4 Timber production and the timber industry

4.1 FOREST TYPES, EXTENT AND MERCHANTABILITY

Two major tall forest formations are recognised for timber production within the south-west. These are the dry sclerophyll jarrah (*E. marginata*) and wet sclerophyll karri (*E. diversicolor*) forests. Several commercially-important timber species occur in mixture within these forest formations, including marri (*Corymbia calophylla*)—which occurs throughout each—wandoo (*E. wandoo*), Western Australian blackbutt (*E. patens*) and Western Australian sheoak (*Allocasuarina fraseriana*). Minor quantities of powderbark wandoo (*E. accedens*), bullich (*E. megacarpa*) and yellow tingle (*E. guilfoylei*) have also been harvested from State forests.

Of the total area of approximately 2.45 million hectares of public native forest managed by CALM, timber harvesting is permitted only on a portion of the multiple-use forests within State forest and timber reserves. The net area of each forest type in which timber harvesting is permitted is calculated by deducting from the total area of each forest type those areas within formal and informal reserves.

Under the current forest management plan (CALM 1994) the net area available for harvest is shown in Table 4.1. The legislative and policy basis for timber production planning is detailed in Chapter 3.

Table 4.1 Area of different forest types available for harvest

Forest type	Area
Jarrah/marri	1 111 000 hectares
Wandoo	50 000 hectares
Karri/ marri	94 000 hectares

A range of log grades is produced with size and quality specifications differing between grades and species depending on the major end use processing (CALM 1996). The hardwood industry is undergoing a major shift from producing structural grades to decorative grades and secondary processing which in turn changes the log grade requirements and specifications.

Log processing is primarily divided into solid wood processing and residue processing.

Solid wood processing

Western Australia's hardwood species are suitable for a range of solid wood products which includes veneers, furniture, panelling, mouldings, flooring, joinery, plywood, laminated veneer lumber, other laminated products and structural grades. Lower grade material from local hardwood species is suitable for uses such as lower specification structural timber and sleepers. Round timbers are also sold as building poles, transmission poles, bridge and jetty timbers and fencing.

Residue wood processing

Mill residues and forest residues suitable for a range of products are produced from harvesting and processing solid wood. These residue materials are suitable for pulp and paper, reconstituted wood panels such as particleboard and MDF, charcoal, activated carbon and firewood.

The proportion that each log grade comprises of the total annual harvest is discussed further in the following section.

4.2 SUSTAINABLE YIELD FOR THE JARRAH AND KARRI FORESTS

Approach

The level of sustainable yield has been determined by setting forest structural goals and ensuring that the annual harvest level does not exceed the gross bole increment of the species (CALM 1994). Because definitions of what constitutes a sawlog will change over time as milling technology and other factors change, the gross bole volume (GBV) is used to provide an estimate of the maximum resource available over time. The supply of logs of current sawlog specifications is then analysed. Chiplogs and residue logs are generated as a consequence of the sawlog harvesting and essential silvicultural operations such as thinning.

The potential to increase wood yields through the application of silvicultural research on stand density, nutrition and spacing practices has been recognised for a number of decades. The historical development of silvicultural practices in the jarrah and karri forests is documented in Stoneman et al. (1989) and Christensen (1992) respectively. Silvicultural practices have been progressively adapted and their impact on timber yield has been incorporated in the regular revisions of the calculation of sustainable yield. Consequently, the sustainable yield levels adopted in the current management plan incorporate many of the economically-viable resource enhancement practices. There is therefore limited capacity to increase forest productivity beyond the projected yield levels.

Level of harvest

The annual sustainable timber resource to be made available for allocation during the period 1 January 1994 to 31 December 2003 was determined by the Minister for the Environment on 16 August 1993 (Minson 1993). This is summarised in Table 4.2.

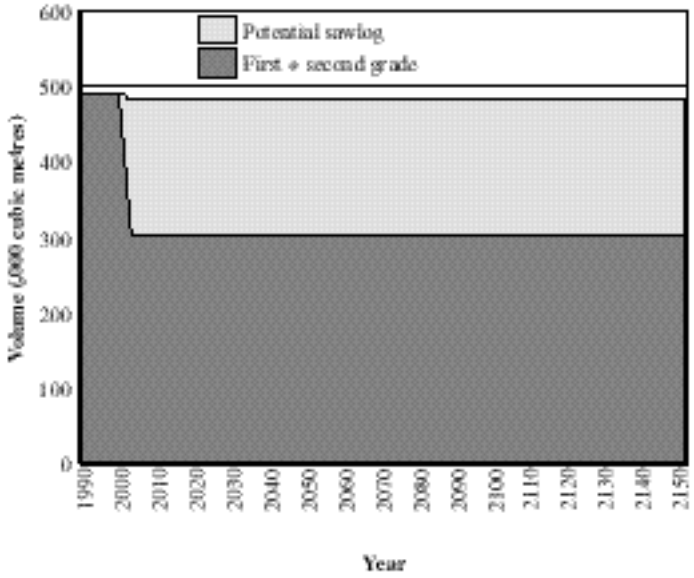
Table 4.2 Annual timber allocation available, January 1994-December 2003

Species	Sustainable yield Gross bole volume m^3/annum	Log product yields (current specifications) m^3/annum		
		First grade sawlogs	First and second grade sawlogs	Other logs
Jarrah	1 360 000		490 000	870 000
Karri	417 000	214 000		203 000
Marri	559 000			

Note: Forest residue material (derived from branchwood and dead trees) may be harvested in addition to gross bole volume.

Figure 4.1 shows the long-term wood flow of grade 1 and 2 jarrah sawlogs associated with the annual sustainable GBV of 1.36 million cubic metres. The long-term non-declining level of sawlog supply based on current specifications, harvesting practices and conversion technologies is approximately 300 000m^3 per annum. However, with the future adoption of whole tree bole logging methods and the further refinement of sawing technologies to enable lower grade logs to be sawn, it is anticipated that the sustainable supply of sawlogs could range between 410 000 and 480 000m^3 per annum.

Figure 4.1 Sustained jarrah sawlog supply (developed for 1994 Forest Management Plan)



This jarrah yield strategy incorporates a number of key assumptions, including:

- adjustment of stand yields to accommodate the effects of disease or degradation;
- commercial and non-commercial thinnings were scheduled for regrowth jarrah stands; and
- a nominal 150 to 200 year rotation length.

Figure 4.2 Sustained karri sawlog supply (developed for 1994 Forest Management Plan)

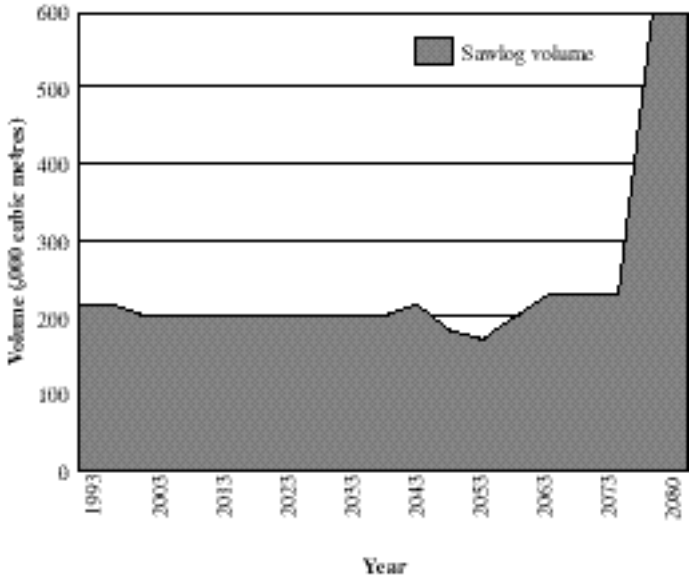


Figure 4.2 shows the long-term supply of karri sawlogs. Over time, an increasing proportion of the sawlog supply will come from thinning or harvesting regrowth stands. The substantial increase in sawlog availability after 2070 coincides with the harvesting of regrowth stands regenerated from the 1970s. Further background is provided in CALM (1992b). The key assumptions used when scheduling the yield include:

- portions of the regrowth estate would be grown on to biological rotation lengths exceeding 250 years and the remainder would be managed on a nominal rotation length of 100 years;
- regrowth stands would be thinned during the rotation, with the timing, frequency and intensity of thinning varying across site qualities; and
- no fertiliser would be applied.

Map 3 shows the relative significance of forest areas to the sustainable sawlog supply during the next 40 years. The various codes depict the contribution of the areas to the scheduled woodflow and were derived on the basis of species, site potential, silvicultural history, timber inventory and disease status.

4.3 INDEPENDENT APPRAISAL OF SUSTAINABLE YIELD

Calculating a sustainable yield for forests involves a sequential process in which data and information are integrated from a variety of information systems in order to develop a schedule of future harvesting. In 1993, the Meagher Committee (Meagher et al. 1993) evaluated the level of sustainable harvest from the jarrah and karri forests. This examination of CALM systems and results incorporated an expert review of the jarrah inventory system and the associated timber estimation procedures by the Australian National University (ANU). The methodology used by CALM was found to be "appropriate and essentially correct" and the importance of monitoring and updating area and volume data was emphasised (Turner and Wood 1993).

A further appraisal of the systems and methodology for each species was conducted for the RFA. This review by ANU and the Commonwealth Government aimed to determine the reliability of the yield forecasts for use in the RFA process. It involved a detailed assessment of the methods of area calculation, inventory, growth and yield prediction, and the scheduling systems.

The results indicate that the datasets, models, systems and methodologies used by CALM to assess sustainable yields from the karri and jarrah forests are appropriate, internally consistent and contain adequate safeguards on data quality through the use of competent staff for their collection and analysis, and the incorporation of monitoring procedures throughout the system. Areas of forest are accurately mapped to a refined level using the modern technologies of large-scale aerial photography, global positioning systems and a geographic information system (GIS). (CALM was the first forestry organisation in Australia to introduce a GIS.) The jarrah inventory procedure is an innovative world-acclaimed system, delivers data within the design error bounds and is acceptably monitored and updated. Estimates of the karri forest resource derive from an inventory completed in 1984 and although the data are updated through a sophisticated tracking and feedback system, a new inventory should be under consideration. Growth data are collected from remeasurements of more than 1000 plots and growth models developed for the estimation of future growth of regrowth stands appear to deliver reliable forecasts under current management strategies. Computerised systems are used to investigate a large number of future (100 to 200 years) scenarios in order to produce recommendations of sustainable yield from the two forest types. The interpretation of these scenarios requires experience and comprehensive understanding of the forests. To assist in this, the management feasibility of these scenarios is checked through a new computerised tool which translates the strategic solutions into maps of the future forest condition.

The reviewers' conclusion is that the systems and procedures developed by CALM staff for estimating sustainable yields from the jarrah and karri forests of the South-West Forest Region are adequate and appropriate and certainly rank among the best in Australia in terms of comprehensiveness of the data base, monitoring arrangements and growth modelling. The complex computerised systems and production of scenarios for estimating future yields are largely the result of the efforts of a dedicated few and the Department needs to ensure that the skill base is disseminated through documentation, training and transparency of decision procedures.

4.4 STRUCTURE AND MANAGEMENT

Overall size and production levels

The timber industry in Western Australia is concentrated in the south-west of the State. Industry activity ranges from the production of tree seedlings, growing, tending and managing the forest estate, harvesting, through to sawn timber conversion and secondary processing to provide a wide variety of wood-based products.

The annual turnover of the combined hardwood and softwood sectors is estimated to exceed $850 million and the industry employs more than 20 000 people either directly or indirectly. The hardwood sector is the larger and more geographically dispersed component of the industry. In 1996-97 the hardwood industry grew more than 22 million seedlings, planted more than 20 000 hectares of hardwood plantation on cleared farmland, harvested or tended more than 24 000 hectares of forest and converted more than 1.5 million cubic metres of roundwood (Table 4.3) into various wood products (CALM 1997e).

Table 4.3 Hardwood log production from Crown land and private property, 1996-97

	Crown land		Private property		Total	
	(m^3)	(tonnes)	(m^3)	(tonnes)	(m^3)	(tonnes)
Sawlog timber [1]						
Jarrah	466 757	613 065	4 234	5 566	470 991	618 631
Karri	190 429	235 532	1 536	1 904	191 965	237 436
Marri	7 232	8 969	1 412	1 751	8 644	10 720
Blackbutt	2 232	2 916	53	66	2 285	2 982
Wandoo	521	685	59	73	580	758
Sheoak	2 676	2 676	199	199	2 875	2 875
Other	5	6	12	15	17	21
Total native	669 852	863 849	7 505	9 574	677 357	873 423
Globulus	473	563	819	974	1 292	1 537
Mallet	0	0	0	0	0	0
Muellerana	72	85	0	0	72	85
Total plantation	545	648	819	974	1 364	1 622
Total sawlogs	670 397	864 497	8 324	10 548	678 721	875 045
Non-sawlog material						
Native hardwood						
Chiplogs	610 188	746 777	57 526	70 479	667 711	817 256
Industrial wood	3 294	4 085	1 725	2 139	5 019	6 224
Firewood	44 472	46 178	860	900	45 332	47 078
Charcoal logs	89 775	94 008	668	668	90 443	94 676
Other [2]	16 338	19 761	1 135	1385	17 473	21 146
Sub-total native	764 067	910 809	61 914	75 571	825 978	986 380
Plantation hardwood						
Chiplogs	6 729	7 873	36 051	42179	42 780	50 052
Industrial wood	0	0	0	0	0	0
Other [2]	1 196	1 228	0	0	1 196	1 228
Sub-total plantation	7 925	9 101	36 051	42179	43 976	51 280
Total non-sawlog material	771 992	919 910	97 965	117 750	869 954	1 037 660
Total log timber	**1 442 389**	**1 784 407**	**106 289**	**128 298**	**1 548 675**	**1 912 705**

Source:CALM (1997)

Notes:

1. Sawlog timber from all sources including veneer, but not including chiplogs, particleboard, industrial wood, firewood, fencing material, poles, piles and minor forest products.
2. Includes poles, bridge timbers, burls, chopping logs, mining timbers, pegging logs and fencing material.

Most of the native forest resource is publicly-owned and managed by CALM. The department is therefore the largest supplier of hardwood logs to the timber industry, supplying more than 90% of Western Australia's annual log production. The supply of hardwood sawlogs and chiplogs from public (Crown) land has remained fairly constant over the past decade (see Figures 4.3 and 4.4).

Although about 350 000 hectares of native forest occur on private property within the south-west (see Table 12.3), it is managed for a variety of purposes and provides only a minor component of annual log production (Figures 4.3 and 4.4). In contrast, substantial areas of hardwood plantations (mostly *Eucalyptus globulus*) have been established on private property during the past five to 10 years. These plantations have been developed by CALM, Bunnings Treefarms (a division of Bunnings Forest Products) and a number of small private companies and will make an increasingly important contribution to the chiplog supply in future years. More than 40 000 hectares of the 62 620 hectares of hardwood plantations established up to 1996 in Western Australia are located in the south-west (Shea and Hewett 1997). With the addition of another 20 000 hectares planted in 1997, the total area planted to *E. globulus* now exceeds 80 000 hectares.

Figure 4.3 Total hardwood sawlog production 1985-97 (,000 cubic metres) public and private forest estates

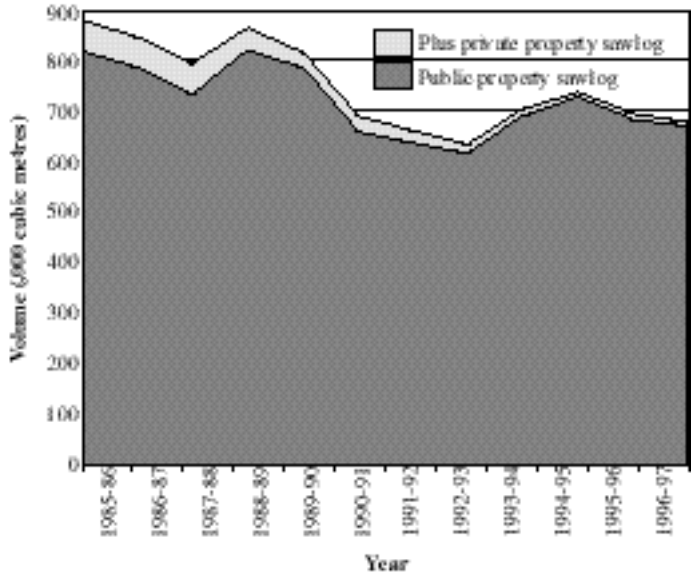
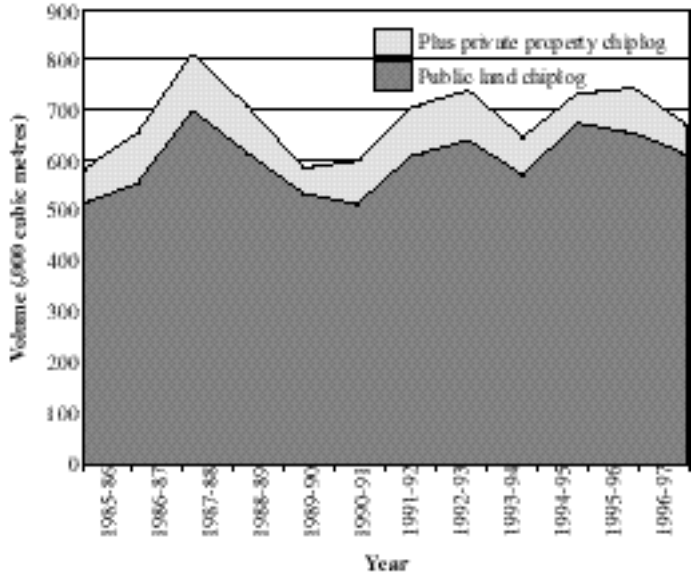


Figure 4.4 Total hardwood chiplog production 1985-97 (,000 cubic metres) public and private forest estates



Forest growing and management sector

The forest growing and management sector provides more than 500 direct jobs in nursery production, field management, research and administration of the public forest estate. CALM's management responsibility includes the implementation of legislation relevant to harvesting operations on public land to ensure that operations have minimum environmental impact, to provide guidelines regarding conduct, practices and log specifications and to ensure safety standards are maintained.

CALM regulates the supply of native forest logs from Crown land to sawmills by offering legally binding contracts of sale. The log allocation system aims to provide equity, security of access to the resource and maintenance of a free market environment by regularly letting tenders for a range of log products. Another objective of the log allocation system is to assist in the development of small mills which contribute to rural economies, create market competition and process a large proportion of second-grade logs (CALM 1987).

Hardwood log pricing varies with log quality, the costs of production and markets. A base price structure exists for all log types—species and grades—which is adjusted annually using an appropriate market-based index. The price of log timber purchased under contracts of sale is based on royalties, costs of production (including harvesting and log transport costs), a requirement for return on investment and to promote value-adding (CALM 1992b).

Harvesting

CALM is responsible for all log harvesting and haulage operations on public land under contracts made between CALM and private companies. Harvesting operators undertake tree felling within the silvicultural objectives specified by CALM and require a thorough knowledge of hardwood log specifications to achieve maximum use from each fallen tree. Contractors are responsible for loading and transporting logs from the landing to mills under operational guidelines defined by CALM, which consider a range of environmental factors such as the dieback status in jarrah forests. Contractors may also be required to stack logs into stockpiles at either the forest landing or the mill.

Sawmilling

The present structure of the hardwood sawmilling industry ranges from large sawmills to single operators using portable mills for commercial craft and hobby purposes. There are more than 70 sawmilling companies in operation, managing 107 registered sawmills (see Map 2 for location of mills and wood processing plants). The industry is dominated by a small number of quite large companies which operate a number of mills. The sawmills are involved in a range of processing activities from predominantly high value kiln-dried and appearance-grade products (including furniture and mouldings) for both domestic and export markets, to green structural timber.

Manufacturing and further processing

Most sawn hardwood timber is processed to the dry-dressed stage and then to veneers, decking, flooring and speciality products such as joinery products, parquetry flooring, laminated beams, laminated benchwood, square dressed timber and wall panelling.

Jarrah is the traditional native timber used in furniture manufacturing in Western Australia, but marri and karri are gaining niche markets because of their attractive grains and structural properties. Extensive gum veins in marri makes the timber difficult to use, but a proportion of marri with acceptable levels of gum veins produces excellent furniture and flooring timber.

Residues and export woodchips

Wood residue material is generated either in the forest as a consequence of sawlog harvesting and silvicultural operations such as thinning, or in the sawmill as a by-product of the conversion of sawlogs. The major market for residue material is presently as export woodchips, to be used ultimately in the production of paper-based products.

There are two major hardwood chipping facilities operating in the south-west. Diamond Mill near Manjimup, which is owned and operated by Bunnings Forest Products, is the State's largest hardwood chipping plant. It processes approximately 700 000m^3 of residue logs each year, of which about 75% are marri and 25% are karri logs. The Whittakers chipping facility at Greenbushes Mill processes mainly sawmill waste, while small portable chippers for log residues and thinning material are also in operation.

Jarrah residues

A major market for lower quality jarrah logs and mill residues is the production of high quality charcoal which, in turn, is used as a reducing agent in the production of silicon metal by SIMCOA Operations Pty Ltd at Kemerton. Under the *Silicon (Kemerton) Agreement Act 1987* the State, through CALM, is required to supply up to 150 000 tonnes of dry jarrah charlogs, or the equivalent of dry jarrah and green jarrah charlogs, of fuelwood quality per year. SIMCOA also produces charcoal from sawmill residue provided by Bunnings Forest Products and Whittakers. Jarrah is a superior charcoal source for silicon production due to the fixed carbon content of between 90 and 95% and the low ash content.

Another significant market for jarrah residues is the domestic firewood industry, in which both commercial and private operators consume a total of more than 45 000 tonnes each year.

Wood panel products, pulp and paper

Wood panel products are composed of wood or other ligno-cellulosic material reduced to fibres or particles which are reconstituted or engineered using binding substances into medium density fibreboard (MDF), particleboard and plywood.

A range of panel products is manufactured in the south-west including:
- flooring material from particleboard;
- architraves, skirtings and furniture from MDF; and
- furniture, construction and marine timbers from plywood.

Hardwood fibres have in the past made up a smaller component of these products, with plantation softwood logs being the preferred fibre source.

In 1996, Bunnings Forest Products concluded an investigation which found that the establishment of a bleached chemi-thermo-mechanical pulp mill in the south-west was not viable at the time. This was due to the high parity price for woodchips on the export market and the relatively high cost of power generation. There is a recycling paper mill at Spearwood which produces packaging-grade paper products and another smaller plant at Canning Vale which produces tissue products from recycled printing and writing-grade paper.

4.5 TRADE IN WOOD AND WOOD PRODUCTS

Exports

Table 4.4 summarises the combined exports of hardwood and softwood products from Western Australia over the five years to 1996-97. Nearly all of these exports were sourced from the RFA area. Since 1995-96, Western Australia has been a net exporter of sawnwood. Most of the sawnwood exports are hardwood, suggesting almost 85% of sawn hardwood timber produced in Western Australia has been consumed locally. This trend is changing rapidly as sawmills and manufacturers focus on a high level of kiln-dried products to target eastern states and overseas markets. Woodchip exports have traditionally comprised around two thirds of the value of timber-based exports.

Table 4.4 Exports of wood and wood-based products from Western Australia, 1992-93 to 1996-97

	Volume unit	1992-93	1993-94	1994-95	1995-96	1996-97
Roundwood	m^3	63	158	204	433	6 629
Sawnwood						
Coniferous roughsawn	m^3	105	204	41	2	4 099
Coniferous dressed	m^3	12	25	601	618	1 018
Broadleaved roughsawn	m^3	8545	14 894	17 522	16 527	19 292
Broadleaved dressed	m^3	0	6	68	276	604
Total		8662	15 129	18 232	17 423	25 013
Railway sleepers	m^3	7941	2859	1912	748	699
Veneers	m^3	1	8	1	14	38
Plywood	m^3	49	98	99	149	127
Panel products						
Particleboard	m^3	18	22	0	46	36
Hardboard	m^3	0	100	0	2	0
Medium density fibreboard	m^3	552	0	52	0	1 181
Softboard and other	m^3	102	148	84	11	23
Total		672	270	136	59	1240
Paper and paperboard						
Printing and writing	tonnes	27	564	19	3	2
Household and sanitary	tonnes	19	152	893	424	74
Packaging and industrial	tonnes	8200	6547	13 293	27 559	32 608
Total		8246	7263	14 205	27 986	32 684
Wastepaper	tonnes	18 548	23 953	24 647	28 620	34 581
Pulpwood [1]						
Hardwood	tonnes	na	435 238	544 617	482 304	483 143
Softwood	tonnes	na			24 177	4 786
Total		na	435 238	544 617	506 481	487 929

	Value unit	1992-93	1993-94	1994-95	1995-96	1996-97
Roundwood	$A 000	44	120	504	359	3 404
Sawnwood						
Coniferous roughsawn	$A 000	28	73	483	3	784
Coniferous dressed	$A 000	18	13	411	218	537
Broadleaved roughsawn	$A 000	6155	11 528	13 459	14 184	15 942
Broadleaved dressed	$A 000	0	11	99	324	918
Total		6201	11 624	14 018	14 730	18 181
Railway sleepers	$A 000	3891	1543	976	433	479
Miscellaneous forest products	$A 000	685	3715	8871	7 775	7 538
Veneers	$A 000	8	29	6	103	148
Plywood	$A 000	66	47	69	256	70
Panels						
Particleboard	$A 000	6	7	0	21	43
Hardboard	$A 000	0	32	0	1	0
Medium density fibreboard	$A 000	231	0	77	0	395
Softboard and other	$A 000	25	102	27	7	15
Total		262	141	104	29	452
Paper and paperboard						
Newsprint	$A 000	0	10	0	0	0
Printing and writing	$A 000	36	337	68	29	30
Household and sanitary	$A 000	23	249	1326	610	137
Packaging and industrial	$A 000	3178	2275	6716	12 946	11 056
Total		3237	2871	8111	13 585	11 222
Wastepaper	$A 000	1920	2530	3942	4 837	4 700
Pulpwood						
Hardwood	$A 000	na	63 009	81 789	76 820	76 430
Softwood	$A 000	na			4 220	647
Total		na	63 009	81 789	81 041	77 077
Total	**$A 000**	**na**	**85 629**	**118 390**	**123 150**	**123 273**

Source: Australian Bureau of Statistics

Notes:

1. Pulpwood exports measured in bone dry units.

Imports

Western Australia is a net importer of veneer, plywood and panel products and is a large net importer of paper and paperboard products (Table 4.5). Imports of these products accounted for more than 60% of the total expenditure on imports of wood and wood-based products in 1996-97. Both paper mills in Western Australia rely mainly on recycled fibre.

Table 4.5 Imports of wood and wood-based products from Western Australia, 1992-93 to 1996-97

	Volume unit	1992-93	1993-94	1994-95	1995-96	1996-97
Roundwood	m^3	127	69	27	38	114
Sawnwood						
Coniferous roughsawn	m^3	7 893	6 587	5 521	5 742	4 346
Coniferous dressed	m^3	1 948	2 308	2 601	1 890	2 792
Broadleaved roughsawn	m^3	12 069	7 667	10 945	6 449	4 929
Broadleaved dressed	m^3	2 087	3 484	3 620	3 114	3 465
Total		23 997	20 046	22 687	17 195	15 532
Veneers	m^3	498	541	519	359	165
Plywood	m^3	4 921	4 086	3 634	6 172	5 615
Panel products						
Particleboard	m^3	345	262	732	97	4
Hardboard	m^3	407	1 072	1 198	880	311
Medium density fibreboard	m^3	1 582	1 378	1 926	2 125	3 016
Softboard and other	m^3	78	97	226	592	238
Total		2 412	2 809	4 082	3 694	3 569
Paper and paperboard						
Newsprint	tonnes	13 133	18 135	23 530	26 402	26 099
Printing and writing	tonnes	33 855	27 691	31 043	22 283	24 612
Household and sanitary	tonnes	1 413	1 266	1 215	750	409
Packaging and industrial	tonnes	2 591	3 032	3 088	3 550	4 303
Other industrial	tonnes	1 870	2 402	2 668	2 350	473
Total		52 863	52 526	61 544	55 334	55 8963
Wastepaper	tonnes	106	601	2125	327	0
Pulp	tonnes	7420	7811	8434	6658	5576
	Value unit	1992-93	1993-94	1994-95	1995-96	1996-97
Roundwood	$A 000	8	3	27	25	204
Sawnwood						
Coniferous roughsawn	$A 000	3 371	3 909	2 926	3 159	2 339
Coniferous dressed	$A 000	826	1 258	1 473	1 574	2 166
Broadleaved roughsawn	$A 000	6 787	5 219	7 682	4 673	3 566
Broadleaved dressed	$A 000	1 228	2 893	3 260	2 641	2 718
Total		12 213	13 280	15 342	12 046	10 783
Miscellaneous forest products	$A 000	10 134	12 804	14 719	14 549	12 815
Veneers	$A 000	424	587	536	608	235
Plywood	$A 000	2 903	3 228	2 730	2 985	3 120
Panels						
Particleboard	$A 000	79	141	204	56	3
Hardboard	$A 000	276	812	662	321	270
Medium density fibreboard	$A 000	958	1 025	1 580	1 389	1 538
Softboard and other	$A 000	12	48	84	37	50
Total		1 326	2 025	2 530	1 803	1 862
Paper and paperboard						
Newsprint	$A 000	9 071	12 657	16 069	27 763	20 780
Printing and writing	$A 000	35 886	34 559	35 943	38 701	33 730
Household and sanitary	$A 000	1 840	1 649	1 462	1 668	787
Packaging and industrial	$A 000	5 891	7 219	4 946	6 444	8 840
Other industrial	$A 000	3 968	4 531	5 154	4 749	2 102
Total		56 655	60 615	63 574	79 325	66 239
Paper manufacturers	$A 000	8 869	10 642	7 919	7 389	5 507
Wastepaper	$A 000	18	95	482	108	0
Pulp	$A 000	4 022	4 047	5 097	5 993	4 375
Total		**96 570**	**107 406**	**113 030**	**124 885**	**104 922**

Source: Australian Bureau of Statistics

During the past three years the value of exports has broadly been in balance with the value of imports. The value of sawn wood exports is now well in excess of the value of sawn wood imports. The value of pulpwood (woodchip) exports has slightly exceeded the value of paper and paperboard imports in recent years.

4.6 FUTURE RESOURCE AVAILABILITY

The quantity and quality of hardwood timber available in the future will be a key determinant of the industry structure during the RFA period.

Production from private native forest is considered likely to remain erratic and of very low volume relative to production from the public forests. Section 4.2 emphasised the long-term sustainability of the base resource available from public forest estate under the 1994 Forest Management Plan. The potential log grades available during the 20-year RFA period under the 1994 plan are summarised in Table 4.6.

Table 4.6 Current and potential hardwood harvest levels from Crown land (,000m³)

Species	Specification	Approximate volume harvested 1996-97	Forest Management Plan 1994-2003	Potential available 2004-2020
Karri	Sawlogs (1st grade)	152	214	200
	Other logs	190	203	203+
	Wood additional to gross bole	12	75	75
Jarrah	Sawlogs (1st and 2nd)	453	490	300+
	Other logs	47	870	up to 900
	Wood additional to gross bole	109	300	100
Marri	Sawlogs	7		70
	Other logs	453	559	490
Blackbutt	All	6		variable
Wandoo	All	0.9		2
Sheoak	All	2.7		variable
E. globulus	All	7		1000 rising to 4000

Several trends are relevant when interpreting the potential available resource shown in Table 4.6:

- The sustained availability of high-grade sawlogs will extend opportunities for value-adding applications in the solid wood processing sector.
- Changes to harvesting practices and conversion technologies can provide the capacity to improve use of high-grade logs and enhance the use of lower-grade jarrah logs. Such strategies would enable the provision of greater volumes of jarrah sawlog material after 2003.
- The potential level of marri sawlog harvest is higher than that which is currently used. Opportunities exist to strengthen the end uses and markets where this species performs best.
- Minor species such as blackbutt, wandoo and sheoak provide a valuable complement to jarrah and karri and given their limited availability it is important that they be used in applications where their maximum value is obtained.
- Native forest residue material should be considered in conjunction with the hardwood plantation and pine residue resources when generating future development options.

Hardwood plantation and pine resource

By the end of the 1997 planting season, more than 80 000 hectares of *Eucalyptus globulus* had been established in Western Australia. Most of the plantings have been established since the late 1980s with a general intent to manage the stands on short rotations to produce woodchips. Stands harvested in 1996-97 produced 42 780m^3 of chiplogs (Table 4.3). Preliminary woodflow forecasts by the Bureau of Resource Sciences (BRS) suggest that the volumes available from these plantations will increase from around the year 2000 (Table 4.7).

Table 4.7 Hardwood plantation yield forecast (,000 m³ per annum)

Period	1995-99	2000-04	2005-09	2010-14	2015-19	2020-2024
	223	1233	1507	2658	3407	5033

Source: Bureau of Resource Sciences (1997)

Because chiplog rotations are 10 to 12 years the supply forecasts beyond 2010 are necessarily speculative as the plantations to supply these volumes have yet to established. Although these forecasts incorporate the owners'plans to expand the forest estate, the actual rates achieved may be higher or lower than those shown in Table 4.7. Moreover, a significant proportion of the resource is already

committed under long-term contracts with overseas investors. A change in silvicultural practices, such as an increased emphasis on sawlog production, would also affect future woodflows.

The softwood estate in Western Australia comprises both public and private forests. The current production from these forests is summarised in Table 4.8.

Table 4.8 Pine log production from Crown land and private property, 1996-97

	Crown land		Private property		Total	
	(m^3)	(tonnes)	(m^3)	(tonnes)	(m^3)	(tonnes)
Pine saw and veneer logs	253 724	253 724	42 944	42 944	296 668	296 668
Industrial wood	327 430	337 460	106 146	106 373	433 576	443 833
Pine rounds	5798	5798	27 785	27 785	33 583	33 583
Total log timber	**585 952**	**596 982**	**176 875**	**177 102**	**763 827**	**774 084**

Source: CALM (1997e)

Notes:

1. Sawlog timber from all sources including veneer, but not including chiplogs, particleboard, industrial wood, firewood, fencing material, poles, piles and minor forest products.
2. Includes poles, bridge timbers, burls, chopping logs, mining timbers, pegging logs and fencing material.

The production of sawlog and industrial wood grades has steadily increased over the past decade as plantations mature (Figures 4.5 and 4.6). Sawlog supply is forecast to exceed 450 000m^3 per annum by 2005, with a commensurate increase in the future availability of industrial wood from these plantations.

Figure 4.5 Total softwood sawlog production 1985-97 (,000 cubic metres) public and private plantation estates

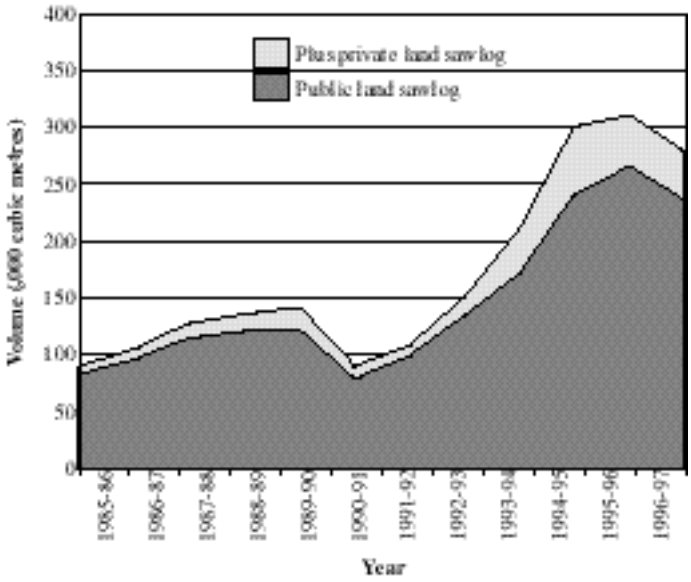
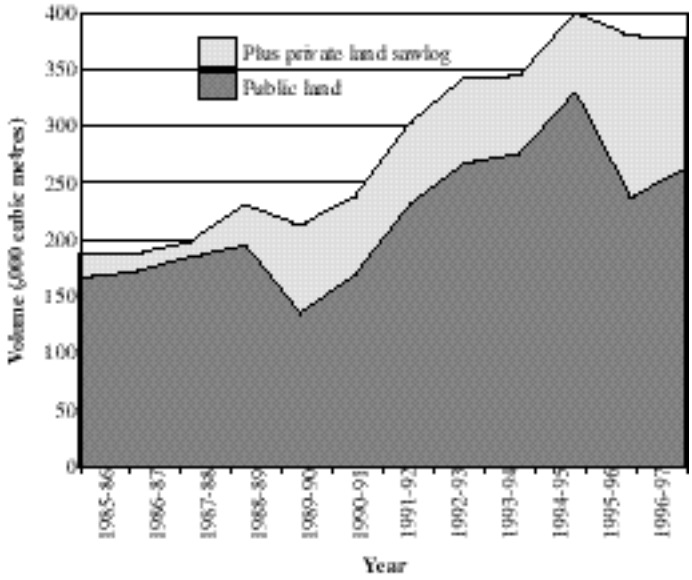


Figure 4.6 Total softwood industrial wood and pine rounds production 1985-97 (,000 cubic metres) public and private plantation estates



4.7 DEVELOPMENT OPPORTUNITIES

An objective of the National Forest Policy (Commonwealth of Australia 1992) and a desired outcome of the RFA process is the development of an internationally-competitive forest products sector. Western Australia's timber industry contributes significantly to the State economy and has undergone major structural adjustment over the past decade to enhance its competitiveness. Because any changes to future resource availability arising from the RFA may impact on the future development of the industry, a separate project was initiated to review the international competitiveness of the industry and to formulate possible scenarios for industry development through to the year 2020.

A consultant, the BIS Shrapnel Forest Group, was engaged to examine the future opportunities.

The first stage of the review examined the properties, potential products and availability of the Western Australian hardwood timber resource. An assessment of international markets for current and potential products was then undertaken. A number of market factors were identified as likely to influence the development opportunities of the Western Australian industry, including:

- reduced availability of tropical sawlogs from traditional producers in south-east Asia;
- a corresponding reduction in suitable veneer logs and hardwood supplies in major Asian markets;
- steady expansion in plantation capacity in south-east Asia;
- current excess capacity for the production of particleboard and medium density fibreboard (MDF) in the Pacific Rim area (although this excess is expected to be short lived due to strong growth in demand for these products in the region);
- a continued strong growth in demand for pulp and paper in the Asian region;
- the large number of pulp plants currently under construction in Indonesia, Korea, China, Thailand and Malaysia will probably contribute towards downward price pressure on both hardwood pulp and woodfree paper in the medium term; and
- possible softening in import woodchip prices in the Japanese market as import barriers to paper products are eased.

The competitiveness of the Western Australian industry relative to international cost structures was then investigated. The key factors influencing the industry's cost-competitiveness are discussed under separate headings.

Stability and security of wood supply

The ability to ensure continuity of supply from a sustainably-managed resource will be a key advantage in distinguishing Western Australian species from many competitors. The current sawlog contract system between CALM and individual sawmillers can guarantee supply for up to 10 years. Another approach has been to use State Agreement Acts to support the establishment of wood and other processing plants, using log timber made available by CALM. This approach has been used to assist the establishment of two softwood board plants and the large-scale charcoal-based metal manufacturing facility.

Wood costs

Western Australian sawlog prices appear competitive compared with suppliers from Malaysia, Indonesia and the United States and, to a lesser extent ,against suppliers from South America and Africa. This advantage over south-east Asian producers is expected to increase in coming years as supplies of tropical sawlogs decline further.

The delivered price for hardwood pulpwood (chiplogs) in Australia is higher than all other major pulp producing regions. The cost of pulpwood in Western Australia is largely driven by the high price of fibre paid by Japan. As trade barriers are reduced, and the Japanese pulp and paper producers are increasingly exposed to international market forces, it is probable that the price paid for pulp logs will decline, with a consequential flow on to Australian prices.

Energy

Although electricity prices in Western Australia are somewhat higher than in eastern Australia, they are comparable to levels in the United States, and are lower than those found in Brazil, Indonesia and Japan. Lower energy prices are expected to be achieved in the south-west from the following changes:

- removal of restrictions on customers with loads less than 5MW obtaining electricity from suppliers other than the Western Power Corporation;
- sale of the Dampier to Bunbury natural gas pipeline, and the building of a second pipeline to the south-west;
- allowing the development of alternative sources of supply of primary fuels; and
- encouraging the use by industry of co-generation opportunities.

Labour

Labour costs in Australia are lower than those of North America, Scandinavia and Japan, but higher than those of developing countries such as Chile, Brazil, Indonesia, and Thailand. However, typically higher productivity is also associated with the higher cost countries.

Other raw materials

Resin costs, which are a major component of wood-based panel costs, are believed to be comparatively high in Western Australia and are estimated to be 10 to 15% greater than in the United States. Some reduction could be achieved with economies of scale of production, given greater demand in Western Australia, however the costs of importing the raw materials are still likely to be high by international standards.

Capital costs

The costs of capital associated with individual companies or regions can vary widely, and depend on a range of factors. Prevailing interest rates have a strong influence on the rate at which finance can be obtained, and the expectations on returns for equity funding. At present interest rates in Australia are comparatively low. However, finance is not necessarily raised in the country where a plant is built, and in such cases will be further affected by changes in the exchange rate. Finance costs will also depend on a company's present mix of debt and equity.

Transportation

The cost of transport from Western Australia is high compared to other Australian states and overseas destinations. With larger export volumes, however, lower prices may be able to be negotiated.

Any reduction in port costs (which are high by international standards) should also lower freight costs. Some operators have already achieved competitive transportation costs by securing good back-loading rates to the eastern states with large volumes and low freight rates currently apply to woodchip shipments from Western Australia.

4.8 INDUSTRY DEVELOPMENT OPTIONS

The consultants, through meetings and workshops with industry, government agencies and specialists, then identified a series of probable development opportunities for the hardwood sectors.

Veneer products

Sliced veneer probably provides the best opportunity for the very best jarrah and karri logs. The natural colour and grain produce an attractive sliced veneer which maximises the use of the superior component of the resource. The comparatively low wood costs will ensure that sliced veneer produced in Western Australia will be able to compete favourably with other sources.

A plywood mill located in Western Australia would appear to be competitive against other hardwood plywood suppliers. The main advantage arises from the relatively low wood costs when compared to mills in Indonesia, Malaysia and Japan. Further confirmation is required of the veneer grade recoveries which can be achieved from the range of log grades and species. A Western Australian-based plant has the ability to combine softwood, plantation hardwood and native hardwoods and thereby make a range of panels suited to various end uses, by using the strengths of each of the species.

A similar set of advantages exists for laminated veneer lumber (LVL), with LVL manufactured from Western Australian native species able to provide both attractive appearance and strength. However, because the LVL market is considerably smaller than plywood, there will be fewer opportunities to concentrate on high-value niche markets, and because LVL can be manufactured from a range of log grades Western Australia's cost advantage may not be as strong.

Sawn timber

The focus for the hardwood sawmill industry is switching from essentially a domestic, structural focus to international markets for high-value solid-wood products. This trend is likely to be accelerated by increased competition from local pine for some structural markets. The hardwood timber resource is available in Western Australia and export opportunities will be created by declining supplies from traditional supply sources. The inherent wood qualities of both jarrah and karri allow use in a range of applications including flooring, furniture, joinery and other internal fixtures and fittings.

Considerable investment in drying and milling technology will be necessary to achieve international competitiveness. Technical research and development in new product areas will be necessary, as well as increased market development and promotion. Investment in drymill processing will be required if further efficient downstream remanufacturing is to be achieved.

Secondary processing

The increased availability of high-value sawnwood provides the opportunity to expand the secondary wood processing industry. This could include a combination of a number of manufacturing processes such as flooring, millwork and moulding, joinery, furniture and a variety of laminated wood products (including structural glue laminated beams, edge glued panels, and non-structural laminated products). It is believed there are excellent opportunities for Western Australian furniture manufacturers in the affluent markets of North America, Europe and Japan.

Efficient value adding will require appropriate drymill processing and investment in drying and secondary processing. Sawmilling companies or independent operators could provide the necessary specialist, intermediary manufacturing capabilities, supplying manufacturers of such products as furniture, joinery, cabinet fixtures and fittings.

While it is possible for an efficient secondary processing industry to develop based largely on export markets for such items as furniture components, there is less risk if there is also a domestic manufacturing focus such as for furniture and joinery. Development of a competitive manufacturing sector will depend on a number of factors including creative design capabilities, marketing and promotional skills, and effective training and education. With comparatively low investment, however, there is good potential in these sectors to add significant value and generate substantial employment opportunities.

Panels

Of all the wood-based panel products, particleboard probably has the best potential to use a component of native and plantation hardwood residue. Though currently high wood costs limit the competitiveness of a Western Australian-based plant, should these decline over time, then an additional particleboard plant based on a combination of softwood, plantation and native hardwoods and sawmill residues could be viable. As particleboard is overlaid in most applications, the impact of any slight change in colour as a result of incorporation of native hardwoods is likely to be minimal.

The already large global market for particleboard is expected to continue to grow, thereby creating new opportunities. There is therefore the potential for an additional particleboard line to be established before 2010, based on a mixture of softwood and plantation and native hardwood.

There will also be potential for expansion of the MDF capacity before 2010, though this is likely to be based on softwood with incorporation of some *E. globulus*. The Asia Pacific market for MDF is expected to be in balance by around 2001 creating opportunities for new investment. Raw material supply, however, will limit expansion until nearer 2010 unless significant volumes of plantation hardwood are used.

The consultants concluded that there would be limited opportunities for an OSB plant to be established in Western Australia as most growth in the market will occur in North America and it would be very difficult to compete with domestic producers in the United States. Regional suppliers of OSB would have to capture a significant market share. It therefore seems unlikely that a Western Australian producer would be able to compete with manufacturers nearer the major markets, as transportation costs would be prohibitive on such a comparatively low-value product.

Pulp and paper

Considerable investigations into the viability of establishing world-scale pulp mills in Western Australia have already occurred. A recent feasibility study concluded that a Western Australian-based pulp mill would not be competitive because of:

- uncertainty over the availability of sufficient wood resource in the immediate future for a bleached hardwood kraft pulp (BHKP) mill;
- relatively high woodfibre costs because of the need to pay parity prices with export wood chips to Japan;
- comparatively high power prices impacting on the overall cost competitiveness of a bleached chemo-thermo mechanical pulp (BCTMP) mill; and
- imminent increases in production for Indonesian pulp and paper, which will add to the risk associated with market pulp-based mills.

These factors could change over time. There will undoubtedly be increasing volumes available from maturing *Eucalyptus globulus* plantations; woodchip prices paid by Japan are forecast to decline over time; deregulation of the power market could lead to reduced power prices; and as Indonesia shifts to use plantation timber, rather than native forest residues, their competitive position may be diminished.

The availability of a large-scale plantation hardwood resource, supplemented by native hardwood residues, is expected in the future to provide the basis for investment in pulp and paper manufacture. The resource is of high quality and will be able to produce a premium pulp for the manufacture of high-quality papers. A BHKP mill is more likely because of the greater ease in selling market pulp (compared to BCTMP), suggesting that investment in a paper-making plant could occur at a later date. Additionally the BHKP process has the potential to use a major component of the native hardwood (karri and marri) resource.

Over the period 2010 to 2020, the competitive position of a Western Australian BHKP mill is expected to have improved sufficiently to warrant investment, with further investment in a paper making machine towards 2020. The timing of such an investment will depend on such factors as the availability of the native forest and plantation chiplog volumes, the extent to which plantation resource is committed to overseas pulpmills, and the overall market value of pulpwood relative to pulp.

Other uses

Further market opportunities need to be developed to encourage the use of jarrah residues. Between 1998 and 2010 the silicon metal manufacturing facility will probably expand, providing the potential for increased use of jarrah residues. There may also be the potential market for the export of jarrah wood chips for charcoal manufacture. A further possibility is the use of jarrah residues in the manufacture of activated carbon, as this market now appears to be entering a period where there is opportunity for new investment. Continued growth is likely because of increasing use in environmental applications.

A summary of the possible industry expansion opportunities developed by the consultant is outlined in Table 4.9.

Table 4.9 Summary of industry structure under proposed development scenario

Current	2010	2020
Existing industry	*Expansion or refurbishment*	*New plants*
Sawmilling structural and appearance	Sawmilling - greater emphasis on value adding	BHKP mill
MDF	MDF, 2nd line	Wood free printing and writing paper
Particleboard	Expansion of charcoal	
Furniture		
Remanufacturing	*New plants*	
Woodchip exports	Plywood mill	
Charcoal	LVL mill	
	Particleboard	
	Expanded remanufacturing and furniture sector	
	Activated carbon	

Interest in the availability of both hardwood and softwood for local processing is currently strong in Western Australia. CALM and the Department of Resources Development report that both local and overseas companies are actively investigating the feasibility of extending existing plants or establishing new plants involving a wide range of solid wood, engineered and reconstituted wood products. It is likely that hardwood woodchip exports, sourced increasingly from plantations, will remain an important component of residue markets.