A REGIONAL FOREST AGREEMENT FOR WESTERN AUSTRALIA

BIS Shrapnel Forestry Group
Global marketing intelligence and forecasting

Review of Value Adding Development Opportunities for the Western Australian Hardwood Industry

MAIN FINDINGS

Prepared for:

Australian Bureau of Agricultural and Resource Economics, &
Department of Conservation and Land Management

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FOREWORD

One of the considerations in each Regional Forest Agreement (RFA) is to identify opportunities to achieve an efficient and internationally competitive wood and wood products industry. This report is the product of a technical consultancy undertaken by the BIS SHRAPNEL FORESTRY GROUP to identify technically feasible and world competitive development opportunities for the hardwood-based industry in Western Australia. The report forms a part of the economic assessment for the Western Australian RFA.

The consultancy was managed jointly by officers of the Australian Bureau of Agricultural and Resource Economics (Mr Peter Connell), the Western Australian Department of Conservation and Land Management (Dr Martin Rayner and Mr Terry Jones) and the Western Australian Department of Resources Development (Mr Nigel Goodall).

The Commonwealth and Western Australian Governments wish to acknowledge the extensive cooperation and assistance provided by individuals and companies in the timber industry in contributing background information and data for this project.

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Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
BCTMP	Bleached chemo-thermo mechanical pulp
BHKP	Bleached hardwood kraft pulp
BKP	Bleached kraft pulp
CALM	Department of Conservation and Land Management
CIF	Cost insurance freight
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DRD	Department of Resources Development
FOB	Free on board
KD	Kiln dried
LVL	Laminated veneer lumber
m^3	Cubic metres
MDF	Medium density fibreboard
NPI	National plantation inventory
ODMT	Oven dry metric tonne
OSB	Oriented strand board
RFA	Regional Forest Agreement
T&G	Tongue and groove
WACAP	Western Australian Chip and Pulp Company
WACC	Weighted average cost of capital

Definitions

Sawlog grades In Western Australia the following sawlog grades are used for native species: Premium grade – straight with a maximum 15% by volume of defective wood; First grade – minimum of 50% millable wood; Second grade – minimum of 30% millable log; Third grade – other logs not meeting second grade specifications, but are selected by the log buyer.

Roundwood equivalent The volume of wood in roundwood form (i.e. logs) required to make a given quantity of final product.

Laminated veneer lumber (LVL) Panel produced in a similar process to plywood, except that rather than having the grain of the adjacent veneer layers orientated at right angles the grain is orientated in the same direction. The panels produced are often resawn into solid wood dimensions.

Oriented strand board (OSB) Panel produced by gluing large chips or flakes. The flakes are layered through the thickness of the panel with adjacent layers having flakes generally oriented at right angles –conveying strength to the panel.

Pulp types Pulp can be divided into the following broad groupings depending on how it is produced – mechanical, where the wood is broken down by a mechanical process (e.g. groundwood pulp, therm-mechanical pulp); semi-chemical, where wood is broken down by a combination of chemical and mechanical processes (e.g. BCTMP), and chemical pulp where the pulping is achieved entirely through a chemical process, removing the lignin and leaving the wood fibres (e.g. BKP). Pulp can also be obtained from recycling of scrap paper.

Woodfree pulp and paper Chemically produced pulp or paper where most of the lignin has been removed from the wood by a chemical process. Paper with less than 10% mechanical pulp is regarded as woodfree.

Paper categories Paper can be broadly classified into the following groupings: newsprint, printing and writing, packaging and industrial, and tissue. Fine paper is a term encompassing printing, writing and copy papers.

1 BACKGROUND

As part of the regional forest agreements process ABARE is to provide information and data relevant to assessing the potential development of a technically feasible and world competitive hardwood based industry in Western Australia through to 2020.

ABARE has engaged BIS Shrapnel Forestry Group Pty Limited to provide support in compiling information from various sources including State Forests, timber industry groups and other relevant organisations, providing qualitative and quantitative assessments of the future outlook of the forest products industry and preparing a report identifying development opportunities for wood based industries in Western Australia.

This report has been prepared based on feedback from the first and second forest industry workshops, industry visits, previous government and industry reports, and in-house information, knowledge and experience. The report outlines the resource, examines potential development options, assesses the costs to develop internationally competitive industries, discusses factors constraining further investment, and suggests strategies for facilitating further development.

2 INTRODUCTION

Western Australia's growing forest resource presents an opportunity to contribute further to the economy of the State through an enlarged and refined processing infrastructure, development of secondary processing, along with further investment in roads, ports and the provision of jobs through construction, processing and service support.

The resource characteristics are similar to the declining Southeast Asian hardwoods. Western Australia's relative proximity to Asia where hardwoods are highly valued and where demand projections indicate future supply shortfalls give rise to our contention of market potential for the Western Australian resources.

However, a number of factors are emerging that may impact projected supply shortfalls. These include a rapid increase in the consumption of panel products such as particleboard and MDF, the emergence of new panel products such as LVL and composites of plywood and MDF in substitution for traditional lumber products. In addition there is the emergence of new hardwood plantations throughout Southeast Asia with rotations of 7 to 10 years that may undermine traditional forestry supply projections.

While our recommendation for future development places an emphasis on new investment in several larger mills directed at high value solid wood recovery, we believe smaller mills could be efficient in processing certain lower grade logs and meeting niche market opportunities.

Our recommendations also focus on greater exploitation of jarrah. While we believe jarrah recoveries can be improved and that jarrah can be positioned competitively against other hardwoods as a decorative timber, there remains a major challenge in the disposal of residue.

Market opportunities for the Western Australian resource need to be reviewed against the special qualities of each species relative to various processing options, and the size and suitability of output to optimise recovery of all elements of the resource and contribute towards achieving lowest possible cost of production.

Given the relative size of Western Australia's domestic market versus the available resource, it is likely any new processing investment will be predicated on export markets with domestic sales as a secondary market.

The combined hardwood resource can be considered suitable for a range of processing options including:

- A change of emphasis from structural grade lumber production to concentration on decorative grade solid wood output.
- Investing in maximum recovery of high grade veneers as a primary processing option for outputs such as LVL, plywood and speciality veneers.
- Residues from solid wood and veneer would be directed to panel product manufacturing as a secondary furnish to soft wood residues.

- Large scale investment in pulp and paper production would consume the major portion of the projected plantation resource and remaining hardwood residues other than Jarrah.
- Chip export will play an ongoing role in ensuring sufficient residue can be drawn down or as opportunities to add value in local processing become available.

3 THE WESTERN AUSTRALIAN FOREST INDUSTRY

3.1 The resource

The major native species harvested are jarrah, karri and marri. The forests can be further divided into mature and regrowth forests. Regrowth timber comes from trees which are generally in the 30 to 100 year age range. The timber properties are intermediate between mature and plantation grown species. Regrowth timber is generally lighter in colour, and has a somewhat lower basic density than mature timber, and is generally regarded as being suitable for a wider range of applications than the mature wood.

3.1.1 Jarrah (Eucalyptus marginata)

Jarrah occurs extensively throughout the south-west of Western Australia. It is generally dark red in colour, and is valued in appearance grade applications such as furniture, joinery and flooring.

Residues can be used for charcoal manufacture which is regarded as being of very high quality for industrial use.

Production of pulp produces relatively poor yields and is virtually impossible to bleach. The potential to utilise jarrah in MDF manufacture is therefore also limited.

3.1.2 Karri (Eucalyptus diversicolor)

Karri occurs as a component of karri/marri forests in the southern region of the State forest estate in the south-west of Western Australia. It is generally medium red in colour and is suitable for sawn timber production. Currently, this species is primarily used in structural applications, but is increasingly being used for appearance grade purposes.

3.1.3 Marri (Corymbia calophylla)

Marri is relatively fast growing and internal growth stresses therefore cause some problems during sawmilling. Internal defects such as "kino" veins are common, though in some instances these are being used as features in furniture manufacture. The wood is comparatively light in colour, and in restricted quantities is suitable for use in MDF and particleboard. Marri pulp bleaches to a reasonable brightness.

3.1.4 Other indigenous species

Minor volumes of other species are potentially available such as wandoo (*Eucalyptus wandoo)*, blackbutt (*Eucalyptus patens)* and sheoak *(Allocasuarina fraseriana)*. While the volumes of these species are not large, and could not on their own sustain the demands of a world scale processing plant, they provide a valuable complement to the major species of jarrah and karri, particularly in value added applications such as furniture and flooring.

3.1.5 Eucalyptus globulus plantations

Approximately 90,000 hectares of *Eucalyptus* plantations have been established in Western Australia, of which around 83,000 hectares are *Eucalyptus globulus.* Most of the plantings have occurred in the last five years, and plantations of any significant area are only just reaching a stage where they can be utilised for wood chip production. The majority of the plantations have been planted in the southern

region of Western Australia extending from Mandurah to the east of Albany where rainfall exceeds 600 mm.

E. globulus provides good pulp yields and is relatively easy to bleach. It can also potentially be sawn to produce a light coloured, clear grained timber or used to produce veneer.

3.2 Current utilisation

The current utilisation levels from the Western Australia hardwood resource are outlined in the table below:

Table 1 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 other 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**

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. Source: CALM 1997.

Historically the majority of sawn timber produced from native forests in Western Australia was used for structural purposes, primarily in roofing, along with other applications such as railway sleepers and mine guides. In recent years there has been a move towards value-adding.

Contracts for premium, first and second grade jarrah logs require at least 50 percent of the green sawn output being converted into value added timber products. Likewise contract holders for the same grades of karri sawlogs are "required to develop appropriate technology and markets to maximise value added timber products" though no minimum percentage is stipulated.

The development of value-added products has necessitated considerable investment in kiln drying technology, and/or the build up of timber stocks for air drying. Dried jarrah and karri is utilised in a range of value-added applications including furniture, joinery, flooring and laminated wood products.

The only significant uses of the jarrah resource that does not meet second grade log requirements, is in the production of charcoal, which is utilised in silicon metal manufacture, and for domestic firewood. Small sawmillers select some of the better quality logs not meeting second grade specifications for processing, though considerable residual volume is left in the forest.

A significant volume of the karri logs which are not regarded as being suitable for sawmilling are chipped along with large volumes of marri. Small volumes of marri are sawn and processed into higher value end uses but currently the major use of this species is for woodchip exports (Table 2).

Table 2 Woodchip exports from Western Australia by wood species (tonnes)

	1992/93	*1993/94*	*1994/95*	*1995/96*	*1996/97*
Total wood chip exports	831,191	773,592	983,234	918,257	915,175
Karri and marri chip logs and sawmill residue	831,191	767,989	923,316	805,000	755,448
E. globulus	nil	5,603	39,548	42,000	35,249
Softwood	nil	Nil	20,370	71,000	98,228
Jarrah	nil	Nil	nil	nil	26,250

Source: DRD, in conjunction with Bunbury Port Authority and Bunnings Forest Products

The majority of the plantation blue gum (*E. globulus)* is destined for woodchip export. Approximately one third is committed to Asian investors, one third is owned by Bunnings Forest Products, and the remaining third is owned by a range of smaller companies. With longer rotations it is potentially a source of sawn timber.

3.3 The industry players

The major players in the Western Australian forestry industry are the Department of Conservation and Land Management (CALM) as the supplier of the resource, Bunnings Forest Products and Whittakers who are involved mainly in hardwood processing, and WESFI as the major softwood growers and processors.

Approximately 98 percent of the hardwood sawlogs processed in Western Australia are supplied by CALM.

Bunnings and Whittakers together control approximately 62% of the first and second grade jarrah cut, and 77% of the first grade karri cut. Bunnings also has a Commonwealth export license for 900,000 tonnes of karri and marri wood fibre, which constitutes only part of the chiplog volume available from that resource.

Bunnings currently have five sawmills, four sawing jarrah and one processing karri. They also have two processing centres where most of the timber drying is undertaken, as well as machining of timber and manufacturing of glulam and joinery. They have invested heavily in predrying technology and plan substantial further investment in kilns and modernisation of the sawmills. Bunnings also has a 50 percent share in the Dardanup softwood sawmill with WESFI. They are a major plantation grower most of which is expected to be exported as blue gum wood chip.

There are two Commonwealth export licenses controlling the maximum production of hardwood chips and these are held by:

1. SPCC 110,000 tonnes – sawmill residue and silvicultural thinnings (Whittakers)
2. WACAP 900,000 tonnes – hardwood chips which includes sawmill residues (Bunnings)

(Expires 31 December 1999, or on signing of the RFA)

Whittakers are predominantly hardwood sawmillers, and exporters of hardwood and softwood chip. They have one site where all the sawmilling and drying is undertaken. Whittakers have some kiln drying capacity but has also built up considerable air dried stocks in recent years. They are also developing specialised capability in the flooring market. Whittakers have a softwood sawmill though it was put on care and maintenance in 1997 during the downturn in the domestic housing market, but is scheduled to recommence operation in January 1998.

WESFI are softwood processors, producing sawn timber, MDF and particleboard. The MDF plant has used a component of marri chips in the past, which constituted up to 15% of the input. However, to date softwood fibre remains the preferred option.

There are a number of other smaller primary wood processors, including 7 other sawmills with a log input greater than 10,000 m^3 and approximately 34 mills processing between 1,000 and 10,000 m^3 per annum.

Simcoa is a significant user of jarrah residues both from the forest and sawmills, which they use for the manufacture of quality charcoal which in turn is used in the production of high value silicon metal. Some jarrah woodchip was also exported to Saudi Arabia in 1996/97, for silicon metal manufacture.

There are a number of secondary processors who are well established, and include flooring, furniture and joinery manufacturers. Outdoor furniture is as important component of the furniture industry, utilising mainly jarrah with some karri. There are three major players: Clarecraft Industries, Inglewood Products Group who also manufacture doors and joinery, and Jensen Jarrah. All three companies have developed a strong export focus.

4 FUTURE HARDWOOD AVAILABILITY

The growth capacity of the publicly owned native forests have been estimated by CALM and the timber harvest constrained to ensure a sustainable timber yield from these forests. These volumes do not include branch wood which can provide additional resource, provided it is obtained from integrated harvesting operations.

The volume of sawlogs available is lower than the total volume which may be harvested due to quality defects or size constraints.

The current harvest levels were determined in 1993 and apply to 2003. The allowable harvest levels for the various species are outlined in the Department of Conservation and Land Management's (CALM) *Forest Management Plan **1994-2003***. These levels are summarised in the table below.

Table 3 Available harvest levels, 1994 to 2003 (m^3)

Species	*First and Second Grade Sawlogs*	*Other sawlogs and chip logs*	*Total available harvest*
Jarrah	490,000	870,000	1,360,000
Karri [1]	250,000	167,000	417,000
Marri [1]	20,000	539,000	559,000
Total			**2,336,000**

1 Second grade is not precisely defined, approximation only

4.1 Jarrah

The available cut of first and second grade jarrah sawlogs as outlined in the CALM Forest Management Plan is set at 490,000 cubic metres. This level can be maintained until 2003, but beyond this date the long term non-declining level of sawlog supply will require further review. It is likely to be between 300,000 and 450,000 m^3 per annum of sawlog material, depending on the quality of logs acceptable to processors.

A further 870,000 cubic metres of third grade jarrah sawlog and residue logs should also be sustainable, in addition to the mill residues which may be up to 160,000 cubic metres (210,000 tonnes) of woodchip and 120,000 cubic metres (158,000 tonnes) of other residues such as sawdust and shavings.

4.2 Karri

The Forest Management Plan allows up to 214,000 cubic metres of first grade karri sawlogs to be harvested. In addition, a further 203,000 cubic metres of logs of other grades can also be recovered. A component of these could potentially be sawn, meaning that perhaps 280,000 cubic metres could be converted to sawn timber.

This leaves approximately 137,000 cubic metres of residue logs available for further processing.

Residues from sawmilling could be as high as 90,000 cubic metres (112,000 tonnes) of wood chip, and 70,000 cubic metres (87,000 tonnes) of other residues.

4.3 Marri

A total marri harvest of 559,000 cubic metres is set which includes both sawlogs and logs used for chip production with no boundary set between the two. Currently the use of marri as sawn timber is relatively limited, due to the prevalence of defects such as "kino" veins. It is however being utilised in some specialist furniture applications, and in structural products such as sleepers.

Utilisation of marri in sawmilling is likely to be around 20,000 cubic metres though this may increase over time. The remaining 539,000 m^3 would be available for some other form of processing.

4.4 Other indigenous species

The volumes of other species currently cut are small. These include species such as blackbutt, wandoo, and sheoak. Some of these have characteristics which suggest that they would be prized in speciality uses such as furniture and flooring.

It has also been suggested that the potential harvest for some species such as wandoo may be much greater than current levels, though more work would be required to determine what is sustainable.

4.5 *Eucalyptus globulus* plantations

There are approximately 83,000 hectares of *Eucalyptus globulus* planted in Western Australia. The majority have been planted in the last five years. Generally the intention is to grow these plantations for chip production.

Woodflow forecasts by the Bureau of Resource Sciences (BRS) (National Forest Inventory, 1997) (Table 4) suggest that the volumes available from these plantations will increase dramatically from around the year 2000.

Table 4 Western Australia Plantation Hardwood Yield Forecast (000 m^3 per annum)

Forecast Period					
1995-99	*2000-04*	*2005-09*	*2010-14*	*2015-19*	*2020-24*
223	1233	1507	2658	3407	5033

Given that chiplog rotations are around 10 years, the volumes available from 2008 onwards are dependent on the future levels of planting.–Current forecasts incorporate the owners' plans for expansion of the forest estate, though the actual rates achieved may be higher or lower than those stated.

A change in the silviculture, such as an increased emphasis on sawlog production, will also affect the outcome.

4.6 Summary

The following table summarises the current hardwood harvest, what has been agreed under the present management plan, and the volumes believed to be potentially available beyond 2003.

Table 5 Current, allowed and potential harvest levels from Crown land (m^3)

Species	*Specification*	*Approximate Volume Harvested*	*Forest Management Plan*	*Potential Available Supply*
		1996-97	*1994-2003*	*2004-2020*
Karri	Sawlogs (1st grade)	152,000	214,000	200,000
	Other logs	190,000	203,000	203,000+
	Wood additional to gross bole	12,000	75,000	
Jarrah	Sawlogs (1st and 2nd grade)	453,000	490,000	300,000+
	Other logs	47,000	870,000	Up to 900,000
	Wood additional to gross bole	109,000	300,000	100,000
Marri	Sawlogs	7,000	559,000	70,000
	Other logs	453,000		490,000
Blackbutt	All	6,000		Variable
Wandoo	All	900		2000
Sheoak	All	2,700		Variable
Eucalyptus globulus	All	7,000		1 million m^3 rising to 4 million m^3

What is apparent from the above table is that there will be little additional high quality (first and second grade) jarrah logs available, and the proportion of second grade logs is forecast to increase. Likewise with karri a high proportion of the better quality logs are already utilised. The opportunity will be to add greater value rather than process more of this resource.

The potential level of marri sawlog harvest is higher than that which is currently utilised. The challenge is to find end uses and markets where this species performs best.

There is clearly a substantial volume of lower quality jarrah logs available, which provides opportunities for establishing innovative processes for utilising this resource.

The minor species 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.

5 SOLID WOOD PROCESSING

5.1 Development Opportunities for Solid Wood Products

5.1.1 Wood resource suitability

Western Australian hardwood species share a number of characteristics with commercially viable hardwoods in nearby Southeast Asia and elsewhere. These timbers have been used and extensively traded over many years and have found ready markets as a basis for high quality veneers, plywood and solid wood applications ranging from mouldings to solid wood furniture.

The depletion of indigenous hardwood resources outside Australia has resulted in major changes in the availability and markets for these resources and opens the way for Western Australian products to be further directed at high end applications.

The impending maturity of Western Australia softwood provides a more cost effective option to hardwood for domestic structural applications and will be a catalyst for change away from use of hardwood in structural use.

5.1.1 Jarrah

The dark red colour and distinctive grain pattern of jarrah makes it an ideal species for utilisation in high value appearance applications. These include furniture, panelling and mouldings. Furthermore jarrah's high impact resistance and relative dimensional stability as dried timber, means it is suitable for uses such as flooring and joinery. The natural durability of jarrah allows use in exterior applications such as decking, outdoor furniture, exterior joinery, and for lower grade material uses such as sleepers.

Jarrah also slices readily, which allows the maximum utilisation of its appearance qualities. However, only a relatively small proportion of the jarrah resource is sufficiently defect-free to be suitable for slicing.

Peeling is also possible though the grade of veneers recovered and therefore the type of products which could be manufactured is unknown. It could be necessary to combine jarrah with softwood to achieve adequate glue bonding in plywood or LVL

In addition to the sawlogs and veneer logs available, there are considerable volumes which do not meet current sawlog specifications. It is believed a significant proportion could recovered from manufacturing solid wood products after further small log processing technology becomes available. This may be veneer based such as LVL which can utilise logs as short as 1.2 metres, or with specific small sawlog sawing technology, solid sawn timber products could be produced.

5.1.1.2 Karri

The appearance of karri sawn timber is not dissimilar to jarrah. Though more work is required in "finishing", karri could potentially be used for a similar range of end uses as jarrah including flooring, joinery, furniture, and fixtures and fittings. However, karri is currently primarily utilised in structural applications, where its strength is a valued asset.

The generally better form of karri logs, with fewer internal defects, would be advantageous in the production of veneer based products such as LVL or plywood. However, as with jarrah, it may be necessary to combine with other species to achieve glue bonds of adequate strength.

5.1.1.3 Marri

Marri is a lighter coloured timber than both jarrah and karri though there is a high variation in colour related to such factors as the age of the forest which has been harvested and the site. Marri also has a high incidence of kino veins which restricts use in higher value applications. However, some progress has been achieved in utilising these as features in certain designs of furniture. The lighter colour also provides a useful complement to the darker red species. Marri is a relatively fast growing species and consequently has internal growth stresses which make it more difficult to saw.

5.1.1.4 Other Native hardwoods

Only small volumes of the other native speciality hardwoods, such as sheoak, wandoo, and blackbutt, are available. These provide a useful complement to the major species, with characteristics such as high density and alternative colours, which make them suitable for a range of added value applications such as furniture and flooring.

5.1.1.5 Plantation hardwoods

The major plantation hardwood species is *Eucalyptus globulus* with most stands having been established since 1985, and the majority in the last five years. Most plantings are currently being grown for pulp production.

With a change in the silvicultural emphasis it is likely that *E. globulus* could be utilised in veneer based applications, and with some development of sawmilling technology, a proportion of the harvest could be processed into value added sawn timber products such as flooring and furniture.

5.1.1.6 Plantation softwood

Both *Pinus radiata* and *Pinus pinaster* can be readily sawn to produce a range of structural and appearance sawn timber grades. Proposed investment in softwood sawmilling technology, will result in increasingly competitive supplies of structural sawn timber in Western Australia. The result will be a declining share of hardwood sawn timber in structural end uses.

5.1.2 Market opportunities for solid wood products

5.1.2.1 Sawn timber

The markets for sawn timber can be classified into two major broad groupings – structural and appearance. Historically the majority of Western Australian hardwood sawn timber has been utilised in structural applications. Most hardwood structural lumber is utilised in building such as general roof construction. Other structural applications include mining timber, electrical cross arms and sleepers. The volume of native hardwood timber used in house construction in Western Australia ranges between 70,000 m^3 and 100,000 m^3 depending on the level of building activity.

The major threat to hardwood's continued use in structural applications is the increasing availability and acceptance of softwood sawn timber. Production of softwood sawn timber will increase by at

least 100,000 m^3 between now and 2003. The scale of the resulting softwood mills will make them extremely price competitive. Steel framing also represents a threat, offering benefits in construction time, uniformity and consistency of performance, and resistance to insect attack.

While there will be some instances where high strength ratings require hardwood being used, changes in design specifications and appropriate grading of softwood sawn timber, will mean that, generally, softwood will be accepted.

Increasingly, therefore, hardwood sawn timber will have to find markets in appearance grade end uses. There is an opportunity for both jarrah and karri to substitute declining supplies of Southeast Asian and South American dark red hardwoods. These include dark red meranti, merbau, nyatoh, and mahogany. There is also potential to capture market share from North American hardwoods such as red oak. Prices by hardwood sawn timber grade and country of origin are presented in Table 6.

Table 6 Sawn timber prices as at September 1997

Source country	Brazil	Ghana	Malaysia	Malaysia	Brazil	Brazil	S.E. Asia	USA	USA
Species	Mahogany	African Mahogany	Dark red meranti	Merbau	Mahogany	Ipe	Dark red meranti	Red Oak	Cherry
Grade	1st & 2nd	1st & 2nd	Select & Btr, KD	Select & Btr, KD	KD	GRS	Clear	KD	KD
Market	UK				USA	Domestic	USA	USA	USA
Length (m)	various	2.4+	Various	various	Various	Various	various	Various	Various
Thickness (mm)	various	various	63.5	various	25	Various	25	25	25
Width (mm)	various	150+	152.4	various	Various	Various	various	Various	Various
Price Point	FOB	FOB	FOB	Ex-mill	West Coast Port	Ex-mill	West Coast Port	Ex mill	Ex mill
Price US$/$m^3$	1020	520	630-650	705	1140	456	973	687	1058

The ability to ensure continuity of supply from an environmentally sensitively managed resource will be a key advantage in distinguishing Western Australian species from dwindling supplies of Southeast Asian hardwoods. Increasingly sawn timber wholesalers and retailers are requiring evidence that timber comes from a sustainably managed resource. B&Q for example, a larger European retailer requires some form of environmental accreditation of the forest resource and processing operations such as is provided by the Forest Stewardship Council or ISO 14001. Additionally the natural durability of jarrah especially, will be an added benefit in markets which are increasingly sensitive to preservatives, and chemical treatment.

The market opportunities for jarrah and karri timber are likely to be as substitute species for traditional hardwoods consumed in North Asian markets such as Japan, Korea and Taiwan. The European market also presents opportunities to supply well established quality furniture and joinery manufacturing industries.

5.1.2.2 Sliced veneer

Sliced veneer is a high value product requiring high quality logs as a raw material source. Veneer achieves maximum use of the aesthetic qualities of the timber, with reduced residue production. Comparative prices of sliced veneer shown in Table 7.

As with sawn timber, jarrah and karri have the potential to substitute for a range of tropical and temperate hardwoods which are in increasingly short supply. Furthermore the consumption of veneer overlays is forecast to increase as reconstituted panels such as MDF and particleboard are accepted in applications such as furniture, millwork and mouldings.

Table 7 Sliced Veneer prices as at September 1997

Source country	Ghana	Ghana	Brazil	USA
Species	Redwoods (Mahogany, Candollei, Edinam)	Sapele	Mahogany	Red Oak
Description	n.a.	Layons - width 950-1250mm, length 1550-2450mm	n.a.	n.a.
Thickness (mm)	0.55	0.55	0.7	0.56
Price point	FOB	FOB	FOB	Ex-mill
Price (US$/m2)	0.55-1.15	1.24	2.8	n.a.
Price (US$/m3)	1000-2090	2250	4000	1960-2940

Because sliced veneer is a high value product transportation costs represent a lower proportion of the total. It is therefore conceivable that markets could be found in Asia, Europe and the United States.

5.1.2.3 Plywood

Hardwood plywood has been the preferred panel in furniture and building in Asia for many years. However with the declining supplies of Southeast Asian hardwoods other panels have been increasingly adopted in recent years. Radiata pine is extensively used in plywood production in Korea, Japan and Taiwan. Over 40 percent of plywood production in Japan now has a softwood component – mainly Russian larch and radiata pine. While hardwood plywood remains the preferred panel in many end uses increasing domestic production of softwood and combi softwood-hardwood plywood will hasten market acceptance of softwood. Combined with this is Japan's gradual move towards performance rather than prescriptive standards, allowing alternatives to Southeast Asian hardwood plywood to gain market share. This includes recent relaxation of the standard for structural plywood to allow softwood plywood use. Therefore the window of opportunity to supply a competitive hardwood plywood is comparatively small, before other alternatives are found and accepted.

Plywood consumption in Japan has remained fairly stable at between 8.8 and 10 million m^3 for the last 10 years. The major end uses for plywood in Japan are in construction and furniture. In certain applications where strength is a major consideration hardwoods can have an advantage such as in concrete form work and in flooring. In furniture thin plywood is commonly used in construction of hollow panels. This type of construction is expensive and will increasingly be exposed to competition

from other panels such as MDF and particleboard. However plywood can be competitive when compared to overlaid panels.

Plywood consumption in the USA is primarily softwood with by far the biggest end use being structural sheathing in housing construction. However, approximately 2 million m^3 of hardwood plywood is also consumed, of which approximately 1 million m^3 is imported from Indonesia and Malaysia. Hardwood plywood is mainly used in appearance applications such as panelling, furniture and cabinetry. Significant volumes are also used in mobile home construction. Domestically produced hardwood plywood is produced from various species such as birch, oak and eucalypts, with maple, walnut and mahogany sometimes used as speciality overlays. It is believed that a quality appearance hardwood plywood could find niche opportunities in this market.

Both temperate and tropical hardwood plywood are commonly used in European furniture manufacture, with consumption of around 1.4 million m^3 for this end use. This consists of imported plywood from Southeast Asia and South America, and domestically produced hardwood plywood though these are generally lighter coloured species – birch, poplar and beech. Some opportunities could also exist in this sector for a quality hardwood plywood.

A comparison of current plywood prices, across various sources and for various timber grades is depicted in Table 8.

Table 8 Plywood prices as at September 1997

Source country	Indonesia	Indonesia	Malaysia	Malaysia	USA	Brazil	Ghana	Brazil
Description	BB, CC grade	BB, CC grade	BB, CC grade	BB, CC grade Phenolic overlaid	4'x8'	n.a.	n.a.	Block-board
Species	mixed	mixed	mixed	mixed	Red Oak face and back, cross bands of poplar or eucalyptus	Mahogany I face	Decorative sliced mahogany overlaid	Mahogany faced
Thickness (mm)	3	6	9-18	12-18	19.05	4	6	15
Price point	FOB	FOB	FOB	FOB	Ex-mill	ex-mill	n.a.	n.a.
Price (US$/sheet)	n.a.	n.a.	n.a.	n.a.	47	n.a.	9.45	n.a.
Price (US$/m3)	410	340	320-350	470	830	1308	529	908

5.1.2.4 Laminated Veneer Lumber (LVL)

The largest consumer of LVL is the United States. North American LVL consumption doubled between 1992 and 1996 and is now around 1.1 million m^3. However most of the North American LVL produced is softwood and utilised in structural applications.

By comparison the Japanese consume a significant proportion of hardwood LVL. Total LVL consumption in Japan is estimated to be between 350,000 and 400,000 m^3. Of this some 80,000 m^3 is imported, though most of this is softwood originating from Juken Nissho in New Zealand. Some hardwood LVL is imported from Malaysia, and a significant proportion of the Japanese domestic

production is hardwood, fluctuating between 50 to 75 percent of the total depending on market demand.

It is likely that LVL in Japan will increasingly be used in structural applications as the inherent strength properties of LVL are utilised to better effect. LVL manufactured from Western Australian native species would be able to provide both attractive appearance and strength.

5.1.3 Secondary Processing

The development of a vibrant secondary processing industry, provides a ready market for primary processed products such as sawn timber, plywood, veneer and LVL. This reduces the dependence of primary processors on direct export markets. Current remanufactured product prices for various timber species and source countries are presented in Table 9.

Table 9 Remanufactured product prices as at September 1997

Source country	Indonesia	Malaysia	Malaysia	Malaysia	Malaysia	USA	Italy	Italy
Species	red meranti	red meranti	red meranti	red meranti	Lauan	Cherry	Mahogany	Mahogany
Description	Grade A moulding	Grade A moulding	Grade B moulding	Grade A panel doors	T&G Flooring	T&G Flooring	Solid wooden doors	Wooden windows
Market	Export	Export	Export	Export	China	China	Europe	Europe
Size	11x68-92mm x 2.1m	11x68-92mm x 2.1m	11x68-92mm x 2.1m		18x70mm x 2.2-4.1m	18x50-70mm x 2-4m		150x120cm
Price point	FOB	FOB	FOB	FOB	CIF	CIF	Ex-mill	Ex-mill
Price US$ per m3	800-820	825-845	660		740-840	805-940		
Price US$ per piece				50-52			150-620	218-320

5.1.3.1 Furniture

Globally the largest furniture industries are located in countries with the biggest markets such as the United States, Germany and Japan, as generally these have developed to service a domestic market. Italy and Taiwan have for some time had a significant furniture export focus. Italy's industry has been developed on good design, quality manufacturing and access to the affluent European market. Taiwan's strength has been the ability to secure supplies of quality hardwoods from Southeast Asia, and initially cheap labour, with furniture designed to meet North American market needs. However, Taiwan is now facing increasing competition from developing economies such as Malaysia, Thailand and Indonesia. Taiwan's response has been to concentrate on more capital intensive manufacturing processes and relocate factories to mainland China.

Western Australia has access to a quality hardwood resource, that to date has been largely under exploited for its inherent appearance qualities. With globally decreasing supplies of high quality hardwoods such as mahogany and meranti, there is potential for furniture produced from Western Australian species to substitute for those traditional species. While MDF and particleboard are increasingly used in furniture production, there continues to be a higher value market for solid wood. The strength and natural durability of jarrah and karri can combine with the aesthetic characteristics to produce premium outdoor furniture.

It is believed that there are excellent opportunities for Western Australian furniture manufacturers in the affluent markets of North America, Europe and Japan.

5.1.3.2 Flooring

Flooring in Australia is dominated by concrete which is the resource used for 75 percent of building flooring. However particleboard and timber strip flooring are the next most popular flooring materials, both having 10 percent of the total market (including alterations and additions and non residential building). Timber strip flooring has increased in recent years from just 6 percent of the market in 1989.

Similarly timber strip flooring has increased in popularity in WA, though from a lower base of 3 percent in 1989 to 6 percent in 1995. The main area of lower wood use in flooring in Western Australia is in the home improvements market. Home improvements includes both house additions and patios/decks where concrete is the dominant material used in Western Australia but clay brick pavers are also commonly used materials for patios. In both these areas wood is the significant material used in other states.

In detached housing the use of timber strip flooring in Western Australia (7 percent) is slightly higher than Australia as a whole (5 percent).

The prevalence of concrete flooring throughout Australia also creates an opportunity for wood as an overlay. A number of systems are possible including combinations of solid wood and wood based panels such as plywood, with some systems attached to the concrete subfloor and others "floating" on it.

There is the potential to take advantage of the increasing popularity of wooden flooring since Western Australia has several timber species which are eminently suited to flooring production. The increasing popularity of wood could also be encouraged by promotion of the aesthetic, environmental and health advantages of Western Australian timber species, in particular to designers and specifiers of new housing. A similar approach could be adopted for export markets since significant opportunities lie in Asian, USA and European flooring markets.

5.1.3.3 Joinery

As discussed previously mahogany, red oak and meranti are species for which jarrah and karri could substitute in many applications. All these species are commonly used in joinery manufacture. The opportunity exists to recover small joinery components from lower grade lumber to manufacture high value joinery products. The natural durability of Western Australia hardwood would favour use in exterior windows and doors.

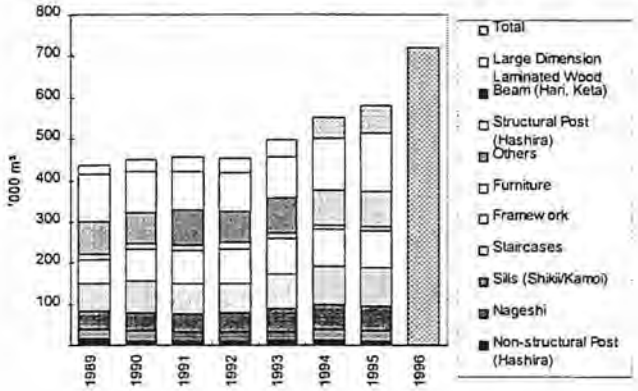
5.1.3.4 Laminated wood products

The advantages of laminated products are increasingly being recognised in the market, notably by Japan. These include dimensional stability, consistency of product performance, and strength. There are a wide range of product possibilities including structural products such as glue laminated beams

and posts, and non-structural products including edge glued panels, laminated window and door components and laminated mouldings.

Japanese production and consumption of laminated wood products have increased rapidly in recent years (Figure 1). While historically the majority of laminated products have been used in non-structural applications such as stair parts and door runners (kamoi/shikii), greater use is now being made of the structural properties of laminated products. Growth areas include use as structural posts in traditional house construction (hashira) and in large dimension glue laminated beams. Successful development of markets for laminated products, based on Western Australian hardwoods, would be dependent on identification of end uses where the aesthetic, durability and strength properties are recognised and valued.

Figure 1 Japan, Laminated Wood Products Production



5.2 Western Australian Solid Wood Forest Industry Competitiveness

5.2.1 Wood costs

Wood costs are inevitably a significant component of any forest industry manufacturing process. Additionally the relative pricing of higher quality logs versus forest residues can have an impact on the resulting structure of the industry.

It is difficult to compare the relative wood costs for competing industries, as consideration must be given to lumber or veneer grade recoveries when assessing a price. Additionally the processing costs associated with one species may differ from others, which will impact on the log price.

Thus, while in absolute terms the price of Western Australian hardwoods is somewhat lower when compared to international hardwood price levels, the high cost of processing and drying Western Australian species offsets this advantage. Nonetheless this provides the basis for an industry which could be internationally competitive. With improvements in milling and drying, through research and employment of newer technology, a greater advantage could be achieved, both for the processor and forest grower. A greater emphasis on the appearance qualities, and the ability to provide a sustainable output of product directed at specific market niches could provide profitable returns on investment.

5.2.2 Energy

Electricity prices in Western Australia are probably somewhat high when compared to elsewhere in Australia and in countries like Canada, though are comparable to levels in the USA, and are lower than those found in Brazil, Indonesia and Japan. A number of factors contribute to the comparatively high costs, including: the nature of the power source in the Southwest (coal), the distances involved in delivering gas to the Southwest and the low demand/extensive distribution system involved. The following changes could result in lower energy prices:

- Removal of restrictions on customers with loads less than 5 MW 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 Southwest
- Allowing the development of alternative sources of supply of primary fuels, and
- Greater use by the industry of co-generation opportunities

(pers comm R. Guyton, DRD)

5.2.3 Labour

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

5.2.4 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 percent greater than the United States. With greater resin demand in Western Australia, some reduction in production costs could be achieved through economies of scale. However the costs of importing materials for resin production are still likely to be high by international standards.

5.2.5 Capital costs

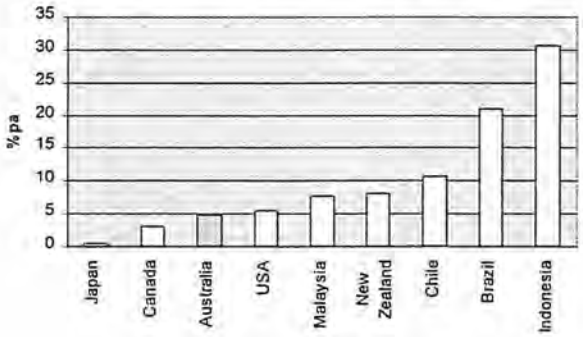
The costs of capital associated with individual companies or regions vary widely, and are dependent on a wide range of factors. Any comparison can be indicative only. Prevailing interest rates have a strong influence on the rate at which finance can be obtained, and the expectations on returns for equity funding. 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.

A project's weighted average cost of capital (WACC) is dependent on the companies mix of debt and equity and the perceived risk associated with the project. The WACC is further influenced by the appropriate tax rate which will impact on the debt component of the funding.

In general a project with a greater proportion of equity will be able to sustain lower prices in the short term because of having lower interest costs. This can be the case in regions with older plants where a large portion of the original finance has been repaid. In the longer term however, a minimum required return on equity, will mean that lower prices will only be sustainable if those returns can be met.

It can be seen in the figure below that current interest rates in Australia are comparatively low.

Figure 2 Short term interest rates, September 1997



The total cost of construction for new plants have been included in Table 14. These are typical costs for building new plants in Australia, based on the costs of recent new investments and indications from plant and equipment suppliers.

5.2.6 Transportation

Transportation costs from Western Australia to both interstate and overseas destinations are relatively high. Lower prices may be able to be negotiated with greater export volumes. Additionally, reform of the transport sector (rail, ports and shipping) would lead to reduced handling costs which are high by international standards. Ultimately this would flow on to shippers in the form of lower freight costs. There is also evidence that competitive transportation costs can be achieved, with some shippers securing good back loading rates to eastern states. Shipment of woodchips, which is normally undertaken in chartered vessels, has been cost competitive with other suppliers to Japan.

Transportation costs will be dependent on the nature of the product and the market demands. Timely shipping of high value products will likely require containerisation. However, if suitable arrangements are made between shipper, shipping company and customer considerable savings can be achieved by employing alternative shipping strategies.

5.2.7 Solid Wood Products

5.2.7.1 Sawn timber

As the hardwood industry moves increasingly to supply appearance grade products there will be a need to develop international markets. Within these markets the Western Australian industry will compete with suppliers from Malaysia, Indonesia, the USA and to a certain extent South America and Africa.

Comparison of the component costs of sawn timber production suggests that the Western Australian hardwood sawmilling industry currently produces sawn timber at a higher unit cost than the Malaysian and the USA hardwood sawmilling sectors. The main reasons for this are:

- Lack of processing scale and critical mass
- Lack of modern technology employed in mills
- High manning levels (compared with US mills)
- Significantly higher labour costs (compared with Malaysian mills), and
- Lower sawn wood recoveries due to the nature of the resource and current sawmill practise

A key issue for the industry will be to ensure that investment in technology is undertaken. This will increase fibre yields and throughputs, thereby reducing unit costs of production. As a consequence, rationalisation of the number of sawmills and staffing levels is envisaged.

Assuming that progressive modernisation takes place, the Western Australian hardwood sector will be well placed to capitalise on globally declining quality hardwood resources.

With declining supplies from traditional sources, and continued growth in demand, it is believed that Western Australia is strongly placed to develop an internationally competitive hardwood industry.

5.2.7.2 Veneer based

Plywood production located in Western Australian could be competitive against other hardwood plywood suppliers. The main advantage is in the relatively low wood costs compared to mills in Indonesia, Malaysia and Japan. This however, would require confirmation by assessing the various veneer grade recoveries 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, utilising the strengths of each of the species.

A similar set of advantages exist for LVL. 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.

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 and maximum utilisation of the superior component of the resource is achieved. The comparatively low wood costs will ensure that sliced veneer produced in Western Australia will be able to compete with other sliced veneers.

5.2.8 Secondary processing

Efficient drymill processing is an essential element in developing a value adding industry. There would be a need for considerable investment in drying and secondary processing, to achieve higher levels of appearance grade lumber output. This may be done by sawmilling companies but also presents an opportunity for independent operators to provide certain specialist, intermediary manufacturing capabilities, to supply components to manufacturers of such products as furniture, joinery, cabinetry, 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 are also domestic manufacturers of furniture, joinery and other re-manufactured products.

Development of a competitive manufacturing sector is dependent on a number of factors including creative design capabilities, marketing, promotional skills, and effective training and education.

5.3 Future Industry Outlook for Solid Wood Processing

5.3.1 Assumptions

In developing the industry scenario a number of assumptions were made which are believed to be realistic targets for the industry. These include:

- A 0.2% per annum increase in the overall sawlog recovery during the period to 2020
- A 0.4% per annum increase in the proportion of premium grade sawn timber recovered for first and second grade logs i.e. the assumed percentage of premium grade improves from 45% in period 1997-2000 to 55% in the period 2015-2020
- A 0.2% improvement in premium grade sawn timber recovery for third grade logs
- Increased utilisation of 3rd grade jarrah logs up to 15 percent of the available 900,000 m^3 by 2020
- Increased emphasis on appearance grade sawn timber, from the current percentage of around 40 percent to 85% by 2005 and beyond
- Acceptance of the National Plantation Inventory (NPI) projections of softwood and plantation hardwood availability.

5.3.2 Solid Wood Processing

5.3.2.1 Sawn timber

The challenge facing the hardwood sawn timber industry is to change from essentially a domestic, structural focus to international markets for high value solid wood products. The timber resource is available in Western Australia and 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.

However, to become internationally competitive considerable investment in drying and milling technology will be required. There will also be a need for technical research and development in new product areas, as well as increased market development and promotion.

Investment in drymill processing will be required if further efficient downstream re-manufacturing is to be achieved.

The Western Australian sawmilling industry currently utilises almost all the available high quality saw and veneer logs. With supply expected to decline over time a challenge will be to continue to increase returns, by increasing recoveries of higher grades from the high quality resource, and processing an increasing proportion of lower quality logs. There is also potential for increased utilisation of plantation hardwoods, should some of these be grown for sawlogs rather than pulp.

It is believed that there will be continued rationalisation of sawmilling operations to achieve economies of scale, and to employ new, more efficient technologies.

5.3.2.2 Plywood, LVL and veneer

Veneer based panels provide an excellent opportunity for utilisation of a component of the native hardwood resource. Continued projected demand, with increasingly constrained supply, will create opportunities for new investment in veneer based products. There is the potential to combine native hardwoods with either softwood or plantation hardwoods to produce a range of panel types suited to various end uses. We therefore suggest that there will be the opportunity to invest in plywood and LVL capacity in the short term.

Sliced veneer provides an excellent opportunity to maximise the appearance qualities and recovery from the superior component of both the jarrah and karri resource. Globally there is a trend for manufacturers of reconstituted panels such as MDF and particleboard to add more value to their product by overlaying. With a well developed MDF and particleboard industry in Western Australia, this is likely to provide an outlet for high quality veneer, in addition to exports.

5.3.2.3 Secondary Processing

The encouragement of a broad secondary wood processing industry is advocated. This could include a combination 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), all of which have domestic and export market opportunities and can be successfully manufactured from the available resource.

This would increase the diversity of markets available to primary processors.

With comparatively low investment there is potential to add significant value and to provide considerable additional employment. An indication of the potential industry development is illustrated in Table 10. While it is believed this provides a realistic indication of the potential, there are clearly alternative options that could be considered. There is potential for re-manufacturing industries to develop more rapidly, and process a greater proportion of the sawn timber output at an earlier date.

The assumed investment requirements, size, and employee numbers are those which are typically associated with furniture, flooring, joinery and millwork and moulding manufacturing facilities. There is further potential in specialised areas such as premium quality furniture which may be small operations, in terms of wood usage, have the potential to generate considerable turnover, and in total provide considerable employment opportunities. Such specialised operations have not been included in this analysis. It is therefore felt that in terms of turnover and employment the following scenario is a conservative outlook, and that there is considerable upside potential in the forecast.

It is not inconceivable that with high quality design and effective promotion of a range of high value products, that employment levels could be perhaps 50 percent higher than those predicted and turnover could be increased (probably anywhere from 20 to 50 percent).

Table 10 Secondary processing potential

	1997-1999	*2000-2004*	*2005-2009*	*2010-2014*	*2015-2020*	***Total***
Required investment A$mill	15.1	17.6	14.5	8.6	9.0	**64.8**
Number of new enterprises	4	4	4	2	2	**16**
Increased turnover A$mill	55	50	52	30	20	**207**
Additional employees	115	120	115	70	75	**495**
Additional native hardwood sawn timber processed (000 m3)	36	27	38	19	11	**131**

6 RESIDUE PROCESSING

6.1 Development Opportunities for Residue Processing

6.1.1 Wood resource suitability

A solid wood processing sector, including plywood and veneer based products, would contribute to an increased volume of residues, both from mill, and from forest silvicultural and harvesting operations. This residue pool could be used in energy generation, production of MDF and particleboard, in addition to woodchip exports, and at a later date, pulp and paper.

6.1.1.1 Jarrah

Utilisation of jarrah residues is a challenge. The high density and high extractive content of jarrah render it unsuitable for pulping, even for kraft pulp which is more flexible in terms of raw material input. These problems, in addition to the short fibre length and dark colour, mean that jarrah is not ideally suited in the manufacture of reconstituted panels such as medium density fibreboard (MDF), and particleboard and potentially unsuitable for oriented strand board (OSB).

Jarrah residues can be used in the manufacture of charcoal, and the high carbon content enables activated carbon production.

6.1.1.2 Karri

While it is possible to manufacture both particleboard and MDF using karri as a component of the raw material input, the result is a darker coloured product, which is likely to be more acceptable in particleboard. It is likely that regrowth wood would be preferred due to the lighter colour when compared to mature wood.

The short fibre length of mature karri can be a problem with panels where strength is required and for thinner panels. The comparatively high density of karri requires that it be mixed with lower density species to meet market needs relative to weight.

Karri residues can be utilised in pulp manufacture, particularly kraft pulp, as the pulp bleaches to a reasonable brightness. When used as a supplement to species with superior pulping characteristics it can be used in the manufacture of fine writing papers providing an outlet for both mill and forest residues. Regrowth karri is considered more suitable for use in reconstituted products, than old growth.

6.1.1.3 Marri

Marri residues can be utilised in pulp manufacture and bleach to an acceptable level of brightness and as such are a suitable furnish for bleached hardwood kraft pulp (BHKP).

Marri can also be utilised in the manufacture of reconstituted panels though, as with karri, there are concerns with the colour of the resulting product and with strength characteristics. Due to the high density of marri and panel weight constraints, it would be appropriate to mix marri with lower density species such as radiata or pinaster pines. Particleboard is more flexible than both MDF and OSB in

terms of the raw material input, and would therefore be more likely to utilise a component of karri and marri residues than other wood based panels.

6.1.1.4 Plantation Hardwoods

E. globulus can be used in the production of both bleached kraft pulp (BKP) and bleached chemical thermo-mechanical pulp (BCTMP). BCTMP manufactured from *E. globulus* has been found to produce pulp of comparable quality to northern hemisphere aspen and birch which make the best quality BCTMP (pers comm Ross Guyton, DRD). *E. globulus* BKP also compares extremely favourably with other northern hemisphere hardwoods, with better physical paper making characteristics such as bulk, porosity, opacity and light scattering co-efficient than birch and mixed northern hemisphere hardwoods (Robert Wilson, 1995).

A major consideration however will be the volume of wood available. A BHKP mill requires in excess of 2 million m^3 per annum of wood fibre input. While, according to the National Plantation Inventory (NPI) the supply of *E. globulus* is forecast to exceed 2 million m^3 per annum around 2010, with rotations of 10-12 years. This is largely dependent on the levels of planting now and in the future. Should the economics of growing pulpwood change, these levels may not eventuate. Additionally, much of the hardwood plantations are committed to export as woodchips and may not be available for supplying a pulp mill, and what is available must be within an economic haul distance of a proposed mill. Conversely, if current planting levels of 20,000 hectares per annum are maintained, a harvest exceeding 4 million m^3 per annum could be sustained by 2005 – considerably higher than the NPI projections. A BCTMP has lower volume requirements of 600,000 to 650,000 m^3 per annum, which would be available between 2005 and 2010, whereas the economically viable volume required for BHKP may not be available before 2015. However, given the uncertainty of the NPI forecasts, and the availability of native hardwood fibre as a supplementary fibre source, sufficient volumes may be available at much earlier dates (2000 for a BCTMP mill, and between 2005 and 2010 for a BKP mill).

There is also potential for use in reconstituted wood products such as particleboard, MDF and OSB. The lower density and lighter colour of plantation grown hardwoods, when compared to native species, mean that *E globulus* is more readily utilised in these manufacturing processes.

6.1.1.5 Plantation Softwood

Softwood can be mechanically or chemically pulped, providing strength to many grades of paper including newsprint, and packaging grades. However, there are insufficient surplus softwood volumes available in Western Australia during the forecast period to sustain a world scale chemical or mechanical pulp mill, as most residues are utilised in local production of MDF and particleboard.

Softwood is favoured because of its light colour and density in the manufacture of reconstituted wood panels such as MDF and particleboard. For this reason the availability of softwood has a significant impact on the potential utilisation of native hardwood residues. While the manufacture of reconstituted wood products such as MDF and particleboard would primarily be based on softwood utilisation (and possibly *E. globulus*), raw material input could also be supplemented by native hardwood fibre.

6.1.2 Market Opportunities

6.1.2.1 Reconstituted Wood Panels

The opportunities for utilising purely native species in reconstituted panel products are limited. However the potential does exist to use native species to supplement the softwood and plantation hardwood volumes available.

In terms of global wood based panels consumption, particle board, with around 42 million m^3 per annum, is second only to plywood, and is between four and five times larger than either OSB or MDF. Continued strong growth in demand for particleboard is forecast in Asia and South America in particular. This has fuelled recent investment in South America and Asian countries, in both developing economies and also in wealthier countries such as Japan. However, investment in new capacity has not been as dramatic as that exhibited in new MDF plants.

There is currently an excess of MDF capacity both in Australia and globally, with resulting declining prices over the last two years. Japan and Taiwan are exhibiting strong growth in consumption and have the greatest need to import. Japan's forecast requirement for imported MDF will grow from 840,000 m^3 per annum in 1997 to 1.6 million m^3 in 2001. Taiwan currently imports 450,000 m^3, which is expected to rise to over 600,000 m^3 by 2001.

Korea and Thailand currently produce sufficient MDF to service the domestic market and export small quantities. However, Korea is forecast to have insufficient production capacity to meet domestic demand by 1999, when it will need to import almost 100,000 m^3, increasing to over 500,000 m^3 by 2001. Thailand will have excess capacity until 2001, when it will need to import almost 100,000 m^3 based on current production capacity and consumption forecasts.

The region as a whole, excluding mainland China, currently has excess capacity of 1.7 million m^3, which is expected to peak in 1998 at 2.8 million m^3, and then decline to 1.4 million m^3 in 2000. By 2001, the region will have a balanced market. An ideal time to invest would therefore be 1999, with production coming on stream in 2000 or 2001.

The growth in OSB consumption over the last ten years has been dramatic, growing from approximately 3.7 million m^3 in 1985 to almost 11 million m^3 in 1995. However, nearly all growth has concentrated in North America. Market growth is unlikely to be as dramatic in other regions, because there are fewer applications for which OSB is suited. Demand for OSB is therefore likely to be satisfied by exports from North America and a limited number of large OSB producers in each region. For example there are currently four mills operating in Europe with a combined capacity of almost one million m^3 – more than twice the present demand. Any new mill would therefore have to ensure price competitiveness, as minimum output levels would require a large regional market share to be captured.

The following table gives current price levels for reconstituted panels and provides and indication of the relativity between different products and regions.

Table 11 Reconstituted wood panel prices as at September 1997

Product	*Source Country*	*Description*	*Thickness (mm)*	*Price Point*	*Price US$/m³*
MDF	Indonesia	Export	12-18	FOB	200-210
	Malaysia	Export	<5	FOB	240-260
	Malaysia	Export	>5	FOB	210-220
	USA	Domestic sales	16-19	Ex-mill	178-200
Particleboard	Brazil	Domestic sales	15	Ex-mill	255
	Indonesia	Export	9-18	FOB	145-155
	Malaysia	Export	6+	FOB	150-155
	USA	Domestic sales	16+	Ex-mill	150-165
OSB	USA	Domestic sales	6.35	Ex-mill	208-220
	USA	Domestic sales	12.7	Ex-mill	146-156
	Canada	Domestic and US	6.35	Ex-mill	139-158
	Canada	Domestic and US	12.7	Ex-mill	132-142

6.1.2.2 Pulp and Paper

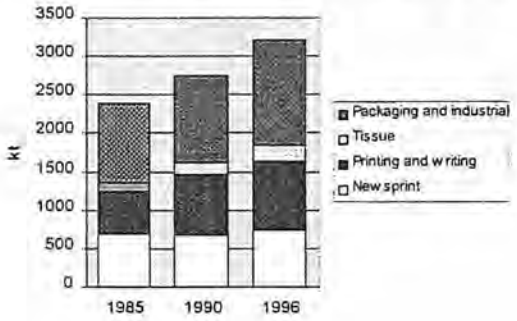
As the developing economies of Asia continue to grow there will be associated rapid growth in pulp and paper demand. Asia Pacific paper and board consumption is expected to pass 100 million tonnes for the first time in 1998. Between 1995 and 2000 consumption is expected to increase from 87 million tonnes to 115 million tonnes at an annual rate of 6 percent. However, production is forecast to increase even faster from 78 million tonnes to 109 million tonnes (Asia Pacific Papermaker, May 1997).

Indonesia, Korea, China, Thailand and Malaysia have projects underway which will add 1.5 million tonnes of kraft pulp capacity, in addition to the 1 million tonnes which will be completed this year. This has been a major factor contributing towards downward price pressure on both hardwood pulp and woodfree paper. Today most of the hardwood used is mixed native hardwood, but there will be a switch to plantations as they mature. This is likely to result in higher pulpwood costs for these producers.

Currently kraft pulp is preferred to BCTMP, with the Pacific Asia market for BCTMP believed to be less than 300,000 tonnes per annum. BHKP is commonly used in the production of printing and writing papers. Asian consumption of writing and printing grades is expected to grow at 5.5 percent per annum until 2000 (RISI), China and Japan accounting for two thirds of the growth. There will be growing deficits in these two countries but this will be offset by increased production in Thailand and Indonesia.

Continued strong growth in consumption of printing and writing papers is forecast in Australia. Over the last 10 years this category has grown more rapidly than the other major paper grades (Figure 3).

Figure 3 Australian paper and board consumption, 1985 and 1986



6.1.2.3 Other Residue Products

Charcoal

Currently this is the major end use for jarrah forest and sawmill residues. Charcoal is produced by Simcoa and used in the manufacture of silicon metal as a high quality reducing agent. There is potential for this plant to double capacity, which seems likely over the time period examined.

There may also be the potential to export jarrah chips for overseas production of charcoal. Trial shipments were made in 1996/97.

Activated carbon

Activated carbon can be manufactured from a range of carbon rich sources such as coal, various agricultural waste products, and wood.

It is used in a variety of applications that can be classified as either gas phase or liquid phase. Liquid phase applications include: water treatment; sweetener decolourising; mining; pharmaceuticals; food and beverages processes; dry cleaning; electroplating; and various chemical processing. Gas phase applications include: control of emissions from automobiles; cigarettes; solvent vapour recovery; and air purification.

World production capacity was estimated by Roskills to be 524,000 tonnes per annum in 1991, which significantly exceeded demand of around 400,000 tonnes per annum (DRD, 1995). Most of the oversupply is the result of capacity expansion to service increased demand for environmental uses which have been slower to eventuate than anticipated.

The United States has the most capacity with around 150,000 tonnes per annum, followed by China which has increased capacity from 50,000 tonnes per annum in 1991 to 95,000 tonnes per annum in 1994.

It is believed that future growth will continue as a result of more stringent environmental legislation. In Japan advanced ozone/granular activated carbon systems have been planned for water purification systems in all major cities, creating an additional demand of 30,000 tonnes per annum by 2003. Likewise use in automotive emission controls in the USA could reach 30,000 tonnes per annum in 2000 (up from 16,000 in 1993) (Roskill, 1994).

Australia is believed to consume around 6000 tonnes per annum of which around half is used in the gold industry and the remainder divided between food and water cleaning uses (DRD, 1995).

Prices for activated carbon vary widely depending on the quality and the end uses for which it is therefore suited. Prices in Australia are believed to range from $1000 per tonne to $4000 per tonne.

Firewood

Currently at least 45,000 m^3 of forest residues are utilised for domestic firewood. Despite continued expected population growth, increasing environmental restrictions suggest that wood consumption in this end use is unlikely to increase. There are likely to be greater standards required in the installation of open fires in new housing, and additional regulations requiring wood to be of a certain moisture content before being sold in the Perth area (with the intention of reducing air emissions).

6.2 Western Australian Residue Processing Competitiveness

6.2.1 General

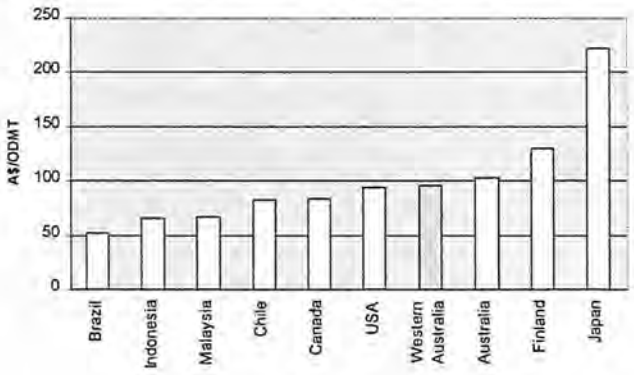
As with solid wood products factors such as energy, resin, labour and transportation are important components of competitiveness in the manufacture of reconstituted wood products. Discussions of these factors is included in sections 5.2.1 to 5.2.6 (pages 18 to 20).

6.2.2 Wood fibre costs

The delivered price for hardwood pulpwood in Australia is A$40 per tonne ($53 per m^3). This is lower than Japan and Finland but higher than all other major pulp producing regions (Figure 4). The cost of pulpwood in Western Australia is largely driven by the high price of fibre paid by Japan. It is believed that as trade barriers are reduced and the Japanese producers are increasingly exposed to international market forces, the price paid for pulp logs will decline with a consequential flow on to Australian prices.

This may have an impact on the profitability of pulpwood growing, but will be beneficial for processing operations dependent on pulp wood fibre. The critical factor will be that if the returns from pulp rotations decline that sufficient resource is established to support fibre based industries.

Figure 4 World Hardwood Pulpwood Prices



NB: prices are generally mill door prices, Chile FOB export price, Japan CIF port

6.2.3 Reconstituted Panels

The competitiveness of hardwood in reconstituted panels manufactured in Western Australia is constrained by the comparatively high wood fibre costs. This partly results from the need to rely largely on roundwood input, rather than sawmill residue. Roundwood prices are further heightened by the need to pay export parity prices with woodchip exports.

Electricity and resin prices are also comparatively high though not prohibitively so.

Transport is a significant barrier on what are essentially comparatively low value commodities.

6.2.4 Pulp and Paper

Considerable work has already been undertaken, investigating the viability of establishing world scale pulp mills in Western Australia. The conclusion reached in a recent study was that a Western Australia based pulp mill would not be competitive because of:

- Uncertainty over the availability of sufficient wood resource in the immediate future for a BHKP mill
- Relatively high wood fibre 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 BCTMP mill
- Imminent increases in production for Indonesian pulp and paper, which will add to the risk associated with market pulp based mills.

(pers comm R. Guyton DRD)

We agree with these findings and the conclusions that these factors could change over time. There will undoubtedly be: increasing volumes available from maturing *E. globulus* plantations; a decline in woodchip prices paid by Japan over time; deregulation of the power market which could lead to reduced power prices; and, a reduction in Indonesia's competitive position as Indonesia shifts to utilisation of plantation timber, rather than native forest residues.

The *E. globulus* plantations on which a pulp mill would primarily be based are believed to produce premium quality hardwood pulp, suitable for production of fine writing and papers, which would be competitive against mixed hardwood pulps such as North American mixed hardwood kraft pulp. A BHKP mill would have the added advantage of being able to utilise significant volumes of karri and marri residue. We therefore believe that by 2010 the competitive position of a Western Australian BHKP mill would have improved sufficiently to warrant investment. The timing of such an investment depends on the extent to which plantation pulpwood volumes increase, the extent to which they are committed to overseas pulp mills, and the overall market value of pulp wood relative to pulp. Given current planting rates sufficient resource may be available at a much earlier date. Investment by a major pulp and paper manufacturer, would also reduce the initial reliance on market pulp, and may also allow earlier investment.

6.3 Future Industry Outlook for Residue Processing

6.3.1 Panels

Of the wood based panels, particleboard has the best potential to utilise a component of native hardwood residue. It is a more flexible process than either MDF or OSB and could therefore use native hardwoods as a component of the raw material furnish. Though currently high wood costs limit the competitiveness of a Western Australia based plant, it is believed these will decline over time, and that an additional particleboard plant based on a combination of softwood, plantation and native hardwoods and sawmill residues could be viable.

The already large global market for particle board is expected to continue to grow, thereby creating opportunities for new players. 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, will however limit expansion till nearer 2010 unless significant volumes of plantation hardwood are utilised.

It is not believed that there will be significant opportunities for an OSB plant as most growth in the market will occur in North America, and it would be very difficult to compete with North American producers. Regional suppliers of OSB would have to capture a significant market share. It seems unlikely that a Western Australian producer would be able to compete with manufacturers nearer the major markets; transportation costs would be prohibitive on a comparatively low value product. One possibility might be a specialised variation of OSB such as "Triboard" manufactured by Juken Nissho in New Zealand. This product has a waferboard core and MDF surface and is a higher value product than OSB. However, the risk associated with such a specialised investment is likely to be high unless a market for a large portion of the production could be secured.

6.3.2 Pulp and Paper

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 produce a premium pulp for manufacture of fine writing and papers. We at this stage suggest a BHKP mill is more likely because of the greater ease in selling market pulp (compared to BCTMP), meaning that investment in paper making plant can occur at a later date. Additionally the BHKP process has the potential to utilise a major component of the native hardwood resource.

Between 2010 and 2020, we believe that the competitiveness of a Western Australian based pulp mill will have improved sufficiently to warrant investment, with further investment in a paper making machine towards the end of that period

6.3.3 Other

It seems likely that between now and 2010 that the silicon metal manufacturing will be expanded, providing the potential for increasing the utilisation of jarrah residues. There may also be the potential

market for the export of jarrah wood chips for charcoal manufacture, and believe that this could reach 50,000 m^3 by 2010.

There is also the potential for utilisation of jarrah residues in manufacture of activated carbon. From a period of oversupply it appears this market may now be entering a period where there is opportunity for new investment. Continued growth is likely because of increasing use of activated carbon in environmental applications.

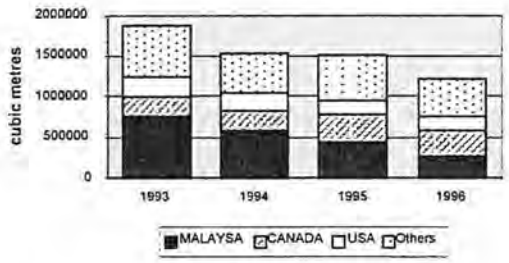
7 PRICE OUTLOOK

7.1 Sawn timber

7.1.1 International

Historically the majority of internationally traded hardwood sawn timber has come from Southeast Asia — particularly Malaysia, Indonesia and the Philippines. The Philippines is no longer a significant supplier, having exhausted virtually all sustainable indigenous wood resources. Raw material supplies are under severe pressure in both Malaysia and Indonesia for the production of both sawn timber and plywood. Imports from Malaysia by major markets such as Japan and Taiwan have continued to decline over recent years. In Japan imports of sawn timber from Malaysia declined from 640,000 m3 in 1993 to less than 400,000 m3 in 1996. Likewise tropical hardwood imports by Taiwan have also decreased significantly. While Taiwan's lumber imports from other sources have remained relatively stable (Figure 5),-those from Malaysia are substantially less than they were in 1993.

Figure 5 Taiwan Timber Imports

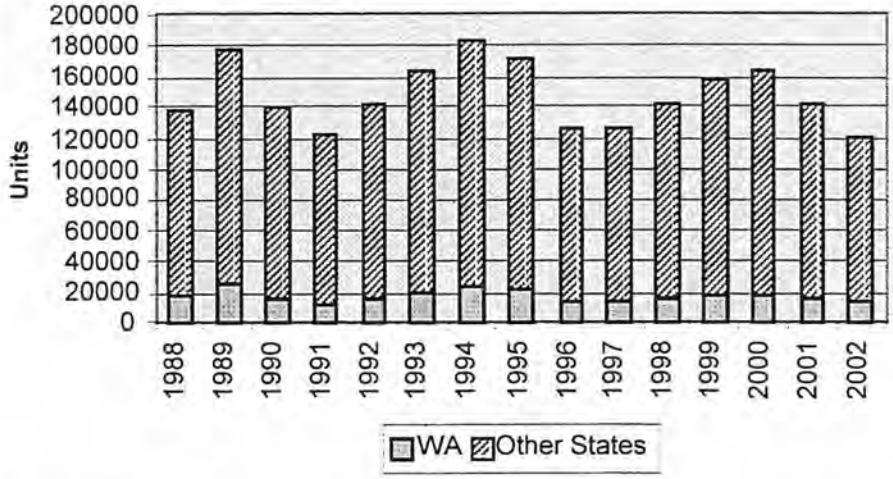


This represents a significant opportunity for sustainably managed Australian native hardwoods.

7.1.2 Australia

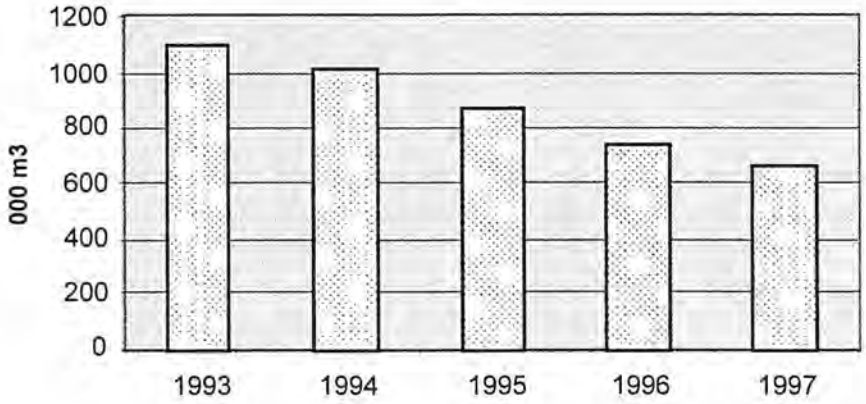
Consumption of sawn timber in Australia is closely tied to building activity, with around 70 percent of all sawn timber consumed in the construction of new dwellings (including alterations and additions). Building activity for Australia bottomed out in 1996 but only improved slightly in 1997. In Western Australia new dwelling commencements were lower for the year ended June 1997 than in 1996. However, for both Australia and Western Australia building activity is expected to improve in 1998, and peak in 2000.

Figure 6 Dwelling Commencements



Traditionally Australia has imported significant quantities of timber from New Zealand and North America. However over the last 5 years this has declined dramatically, driven by a reduction in building activity and an increase in the supply available from domestic plantation sources. The magnitude of the impact has been less significant in Western Australia with sawn timber imports generally only ranging between 15-20,000 m^3.

Figure 7 Australian Sawn Timber Exports

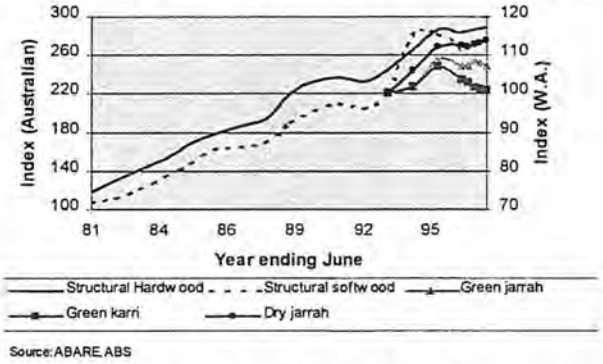


7.1.3 Prices

Over the past 15 years nominal Australian structural hardwood timber prices have increased at an average of around six per cent per annum. However, in CPI adjusted terms this represents only a minimal increase in price. It is believed that the greater availability of softwood both in Western Australia and Australia as a whole will lead to competitive pricing in structural applications with softwood likely to dominate over time except in applications where high strength ratings are required. However in certain applications, such as those requiring particularly high strength ratings, and where the appearance of hardwood is valued, the scarcity of suitable hardwood will likely continue to attract

premiums. Prices of softwood sawn timber, and Western Australian green sawn hardwood timber have been influenced by the down turn in housing activity. This is particularly noticeable for karri which is still primarily used in construction. Meanwhile dry jarrah has appreciated over the last four quarters, reflecting its use in a wider range of appearance grade end uses.

Figure 8 Australian & Western Australian Sawn Timber Prices

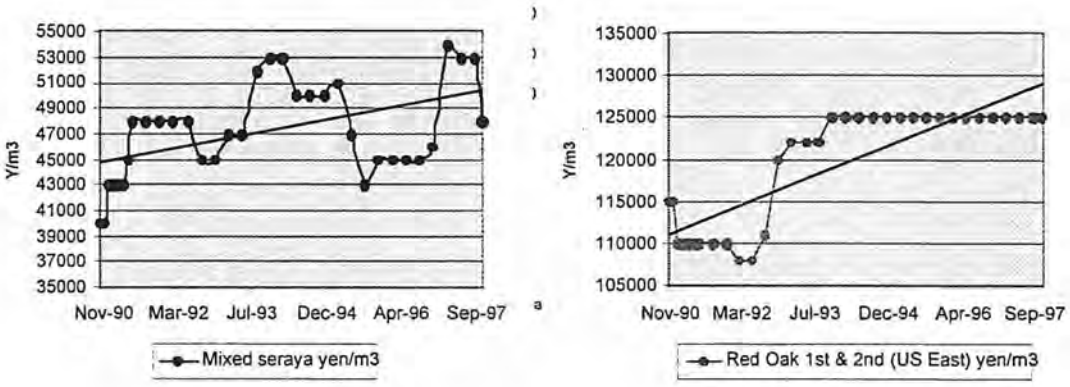


Source: ABARE, ABS

Additionally, as Western Australian sawn timber producers become more export oriented they will be increasingly exposed to international price trends. Japanese prices for hardwood have increased by between one and three per cent during the 1990's. In a period of declining producer prices this represents a real increase of between two to four per cent.

Figure 9 Japanese Sawn Hardwood Prices

Importer's selling price



Over the longer term we anticipate real price increases for premium grade sawn timber of 1.5 per cent per annum. For standard grades a one per cent per annum real price increase has been assumed, with utility grades remaining unchanged in constant dollar terms. This is a reflection of the increasing scarcity value associated with higher grades of sawn timber, both domestically and internationally.

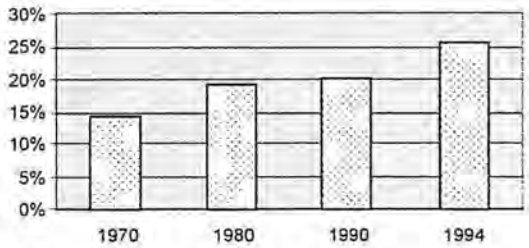
7.2 Panel products

7.2.1 International market

Internationally, panel products have been capturing an increasing share of all wood products markets, replacing sawn timber in a range of applications. Analysis suggests that this trend will continue, as construction technologies evolve which enable the use of panels and smaller volumes of timber, where previously solid sawn timber was required.

Despite increasing demand, downward pressure on prices will continue for the near future due mainly to excess supplies of structural panels in North America, and globally rapid increases in reconstituted panel capacity.

Figure 10 World Wood Based Panels
Share of all Wood Products



7.2.2 Plywood & LVL

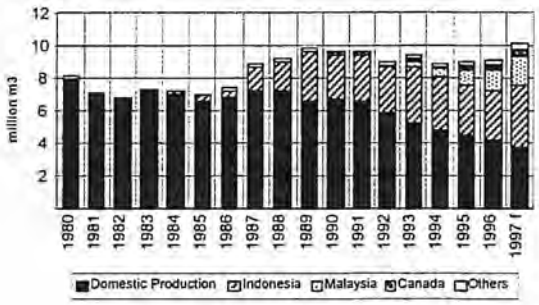
Though plywood's share of global panel consumption is declining, plywood consumption continues to increase though at a slower rate than other panel products. However, plywood remains the panel which is consumed in the greatest quantities internationally.

Most of the decline in plywood consumption has been in North America where the majority of plywood is used in construction. The emergence of OSB as a cost competitive alternative for-this end use has resulted in significant declines in plywood consumption. However plywood used in other applications, such as sanded and siding plywood, has not been affected to the same degree due to the superior performance of plywood in those applications.

In Asia, where concrete formwork is the major use of wood based panels, plywood is preferred. Japan is the only major Asian market using significant volumes of plywood in construction. This could conceivably be replaced by OSB, but at this stage the trend is to replace hardwood plywood with softwood, both from domestic production and imports from Canada especially.

The use of thin plywood in furniture is also common in Asia, particularly in Japan and China. Over time this will come under increasing pressure from overlaid thin MDF.

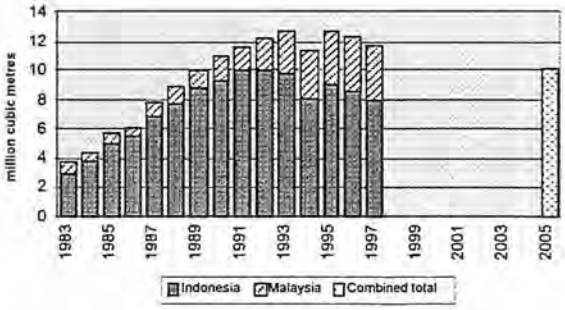
Figure 11 Japanese plywood production, consumption & imports



The switch to softwood plywood in Japan has been brought about by the lack of suitable hardwood logs available for domestic production, and increasing pressure on supplies from Southeast Asia. Indonesian production of plywood peaked in 1992 and has been declining since then. While that decrease was initially made up by increased production from Malaysia, it is unlikely that Malaysian production will increase far beyond current levels and will most likely decline in the near future.

This presents an opportunity for an alternative supplier of hardwood plywood, though this will decline over time as softwood plywood and other panels become established in Asian markets.

Figure 12 Indonesian and Malaysian plywood production



As with plywood the two major consuming countries of LVL are the USA and Japan. However, the manufacturing technologies and the end uses for LVL are quite different. In North America LVL tends to be manufactured by plywood manufacturers using the same plant, whereas in Asia LVL is generally manufactured with dedicated processing facilities.

The end uses for LVL in North America are primarily structural, with I-joists accounting for just under half of all LVL consumption. In Japan however, the majority of LVL is used in non-structural appearance applications, with fixtures, fittings, door and stair components constituting approximately 85% of all LVL consumption. This probably presents the greatest opportunity for utilising the appearance qualities of the Western Australian hardwood resource.

Plywood consumption in Australia and New Zealand combined is around 230,000 cubic metres. This is unlikely to increase significantly though a world scale plywood plant could push prices down to international levels, with plywood consequently gaining some market share from other panels. A

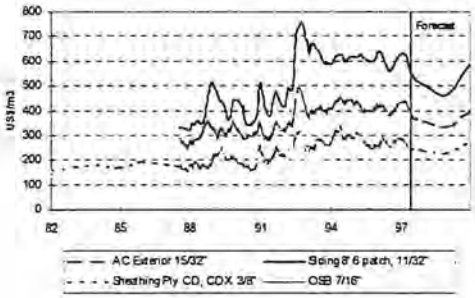
change in building techniques to a more American style approach would also encourage plywood usage.

7.2.3 Prices

Plywood prices in the US have been on a generally upward trend since the early 1980's. This has been despite the emergence of OSB as a significant competitor in the major structural sheathing market. During the 15 year period between 1982 and 1997 nominal plywood prices increased on average by around 4 percent per annum, and in real terms this equates to between 1.5 to 2 per cent per annum. By comparison OSB prices while marginally higher than they were in 1982, have declined in real terms. Most of the increase in plywood price has been the result of declining availability of veneer quality logs, and increasing stumpage prices. Over the longer term this trend is expected to continue, particularly for higher quality plywood products which compete less directly with OSB. However, until 2000 there is expected to be downward pressure on prices due to continued competitive pressure from low-cost OSB and a predicted down turn in housing construction.

Figure 13 United States Panel Prices

Nominal, Ex mill



In US dollar terms, plywood prices in Japan were comparatively stable during the 1980's and early 1990's. Though with an appreciating yen this represented a decline in the domestic price. However, in 1993 a spike in the demand for logs, driven mainly by the Chinese, pushed prices for both logs and plywood higher. Since then price levels have declined, partially being driven, over the last two years, by a weakening yen (Figure 14). Overall plywood prices in Japan have appreciated by around one percent, however because of a generally strengthening yen over that period increases have been greater in US$ terms. It can also be argued that stable prices represent a real increase in a market with falling producer prices, which has been the case in Japan.

Figure 14 Japanese Plywood Prices

Importer's selling price, nominal

Diminishing supplies of raw material suitable for manufacture of quality plywood will result in increases in production being limited. Plywood will increasingly be used in specialised end uses, not easily met by other panels, and where higher costs of production and prices can be sustained. It is believed there will be continued upward price pressure on plywood over the period till 2020, and that real increases of 1 per cent per annum are possible.

Sliced veneer, requiring production from the best quality logs, and with likely greater demand from the increased use of overlaid panels, will also lead to higher real prices. This will be somewhat constrained because of the potential for substitution by foils and other synthetic overlays, but it is believed that real price increases of 1 percent per annum are likely.

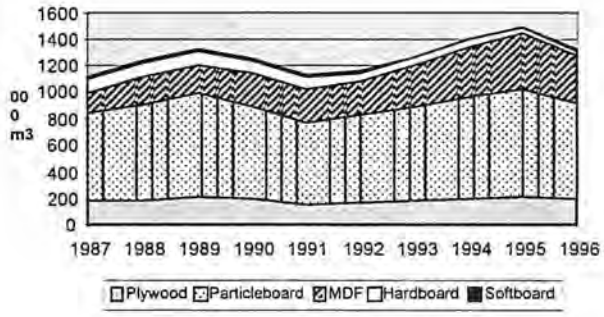
To some extent prices of LVL will be influenced by plywood as some manufacturers have the ability to switch between whichever product is most profitable. Internationally LVL is forecast to provide a cost effective substitute for large dimension structural lumber, which will be more difficult to produce from available resources. However because the market is currently comparatively small, and production could be increased relatively easily, price increases for LVL have been assumed to be less bullish than plywood. Over the longer term real increases in price of 0.5 per cent are forecast.

7.3 Reconstituted panels

7.3.1 Particleboard

Particleboard is often viewed as a product that has reached maturity. However, it remains the dominant panel in Europe and Australia (Figure 15).

Figure 15 Australian wood based panels consumption



In many end uses, such as cabinetry and furniture, particleboard competes directly with MDF. MDF has some advantages such as surface finish and edge screw holding ability, but production costs for particleboard are generally lower and it therefore has a price advantage. Production of particleboard generally requires less wood, resin, electricity, and water per cubic metre of finished product than MDF. While this cost competitiveness remains, it is likely that particleboard will continue to be the preferred panel in many end uses.

Considerable expansion of particleboard capacity is occurring in both South American and Asian markets.

The widespread use of particleboard in flooring in Australasia is somewhat unusual, where internationally plywood is the preferred panel due to its greater moisture resistance.

7.3.2 Medium density fibreboard (MDF)

Since 1995 production capacity has expanded more rapidly than consumption, with consequential downward pressure on prices as the markets adjust to oversupply.

Continued capacity expansion is expected to be strongest in Canada, Malaysia and Indonesia, in addition to recent increases in Australia, New Zealand, Korea, and parts of South America.

Growth in demand has been expanding more rapidly than expected in Indonesia, Malaysia and Europe, and Japan, China and Taiwan continue to require imports.

Additionally over the past two years a number of plans for expansion have been curtailed, and the oversupply may therefore recede more quickly than may have been expected.

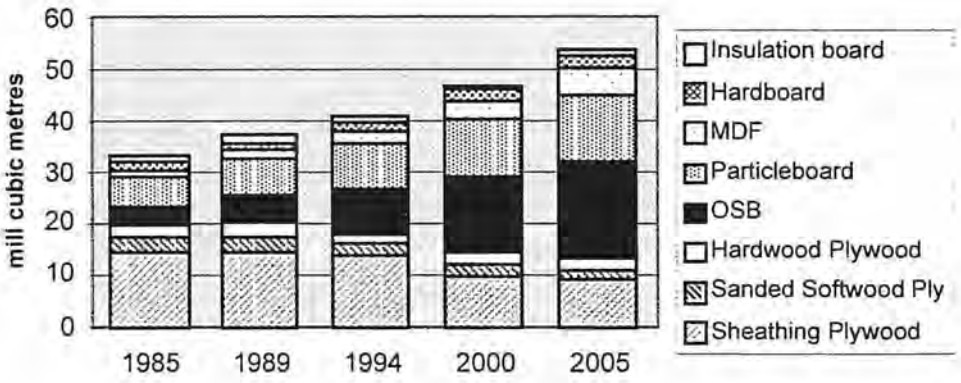
Australian production capacity is expected to reach 945,000 m3 in 1997, and is unlikely to increase significantly beyond that in the near term. Demand, however is expected to increase quite rapidly as a consequence of an improved housing market and greater penetration of MDF in applications such as mouldings and kitchen cabinets, in addition to the traditional uses for furniture and office fitouts.

The most difficult period for MDF producers in Australia will be the three years to 1999 when the increased capacity will require rapid penetration of export markets. However, the two new plants, Dominance in Victoria, and Hokushin in Tasmania, with a combined capacity of 340,000 m3, will likely dedicate most of their production capacity to export markets. This suggests that the remaining domestic producers will need to export less than 200,000 m3 in 1997 to operate at full capacity.

7.3.3 Oriented strand board (OSB)

The rapid growth in OSB consumption is largely a North American phenomenon (Figure 16). This is a reflection of the method of house construction employed in both the USA and Canada, where extensive use is made of structural sheathing panels to add strength and rigidity to the wooden framed structure. The advent of OSB provided a cost competitive panel to plywood while still providing adequate performance in terms of strength.

Figure 16 USA wood based panels consumption



Neither Europe nor Asia commonly employ wood based panels for construction sheathing. Japan is somewhat the exception, commonly using plywood in house construction. Provided OSB can gain acceptance there is potential for increased use, but Japan's preference for solid wood and plywood could prove a barrier.

Until OSB is proven to be acceptable in exterior applications it is unlikely that the growth in consumption will be as dramatic in other markets as it has been in the USA. The largest use of panels in Asia is in concrete form work, and OSB is yet to be accepted for this application. OSB is unlikely to compete significantly with either particleboard or MDF in furniture which is the other major use of panels in both Asia and Europe.

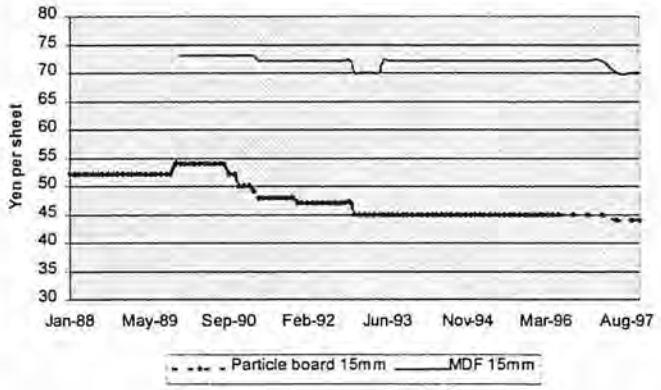
OSB has potential in areas such as packaging and temporary uses such as hoarding up of building sites.

Prices for MDF in Australia have fallen over the last 3 years, as a result of excess capacity in the Pacific rim and declining construction activity in Australia. This trend is likely to continue into 1998 as a result of planned new capacity. However, increased demand due to stronger building activity through to 2000 may result in a stabilisation of prices in 1999 with some improvement in 2000.

7.3.4 Prices

Prices in Japan for both MDF and particleboard have generally declined over the last eight to ten years, though they have been less volatile than plywood (Figure 17).—A forecast decline in housing activity over the next two to three years, along with competitively priced supplies from Southeast Asia and Korea, will continue to exert downward pressure on prices. However, with MDF production capacity and demand forecast to be in balance around the Pacific rim after 2000, more stable prices are forecast.

Figure 17 Japan, Reconstituted Panel Prices



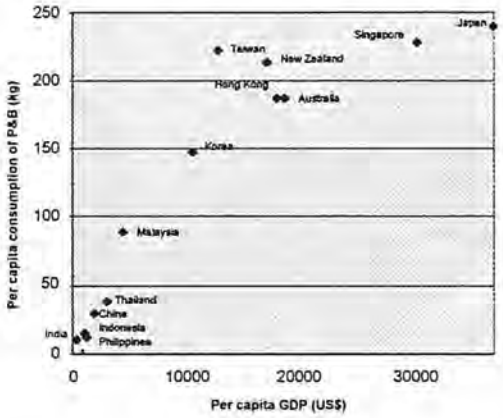
In North America, MDF prices prior to 1993 exhibited little year to year variation. Rapid price increases in 1993 and 1994 were followed by declines in 1995 and 1996 in response to expanding supply. Further declines are forecast, with prices bottoming out in 1998 or 1999. Particleboard is likely to follow a similar trend with both primarily used in furniture and cabinetry.

It seems unlikely there will be significant real price increases in the longer term. The potential to use non wood fibre such as wheat straw in panel manufacture, and the emergence of alternative wood fibre sources, including plantations, will continue to ensure that raw material will not be a constraint on production. Continued strong demand growth will retard any significant erosion of prices over the long term.

7.4 Pulp and paper

Consumption of pulp and paper is strongly influenced by GDP growth. With continued strong growth in Asia this region continues to demonstrate the biggest gains in pulp and paper consumption, and is likely to exceed 100 million tonnes for the first time in 1998. Additionally paper consumption tends to rise much faster for those countries starting from a low base as demonstrated in the chart below. In the near future those economies in Asia at the lower end of the range will grow at a greater rate than the world average, with a consequently even greater impact on paper consumption.

Figure 18 Asia: per capita GDP vs P&B consumption



It has been forecast that 50 million tonnes of new paper and board supply must be found for Asia over the next 20 years. It is therefore not surprising that there is considerable investment in pulp and paper capacity particularly in Indonesia, Korea, China, Thailand and Malaysia.

This will create demands for additional fibre. However, the greatest shortage will be for softwood fibre to provide strength in packaging. Asia will be able to source hardwood fibre from both lower quality small logs not previously utilised from natural resources, and increasing volumes coming on stream from eucalyptus, acacia and other fast growing hardwood plantations in the region.

7.4.1 Packaging and Board

Current over capacity in the packaging and board market has constrained any improvement in prices. Although prices appeared to have bottomed in the middle of 1997 there has to date been little upward price movement. However this situation is expected to change after 2000. There will be rapid demand growth outside of the USA, but fibre constraints will limit capacity growth. Few additional softwood resources will be available, nor will there be sufficient economically feasible recycled fibre.

7.4.2 Printing and Writing

Steady growth in demand for printing and writing paper is expected to 2000, as a consequence of healthy global economic growth. A large proportion of this increase in demand will be from Japan and China. However much of this increase in demand will be offset by increased production, particularly in Thailand and Indonesia.

7.4.3 Australia

Over the last 11 years, Australian paper and board consumption has grown at an average rate of 2.7 per cent per annum. Newsprint consumption showed the lowest yearly growth rate (0.8 per cent per annum) and printing and writing grades showed the highest growth (4.7 per cent).

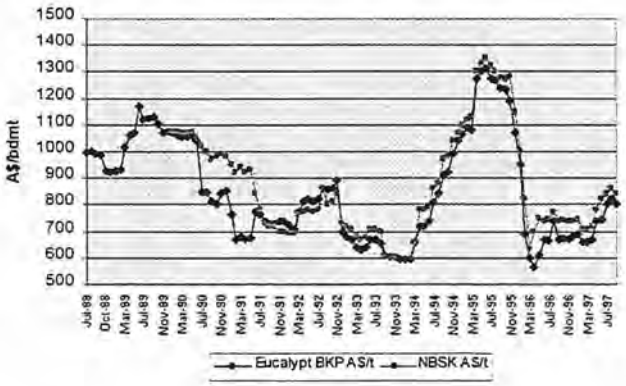
Table 12 Consumption of Paper and Board in Australia, 1996 (Kt)

Item	Newsprint	Printing and writing	Tissues	Packaging and Industrial	Total
Production	466	351	180	1341	2341
Export	1	26	12	200	239
Local sales	465	325	168	1144	2102
Imports	282	575	25	227	1109
Apparent Consumption	747	900	193	1371	3211

Demand for printing and writing paper in Asia is forecast to be strong through to 2000, averaging 5.5 per cent per annum (RISI, 1997). China and Japan will account for two thirds of this expansion. However, this increase in demand will be offset by capacity expansion in Thailand and Indonesia. This will limit the potential for substantial price rises during that period.

There is also considerable new BHKP capacity coming on stream over the next three to five years in both Southeast Asia and South America. However, many of these expansions will be rapidly integrated forward with paper making, meaning that the impact on market pulp prices may not be as severe, though any downward pressure on paper prices could flow through to market pulp.

Figure 19 Australian Bleached Pulp Prices



Though there will continue to be major fluctuations in pulp and paper prices in the future, it is believed that continued increases in demand will generally support prices. Additionally, an integrated operation, or one with offshore paper making facilities will be less exposed to the volatility associated with market pulp prices. While improvements in technology may help to reduce costs, these will be offset to a degree by greater environmental controls and the need to utilise more expensive fibre. Prices close to the long run average have therefore been assumed over the life of the RFA.

8 SUMMARY

The greatest potential for utilisation of the native hardwood resource is in the solid wood sector. The native hardwood resource has aesthetic, durability, and strength characteristics which are not easily replicated, and allow usage in a range of appearance and outdoor applications, and end uses were a particularly high strength rating is required.

Veneer based products also show considerable promise. Production of sliced veneer is advocated for the premium component of the resource. Additionally the production of plywood and LVL from a combination of hardwood and softwood has considerable merit.

There is also potential to add further value, by expansion of such re-manufacturing industries as indoor and outdoor furniture, joinery, millwork and moulding, laminated products, fixtures and fittings and cabinetry.

In the process of producing solid wood products considerable residues are created both in the mill and in the forest. Here the native hardwood residues have the potential to supplement softwood and hardwood plantations in panel manufacture, and provide fibre in addition to the substantial *E. globulus* plantations for pulp and paper production.

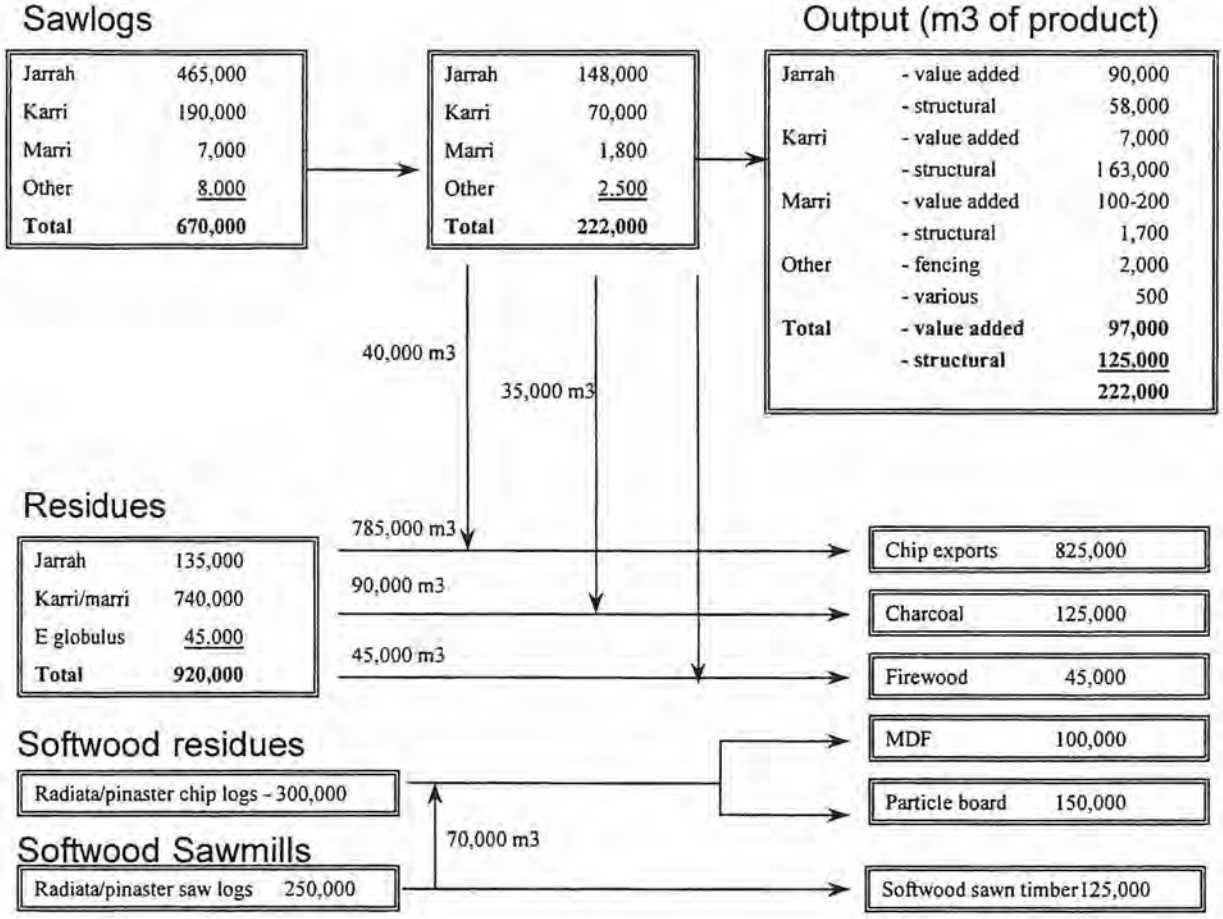
Jarrah residues are, in general, not believed to be suited to either panel or pulp and paper manufacture, and therefore provide a greater challenge in utilisation. Potential applications include charcoal production, use in silicon metal manufacture, activated carbon, and for domestic firewood.

A summary of proposed industry expansion potential is outlined in the following table. The impacts of these developments are detailed more fully in figures 20, 21, 22 and 23 and tables 14 and 15.

Table 13 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	Woodchip exports
Furniture	**New plants**	
Re-manufacturing	Plywood mill	
Woodchip exports	LVL mill	
Charcoal	Particleboard plant	
	Expanded re-manufacturing and furniture sector	
	Activated carbon	
	Additional re-manufacturing – furniture, flooring, joinery, millwork & moulding	
	Woodchip exports	

Figure 20 Current Industry Structure

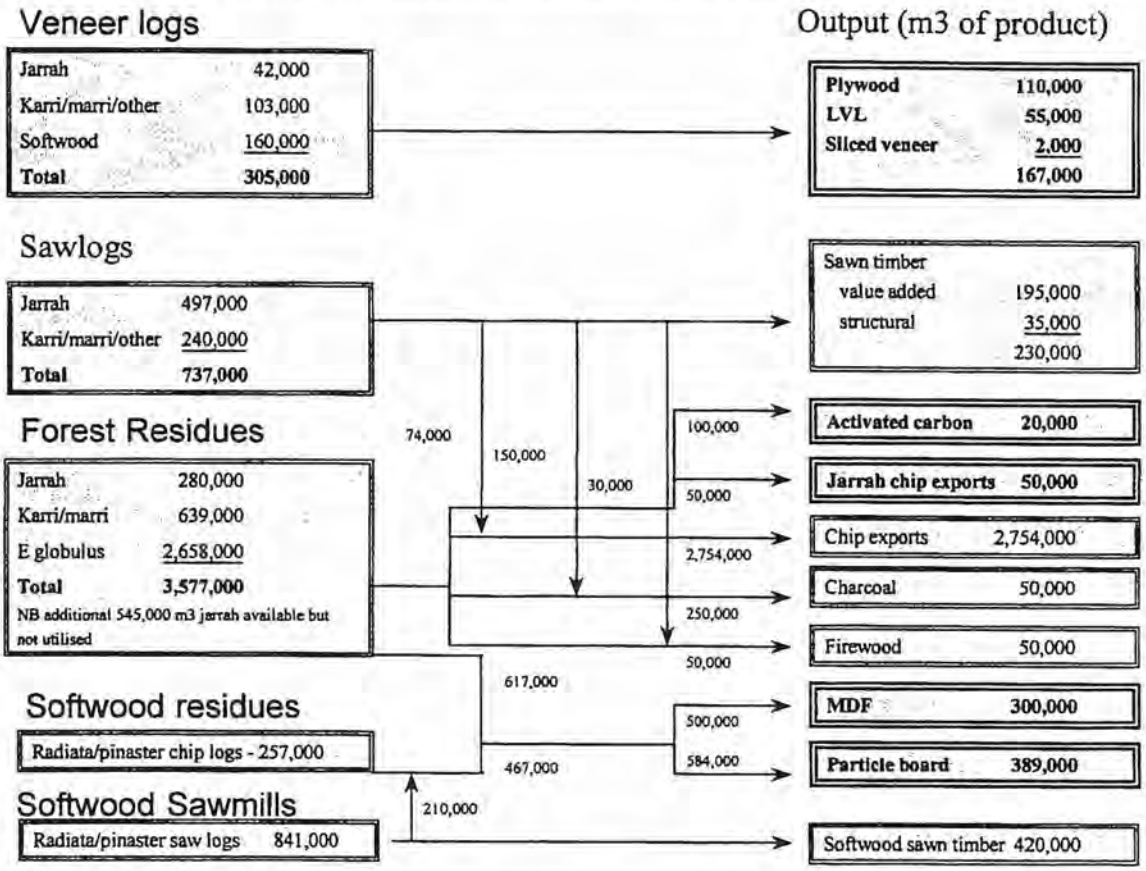


- *The hardwood industry is currently experiencing a major change towards value adding and away from structural sawn timber. Approximately 45 percent of the sawn timber is value added in some form, the majority of this being jarrah.*

- *The woodchip industry is currently based largely on native hardwood chip, though rapid expansion of plantation hardwood chip exports is forecast.*

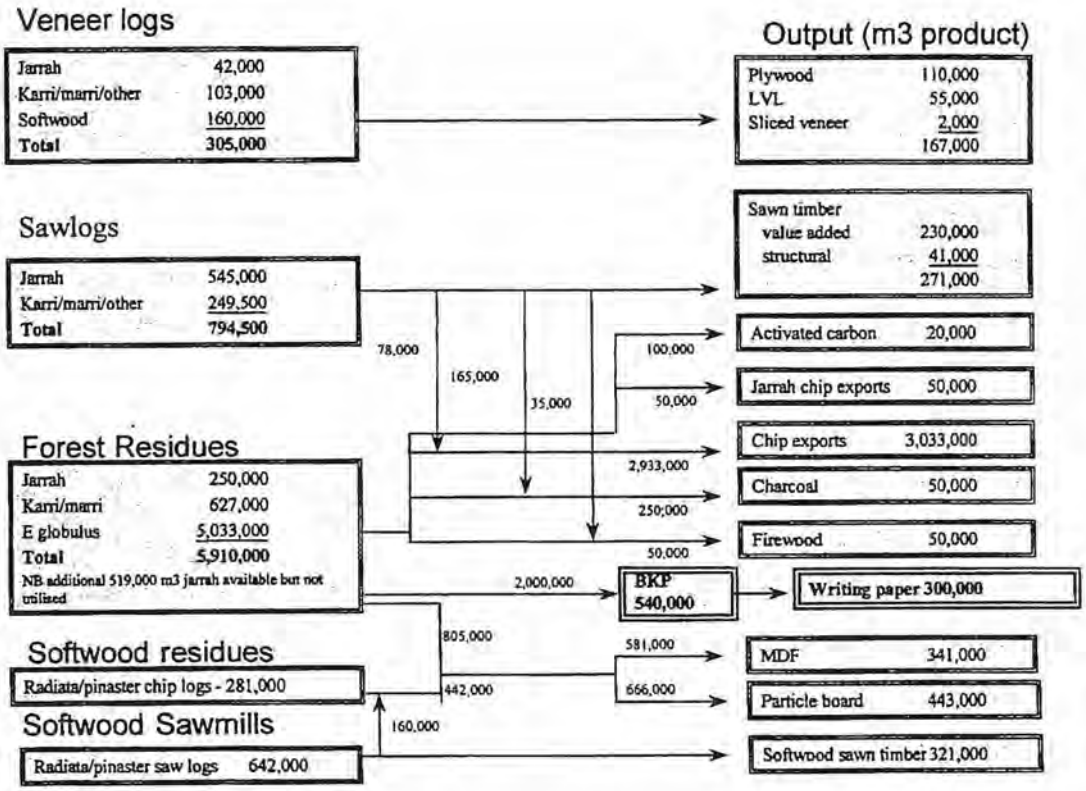
- *Reconstituted panels are at present based almost exclusively on softwood mill and forest residues, but provide an opportunity for utilisation of some hardwood as low cost supplementary fibre.*

Figure 21 Proposed Western Australian Industry Structure, 2010



- *By 2010 it is believed that there is potential for establishment of a veneer based industry, involving plywood, LVL and sliced veneer. There may also be potential for a veneer based flooring plant though this has not been specifically detailed. Such an industry has the potential to generate $ 133 million in turnover and provide 360 jobs. It is believed that veneer based operations could be established between 2000 and 2005.*
- *Sawn timber production would have much greater emphasis on value adding with 85% being further processed. Despite the increased proportion of lower grade logs an increased volume of logs processed could lead to a greater output, and the increased emphasis on value added products could lead to an increase in turnover of about $25 million with further increases through to 2020.*
- *Output of appearance grade lumber also provides the opportunity for considerable downstream processing (see Table 15).*
- *Activated carbon has the potential to generate $60 million in turnover, through utilisation of residues what is currently not processed in any way.*
- *There is also the potential to generate a trade in jarrah woodchips for manufacture of high grade charcoal.*
- *By 2010 there is potential to utilise both plantation and native hardwood as supplementary fibre in the manufacture of reconstituted panels, with the potential to expand both MDF and particleboard manufacturing operations. This is unlikely to occur befor 2005 due to the limitations on the availability of sufficient softwood fibre before that date.*

Figure 22 Proposed Western Australian Industry Structure, 2020



- *By 2020 turnover from the native sawn timber industry could have increased by $82 million to $228 million, due to increased emphasis on value added lumber production and forecast real price increases for those grades of lumber. Direct employment in the industry is likely to have declined by around 260 but this will be more than compensated by increased employment levels in further downstream processing. Processing of value added lumber has the potential to add over $200 million to the Western Australian economy and provide employment for almost 500 additional people (see Table 14).*

- *By 2020 there will be sufficient resource to establish both a pulp mill and paper making facilities. These two operations would contribute almost $800 million to the Western Australia economy and directly employ almost 300 people. If current planting levels are maintained there would be sufficient resource available for a BKP mill to be built before 2010. This would allow a paper machine to be installed shortly after 2010. However, given the uncertainty over future pulpwood availability, construction of a pulp mill has not been forecast until around 2015. The economics of such an investment would also need to be considered at the time of investment.*

Table 14 Predicted industry output and social and economic impacts of proposed scenario

Development Option	*Period*	*Investment capital (A$mill)*	*Resource requirements incl. SW & HW plantations (000 m3)*	*Native hardwood input (000 m3)*	*Production*	*Value of output (A$000)*	*Unit value of output*	*Direct construction employment*	*Direct operational employment*	*Total direct employment*
Native Hardwood Sawmills	1997-2000	30	794	794	264	145852	553	50	1039	1089
	2001-2010	70	807	807	223	170185	764	35	909	944
	2011-2020	60	908	908	260	227951	876	30	779	809
Plywood & other veneer based products	1997-2000									
	2001-2010	90	300	140	167	133864	802	40	360	400
	2011-2020		300	140	167	144147	863		360	360
Subtotal – Solid wood sector	***1997-2000***	***30***	***794***	***794***	***264***	***106519***		***50***	***1039***	***1089***
	2001-2010	***115***	***1107***	***947***	***390***	***258134***		***75***	***1269***	***1344***
	2011-2020	***60***	***1208***	***1048***	***427***	***310593***		***30***	***1139***	***1169***
Particleboard (new plant) [1]	1997-2000									
	2001-2010	120	264	117	176	38914	280	40	90	130
	2011-2020		346	124	230	50916	280		90	90
MDF (new line) [1]	1997-2000									
	2001-2010	120	324	0	185	74057	400	40	90	130
	2011-2020		405	81	231	92571	400		90	90
BKP	1997-2000									
	2001-2010									
	2011-2020	1400	2000	500	540	475200	880	100	230	330
Printing and Writing Paper	1997-2000									
	2001-2010									
	2011-2020	400	190 tonnes BHKP		300	480000	1600	150	58	208
Activated carbon	1997-2000									
	2001-2010	20	100	100	20	60000	3000	10	20	30
	2011-2020	20	100	100	20	60000	3000		20	30
Woodchip exports	1997-2000		923	700	923	46150	50		70	70
	2001-2010		2754	596	2754	110172	40		120	120
	2011-2020		2933	0	2933	102666	35		120	120
Total	**1997-2000**	**30**	**1717**	**1494**		**192002**		**50**	**1109**	**1159**
	2001-2010	**420**	**4549**	**1760**		**597570**		**165**	**1589**	**1754**
	2011-2020	**1860**	**6892**	**1753**		**1587028**		**280**	**1727**	**2007**

data refers just to new particleboard and MDF facilities, except native hardwood input which would be mixed into the furnish for both new and old plants

TABLE 15 PREDICTED SOCIAL AND ECONOMIC IMPACT OF PROPOSED REMANUFACTURING INDUSTRY

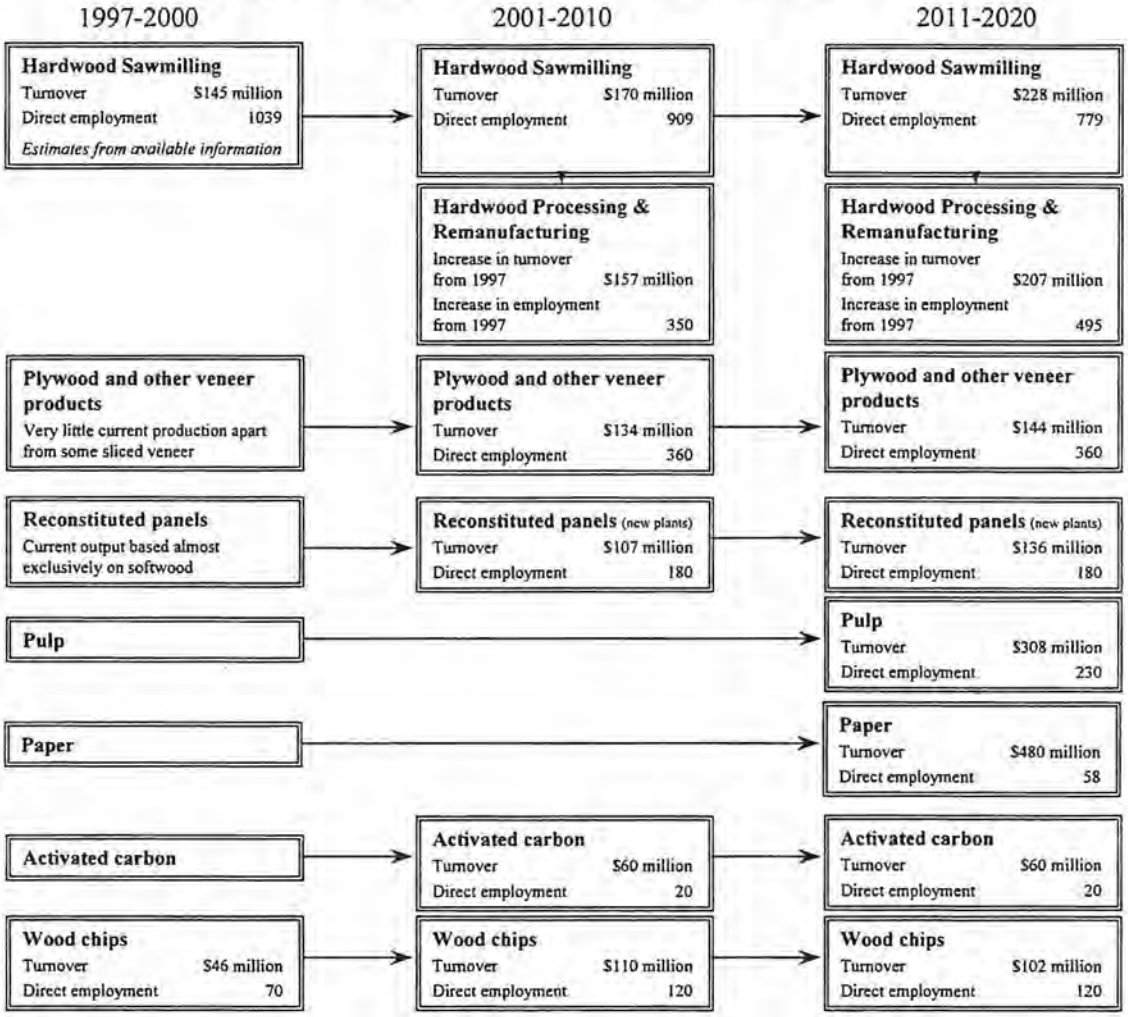
Period	*Number of new enterprises*	*Investment capital (A$mill)*	*Increase in total native hardwood sawn timber processed (000 m3/annum)*	*Increase in value of output (A$mill)*	*Average return per m3 sawn timber input (A$)*	*Additional direct employment*
1997-1999	4	15.1	36	55	1528	115
2000-2009	8	32.1	65	102	1610	235
2010-2020	4	17.6	30	50	1699	145
Total	**16**	**64.8**	**131**	**207**		**495**

The above scenario (Table 15)-is based on the availability of dried sawn timber which is forecast to be available during the forecast periods, but still keeping a component of lumber sales. There is the potential to invest more rapidly in re-manufacturing plants than is portrayed but the proposed scenario is believed to be realistically achievable.

The assumed re-manufacturing operations included: indoor and outdoor furniture, flooring and/or mouldings, joinery and laminated products. The assumed plant sizes are international norms for the type of operation considered. While it is believed that there is potential for competitive industries to develop in all these sectors, the final mix of plants will be dependent on market conditions prevailing at the time of investment.

With effective marketing and promotion, combined with high quality design and manufacturing it is conceivable that returns and the impacts on employment could be considerably higher than that forecast.

Figure 23 Summary of impacts of proposed scenario



Note:

- *Plywood and veneer production includes input of 160,000 m^3 of softwood roundwood.*
- *Reconstituted panels include input of between 440,000 to 470,000 m^3 of softwood, and 450,000 m^3 of E. globulus rising to 600,000 m^3 by 2020, in both new and old plants.*
- *The turnover from pulp only includes the pulp sold as market pulp, as integration is assumed with the paper making machine.*

9 CONSTRAINTS AND CRITICAL SUCCESS FACTORS

Western Australia's relatively large hardwood resource, its proximity to Asian markets, along with an experienced sawmilling sector provide the basis for establishing competitive industries that could utilise the decorative qualities and the superior properties of hardwood for uses in furniture, cabinetry, panelling, mouldings, flooring and other such uses.

In order to establish competitive advantage, new investment would need be directed at fully integrated processing operations and be globally competitive in terms of cost and quality output.

The global decline in hardwood harvesting from natural forests will likely see an increasing premium for quality Western Australian hardwood timbers. These will provide an increasingly valuable asset for Australian producers.

A government policy committed to supporting forestry development would be valuable in underpinning the change process necessary to predicate new investment in the industry. This would be seen as an important supportive factor to offset risk factors associated with new investment, in particular in the forestry sector relating to labour and environmental issues.

A commitment by the Federal and State governments or resource owners to establishing short term incentives to encourage new investment would be a valuable incentive to underpinning these recommendations.

There is a strong interest in the availability of both hardwood and softwood timber, including residues, in Western Australia for local processing by existing local manufacturers and by overseas companies. The interest covers the range of products discussed in this report.

9.1 Risks

The relatively small number of major players in the forestry sector means the industry does not enjoy a large pool of expertise relative to competing regions.

The low population base in Western Australia and its isolation from the east coast markets, mean that any new investment will be dependent on export markets.

The limited number of resource owners reduces competition in supply.

Changes from established production and marketing practices can carry perceived higher risks than maintaining the status quo.

Recent adverse economic trends in Southeast Asia will de-stabilise the short term market outlook within Asia in the building and construction sectors. Falling Asian currencies will serve to make Southeast Asian hardwoods more attractive to importers outside the region and by implication Western Australian hardwoods more expensive.

Western Australia's relative isolation from export markets poses concerns in meeting regular shipping and cost of freight to export markets.

While our proposals are based on available data, more research needs to be completed to verify both the size of available resource and to define more precisely the available log grades before definitive investment options can be taken further. There is also the need to positively identify potential markets and then determine the optimum log mix to meet the production requirements.

Western Australia's lack of cost competitiveness in terms of key cost components such as energy and labour make it less attractive than some other Southeast Asian countries. However it is believed these can be offset with productivity advances relating to solid wood processing, and targeted output to maximise the decorative quality of the wood. Lower residue wood costs and freight costs give countries such as Indonesia cost advantages over Australia in paper production in the short to medium term, but these are expected to level out over the next 10 years relating to demand projections and pressure from alternative land use.

9.2 Critical Success Factors

1. *Acceptance of the potential resource value for processed hardwood*

Acceptance of the recommendations to proceed in upgrading the value of Western Australia's hardwoods with new integrated solid wood processing ventures needs to be secured as the first step forward. Following discussion and debate on the report we recommend that an industry task force be established to overview and confirm the assumptions made on the suitability and marketability of karri, marri and jarrah for specific product applications. Such confirmation would provide an essential commercial perspective that would encourage investors to the next step. Consideration could also be given to development grants to the private sector based on structured market evaluations relevant to solid wood markets.

2. *Government leadership in establishing an appropriate investment environment so as to attract new investment into Western Australia*

The right political environment is seen as an essential aspect in attracting new investment to the sector. This can offset risk perceptions relating to the industry. Government leadership would provide an essential catalyst to change and need not be related to any distortion in free market policies. For example, government support could ensure a positive environment relating to regulatory, labour and environmental aspects of the forestry sector.

3. *Supply allocated in parcels large enough to attract economies of scale while encouraging diversity of producers to ensure competitive rivalry within the sector.*

The need to establish integrated ventures based on maximum economy of scale will be necessary to ensure price competitiveness for several large scale solid wood processing operations deemed necessary to underpin these recommendations. At the same time, we see opportunities for small solid wood specialist operations to maximise recovery of lower grade logs. We see a diversity of production interests generating a more responsive and competitive environment creating more attractive employment options and leading to a robust forestry industry.

4. *Emergence of one or two lead players who can demonstrate success in opening new export markets*

The role of first movers will be crucial in establishing an impetus towards changing from traditional business operations. We see benefit in offering short term incentives to firms that are prepared to shoulder first mover risk in initiating new plants based on recovering high value output rather than structural timber.

5. *Government and community commitment to commercial forestry of the native hardwood estate*

Understanding and acceptance of the economic benefits relating to commercial forestry along with sound environmental control and management are imperative to the future availability of the resource. Uninformed debate by diverse environmental interests have the potential to slow down or halt commercial development. This is process which is gaining momentum around the world.

6. *Funding for integrated growing, product development and marketing research*

Successful development of the existing mature and regrowth native forest resources with an evolving plantation and farm forestry resource will require explicit recognition of the need for substantial, co-ordinated research and development programmes across the tree growing, wood processing and marketing areas.

For some players, such an emphasis will require a paradigm shift to focus on utilisation and market development outcomes required to achieve and maintain international competitiveness.

Extension of the current utilisation, product and market development research in Western Australia is critical to enable industry to fully exploit the range of opportunities that the wood resource could provide. The CALM Timber Technology centre is an example of a successful approach, which has operated for more than a decade with a network of industry and processing input and financial backing by CALM. However, to develop the centre as a state of the art facility and to attract greater industry participation, will require substantial capital investment.

9.3 Issues

- Security of supply is a key issue affecting future investment. A successful conclusion to the RFA will help in this regard. However notwithstanding the outcomes, consideration should be given to managing the transition of the resource available prior to 2003 and the post 2003 harvest, both in terms of quality and quantity. A dramatic drop in the volumes of high grade logs over a short period could have severe repercussions on the industry. If the change in quality of the resource is managed over a longer period it will be more manageable.

- Increased certainty is required on the availability of the plantation resource. There is considerable debate over the likely future volumes of both softwood and plantation hardwood that will be available. Greater certainty will be required if large scale investment is to be contemplated based on these resources. We therefore recommend the need for a detailed independent inventory of the extent of the hardwood plantation plantings and harvesting volumes in Western Australia. This would assist potential investors in the value adding wood processing project with planning.

- Development of an industry strategy, to achieve a coordinated approach between the solid wood sector and residue processing industries.

- With the changing nature of the native log resource it will be important to encourage utilisation of lower quality log material. Whole bole logs sales have been promoted as a possible mechanism. While this will undoubtedly force the industry to utilise a component of the lower quality material, consideration should be given to the impacts of such a policy. This could lead to market distortions with consequential inefficiencies both in terms of transportation and utilisation of the resource.

- A royalty pricing structure more in line with international norms would involve lowering the price of residue wood while charging more for high quality logs. This would promote domestic processing of the lower grade material while encouraging local processors to extract the maximum value from higher grade logs, and maintain grower returns. Such a policy should be clearly outlined, and implemented over time to allow the industry to adapt. The mechanisms for determining price needs to be clearly defined to give industry certainty over future price levels and how they will be set. In making this recommendation it is acknowledged however, that Government will need to take into account the contributions that commercial hardwood plantations make in the rehabilitation of degrading farm lands.

- Given the limited market size in Western Australia, increased emphasis on value added processing and re-manufacturing will require development of export markets. While there are some examples of export success, generally there is limited experience in overseas marketing and promotion. Key to the success of an internationally successfully hardwood industry will be cooperation among industry participants. This could include sharing of market information and joint promotional activities. A mechanism needs to be developed to enable this to occur.

- With the transition away from structural applications for native hardwood there will be a continued need for product and market studies. These are essential to determine the feasibility of manufacturing certain products from the wood species discussed, and the potential markets for those products. Such studies could play an important role in attracting investment into Western Australia.

- An efficient local processing and re-manufacturing sector needs to be encouraged. This will reduce the dependence of primary processors on export markets and provide greater flexibility in products and markets. This may require some of the larger players assisting, in the initial stages, smaller re-manufacturing operations to establish markets and promote their products.

- The State government needs to create an environment which encourages investment, by proceeding with micro economic reform particularly in the areas of transportation and energy.

- The State government also has an important role in provision of information. In this regard a report summarising the position, importance and potential for investment in forestry in Western Australia would be a useful initial tool for investment promotion.

- Support for continued woodchip exports, as a suitable end use for residue material, until such time as a resource of sufficient size can be established on which to base a pulp and paper industry.

- Community perceptions and concerns need to be addressed. A viable forest industry strategy based around high value solid wood products from the native forest sector would be a useful promotional tool in this regard.

- Successful resolution of environmental concerns will be a prerequisite of overseas promotion of Western Australian native hardwoods. Increasingly purchasers of sawn timber require some form of accreditation of the environmental management of the forest resource and processing operations. This will be more readily achieved when the majority of environmental concerns have been addressed.

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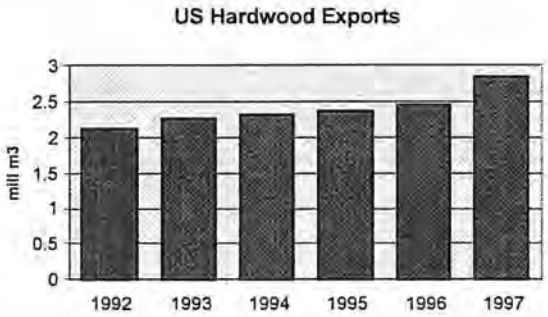
Appendix 1 Case study: US hardwood industry

The United States hardwood industry, is one which has transformed itself into a highly competitive and successful exported orientated industry. Hardwood exports have grown from around 1.2 million m^3 per annum in the mid 1980's to an expected 2.84 million m^3. Exports in 1997 are forecast to be 15% higher than in 1996, at a time when domestic demand is also strong in end uses such as flooring, kitchen cabinets, furniture and DIY outlets.



During that time prices have risen even more rapidly, with average export prices now around US$500.

The major species exported, in declining order, are: red oak, white oak, hard maple, and western red alder, each with export volumes exceeding 220,000 m^3.

Canada is the major export market with 34 percent of the total, but Japan is also significant at 10 percent, with the large furniture industries of Italy and Taiwan also taking 7 percent each. Sales to Germany and Hong Kong have also exhibited rapid growth in recent times.

The North American industry has demonstrated that with effective marketing and promotion a successful export industry can be established despite obstacles such as a strong currency, relatively high labour costs and expensive raw material.

R F A

Regional Forest Agreement

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