	0	0	0	0	0	19
P. radiata	30	220	30	0	0	0	24	70	40	16	0	110	16

Category	Clear-fall	Sawlog yield	Pulplog yield	Third thinning age	Sawlog yield	Pulplog yield	Second thinning age	Sawlog yield	Pulplog yield	First thinning age	Sawlog yield	Pulplog yield	Mean annual increment
	Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare		Years	cubic metres per hectare		cubic metres per hectare per year
Tasmania													
Eucalypt pulplog	10	0	250	0	0	0	0	0	0	0	0	0	25
Eucalypt sawlog	25	150	170	0	0	0	15	0	100	9	0	80	20
E. nitens	15	0	220	0	0	0	0	0	0	0	0	0	15
P. radiata	30	320	40	0	0	0	17	40	80	12	0	100	19

Glossary

Term	Definition
African mahogany (<i>Khaya senegalensis</i>)	A tall hardwood tree from Africa that has shown promise for sawn timber production in northern Australia
Araucaria	A genus of large softwood trees, two species of which— <i>Araucaria cunninghamii</i> (hoop pine) and <i>A. bidwillii</i> (bunya pine)—are native to Australia. <i>A. cunninghamii</i> is the only native softwood tree used extensively in plantations in Australia
Blue gum (<i>Eucalyptus globulus subsp. globulus</i>)	A species of eucalypt native to Tasmania and parts of southern Victoria. One of the hardwood species preferred for the production of wood fibre for paper manufacture in regions with a temperate climate. Also known as Tasmanian blue gum
Caribbean pine (<i>Pinus caribaea</i>)	See 'Southern pines'
Flooded gum (<i>Eucalyptus grandis</i>)	A species of eucalypt native to coastal New South Wales and Queensland and widely planted in sub-tropical regions for pulplog and sawlog production. Also known as rose gum
Green Triangle	The name given in the plantation timber industry to the region straddling the border between the south-eastern corner of South Australia and the south-western corner of Victoria
Hardwood	Timber from flowering trees, such as eucalypts, irrespective of the physical hardness of the timber; also used to refer to the trees that have such timber
Hybrid southern pines	See 'Southern pines'
Mangium (<i>Acacia mangium</i>)	A medium-sized hardwood tree native to Queensland and Papua New Guinea, grown in tropical regions for pulplog. Also known as brown salwood
Maritime pine (<i>Pinus pinaster</i>)	A softwood tree species introduced to Australia from southern Europe and planted for sawlog production in lower-rainfall, temperate climates not suitable for radiata pine
Plantation	An intensively managed stand of trees of native or exotic (that is introduced) species established by the regular placement of seedlings or seeds, usually to produce timber. The NPI currently does not collect data on plantations established primarily to produce eucalyptus oil, sandalwood oil, bioenergy, carbon or other non-timber products or services
Pulplog	Logs used to manufacture fibreboard, particleboard, paper products, and small-diameter logs used for posts and poles
Radiata pine (<i>Pinus radiata</i>)	A softwood tree species introduced to Australia from California. Widely held to be the most productive plantation species in medium to higher rainfall temperate climatic regions in southern Australia
Rotation	In silviculture, the planned growing period of a tree crop. Short rotations, typically of 10–15 years, are used for pulplog production. Rotations of 20–30 years or more are typically required to produce sawlogs. A second (or subsequent) rotation is the second (or subsequent) generation of planted trees on a site
Sawlogs	Logs used in the manufacture of veneer, plywood and sawn timber

Term	Definition
Shining gum (<i>Eucalyptus nitens</i>)	A eucalypt species native to eastern Victoria and New South Wales. One of the hardwood species preferred for the production of wood fibre for paper manufacture
Silviculture	The science and technology of managing forest establishment, composition and growth
Slash pine (<i>Pinus elliottii</i>)	See 'Southern pines'
Softwood	Timber from cone-bearing trees, such as pines, irrespective of the physical softness of the timber; also used to refer to the trees that have such timber
Smoothing	Adjusting wood availability to achieve a more practicable pattern of supply over time
Southern pines	Softwood species introduced from southern North America and the Caribbean. Species include Caribbean pine (<i>Pinus caribaea</i>) and slash pine (<i>P. elliottii</i>) and several varieties of these. A hybrid between southern pine varieties is now the preferred softwood plantation species in sub-tropical and tropical regions of Australia
Teak (<i>Tectona grandis</i>)	A hardwood species originating in tropical areas of Asia and planted widely in Indonesia, India and other countries to produce cabinet and furniture timber