TIMBER PRODUCTION IN WESTERN AUSTRALIA

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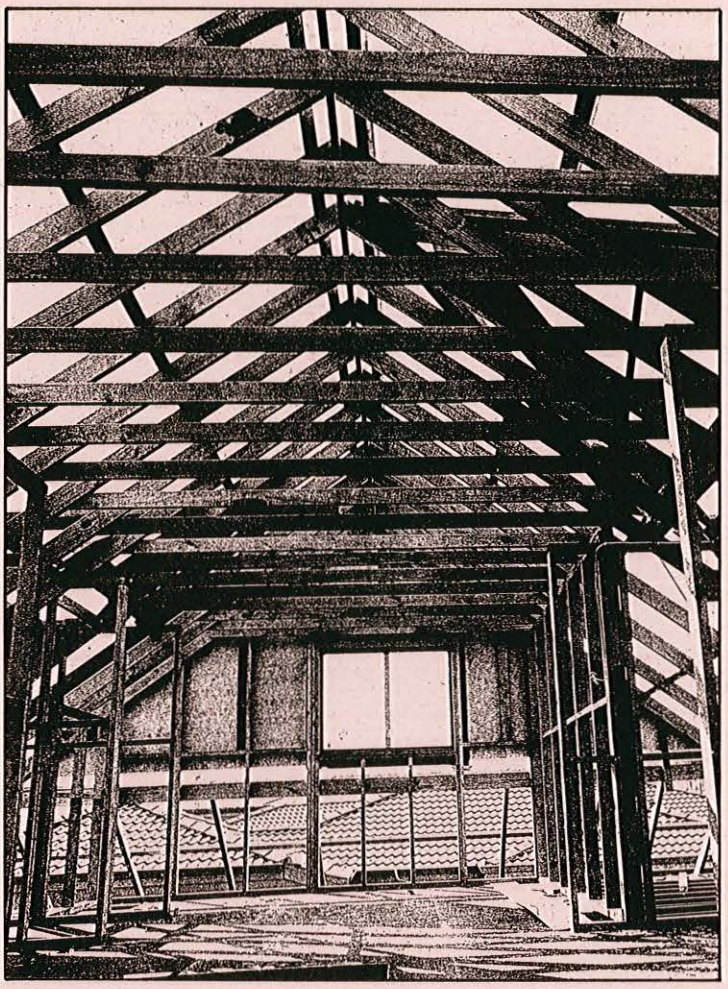

A Strategy to take W.A.'s Forests into the 21st Century

APRIL 1987

Prepared by the Department of Conservation and Land Management on behalf of the Lands and Forests Commission.

A STRATEGY TO TAKE W.A.'s FORESTS INTO THE 21st CENTURY

APRIL 1987

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OBJECTIVE

The objective of this strategy is to provide a plan for an efficient timber industry which is sustainable indefinitely. At the same time the water catchment, conservation and recreation opportunities provided by the State's forests will be protected and managed to meet the needs of all Western Australians.

DEMAND FOR TIMBER PRODUCTS

1. It is proposed that the quantity of timber supplied from W.A. forests should be:

   (a) sufficient to meet the local demand for wood if it can be produced at competitive prices;

   (b) sufficient to meet assured export opportunities of economic and social benefit to the State and nation.

2. It is estimated that the demand for W.A. sawn timber will rise from approximately 1 million cubic metres (round wood equivalent) in 1990, to between 1.2 to 1.7 million cubic metres by 2050.

3. It is proposed that the proportion of hardwood logs processed to high value products be increased from 13 per cent to 50 per cent by 1997.

4. It is proposed that exports of W.A. timber products (primarily value-added hardwoods) will increase to 10 per cent of total hardwood sawlog production by 1990 and to 30 per cent of total hardwood sawlog production by 2000.

5. The estimated current demand for short-fibred woodchips suitable for paper is approximately 950 000 tonnes per annum. This would be increased by more than 500 000 m^3 if a pulp mill was built in W.A.

6. The current demand for softwood residue is 294 000 m^3 per annum. It is anticipated that this will rise to 400 000 m^3 per annum by the year 2000.

WESTERN AUSTRALIA'S FOREST RESOURCE

1. If the proposed changes in the reserve system are implemented, there will be 1 372 000 ha of hardwood forest available for timber production. The current estimated standing volume of trees suitable for sawlog production is 27.64 million m^3. The estimated total annual hardwood increment is 1.6 million m^3 per annum. The estimated volume available for residue based timber products is 107.6 million m^3.

2. There are 61 000 ha of State-owned pine plantations and 13 000 ha of private pine plantations.

W.A. FOREST INDUSTRY

1. W.A. forest based industries employ directly or indirectly over 20 000 people. The industry has an annual turnover of over $300 million.

2. The major factor preventing investment in the industry is the absence of security of the timber resource. This strategy proposes to achieve security of the resource by providing:

(a) 'A' class security of tenure and purpose to State forest areas available for timber production, and

(b) allocating a proportion of the timber resource for periods of between 5-15 years with legally binding contracts.

3. It is proposed that CALM, in co-operation with the timber industry, will upgrade timber marketing and utilisation research.

4. It is proposed to restructure the Forest Production Council to make it a tripartite body.

5. It is proposed to investigate the potential for the formation of a syndicate to market hardwood value added products.

FOREST MANAGEMENT

1. It is proposed that the security of tenure and purpose of State forest be secured by amendment of the Conservation and Land Management Act.

2. Multiple use will continue to be practiced in State forest but the major priority uses of State forest will be catchment protection and timber production.

3. Forest managed with a priority use for timber production will be managed to ensure that the yields can be sustained indefinitely.

4. Existing forest management practices will be continued but the thinning programs in the jarrah and karri regrowth forests will be increased to 4 000 ha and 2 000 ha per annum respectively.

5. A comprehensive inventory of the jarrah forest will be initiated immediately and completed by 1991.

6. It is proposed that CALM will progressively introduce integrated logging operations under Departmental control throughout the hardwood forest.

7. The softwood sharefarming scheme will be continued. The potential to expand this scheme to broaden its objectives to include catchment protection and the establishment of short rotation hardwoods on private property will be assessed.

8. It is proposed to assist private owners of softwood and hardwood forests to upgrade their management by providing a technical advisory service and contract on a voluntary basis, to harvest and sell logs from private property.

9. It is proposed to maintain a State plantation establishment rate of 2 000 ha per annum of P. radiata until the early part of the twenty-first century. One thousand, 500, and 500 ha per annum will be established near Albany and in the Southern Forest Region and the Central Forest Region respectively.

THE ALLOWABLE CUT

Sawlogs

1. All logs that can be commercially converted to sawn timber will be included in the 'allowable cut'.

2. The jarrah allowable cut will be reviewed in 1992 following completion of the jarrah forest inventory.

3. The annual quantity of first grade karri logs harvested in the Southern Forest Region will be reduced by 15 000 m^3. This reduction will be compensated for by the supply of 20 000 m^3 of second grade karri logs, 50 000 m^3 of regrowth karri logs and 30 000 m^3 of marri logs.

4. The annual quantity of jarrah first grade logs currently supplied in the Southern Forest Region will be reduced by 30 000 m^3 over the next five years. This will be compensated for by the supply of 23 000 m^3 of second grade jarrah logs and 11 000 m^3 of jarrah short logs.

5. The annual quantity of first grade logs supplied in the Northern and Central Forest Regions will be reduced by 41 000 m^3 over the next five years. This will be compensated for by the provision of 45 000 m^3 of jarrah second grade logs and 15 000 m^3 of short jarrah logs.

6. The allowable cut of pine sawlogs will be increased to approximately 250 000 m^3 during the period of the plan.

Residue

7. Marri and karri residue will be supplied to meet the contracted requirement to WACAP of approximately 630 000 m^3 per annum of logs (680 750 tonnes of green woodchips).

8. Pine residue material will be supplied to the contracted requirement of 330 000 m^3 per annum.

9. The potential for the establishment of a panel board plant based on the Pinus pinaster resource in the Northern Forest Region will be investigated.

ALLOCATION OF LOG RESOURCE

Hardwoods

1. It is proposed to progressively introduce, over the period of this plan, a four-tiered resource tenure system. Sixty-five per cent, 20 per cent and 10 per cent of the total log resource will be allocated for periods of 10-15 years, 5 years, and 2 years respectively. Five per cent of the resource will be retained to be auctioned in varying size parcels of logs for periods less than two years.

2. It is proposed that seven major mills (intakes in excess of 20 000 m^3) will allocate between 50-90 per cent of their current intake (adjusted for reduction in the allowable cut) for between 10-15 years under legally binding contract.

3. It is proposed that medium sized mills (intakes less than 20 000 m^3) will be allocated between 50-90 per cent of their current intake (adjusted proportionately to allow for reductions in the allowable cut) for five years under legally binding contract.

4. It is proposed that all existing salvage mills with an existing entitlement will be allocated 50 per cent of their existing intakes under five year legally binding contracts.

5. The remaining resource will be allocated by tender or auction. The parcels of logs will include varying proportions of first and second grade logs.

6. It is proposed to provide the opportunity for the establishment of a sawmilling facility designed specifically to provide an assured supply of high grade sawn material for the furniture industry. This will be achieved by tendering, for a period of 15 years, up to 30 000 m^3 per annum of the highest grade karri, jarrah and speciality logs.

Softwoods

7. Existing contract obligations will be met.

8. It is proposed to provide the major shareholders of Softwood Products 62 000 m^3 per annum of pine sawlogs by 1995. Western Pine Associates will be provided with 38 000 m^3 per annum of pine sawlogs by 1995.

PRICING OF LOGS

The price of logs will be increased to ensure that the royalty at least covers the cost of production of logs. The rate of royalty increases will be adjusted in consultation with the timber industry to minimise the effect of the increase on the commercial viability of the industry.

SUPPLY/DEMAND SCENARIO

If the proposals outlined in this strategy are implemented, it will be possible to provide sufficient resource from W.A. forests to supply most of the W.A. demand for timber products and significantly increase export income on a sustained basis. The existing level of sawlog production in each of the three forest regions will be maintained and the value of the log resource and the products made from it will be significantly increased over the period of the plan.

1. OVERVIEW

MANAGEMENT PLANS AND THE TIMBER STRATEGY

The Department of Conservation and Land Management (CALM) is required to produce management plans which are subject to public review under Sections 54 and 55 of the CALM Act (1984). The plans are produced on behalf of the Lands and Forest Commission, the body in which State forests are vested.

The release of this timber strategy for public comment coincides with the release of three management plans for the forest regions of the State. The strategy deals with timber production in the areas covered by the management plans, and is an integral part of these plans. Consequently, the timber strategy is legally a supplement to each of the three management plans.

PUBLIC REVIEW

Both the management plans and timber strategy are released in draft form for public comment.

Submissions should be addressed to:

The Executive Director
Department of Conservation and
Land Management
50 Hayman Road
COMO WA 6152
Ph: (09) 367 0333

Submissions close on 17 June 1987.

WHY A TIMBER STRATEGY?

This is the first time that a comprehensive strategy has been developed for the timber industry in W.A. The need for a strategy is critical because:

1. Within the next 30 to 50 years, the original native forests which have supplied most of our hardwood timber so far will be harvested. It is essential that the timber industry has time to restructure so that it can efficiently process the regrowth forests which are replacing the original forest.

2. Most sawmills in W.A. need major remodelling to take advantage of new technology. New processing techniques and new equipment are both required to efficiently mill and season logs from the new forest.

3. The timber industry is one of the few industries in the rural sector which has the potential for growth.

4. The timber industry can help reduce Australia's trade deficit in wood products which is currently $1.3 billion. The export of hardwood products and the replacement of many timber imports with locally-grown softwood will contribute to reducing the trade deficit.

Under Section 56 (1) (a) and (b) of the Conservation and Land Management (CALM) Act (1984) the objectives for the management of timber production forests are as follows:

'56. (1) A controlling body shall, in the preparation of proposed management plans for any land, have the objective of achieving or promoting the purpose for which the land is vested in it, and in particular management plans shall be designed -

(a) in the case of indigenous State forest or timber reserves, to ensure the multiple-use and sustained yield of that resource for long-term social and economic needs;

(b) in the case of State forest or timber reserves planted with exotic species, to achieve the optimum yield in production consistent with long-term social and economic needs;'

OBJECTIVE

The objective of this strategy is to provide a plan for an efficient timber industry which is sustainable indefinitely. At the same time the water catchments, conservation and recreation opportunities provided by the State's forests must be protected and managed to meet the needs of all Western Australians.

PRINCIPLES

This strategy is based on the following principles:

1. there is an equitable reservation of forest areas for conservation, recreation and timber production, and that these areas have security of tenure and purpose;

2. areas of native forest reserved for timber production will also be managed to provide for the other values of the forest, according to the principles of multiple-use management;

3. all forest areas harvested for timber production will be regenerated;

4. the cost of regenerating, establishing, and managing both native forests used for timber production and exotic pine plantations will be recouped from the sale of the harvested logs;

5. the yield from forest areas reserved for timber production will be regulated to levels that can be sustained indefinitely;

6. the processing of logs from State forests will be managed to maximise the employment and economic benefits for W.A;

7. all forest management operations, including logging, will be controlled by the Department of CALM.

2. THE DEMAND FOR WOOD

The development of a timber strategy for W.A. must include an assessment of local Australian and overseas demand for W.A. wood products.

The quantity of timber supplied from W.A. forests should be:

1. sufficient to meet the local demand for wood if it can be produced at competitive prices, allowing for interstate trade flows which cannot be prevented under the Australian constitution, and allowing for local demands for overseas speciality timbers which cannot be produced in W.A;

2. sufficient to meet assured export opportunities of economic and social benefit to the State and nation.

Wood is used for a variety of purposes. Over the past 30 years, new products have replaced wood in some uses. But, the demand for wood continues to grow as population grows. The qualities and cost of wood against substitutes also ensures its demand.

GLOBAL DEMAND FOR WOOD

The world demand for and supply of wood is clouded by the inability to pinpoint population growth, rates of exploitation and afforestation. Predictions of world demand for industrial wood in the year 2000 range from 1 818 to 3 770 million m^3 of logs. Some estimates are in Table 1.

TABLE 1

WORLD DEMAND FOR INDUSTRIAL WOOD IN 2000 AD

	SOURCE	FORECAST MILLIONS (CUBIC METRES ROUND)
1.	Madas A. 1974 World Consumption of Wood: Trends and Prognoses. Akademiai Kiado, Budapest	3170-3770
2.	Economic Intelligence Unit 1981: World Timber to the Year 2000. Report in World Wood 27(7):44	2800
3.	Centre for Agricultural Strategy 1980. Strategy for the U.K. forest industry. CAS Report 6	2761
4.	FAO Industry Working Party 1982. FAO Forestry Paper No. 29 Page 25	1818

On the world scene, Sutton (1975) and Hillis (1984) have predicted future timber shortages. Maloney (1981) sees little possibility of increasing world supplies and little chance of meeting the higher levels of predicted demand.

The Bureau of Agricultural Economics (1978) doubts there will be a world shortage but short term and/or regional shortages are possible. FAO (1982) considers supplies will be adequate but fully stretched by the year 2000.

Everyone agrees that demands will increase, causing a tighter supply and increases in real timber price of up to 70 per cent by the turn of the century (Fairgrieve 1980).

North America is likely to remain a net exporter for the next 30 years (FAO 1982), but with increasing real prices and declining timber quality (Leslie 1984). Low regeneration rates however, could affect long term supplies (Global 2000, 1980).

The USSR is also likely to remain a net exporter of timber in the foreseeable future, but the technical and economic feasibility of harvesting the Siberian resource has been qustioned by Stockman (1978) and others.

Europe is expected to remain a net importer (FAO 1982).

China could become a large timber importer, while South Korea and Taiwan are facing chronic shortages of wood for domestic consumption and export processing (FAO 1982).

The South East Asian forests are being rapidly depleted (Aranez 1982, Cullity 1978) and the region could find it difficult to meet its own future demands (Maloney 1981).

Tropical forests in Africa and South America are also being rapidly depleted (Global 2000) which could seriously affect future supplies on traditional export markets.

Elliott (1982) has predicted an exportable surplus of softwoods from Australia, New Zealand, Chile and Fiji, increasing from about 7.1 million m^3 annually in 1986-89 to 39.3 million m^3 annually for the period 2001-05.

This could, however, be absorbed by Japan's estimated requirements of 75.5 million m^3 in 1996 (Utzuki 1981) or 118 million m^3 annually in 2000 (FAO (1982). Japan is currently the largest importer in the world and is expected to remain so (FAO (1982).

Australia would have to compete with Japan's established trade for future imports from both New Zealand and other sources in the South East Asian and Pacific regions (BAE 1978) against a possible measure of adverse price discrimination which could worsen as world prices increase during periods of high international demand.

More recently, the devaluation of the Australian currency has made imports from North America, Malaysia and New Zealand more expensive.

The phasing out of performance-based exporting incentives by 1987 in New Zealand is likely to establish equitable trading competition, but it is unlikely that exporters would give high priority to Australian markets if better prices could be achieved elsewhere.

AUSTRALIAN DEMAND

Australian consumption of wood for 1983-84 was 10.4 million m^3 of sawlogs and 8.1 million m^3 of pulp logs. Australia is a net importer of sawn timber and pulp products resulting in an import deficit of $1.3 billion in 1983-84.

Recent predictions of the future demands for wood in Australia and the capacity of Australian forests to meet that demand are in Table 2. The estimate shows there will be a significant shortage of wood in Australia up to 2010 A.D. There is some uncertainty about Australian sawlog demands/supplies beyond this. Predictions indicate that the sawlog demand/supply for 2020 A.D. could range from either a deficit of 32 per cent to a surplus of 23 per cent. It is estimated there will be a pulplog deficit of more than one million cubic metres by 2020.

WESTERN AUSTRALIAN DEMAND

Demand for sawlogs

Accurate forecasts of the demand for wood in W.A. are critical to the long-term management of our forests. The major objective of wood production management in W.A. is the production of sawlogs as the log product of highest demand.

Consequently, the principle requirement is to predict accurately the demand for sawlogs. Predictions of forest residues (mostly chiplogs or pulplogs), are also needed to determine whether this resource, a by-product of sawlog production, will be saleable.

The demand for sawlogs in W.A. is determined by such factors as population, industrial activity, interest rates, inflation rates, and the substitution between wood and non-wood products.

Historically, sawn wood imports to W.A. have been a small proportion of local consumption, compared with other mainland States (Table 3). This reflects the relative efficiency of W.A. timber production and the relatively high cost of importing timber. (The cost of railing timber from South Australia, the nearest external supply source, is $96.42 per cubic metre).

TABLE 2

AUSTRALIA'S SAWLOG AND CHIPLOG SUPPLY AND DEMAND 1990-2020 AD
(CUBIC METRES ROUND)

A. SAWLOGS (Excluding material for railway sleepers. Forestry and Forest Products Industry Council conversion factor uses - 1 cubic metre square = 2.5 cubic metres round)

	1990	2000	2010	2020
		(1000's cubic metres)		
Demand				
FAFPIC *1 (1985)	12 855	14 033	15 273	16 540
BAE *1 (1985)	13 330	11 083	9 703	10 183
Bis-Shrapnel *2 (1984)	10 258	11 170		
Jaakko Poyry *3 (1985)		10 963		
Supply				
FAFPIC (1985)	7 474	9 720	11 687	12 560

B. PULPLOGS *4

Demand				
FAFPIC (1985)	10 155	11 859	13 226	14 226
Supply				
FAFPIC (1985)	11 723	12 248	12 348	12 822

Notes

*1. Sawn timber, plywood and veneer.

*2. Sawn timber only.

*3. Sawn timber and plywood only.

*4. Particle board, fencing and landscaping, medium density fibre-board, hardboard, softboard, newsprint, printing and writing paper, paperboard and other paper.

TABLE 3

SAWN TIMBER IMPORTS AS A PERCENTAGE OF SAWN TIMBER CONSUMPTION

	OVERSEAS			INTERSTATE		
State	1970	1975	1982	1970	1975	1982
NSW	35.21	30.21	35.96	7.90	9.80	9.04
VIC	13.48	16.72	21.26	25.93	24.86	20.51
QLD	5.07	8.38	22.95	18.28	16.32	18.98
SA	40.50	47.63	33.87	18.98	12.72	10.04
NT	68.30	83.92	79.80	27.87	15.00	18.72
WA	11.10	5.92	6.74	0.12	0.07	1.60

W.A. timber is expected to remain competitive with imports in the future, because of anticipated increases in world timber prices, the high cost of import, the expected construction of highly efficient pine mills, greater volumes of large pine logs from W.A.'s maturing plantations, and the decline in the value of the Australian dollar since 1985.

W.A. timber exports average less than 10 per cent of production. The total timber export over many years has slightly exceeded the total timber import.

In 1984-85, consumption of all sawlog material was 928 000 m3 round, of which sawn timber consumption was 89 per cent.

Projections made by CALM (1986), BAE (1982) and Bis-Shrapnel (1984) of future W.A. demands for sawlogs are shown in Table 4 and Figure 1.

The CALM (1986) estimates are low compared with the other projections. As Gross Domestic Product growth over the last 25 years has averaged 2.25 per cent per capita, and net migration into W.A. over the last decade has been about 12 500 persons per year, actual domestic demand levels are more likely to fall closer to the upper domestic demand level.

The estimated demand for W.A. sawn timber is shown in Figure 1, assuming net exports (predominantly of high value products) will be equal to 10 per cent of hardwood sawlog production in 1990, increasing to 30 per cent by the year 2000.

Demand for high grade hardwood products

Local Eastern States and overseas demands for different types of high grade W.A. jarrah and karri sawn timber are difficult to predict because the market potential for these products is not known.

TABLE 4

DOMESTIC AND EXTERNAL DEMAND FOR SAWLOGS: W.A. 1990-2050 AD
(Millions cubic metres round)

	1990	2000	2010	2020	2030	2040	2050
1. DEPT OF CALM (1986)							
* Domestic demands (no net exports)							
(a) High	1.033	1.187	1.266	1.360	1.435	1.503	1.565
(b) Average	0.946	1.043	1.072	1.111	1.129	1.144	1.154
* Domestic demands plus net exports							
(a) High	1.109	1.371	1.442	1.525	1.588	1.639	1.688
(b) Average	1.022	1.227	1.248	1.276	1.282	1.280	1.277
2. BIS-SHRAPNEL (1984)							
* Domestic demands (no net exports)	1.083	1.146	n/a	n/a	n/a	n/a	n/a
* Domestic demands plus net exports	1.159	1.330	n/a	n/a	n/a	n/a	n/a

TABLE 4 Cont...

	1990	2000	2010	2020	2030	2040	2050
3. BAE (1982)							
* Domestic demands (no net exports)	1.494	1.721	2.199	2.647	n/a	n/a	n/a
* Domestic demands plus net exports	1.570	1.905	2.375	2.812	n/a	n/a	n/a

NOTES

1. External Demands (net exports) equal 10% of WA hardwood sawlog production in 1990, increasing to 30% by the year 2000.

2. DEPT OF CALM (1986)

   (a) Based on a WA net migration rate and GDP growth rate/capita of 15,000 persons/year and 2.25%/year respectively in the long term.

   (b) 11,000 persons/year and 2.0%/year respectively.

3. BIS-SHRAPNEL (1984) AND BAE (1982)

   - The predicted sawn timber demands were adjusted slightly to cover CALM's predictions of demands for minor sawlog products eg. sleepers.

   - BAE produced a range of conditional estimates and those shown are the lowest of the estimates produced. The estimates were also adjusted for the current projection of future WA population based on a net migration rate of 11,000 persons/year.

   - WA recovery factors were used to convert the estimates to 'round log' volumes.

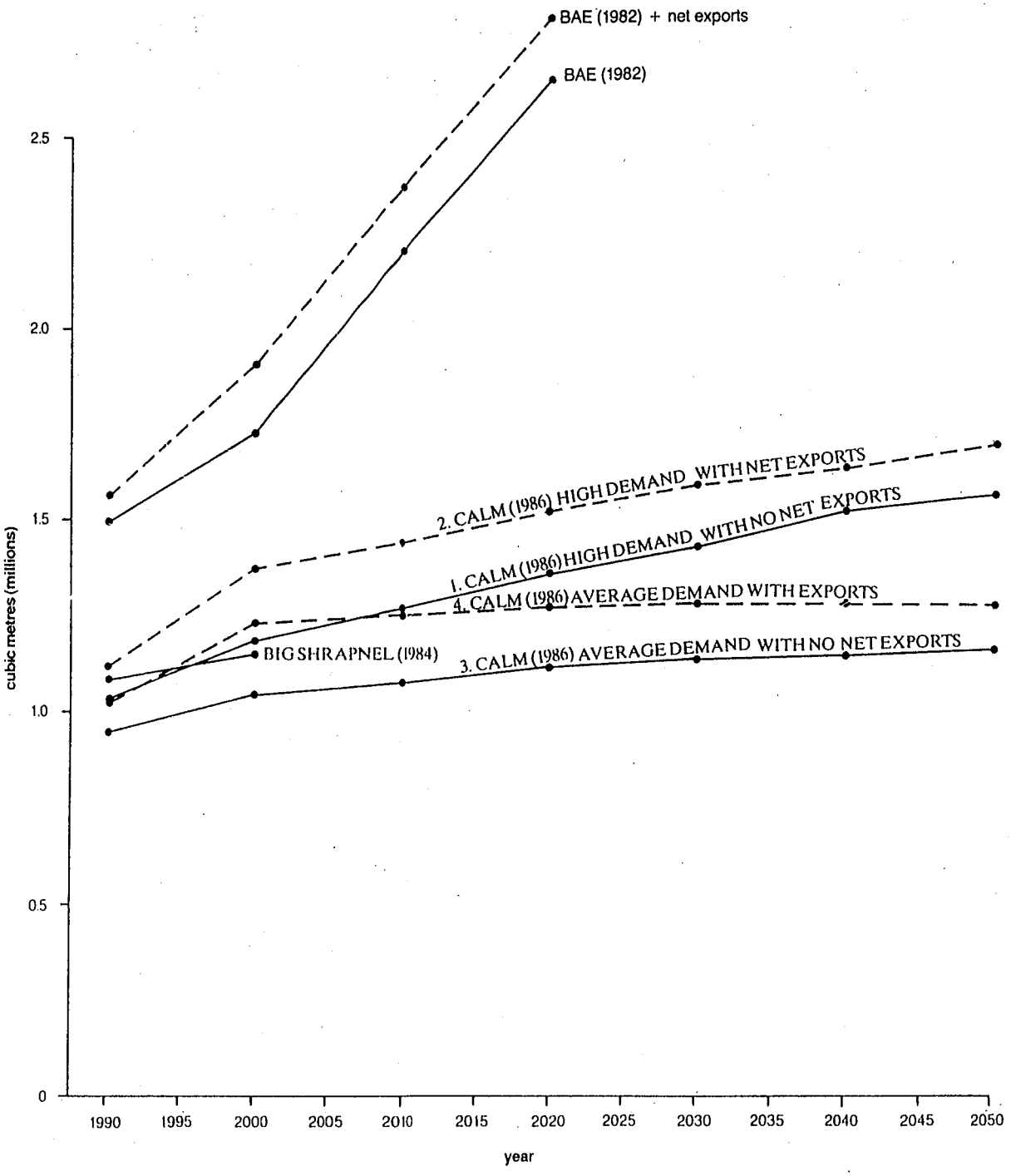

Figure 1
External and domestic demands for sawlogs: Western Australia

The current W.A. production of karri and jarrah high-value products (seasoned and appearance grade timber used for furniture, exposed beams and parquetry flooring) is 35 000 m^3 processed or some 205 000 m^3 round log. (Lower grade products are also produced from the same logs). Some of the high-valued products are exported, but it is impossible to accurately determine the volume.

The future demand for these products will be determined by factors external to W.A. since the W.A. market is too small for large quantities of high grade hardwood products. An increase in the proportion of sawn timber used for high quality products from the present 13 per cent to an estimated 50 per cent by 1997 would be an increase of 80 000 m^3 (processed) of high value products.

Major factors determining external (Eastern States and overseas) demand for these products are:

1. Competition from alternative hardwoods

   While data is difficult to obtain on the quality of alternative hardwood, the failure of countries that are the prime source of these products to regenerate their forests suggests there will be a rapid decline in the availability of hardwood logs. The rate of destruction of tropical hardwood forest, the major source of this product, is between 7.1 million ha per annum (FAO 1982) and 24 million ha per annum (Myers 1980). It is anticipated there will be major reductions in the supply of tropical hardwood logs (as well as other material) by the end of the century (FAO 1982).

2. Price competitiveness

   The ability to sell W.A. products overseas will depend on price, but this is not necessarily the major factor influencing demand for furniture material.

3. Marketing

Although there probably will be a deficit of high quality hardwood, the demand will be limited without marketing. Demand for any product whose principle attraction is appearance is dependent on the consumer knowledge of the product and its superior quality.

4. Technological expertise

The manufacture of superior products from W.A. hardwoods at competitive prices will depend on the local industry using the most modern timber technology to ensure:

(a) costs are as low as possible;

(b) quality is high;

(c) maximum use is made of the resource available. Technology must be developed that substantially increases the proportion of each log utilised for high value products and ensures there is minimal loss in the production line.

5. Secure supply of enough wood

As with any product, the quantity that can be supplied and the security of that supply will influence the decision to invest in developing and marketing the product.

6. Increase for high-valued timber production

It is proposed that over the statutory period this plan covers (1987-1997) the production of high-valued timbers will be increased from the estimated current 35 000 m^3 processed (13 per cent of sawn

timber production and based on some 205 000 m^3 of sawlogs) to 115 000 m^3 processed (50 per cent of sawn hardwood timber production).

Demand for chiplogs and sawlog residues

Estimates of local and external demands for W.A. chiplogs (pulplogs) and residues are in Table 5. The table also gives estimates of potential W.A. demand for wood for local pulp and paper production if a pulp mill were established in W.A.

WOODCHIP EXPORTS FOR PULP AND PAPER PRODUCTION

The removal of woodchips from State forests in 1985-86 was 514 436 m^3, consisting of 83 per cent marri and 17 per cent karri.

There is an excess of long fibre woodchip for paper production on the world market. Short fibred eucalypts, necessary for high quality papers, are in short supply.

The world demand for short-fibred woodchips is about 160 million m^3 (FAO 1982).

This is anticipated to increase to 187 million m^3 in 1990 and 264 million m^3 in 2000 A.D. (FAO 1982).

The current W.A. demand for chipwood is approximately 750 000 tonnes of green hardwood woodchips per annum. There is currently a proposal to export an additional 240 000 tonnes in the long term (Table 5).

Despite the high demand for short fibre eucalypt wood pulp, the demand for relatively low quality chipwood, such as jarrah chipwood, is limited. The cost of paper production from this wood residue is too high for it to compete with other species.

TABLE 5

DEMAND FOR W.A. CHIPLOGS, SAWMILL RESIDUES, AND OTHER MINOR FOREST PRODUCTS
1990-2030 AD

	1990	2000	2010	2020	2030
HARDWOODS					
For Export					
1. Woodchip existing project (R&S) [tonnes woodchips]	750 000	750 000	750 000	750 000	750 000
2. Woodchip (proposed new project) (R&S) [tonnes woodchips]	144 000-228 000	180 000-234 000	240 000	240 000	240 000
3. Fuelwood (R&S) [cubic metres round equivalent]	150 000	150 000	200 000	200 000	200 000
For Local Use					
4. Mining Timber (R) [cubic metres round equivalent]	3 600	4 200	3 700	3 400	3 000
5. Jarrah Charcoal for Silicon Production (R&S) [cubic metres round equivalent]	160 000	100 000	100 000	100 000	100 000

TABLE 5 cont...

	1990	2000	2010	2020	2030
SOFTWOODS					
For Local Use					
6. Particleboard (R&S) [cubic metres round equivalent]	294 000	300 000	300 000	300 000	300 000
7. Panel board (R&S) [cubic metres round equivalent]	45 000	80 000	80 000	100 000	100 000
OTHER HARDWOODS & SOFTWOODS					
For Local Use					
8. Fence posts & Strainers (R) [cubic metres round equivalent]	16 800	19 100	21 600	24 400	27 700
9. Residential & Industrial Firewood (R&S) [cubic metres round equivalent]	100 000	117 000	133 000	149 000	163 000
10. Pulp & Paper (R&S) (Potential Demands) [cubic metres round equivalent]	728 000	942 100	1 120 000	1 263 600	1 350 000

R: Roundlogs
S: Sawlog Residues

TABLE 5 cont...

SOURCES OF PROJECTION

1, 2, 3, 5, 6, 7 - Relevant WA firms and Department of Conservation and Land Management (1986).

4, 8, 9 - Department of Conservation and Land Management (1986).

10 - Forestry and Forest Products Industry Council (1985 Draft Report), and Department of Conservation and Land Management (1986).

FUEL WOODS

Local

Local demand for domestic firewood is estimated at approximately 100 000 m^3 per annum. The demand is expected to rise to 163 000 m^3 per annum by the year 2030 (Table 5).

Exports

There is a significant Australian and overseas demand for fuel wood products. In part, this is due to the devastation of forests in developing countries, in particular in Africa. There are also potentially large demands for fuel wood throughout Asia with increasing living standards and population growth. The potential demand for fuel wood from W.A. hardwood forests far exceeds the potential to supply.

For example, the consumption of fuel wood in the Far East and Oceania has been and is expected to be:

FUEL WOOD DEMAND
(Million Cubic Metres)

	1975	2000
Far East (Including India, Pakistan, Indonesia, and Korea	495	600
Oceania	1	2

(Source : FAO 1982)

The external demand for W.A. fuel wood will depend almost entirely on price.

150 000 to 200 000 m^3 of wood per annum are proposed to be exported to South East Asia for use as fuel wood in the form of coal/wood briquettes.

LOCAL MINING TIMBER DEMANDS

Small logs, as well as sawlogs, are required for mining operations. The estimated demand for these are shown in Table 5.

JARRAH CHARCOAL FOR SILICON PRODUCTION

Jarrah has very favourable properties for the production of high grade charcoal. It is not possible to estimate demand for this product. The Government is, however, considering a project to produce high grade silicon , which if successful, will result in a demand for jarrah residue of about 100 000 m^3 per annum.

SOFTWOODS

There is an oversupply in Australia of small softwood logs and residues. Acceptable commercial outlets for this material would enable all softwood plantations to be thinned commercially for sawlog production. The estimated demand for this source is in Table 5.

LOCAL WOOD DEMANDS FOR PARTICLE BOARD PRODUCTION

At present in W.A. softwood chiplog and sawlog residues are mainly used for particle boards at the Dardanup plant operated by Westralian Forest Industries (Wesfi).

Wesfi have negotiated an export market for particle board which, if sustained, could significantly increase the demand for softwood residue material. (Note - For commercial reasons the quantities being exported cannot be disclosed.)

The estimated demand for softwood chiplogs and sawlog residues for particle board is in Table 5.

POTENTIAL WOOD DEMANDS FOR W.A. PULP AND PAPER PRODUCTION

A pulp and paper industry in W.A. would provide a substantial commercial outlet for W.A.'s forest thinnings and sawlog residues.

Expanding Pacific Rim markets are good export prospects for pulp and paper. However, only large-scale integrated pulp and paper plants can be competitive in the international markets. Each mill could require a wood supply of over 1 million m^3 per annum. (Jaakko Poyry 1986).

There is some uncertainty as to whether such an industry will be established in the near future because:

1. of the large capital needed;

2. of the need for large quantities of the right mix of short and long fibred material to sustain the plants. The fibre mix depends on the paper products produced;

3. of the need for adequate markets for the products. Because of W.A.'s small population, a local industry will need to export a significant proportion of its production.

It is possible, however, that sufficient quantities of the appropriate fibre mix could be produced by the establishment of tree plantations on cleared agricultural land which, together with the existing residue material from forests, would provide sufficient resource for a pulp mill.

It is possible that such a farm plantation program, in addition to providing a profitable return to farmers (estimated gross return could exceed $200 per hectare per annum) could be used to rehabilitate water catchments.

Consequently, it is proposed to investigate the potential for, or the establishment of, a pulp mill in W.A. over the planning period.

SUMMARY

Various demands for W.A. sawlogs have been calculated and are summarised in Figure 1. Four scenarios are presented:

1. High demands with no net exports (2.55 percent G.D.P. growth rate and 15 000 persons net migration).

2. High demands: increase in net exports (predominantly of high value products) equal to 10 per cent of hardwood sawlog production in 1990, increasing to 30 per cent by 2000.

3. Average demand with no net export (2.0 percent G.D.P. growth rate and 11 000 persons net migration).

4. Average demand: increase in net exports (predominantly of high value products) equal to 10 per cent of hardwood sawlog production in 1990, increasing to 30 per cent by 2000.

The estimated demand for residue materials are shown in Table 5.

3. WA's FOREST RESOURCE

AREA AND DISTRIBUTION OF NATIVE FORESTS AND EXOTIC PLANTATIONS IN W.A.

Public forests

The area and distribution of major native hardwood species and exotic pine plantations available for timber production are shown in Table 6 and Figure 2 respectively.

TABLE 6

AREAS OF PRODUCTION FOREST IN W.A.

Pinus pinaster	Pinus radiata	Karri	Jarrah
27 508 ha	33 004 ha	116 000 ha	1 257 420 ha

Private forests

Private ownership of native forest is approximately 700 000 ha. This may be of significant conservation value for the State, but very little of it is managed for timber production. The logs that do find their way into the wood processing industry come from land clearing or opportunistic cutting.

Most exotic plantations consist of radiata pine established by investment companies, although there are industrial plantations of both pine and hardwood.

There are approximately 835 ha of privately owned eucalypt plantations and 13 000 ha of privately owned pine plantations.

NORTHERN, CENTRAL AND SOUTHERN FOREST REGIONS

Department of Conservation and Land Management

SCALE

0 30 60 km

N

- Conservation Areas
- Priority Areas for Catchment, Protection and Production
- Pine Plantations
- Private Property
- Other land

INDIAN OCEAN

Northam

Perth

Bunbury

Manjimup

Walpole

CONSERVATION AREAS

National Parks
State Parks
Forest Parks/Reserves
Nature Reserves

Significant Conservation Areas

1. Avon Valley
2. Walyunga
3. John Forest
4. Yanchep
5. Yalgorup
6. Ludlow
7. Leeuwin-Naturaliste
8. D'Entrecasteaux
9. Shannon
10. Walpole-Nornalup
11. Soho-Wattle-Johnson
12. Beedelup
13. Warren
14. Brockman
15. Serpentine
16. Monadnocks
17. Dale
18. Neerabup
19. Preston-Noggerup
20. Mullalyup
21. Lennard
22. Lane-Poole Reserve
23. Julimar
24. St. John's Brook
25. Blackwood River
26. Boranup
27. Giants/Keystone
28. Perup
29. Moore River
30. Benger Swamp
31. Chester
32. Milyeannup
33. Dickson
34. Strickland
35. Bolbelup
36. Lake Muir
37. Unicup Lake

Whilst this is quite a large potential resource, its value is affected by fragmented ownership and variability in the quality of management it has received.

INVENTORY OF THE JARRAH FOREST

Western Australia's jarrah forests have been exploited for timber since European settlement in 1829. Approximately 26 million m^3 of jarrah have been extracted from Crown land since then. Despite this cutting, the ravages of wildfire, and the introduction of dieback caused by the plant pathogen Phytophthora cinnamomi, the forest still yields 550 000 m^3 of timber per annum and has the potential to sustain indefinitely a viable and profitable timber industry.

For the purpose of this strategy, the jarrah forest has been divided into two broad categories - the northern and southern forests.

THE NORTHERN JARRAH FOREST

The northern jarrah forest (comprising the northern and central forest regions) has been thoroughly cut over, and in its western zones severely degraded by dieback. Since 1970, 5 648 ha of forest have been mined for bauxite. Severe wildfires have also contributed to the degradation of the forest.

The structure of the forest varies according to cutting history, site quality, fire damage and incidence, and severity of dieback. The northern jarrah forest can be loosely divided into the following categories:

1. Regrowth forests

There are approximately 140 000 ha of relatively even-aged regrowth forests. These forests were regenerated after heavy cutting (almost clearfelling) of the original forest. They vary in age from 10 to 80 years. Some of the regrowth forests have been thinned. The regrowth can occur as extensive blocks, but is often in areas as small as 10 to 15 ha.

The most productive regrowth is usually located on more fertile sites, which also tend to be more resistant to dieback. Their faster growth, and apparent resistance to P. cinnanomi, identify these areas as an important future source of timber. The principal factor which limits their potential for sawlog production is the absence of a market for the small trees which need to be removed in a thinning operation.

2. Old growth (original) forests

There are no significant areas of original forest, except those in national parks or conservation reserves, which have not been cut over. The remaining old growth usually consists of individual residual trees or groups of trees once marked for retention or that were unsuitable for milling. These are interspersed with groups of saplings or small poles. One of the factors that inhibits regeneration and growth in old growth areas is the dominance of large old trees which are unsuitable for sawmilling, but whose presence restricts the development and growth of young trees. When these areas are logged the old over-mature trees are removed and the dense young stands are thinned to protect the young regrowth and aid germination (regeneration) of seedlings.

3. Low productivity diseased forest

Extensive areas of forest have been severely affected by dieback, and at present have potential for growth of a new forest providing they can be rehabilitated. Many of these areas have standing volumes of dead or over-mature and fire-damaged trees. Many of these trees could yield millable timber if they were logged as part of an integrated operation which supplied a residue market.

The standing value of this timber and its various uses, is shown in Table 7. The volume of sawlogs has been calculated according to current utilisation standards. The number of sawlogs will be significantly higher if utilisation standards continue to improve at the current rate and if a market for forest residue is developed.

4. Bauxite mining areas

Bauxite mining in the jarrah forest has had less impact on the forest than originally anticipated, because:

(a) the demand for bauxite has been lower than originally projected.

(b) mining has been relocated in a more concentrated area.

(c) reliable long-term (25 year) mining plans aid forward-planning.

(d) significant improvements in management of the mining operations will minimise the impact of mining on forest adjacent to the mine pit.

TABLE 7

INVENTORY OF TIMBER RESOURCE ON AREAS OF HARDWOOD FOREST AVAILABLE FOR TIMBER PRODUCTION

FOREST TYPE	AREA	SAWLOG VOLUME (10^6 m^3)			OTHER WOOD VOLUME	ESTIMATED INCREMENT (m^3/ha/year)		ESTIMATED TOTAL INCREMENT (10^6 m^3/year)	
		1st GRADE	LOWER GRADES	SMALL DIAM. LOGS		CURRENT	POTENTIAL	CURRENT	POTENTIAL
OLD GROWTH KARRI AND KARRI-MARRI	84 000	6.58	0.88	0.27	7.34 (2)	1.5	8 (4)	0.1	0.50
EVEN-AGED REGROWTH KARRI	31 000	0.96	-	0.70	1.38 (2)	5	8 (5)	0.14	0.22
OLD GROWTH SELECTION CUT JARRAH_MARRI FOREST (INCLUDES SUBSTANTIAL AREAS OF REGROWTH)	1 257 000	13.6 (1)	2.65	2.00	98.9 (3)	1.1	1.7 (5)	1.38	2.13

(1) INCLUDES SMALL VOLUMES OF WANDOO AND BLACKBUTT.
(2) INCLUDES MARRI AND KARRI CHIP QUALITY MATERIAL.
(3) INCLUDES MARRI, JARRAH AND SMALL VOLUMES OF OTHER SPECIES CONTAINED IN TREES GREATER THAN 10CM DIAMETER.
(4) THIS INCREMENT WILL BE ATTAINED AFTER FELLING AND REGENERATION.
(5) THESE INCREMENTS WILL BE ACHIEVED FOLLOWING APPROPRIATE SILVICULTURAL TREATMENT.

TABLE 7 Cont...

Note

a) OTHER WOOD VOLUME includes all other wood currently standing in the forest which is not utilisable for sawlogs.

b) The 98.9 million m^3 OTHER WOOD VOLUME within the jarrah-marri forest type includes 49.8 million m^3 of jarrah residue in live and dead trees greater than 10cm diameter.

(e) new planting techniques have led to better growth of trees replanted on mine pits.

THE SOUTHERN JARRAH FOREST

The southern jarrah forest (south of Preston River) has been cut-over more recently and less extensively than the northern jarrah forest. Many areas of the southern forest are of lower quality than in the north although areas at Nannup and Kirup are of very high quality. Jarrah in this forest often grows with other species, notably marri, but also with karri or W.A. blackbutt (E. patens).

Sporadic mining for tin near Greenbushes over the past 100 years, and for mineral sands in some areas south of Capel, has affected a limited area of forest.

Part of the forest is infected by dieback, but high impact sites are not common. Much of the early logging in southern forests concentrated on karri, and extensive logging of jarrah began only 50 to 60 years ago.

The recent cutting history and the dominance of marri in the forest have resulted in poor jarrah regrowth. Jarrah regrowth is often severely suppressed particularly by faster growing marri trees, and is not expected to reach millable size until well into the next century.

Even then, it will require intensive silvicultural treatment in the next 15 to 20 years to maintain growth on selected crop trees.

INVENTORY OF THE KARRI FOREST

The structure and yield potential of the karri forest is affected principally by silvicultural practices. It is more productive than the jarrah forest and is relatively unaffected by disease, although like the jarrah forest, it has been subjected to severe wildfire and there are areas

of fire damaged trees. In addition to its productivity, the karri forest has benefited by the presence, since 1976, of a residue-using industry which has made widespread silvicultural treatments possible. The tree itself is more easily utilised in smaller logs than jarrah. For all those reasons, the potential of the karri forest to produce a high sustainable yield is greater than that of the jarrah forest.

For the purpose of this strategy, the forest can be placed in four categories which reflect past silvicultural practices:

1. Old growth virgin karri forest

   This forest has not been cut although a significant proportion of it has been damaged by fire. This category includes pure karri stands and stands with different proportions of marri and karri.

2. Regrowth forests regenerated prior to 1939

   Prior to the introduction of selective cutting in the late 1930's, the karri forests were clearfelled. The forests that regenerated from this period now average 50-60 years and are in the process of being thinned.

3. Selection cut forests

   In the late 1930's, because no residue-using industry existed, a 'selection cut system' was introduced to the karri forest. Groups of trees were logged - each group usually no larger than between two to ten hectares. New karri forest regenerated in the gaps, but in some situations failed completely. The young trees that did regenerate were suppressed by old trees nearby, which themselves deteriorated. It was impossible to log near these small areas without

damaging the regrowth in the process, and protection from fire by prescribed burning was also almost impossible.

This forest consists of patches of regrowth of varying size and quality situated among old growth stands.

4. Regrowth forests regenerated after 1966

Since 1966 approximately 22 000 ha of karri forest in areas designated for wood production have been regenerated using the clearfelling system. This new forest's average yield exceeds six cubic metres per year. The sawlog yield potential of this forest could be increased by more than 65 per cent by thinning and fertilisation.

INVENTORY AND YIELD POTENTIAL OF PINE PLANTATIONS

Although experimental planting of pine species in W.A. began early this century and expanded in the 1920-1930 period, it was not until the Commonwealth Softwood Agreement Act in the 1960s that plantations were established on a large scale.

Tree breeding, scrub competition, nutrition, and silviculture have all posed problems which have been overcome during the past 60 years. But one of the major problems which still faces all new plantation development is to find markets for the small logs produced as first thinnings. Currently much of this material is used for particle-board and for preservative-treated posts and rails, but there is still a need for new markets for small logs, especially those from privately owned pine forests. Several years of low rainfall, coupled with some delay in thinning the plantations, have contributed to present pine sawlog volumes being less than were estimated in the 1982

General Working Plan for State forests (Forests Department). Heavy fertiliser application to selected areas in 1986 and subsequently, and progress with thinnings, are correcting this shortfall and allow a more optimistic forecast of yields for the next 5 to 10 years.

Table 8 shows the area available and age of pine in State-owned plantations in 1986.

TABLE 8

AREA AND AGE OF PINE IN STATE PLANTATIONS, 1986

	NORTHERN REGION			CENTRAL REGION			SOUTHERN REGION			NORTHERN + CENTRAL + SOUTHERN REGION		
	RADIATA	OTHER	TOTAL	RADIATA	OTHER	TOTAL	RADIATA	OTHER	TOTAL	RADIATA	OTHER	TOTAL
0- 9 years P.YR 1976-1985	261.8	6 085.5	6 347.3	16 405.0	1 658.5	18 063.5	537.3	-	537.3	17 204.1	7 744.0	24 948.1
10-19 1966-1975	1 526.4	10 458.0	11 984.4	8 760.3	1 260.9	10 021.2	208.5	37.1	245.6	10 495.2	11 756.0	22 251.2
20-29 1956-1965	496.9	3 266.1	3 763.0	4 166.4	726.9	4 893.3	257.9	14.3	272.2	4 921.2	4 007.3	8 928.5
30-39 1946-1955	48.7	2 210.8	2 259.5	271.9	552.1	824.0	5.2	-	5.2	325.8	2 762.9	3 088.7
40-49 1936-1945	5.8	297.2	303.0	22.9	65.8	88.7	-	-	-	28.7	363.0	391.7
50+ -1935	11.7	455.2	466.9	17.0	419.7	436.7	-	-	-	28.7	874.9	903.6
	2 351.3	22 772.8	25 124.1	29 643.5	4 683.9	34 327.4	1 008.9	51.4	1 060.3	33 003.7	27 508.1	60 511.8

4. FOREST-BASED INDUSTRIES OF W.A.

INTRODUCTION

While most of the log resource in W.A. is owned and distributed by the Government, log processing is carried out entirely by the private sector. Consequently, Government can only act as an advisor to industry on timber processing and marketing practices. While there has been a relatively high level of co-operation between CALM and private timber processors, much greater co-ordination and collaboration within the private sector and between the private sector and the Department is essential if the industry's potential is to be realised.

SOCIAL AND ECONOMIC SIGNIFICANCE

The timber industry employs more than 20 000 people directly or indirectly. Its annual turnover is about $300 million. The industry is decentralised and is a major employer in the south-west of the State. The impact of the industry on social and economic development of the South West is further enhanced because many farmers supplement their farm income by full or part time employment in the timber industry.

STRUCTURE OF THE INDUSTRY

The timber industry is very diverse. There are several major companies which process in excess of 80 per cent of the log resource. There are, however, numerous small companies, both in the sawmilling and manufacturing sector. A number of the major companies have vertically integrated operations.

SAWMILLING

Hardwood sawmilling

The major hardwood sawmillers account for more than 80 per cent of the sawlog production of the State. There is a large number of medium and very small sawmill companies which account for the remainder of the resource. A list of registered hardwood sawmillers in W.A. is provided in Appendix A.

The large sawmilling companies have a high degree of vertical integration by comparison with other Australian States. These companies actively market, re-manufacture (eg seasoning, computer modelling and truss fabrication), and have active product research programs.

The small sawmilling sector mainly produces green sawn products. Although some companies have and are actively introducing new technology, much of the industry is characterised by out-of-date plant.

Softwood sawmilling

There are 11 softwood sawmills in W.A. producing sawn timber and case material. Softwood sawmilling is in the early stages of development, but by 1995 three major softwood sawmills are expected to be operating in W.A. One major mill at Dardanup is owned by WESFI, and currently utilises more than 50 000 m^3 of sawlogs a year. Recently there has been increased competition in softwood sawm timber from eastern Australia and New Zealand. This is mainly due to a depressed housing market in eastern Australia.

MANUFACTURING SECTOR

Furniture and joinery

Furniture and joinery manufacturers form six per cent of the total manufacturing industry in W.A. Annual turnover exceeds $6 million. There are only two furniture manufacturers publicly listed, but several others are expected to seek second board listing in 1987/88. The furniture industry is characterised by a relatively large number of small units. The Guild of Furniture Manufacturers Incorporated is an active industry body. The industry recently has taken a number of initiatives in an attempt to develop an export market for W.A. furniture products. For example, they have maintained a presence in the annual Singapore International Furniture Show and have established a showroom and sales outlet in Singapore.

The Guild is currently concerned at their inability to secure an assured supply of high-quality seasoned W.A. hardwood, and at recent price increases for seasoned hardwoods.

Panel products

Plywood and veneers are being produced in W.A. by several local manufacturers. Traditionally, jarrah veneer has been produced as a decorative finish for other local panel products.

WESFI is a major producer of particle board from its Dardanup plant.

Residue-based industries

The residue-based industry in W.A. mainly processes marri and karri woodchips for export. The industry employs about 500 people directly and indirectly and has export earning

of $37.5 million. The commercial viability of the Westrail Bunbury/Manjimup railway line is enhanced by the transport of woodchips from Manjimup to Bunbury.

Firewood for domestic consumption

There is a significant and growing demand for firewood. Production of firewood for the domestic market is carried out by a large number of small producers.

Logging

The logging sector of the industry is extremely diverse. This sector is efficient and progressive and has large investments in modern equipment. Some are large logging companies, two of which are owned by a major sawmilling company. There are a number of small companies which operate one or two logging units.

FUTURE DEVELOPMENTS

Security of tenure

Representations to CALM from all sectors of the timber industry consistently state that resource security is an essential prerequisite to industry re-investment. The proposals set out in this strategy are designed to meet this request while maintaining a competitive environment.

Marketing and product development

Cyclical fluctuations occur in the demand for timber products and which are related to the housing market. These variations inhibit long-term planning and investment.

It is proposed, in co-operation with individual companies and industry bodies to:

1. Diversify timber products to buffer the effect of fluctuations in the housing market. Proposals in this strategy to substantially increase the proportion of hardwood used for high-value products will make a major contribution to achieving this aim.

2. Actively export W.A. produced timber products. The products most likely to be successful as exports are high-value hardwood products. Recently, WESFI have increased the export of particle board.

3. Conduct market surveys. In particular overseas markets will be surveyed to assess the potential for sale of value added hardwood products.

4. Develop an economic model for industry which will identify the most profitable markets and those components of the production cycle from the stump to the sales door which are most sensitive to cost reduction.

Utilisation

Improvements in the proportion of logs converted to sawn material, the prevention of sawn timber degradation during processing, and reductions in the cost for seasoned hardwood timber, will have a major impact on the commercial viability of the timber industry. For example, currently it is more profitable to produce green scantling than seasoned hardwood because of the seasoning costs. Although individual companies have, and are conducting, innovative research programs in this area, there are obvious benefits for the industry as a whole if this research is undertaken on a collaborative basis.

Recognising the importance of utilisation research, the Department of CALM established a wood utilisation research centre (W.U.R.C.) in 1984.

In 1985 the Forest Production Council (an industry advisory body to the Department) proposed to the Australian Government research and development commercial techniques for sawing and seasoning small regrowth hardwood logs.

This resulted in an agreement which with additional funding from the State Government has increased expenditure on utilisation research at the Harvey Centre by $4.63 million over a four-year period.

Much of the research conducted at the Harvey Centre is carried out in collaboration with private companies and all research results are publicly available.

It is proposed to establish a utilisation research committee to further assist collaboration within industry and between the industry and the Department. It is proposed that this research committee be a subcommittee of the proposed tripartite Forest Production Council. (See below).

It is also proposed, in association with other sectors of the timber industry, to establish training, quality control, quality assurance and technical advisory services.

Industry and department liaison

1. It is proposed to amend the CALM Act so that the Forest Production Council will include tripartite industry, trade union and departmental representation.

2. It is proposed to investigate the potential for the formation of a marketing syndicate, or co-operative, to market hardwood value-added products.

5. FOREST MANAGEMENT

LAND USE ALLOCATION

The three regional management plans and supplementary documents give detailed information on proposals for allocating land in the forests of south-west W.A. This section summarises these proposals and their significance to the timber industry.

The native forests of W.A. are important for conservation and a number of different purposes. Forests can be managed for these different uses without affecting their conservation value or long term survival (see Multiple Use Management below). However, scientists and the public alike realise there is a need to set aside representative areas of forest free from commercial timber exploitation.

In the Forests Department General Working Plan No 87 (1982) a number of management priority areas were created throughout the forest for conservation and/or recreation.

The security of tenure of these areas was the maximum possible since any excision of State forest required the assent of both Houses of the State Parliament. A limitation on this method of reservation of forests for specific uses was that the security of purpose of these reserves was inadequate. The purpose of the reserves could be changed without reference to Parliament.

The management plans for the Northern, Central and Southern Forests propose that areas which have been designated for conservation will be revested in the National Parks and Nature Conservation Authority as 'A' class reserves. This will mean that neither tenure nor purpose of the reserves can be changed without reference to the two Houses of the State Parliament.

Just as forests set aside for conservation and recreation have security of tenure and purpose, forests set aside for production will have the same security.

Although State forest has adequate tenure security, its purpose (including timber production) may be changed without reference to Parliament.

The management plans propose to amend the Conservation and Land Management Act to permit those areas of State forest for which the primary use is production (including timber production) or catchment protection, to be gazetted for these purposes. Once an area of forest has been reserved for timber production, it will not be possible to exclude this activity without the approval of both Houses of the State Parliament.

The land use proposals are summarised in Figure 2. If these proposals are accepted by Government, State forest will remain vested in the Lands and Forest Commission and managed for multiple use, but its major priority uses will be production and catchment protection with 'A' class security of tenure and purpose.

MULTIPLE USE

One of the most important values of forests is that provided they are managed efficiently, they can be used for a wide variety of purposes simultaneously, and in perpetuity. This is the concept of multiple use.

Multiple use has been a part of W.A's forests for many years. The forests have provided timber, protected water catchments, preserved flora and fauna and provided scenic landscapes and areas for recreation. For example, Boranup State forest was clearfelled to provide timber at the turn

of the century. Today, it has regrown and is considered to be amongst the most beautiful in the State. Many popular recreation sites are in regrowth forests near Dwellingup and Pemberton, and in other parts of the south-west.

The concept of multiple use in State forest is often criticised, partly because it is very difficult for people to imagine a recently logged area regrowing into a beautiful and productive new forest.

Multiple use does not necessarily mean all uses can be practised at the same time in the same area. Some forest uses will never be compatible - for example, timber production and preservation of old growth virgin forest. Incompatible uses must be provided for on separate areas of forest, which is what the management plans do (see Fig 2). Other uses are compatible, but must be separated in time to prevent conflict between users, for example timber production and recreation.

Uses of a forest will vary with the type of forest, its location and its past history. Often there is no conflict between a variety of uses, and in some situations, different uses benefit each other. But often it is necessary to specify a priority use. The priority or dominant use of an area is determined by the attributes of the forests and the level of demand for different uses. A priority use does not mean the area is only used for that purpose. However, where there is conflict between different uses, the priority use gets more consideration.

Because State forest is managed for multiple use, in addition to the forests set aside as national parks and nature reserves, the State forests make a major contribution to meeting the demands for conservation and recreation.

SUSTAINED YIELD

One of the most important and positive attributes of the timber industry is that the resource on which it is based can be sustained in perpetuity. A fundamental principle on which this timber strategy is based is that the amount of timber extracted from the forest does not exceed the annual growth of the forest. A forest manager following the principle of sustained yield is like a banker who maintains the yield in interest from the capital invested by a client by ensuring that the levels of capital can sustain the annual interest payment.

While ensuring the amount of timber removed from a forest does not exceed the annual growth, forest managers also ensure the structure of the forest generates a range of material each year that can be utilised economically. This is more easily achieved when the age or size class distribution of a forest is balanced. In forestry terminology, this is called a 'normal' forest.

In the hardwood forest of W.A. (and in most native forests throughout the world) there is an imbalance in the structure of the forests because the trees of the new forest have not had enough time to grow as large as those in the original forest.

The annual increment of wood in the karri and jarrah forests (1.6 million m^3) exceeds the annual amount of timber removed (1.2 million m^3). However, the rate at which individual hardwood trees are growing is too low to ensure, at the current rate of extraction of logs in the forest, that when the old growth forest is exhausted, there will be enough trees in a range of sizes to sustain the current cut.

A sustained yield of sawlogs will be achieved by:

1. reducing the level of cut in the original forest;

2. improving utilisation of logs from the original forest;

3. developing new technology to utilise thinnings from regrowth forests. (Note: In the past 18 months, 50 000 m^3 of small trees from karri thinning have been allocated to successful tenderers);

4. fertilising and thinning regrowth hardwood stands. Current research shows that the sawlog volume production of karri regrowth stands can be increased by more than 65 per cent by thinning and fertilisation;

5. substituting pine sawlogs for hardwood.

TENDING THE FORESTS

Silviculture is the establishment and growing of forests to produce timber. It is a process that spans the life of a forest, from planting seedlings or sowing seed, through tending and thinning, to the harvest and regeneration of mature forests.

Different silvicultural methods must be used for different forests. The most appropriate techniques depend on the species and its reproductive biology, the site, the history of the area, local environmental requirements and the markets for the forest products.

A variety of silvicultural methods are used in W.A. hardwood forests and are described in Departmental publications (see Appendix B).

JARRAH FORESTS

The mature jarrah forest usually has its own replacement forest ready-made on the forest floor in the form of tough, shrubby jarrah seedlings called 'lignotuberous advanced growth'. When the mature trees are harvested, the advanced growth is stimulated by additional light and moisture and quickly develops into a vigorous sapling stand.

Mature jarrah forest can either be clearfelled (all mature trees removed at once) or selectively cut (mature trees are removed over many years by extracting individual trees or groups of trees). Most early jarrah forest harvest was by clearfelling. Since the 1930's, selection cutting has become more common.

In either case, the openings in the jarrah forest created by timber harvesting quickly fill up with regrowth. This grows very slowly in dense stands, but growth rates improve dramatically with thinning. Sawlogs from thinnings can come from high quality jarrah stands after 40-60 years. The best trees can be cut for sawlogs after about 60-80 years, but it is likely that stands will be grown to at least 100 years before the next felling cycle is introduced.

In general, jarrah forests regenerate very readily after harvest. Rapid growth rates are maintained in the regrowth forest by silvicultural thinning. There is also a potentially significant sawlog resource in the jarrah forest.

KARRI FORESTS

Karri forests are regenerated after harvest by ensuring seedfall or by planting nursery-raised seedlings onto fresh ashbeds created by burning logging debris. The marri (which grows intermixed with much of the karri forest) regenerates by natural seedfall but also develops a lignotuberous advance growth like jarrah, and regenerates quickly in cutover forests.

During the period 1940-1967, selection cutting was done in the karri forest. This was discontinued because regeneration was inadequate. Where regeneration did occur, the young trees' growth was severely retarded by adjacent old growth trees. It was also virtually impossible to protect the young trees from fire and damage resulting from the removal of the older trees.

The only difference between clearfelling and selection cutting is the size of the area cut. The most extreme form of selection cutting is single tree removal. But most selection cuts involve removal of at least 3-5 trees in a group. The size and growth habits of karri trees make selection cutting impracticable in the karri forest.

Clearfelling was introduced to overcome the disadvantages of selection cutting. The average size of the cut area in the karri forest is 70 ha.

Pre-1940 and post-1966 karri has been managed on a clearfelling system. Karri stands regenerated under this system regenerate prolifically and grow vigorously.

Young regrowth karri and karri-marri forests grow very rapidly. Thinning is not as essential for growth as it is with jarrah. But, the trees grow even more quickly following thinning and the thinned out trees that would normally die can be utilised.

Regrowth stands can be thinned several times between age 15 and age 80, generating a range of log products and accelerating the growth of retained trees. The forest is mature enough by age 100 for the next harvest cycle to begin.

THINNING

Thinning is one of the most universal practices of crop and animal husbandry. It is the process of selecting the best individuals within groups, and favouring their growth and development. Individuals competing with the best are not wanted and are taken out.

The science of thinning forests to enhance the growth of the best trees in the stand is well understood. A forest site is inherently capable of growing a certain volume of timber. This 'total yield' is determined by factors like soil fertility, rainfall and tree species. Thinning maintains the total potential yield of the site, but concentrates it onto the fewest possible number of best trees.

The main problem with thinning forests is not the science, but how to dispose of the unwanted trees. They are often small, crooked and defective, making them unsaleable to sawmills, or else the area is remote and salvage for fencing material or firewood is not possible. The most efficient thinning operation harvests thinnings for a 'residue' market, for example, particle board, woodchips, charcoal. Here, the thinning pays for itself and a potential resource is used.

Where markets for thinnings are unavailable, unwanted trees must be felled and left to rot away or be burnt; or they can be poisoned and left standing. Whilst this operation provides the required thinning, the area is temporarily unsightly, giving an unfavourable image of forest management.

Thinning also can aid areas other than timber production. For example, thinning in the jarrah forest helps develop structure and density similar to the original stands. In the karri forest, thinning along roadsides improves vistas through the forest. In pine plantations growing above underground water resources, thinning recharges the aquifer

annually and in parts of the northern jarrah forest, thinning can increase groundwater storage and streamflow, helping to fill water reservoirs.

The inability to commercially thin the hardwood regrowth forest in the past is the principal cause of the projected deficit in sawlogs.

PRESCRIBED BURNING

Fires occur each year in W.A's forests. The summer weather is always hot and dry, the forests are naturally very inflammable and there are constant sources of ignition (lightning and man).

Our native forests are well adapted and resistant to occasional fires. Following a fire, the forests appear blackened and ruined, but they quickly recover. Over millennia, forest ecosystems have been burned many thousands of times.

Even though high intensity fire may not destroy the forest, it causes serious damage. Severe fires threaten the life and property of people living in or near the forest, and damage timber by killing or scarring mature trees, or killing regrowth forests. High intensity fire can also destroy forest landscapes.

The prevention and control of forest fires is a critical part of forest management and a fundamental aspect of this strategy.

An effective forest fire control system has been developed in W.A. Recognising that fires cannot be absolutely prevented, the system seeks to minimise the damage which fires cause and maximise the ease of their control. The key strategy adopted is <u>prescribed burning</u>: fires are deliberately lit in selected areas of forest under mild weather conditions. These 'prescribed' fires burn slowly,

cleaning up the accumulated debris of leaves and twigs on forest floor. In areas that have been recently prescribed burnt, wildfires burn less intensely, and can more easily be tackled and extinguished.

Where prescribed burning is done, areas are reburnt at intervals of several years. So fuel levels do not become too great. The normal interval between prescribed burns is about 5-7 years in the jarrah forest and 7-10 years in the karri forest.

Cyclic prescribed burning is not done routinely to all forest areas. But in areas managed for timber production, in forests of special aesthetic value, or in areas near towns and settlements, it is an essential management tool that will continue to be used.

Prescribed burning is often criticised because of a perception that burning permanently destroys flora and fauna, or has other undesirable environmental consequences. Research has shown that, provided fire does not occur too frequently and that where there is occasional variation in season of burn, permanent harmful effects do not occur.

FERTILISATION

Most W.A. forest soils are infertile. By international standards, they are deficient in nitrogen, phosphorus and trace elements such as zinc and copper.

Native trees are well adapted to these soils, but research has shown they do respond to fertiliser. The growth response is even more dramatic in the case of introduced timber species such as Pinus pinaster and Pinus radiata.

Fertilisation is a routine operation in W.A. pine plantations. Application rates and frequency are calculated to ensure the cost is recovered by improved growth. Widescale fertilisation has not yet been done in hardwood

timber production forests although data demonstrate that the growth rates of thinned regrowth hardwood stands can be increased by fertilisation.

DIEBACK

Jarrah dieback is a disease caused by an introduced soil borne fungus Phytophthora cinnamomi. During the 1950s and early 1960s, this fungus caused mass destruction of large areas of jarrah forest.

An intensive research program has been conducted into the disease over the past 20 years. Parallel with this program, techniques were developed to slow the spread of the fungus in infected soil adhering to vehicles. Large areas of the forest were quarantined to provide a period during which further introductions of the disease into the forests was minimised. This was to ensure that when detailed aerial photography of an area of forest that had been quarantined was done, all existing infections were located. Knowing where the infections were enabled operations to avoid infected areas.

A sophisticated system of disease detection and management has been developed and is in operation.

One of the principal concerns of researchers was that even with such a management program, unseasonal heavy rainfall could result in a return to major extension of the disease and mortality.

In the 1980s, researchers discovered that the severe occurrences of the disease were related to specific sites. Although it is not possible to specify accurately those sites which are not susceptible to severe disease, it is probable that a large proportion of the high quality jarrah forest sites are in this category.

Although jarrah dieback still poses a severe hazard to the forest, it is believed that the intensive disease management program and further research on site susceptibility will ensure that the disease can be contained.

LOGGING

Hardwood logging (the felling of trees, and the loading and hauling of logs from the forest) in W.A. has traditionally been carried out by sawmilling companies licensed by the Department to harvest timber. Royalties are paid to the Government on the basis of a price per volume of timber removed. This method operated well where a single log product was harvested by a single company.

However, when more than one log product (eg sawlogs and chiplogs) comes from one tree or one area, or when products are processed by different companies, 'integrated' logging is more efficient.

Integrated logging is the concurrent or closely linked harvesting of several log products by independent contractors for sale to one or more buyers. The system has been operating in W.A. pine plantations for more than ten years, with the contractor being employed by the forest owner (CALM) who contracts for the sale of logs to the processors (sawmillers).

Integrated logging has several advantages, mainly:

1. fewer entries into a forest area, reducing the chance of introduction or spread of forest diseases and the risk of other environmental damage;

2. maximisation of the favoured (highest value) log product;

3. equitable apportionment of fixed costs associated with harvesting, such as road construction and maintenance, and supervisory costs;

4. economies of scale;

5. reduced supervision is required; and

6. inter-company disputes, where one company may be harvesting logs for a competitor, are eliminated.

It is proposed that integrated logging systems will be progressively extended throughout the hardwood forest over the next five years. Independent logging operators will be contracted by CALM to harvest all logs from Crown land. In addition, it is proposed that these contractors will be trained in fire control and forest hygiene and will make an important contribution to the control of fire and disease in the forest.

As part of the new hardwood integrated logging procedure the Department will progressively assume responsibility for log road construction and maintenance. All log buyers will be charged an appropriate fee to cover the use of these roads. These charges will be indexed every six months and reviewed every two years to ensure that the Department's costs are recovered. The work will be carried out under contract to CALM by private companies.

PINE PLANTATIONS

Establishment

In W.A. two main species of pine are grown for timber: pinaster pine is used on the more difficult and infertile sites, such as the Swan Coastal Plain, while the more productive radiata pine is used in areas of higher rainfall and more fertile soil. Small areas of other species are used on special sites.

Early pine plantings took place on State forest, but in the mid 1950's the former Forests Department began to purchase farmland for pine planting. Funds for land purchase were

very limited and there was considerable opposition to this policy from rural communities, and particularly from local government.

These factors led to the development in the 1970's of the Sunkland pine project, under which a total of 60 000 ha of poor quality jarrah forest was to be converted to pines over a period of 30 years. This program was halted in 1983 when Government policy reverted to the purchase of agricultural land.

Purchase by the State of private property is expensive and in some rural communities is unpopular. In 1986, the Government of W.A. introduced a scheme, Softwood Sharefarming, which allows farmers to grow pine trees in partnership with the Department. Participators in the scheme are paid an annuity and a proportion of the final crop return. They are also encouraged to undertake development of the plantations (eg pruning, firebreak construction) and are paid by the Department.

The scheme operates throughout the south-west and has recently been extended to Albany.

In the first year of planting, it is expected that 1 500 ha of pine plantation will be established under the scheme. On the basis of this response and the number of farmers who have expressed interest in the scheme, it is anticipated that up to 80 per cent of the annual plantation program will be achieved by 'sharefarming'.

It is proposed to broaden the objectives of the scheme in co-operation with the private sector to include catchment protection. For example, it is possible that re-establishment of trees on catchments prone to salinity problems could restore water quality as well as promoting a commercial timber yield. Extension of the scheme could involve fast growing hardwoods, as well as pine.

Silviculture

CALM's pine plantations have been managed since 1970 to produce high quality sawlogs in the shortest possible time. Management is very intensive and includes using tree breeding programs to improve genetic quality of the planting stock, weed control and strictly-timed pruning and thinning operations.

Research has also led to the development of agroforestry in pine plantations on a large scale, and W.A. is a world leader in this land management technique.

Thinning

An essential requirement for the rapid production of sawlogs is a reliable and adequate market for thinnings, especially the small logs coming from the critical first thinning of 12-14 year old stands. These first thinnings are suitable only for pulpwood, particle board or fence posts. Second thinnings, from trees 18-25 years of age, produce a mixture of sawlogs, small logs and transmission poles. Final fellings in stands older than 30 years in radiata pine and 40 years in pinaster produce almost entirely sawlogs and veneer-quality logs.

Inability to thin young stands seriously delays sawlog production, exposes the stand to tree losses during periods of drought and can have adverse effects on groundwater recharge.

Fertilisation

Most soils available for pine planting in W.A. are of naturally low fertility. In some cases, fertilisers are required for the successful production of any crop at all.

In others, the use of fertilisers gives higher productivity from the plantations and shortens the time it takes for trees to reach sawlog size. Large investments in fertiliser application must be continued if existing plantations are to produce the best possible crops.

Logging

CALM supplies all softwood logs from State plantations to industry on contract, but sub-contractors carry out the actual logging. Sawlogs are delivered to mills at Grimwade, Dardanup, Pemberton and Perth; small logs are supplied to the Dardanup particle board factory and to fence-post treatment plants; and pine transmission poles are supplied to the State Energy Commission. At present, the only plantations with access to a good market for small logs are those within a radius of about 100 km of the Dardanup particle board factory. Lack of markets has hampered Departmental thinning programs, especially on the coastal plain north of Perth.

Due to the backlog of softwood thinning, CALM has so far given priority to thinning its own forests. Comparatively little thinning has been carried out in private forests, except those owned by timber companies. This situation is in the process of change and CALM is increasingly directing contractors into private forests.

The success of WESFI in obtaining a significant new export market for particle board will make a major contribution to decreasing the thinning backlog in private plantations.

PRIVATE FOREST MANAGEMENT

Softwood plantations

There are currently approximately 13 000 ha of privately owned softwood plantations. The management of these plantations is varied, but in general is substandard. This is partially a consequence of the poor market for small logs derived from thinning. The level of expertise available to plantation owners is not adequate.

It is proposed that the Department of CALM will provide technical and management service (operating on the user pay principle) to private plantation owners.

The Department also proposes to investigate the potential to co-ordinate (on a voluntary basis) the sale of logs from private plantations by acting as the contractor for pine logs from private plantations.

Hardwood forest

There are 700 000 ha of hardwood forest in private ownership. The majority of this forest is unproductive and is not being regenerated.

The Department proposes to investigate the potential of these forests for long term timber production by:

1. undertaking an inventory of private hardwood forests;

1. providing advice to private property owners on silvicultural management of hardwood forests;

3. investigating the potential to introduce a 'hardwood sharefarming scheme' based on the same principles as the existing softwood scheme;

4. contracting private property owners to log and sell timber products from private hardwood forests on their behalf;

5. in co-operation with private forestry companies, encouraging where appropriate, planting of hardwood trees on private properties.

FUTURE FOREST MANAGEMENT PROPOSALS

The scientific basis for management procedures and operational procedures currently practiced in Western Australian hardwood and softwood forests are described in the Departmental publications listed in Appendix B. The existing management procedures detailed in these documents will be continued.

It is proposed to further upgrade forest management during the planning period by:

1. thinning 4 000 ha of jarrah regrowth stands per annum;

2. commencing thinning 500 ha per annum (rising to 2 000 ha per annum by 1992) of karri regrowth stands at age 15;

3. immediately initiating a comprehensive inventory of the jarrah forest and completing it by 1990;

4. continuing and upgrading research programs currently in progress, which are aimed at developing commercially viable fertiliser programs for karri and jarrah regrowth stands to ensure that operational fertilisation of these stands can be undertaken at a minimum rate of 1 000 ha per annum, by 1992. On the basis of current research, it is estimated that the yield of regrowth stands can be increased by between 20-30 per cent by fertiliser application;

5. karri and jarrah growth models, which will permit the derivation of optimum thinning regimes for regrowth karri and jarrah stands will be developed by 1988;

6. the embryo hardwood tree breeding programme will be continued and expanded;

7. 2 000 ha of Pinus radiata plantations will be established per annum to the early part of the twenty-first century. One thousand, 500 and 500 ha will be established near Albany and in the Southern Forest Region and the Central Forest Region respectively.

6. THE ALLOWABLE CUT

The 'allowable cut' is the volume of timber that can be removed from the forest each year. The calculation of the allowable cut is based on the following principles and assumptions:

1. The volume of logs removed from the forest each year will not exceed the volume of timber grown in the forest each year.

2. The quantity of old growth logs extracted from some areas of the hardwood forest will be progressively reduced to a level at which the sawlog yield can be sustained indefinitely. The reduction will be scheduled to minimise disruption in communities that depend on the resource.

3. In those areas where the hardwood sawlog cut is being reduced, an equivalent resource of either hardwood regrowth logs/or pine sawlogs will be provided if possible.

4. The allowable cut will include all logs that can be processed for sawn material or other higher value products. In past working plans, the level of the annual allowable cut has included only first grade logs. Improved technology, more efficient logging systems, the structuring of royalty levels to provide economic incentives, and the development of residue industries have all contributed to a dramatic improvement in the standard of utilisation over the past two years.

5. The areas of forest proposed for timber production priority in the draft management plans are accepted as recommended. If the area of forest for timber production is changed, the allowable cut will need to be recalculated.

6. The proposals for increased investment in native forests to increase the productivity of regrowth stands are implemented.

7. The current level of investment in pine plantations in order to improve growth rates is maintained.

8. A pine planting program of 2 000 ha per year in the regions specified in this strategy is carried out.

9. The existing woodchip licence is renewed and the quantity of residue material currently marketed is maintained.

10. The allowable cut in the jarrah forest is based on the most conservative assumptions of yield from this forest. When a new inventory for this forest is completed, it is possible that significantly larger volumes of sawlogs may be available. If a residue-using industry based on jarrah is successfully developed, it will be possible to use more second grade logs from this forest. The allowable cut may be further increased if techniques to improve the productivity and utilisation of regrowth logs are further developed.

    Consequently, it is proposed that the allowable cut from the jarrah forest be recalculated in 1992.

THE SOUTHERN FOREST ALLOWABLE CUT

Karri-marri

Sawlogs

The allowable cut from the karri and marri forests of the Southern Forest Region is set out in Table 9 and is illustrated in Figure 3.

The current allowable cut of first grade karri sawlogs in the Southern Region is 168 000 m^3 per annum. In General Working Plan No 87 of the Forests Department, it was foreshadowed that this would be reduced to 133 000 m^3 per annum in 1987. It is proposed to reduce the annual cut of first grade sawlogs to 153 000 m^3 per annum during the period of the Plan.

This reduction in first grade logs will be compensated for by the provision of 20 000 second grade karri logs, 50 000 m^3 of karri regrowth logs and 30 000 m^3 of marri sawlogs.

Note that -

1. As is proposed in the Southern Region Management Plan, no timber will be removed from stream and river reserves by clearfelling. It has been assumed, however, that the existing practice of selective thinning of these reserves will continue, provided this practice is compatible with conservation and catchment protection objectives.

TABLE 9

THE ALLOWABLE CUT OF KARRI AND MARRI SAWLOGS IN THE SOUTHERN FOREST REGION

(Volume Cubic Metres)

YEAR	KARRI 1ST GRADE	2ND GRADE	TOTAL	KARRI SMALL LOGS	TOTAL KARRI	MARRI	TOTAL SAWLOGS
1987	168000	20000	188000	50000	238000	30000	268000
1988	168000	20000	188000	50000	238000	30000	268000
1989	153000	18000	171000	50000	221000	30000	251000
1990	153000	18000	171000	50000	221000	30000	251000
1991	153000	18000	171000	50000	221000	30000	251000
1992	153000	18000	171000	50000	221000	30000	251000
1993	153000	18000	171000	50000	221000	30000	251000
1994	153000	18000	171000	50000	221000	30000	251000
1995	153000	18000	171000	50000	221000	30000	251000
1996	153000	18000	171000	50000	221000	30000	251000
1997	153000	21500	174500	50000	224500	30000	254500
1998	153000	21500	174500	50000	224500	30000	254500
1999	153000	21500	174500	50000	224500	30000	254500
2000	153000	21500	174500	50000	224500	30000	254500
2001	153000	21500	174500	50000	224500	30000	254500
2002	153000	21000	174000	50000	224000	30000	254000
2003	153000	21000	174000	50000	224000	30000	254000
2004	153000	21000	174000	50000	224000	30000	254000
2005	153000	21000	174000	50000	224000	30000	254000
2006	153000	21000	174000	50000	224000	30000	254000
2007	153000	21000	174000	50000	224000	30000	254000
2008	153000	21000	174000	50000	224000	30000	254000

TABLE 9 cont...

YEAR	KARRI 1ST GRADE	2ND GRADE	TOTAL	KARRI SMALL LOGS	TOTAL KARRI	MARRI	TOTAL SAWLOGS
2009	133000	18000	151000	50000	201000	30000	231000
2010	133000	18000	151000	50000	201000	30000	231000
2011	133000	18000	151000	50000	201000	30000	231000
2012	133000	18000	151000	50000	201000	30000	231000
2013	133000	18000	151000	50000	201000	30000	231000
2014	133000	18000	151000	50000	201000	30000	231000
2015	133000	18000	151000	50000	201000	30000	231000
2016	133000	18000	151000	50000	201000	30000	231000
2017	133000	18000	151000	50000	201000	30000	231000
2018	133000	18000	151000	50000	201000	30000	231000
2019	133000	18000	151000	50000	201000	30000	231000
2020	133000	18000	151000	50000	201000	30000	231000
2021	133000	18000	151000	50000	201000	30000	231000
2022	133000	10000	143000	50000	193000	30000	223000
2023	133000	10000	143000	50000	193000	30000	223000
2024	133000	10000	143000	55000	198000	30000	228000
2025	133000	10000	143000	59000	202000	30000	232000
2026	133000	7000	140000	59000	199000	30000	229000
2027	133000	7000	140000	59000	199000	30000	229000
2028	133000	7000	140000	59000	199000	30000	229000
2029	133000	7000	140000	59000	199000	30000	229000
2030	133000	7000	140000	59000	199000	30000	229000
2031	133000	7000	140000	59000	199000	30000	229000
2032	133000	7000	140000	59000	199000	30000	229000
2033	133000	7000	140000	59000	199000	30000	229000
2034	133000	7000	140000	59000	199000	30000	229000
2035	133000	7000	140000	59000	199000	30000	229000

TABLE 9 cont...

YEAR	KARRI 1ST GRADE	2ND GRADE	TOTAL	KARRI SMALL LOGS	TOTAL KARRI	MARRI	TOTAL SAWLOGS
2036	213000	7000	220000	59000	279000	30000	309000
2037	213000	7000	220000	59000	279000	30000	309000
2038	213000	7000	220000	59000	279000	30000	309000
2039	213000	7000	220000	59000	279000	30000	309000
2040	213000	7000	220000	59000	279000	30000	309000
2041	213000	7000	220000	59000	279000	30000	309000
2042	213000	7000	220000	59000	279000	30000	309000
2043	213000	7000	220000	59000	279000	30000	309000
2044	213000	7000	220000	59000	279000	30000	309000
2045	213000	7000	220000	59000	279000	30000	309000
2046	213000	7000	220000	75000	295000	30000	325000
2047	185000	0	185000	75000	260000	0	260000
2048	185000	0	185000	75000	260000	0	260000
2049	185000	0	185000	75000	260000	0	260000
2050	185000	0	185000	75000	260000	0	260000
2051	185000	0	185000	75000	260000	0	260000
2052	185000	0	185000	75000	260000	0	260000
2053	185000	0	185000	75000	260000	0	260000
2054	185000	0	185000	75000	260000	0	260000
2055	185000	0	185000	75000	260000	0	260000
2056	185000	0	185000	75000	260000	0	260000
2057	185000	0	185000	75000	260000	0	260000
2058	185000	0	185000	75000	260000	0	260000
2059	185000	0	185000	75000	260000	0	260000
2060	185000	0	185000	75000	260000	0	260000
2061	185000	0	185000	75000	260000	0	260000
2062	185000	0	185000	75000	260000	0	260000
2063	185000	0	185000	75000	260000	0	260000
2064	185000	0	185000	75000	260000	0	260000

TABLE 9 cont...

YEAR	KARRI 1ST GRADE	2ND GRADE	TOTAL	KARRI SMALL LOGS	TOTAL KARRI	MARRI	TOTAL SAWLOGS
2065	190000	0	190000	75000	265000	0	265000
2066	190000	0	190000	75000	265000	0	265000
2067	190000	0	190000	75000	265000	0	265000
2068	190000	0	190000	75000	265000	0	265000
2069	190000	0	190000	75000	265000	0	265000
2070	190000	0	190000	75000	265000	0	265000
2071	190000	0	190000	75000	265000	0	265000
2072	190000	0	190000	75000	265000	0	265000
2073	190000	0	190000	75000	265000	0	265000
2074	190000	0	190000	75000	265000	0	265000
2075	503000	0	503000	75000	578000	0	578000
2076	503000	0	503000	75000	578000	0	578000
2077	503000	0	503000	75000	578000	0	578000
2078	503000	0	503000	75000	578000	0	578000
2079	503000	0	503000	75000	578000	0	578000
2080	503000	0	503000	75000	578000	0	578000
2081	503000	0	503000	75000	578000	0	578000
2082	503000	0	503000	75000	578000	0	578000
2083	503000	0	503000	75000	578000	0	578000
2084	503000	0	503000	75000	578000	0	578000
2085	503000	0	503000	75000	578000	0	578000
2086	503000	0	503000	75000	578000	0	578000
2087	503000	0	503000	75000	578000	0	578000
2088	503000	0	503000	75000	578000	0	578000
2089	503000	0	503000	75000	578000	0	578000
2090	503000	0	503000	75000	578000	0	578000

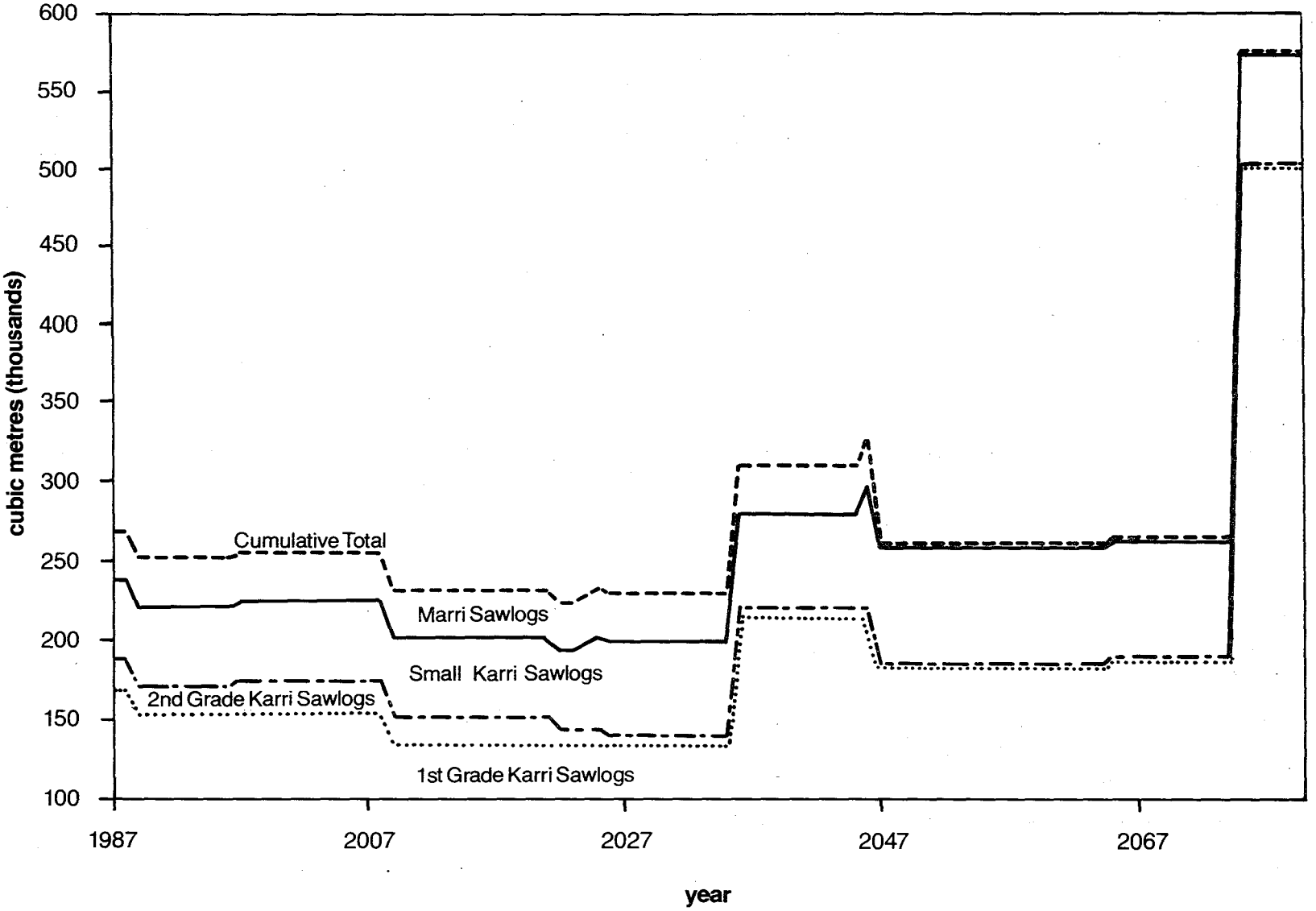

Figure 3
Projected quantity of karri and marri sawlogs

2. The quantity of second grade karri and marri logs sold to sawmills each year varies according to market demand, and the improvement of milling techniques.

Jarrah

Sawlogs

The current allowable cut of jarrah in the Southern Region is 206 000 m^3 of first grade logs. However, the actual cut in 1985-86 was 181 000 m^3. For reasons outlined in Chapter 6 it is necessary to significantly reduce the level of cut over the next 40 years. However, as noted above, the allowable cut for jarrah in this region will be reviewed and re-evaluated in 1992.

The proposed allowable cut for jarrah is shown in Table 10 and illustrated in Figure 4 to the year 2040. At this time, the old growth forest resource will be replaced with regrowth karri logs.

It is proposed to immediately lower the current allowable cut for first grade logs to the actual level of cut. During the next five years, the cut of first grade logs will be reduced by an additional 30 000 m^3.

Although the quantity of first grade logs will be reduced, this will be compensated for by the supply of 27 000 m^3 of second grade logs and 11 000 m^3 of short logs (a proportion of which will be suitable for furniture products).

Residue

The volume of chiplogs available is determined by the sawlog cut. Chiplogs are primarily obtained from karri and marri forest in the Southern Region. However, marri chiplogs will also be obtained from integrated operations

TABLE 10

ALLOWABLE CUT OF JARRAH SAWLOGS IN THE SOUTHERN FOREST REGION

(Volume Cubic Metres)

YEAR	1ST GRADE	2ND GRADE	TOTAL	SHORT LOGS	TOTAL SAWLOGS
1987	206000	10000	216000	0	216000
1988	150000	23000	173000	0	173000
1989	150000	23000	173000	0	173000
1990	150000	23000	173000	0	173000
1991	150000	23000	173000	11000	184000
1992	150000	23000	173000	11000	184000
1993	150000	23000	173000	11000	184000
1994	150000	23000	173000	11000	184000
1995	150000	23000	173000	11000	184000
1996	100000	15000	115000	6000	121000
1997	100000	15000	115000	6000	121000
1998	100000	15000	115000	6000	121000
1999	100000	15000	115000	6000	121000
2000	100000	15000	115000	6000	121000
2001	100000	15000	115000	6000	121000
2002	100000	15000	115000	6000	121000
2003	100000	15000	115000	6000	121000
2004	100000	15000	115000	6000	121000
2005	100000	15000	115000	6000	121000
2006	100000	15000	115000	6000	121000
2007	100000	15000	115000	6000	121000
2008	100000	15000	115000	6000	121000
2009	100000	15000	115000	6000	121000
2010	100000	15000	115000	6000	121000
2011	100000	15000	115000	6000	121000
2012	100000	15000	115000	6000	121000
2013	100000	15000	115000	6000	121000
2014	100000	15000	115000	6000	121000
2015	100000	15000	115000	6000	121000
2016	100000	15000	115000	6000	121000
2017	100000	15000	115000	6000	121000
2018	100000	15000	115000	6000	121000
2019	100000	15000	115000	6000	121000
2020	100000	15000	115000	6000	121000
2021	40000	6000	46000	2000	48000
2022	40000	6000	46000	2000	48000
2023	40000	6000	46000	2000	48000
2024	40000	6000	46000	2000	48000
2025	40000	6000	46000	2000	48000
2026	40000	6000	46000	2000	48000

TABLE 10 cont...

YEAR	1ST GRADE	2ND GRADE	TOTAL	SHORT LOGS	TOTAL SAWLOGS
2027	40000	6000	46000	2000	48000
2028	40000	6000	46000	2000	48000
2029	40000	6000	46000	2000	48000
2030	40000	6000	46000	2000	48000
2031	40000	6000	46000	2000	48000
2032	40000	6000	46000	2000	48000
2033	40000	6000	46000	2000	48000
2034	40000	6000	46000	2000	48000
2035	40000	6000	46000	2000	48000
2036	40000	6000	46000	2000	48000
2037	40000	6000	46000	2000	48000
2038	40000	6000	46000	2000	48000
2039	40000	6000	46000	2000	48000
2040	40000	6000	46000	2000	48000

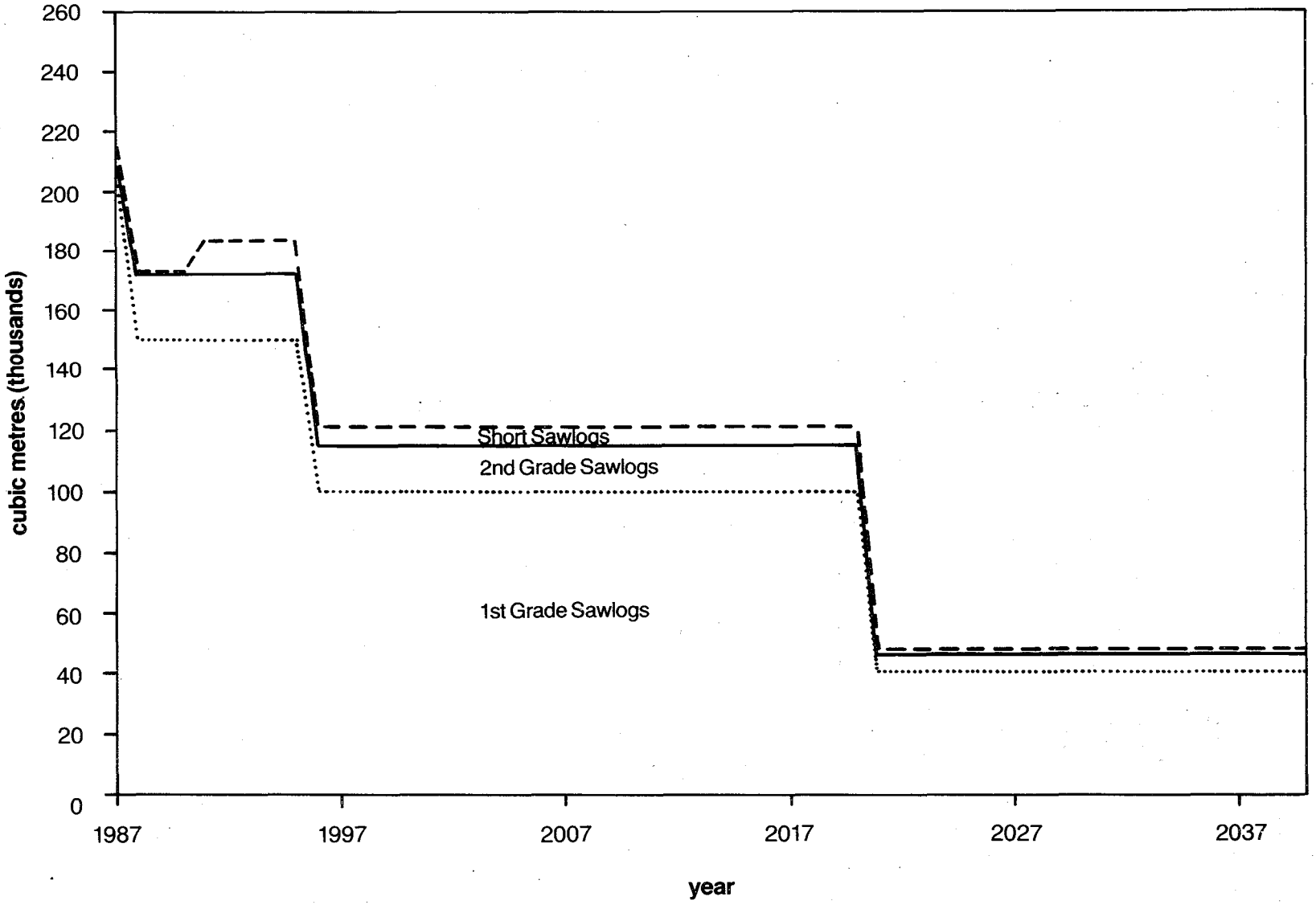

Figure 4
Projected allowable cut of jarrah sawlogs
Southern Forests Region

in the jarrah forest in the Central and Southern Regions. The quantity of chiplogs available for sale includes this resource.

The quantities of chiplogs from these different sources are set out in Table 11 and illustrated in Fig 5.

THE CENTRAL AND NORTHERN REGION ALLOWABLE CUT

Sawlogs

The present allowable cut of first grade logs is 350 000 m^3.

The proposed allowable cut of jarrah is shown in Table 12 and is illustrated in Fig 6 to the year 2040. It is anticipated at this date the old growth forest will be completely replaced by logs from regrowth forest. As noted above, the level of cuts proposed will be reviewed in 1992.

In the next five year period, it is proposed to reduce the cut of first grade logs in these two regions by 41 000 m^3.

This reduction in cut will be compensated for by the supply of 45 000 m^3 of salvage logs and 15 000 m^3 of short logs (a significant proportion of which will be suitable for the production of furniture grade timber).

During the next five years between 15 000 m^3 and 32 000 m^3 of regrowth jarrah logs will become available.

Residue

The estimated total volume of jarrah residue (dead trees and trees unsuitable for sawn timber) available in each region is estimated to be 49.8 million m^3.

TABLE 11

ALLOWABLE CUT OF KARRI AND MARRI RESIDUE

Source of Logs
(Volume Cubic Metres)

YEAR	MATURE KARRI/MARRI	MATURE JARRAH/MARRI	REGROWTH KARRI THINNING	TOTAL
1987	160000	423000	90000	673000
1988	160000	423000	90000	673000
1989	160000	423000	90000	673000
1990	160000	423000	90000	673000
1991	155000	398000	90000	643000
1992	155000	398000	90000	643000
1993	155000	398000	90000	643000
1994	155000	398000	90000	643000
1995	155000	398000	90000	643000
1996	130000	312000	170000	612000
1997	130000	312000	170000	612000
1998	130000	312000	170000	612000
1999	130000	312000	170000	612000
2000	130000	312000	170000	612000
2001	140000	312000	190000	642000
2002	140000	312000	190000	642000
2003	140000	312000	190000	642000
2004	140000	312000	190000	642000
2005	140000	312000	190000	642000
2006	165000	306000	120000	591000
2007	165000	306000	120000	591000
2008	165000	306000	120000	591000
2009	165000	306000	120000	591000
2010	165000	306000	120000	591000
2011	150000	306000	118000	574000
2012	150000	306000	118000	574000
2013	150000	306000	118000	574000
2014	150000	306000	118000	574000
2015	150000	306000	118000	574000
2016	150000	306000	90000	546000
2017	150000	306000	90000	546000
2018	150000	306000	90000	546000
2019	150000	306000	90000	546000
2020	150000	306000	90000	546000
2021	100000	175000	140000	415000
2022	100000	175000	140000	415000
2023	100000	175000	140000	415000
2024	100000	175000	140000	415000
2025	100000	175000	140000	415000
2026	60000	115000	190000	365000

TABLE 11 cont...

YEAR	MATURE KARRI/MARRI	MATURE JARRAH/MARRI	REGROWTH KARRI THINNING	TOTAL
2027	60000	115000	190000	365000
2028	60000	115000	190000	365000
2029	60000	115000	190000	365000
2030	60000	115000	190000	365000
2031	60000	115000	150000	325000
2032	60000	115000	150000	325000
2033	60000	115000	150000	325000
2034	60000	115000	150000	325000
2035	60000	115000	150000	325000
2036	0	75000	170000	245000
2037	0	75000	170000	245000
2038	0	75000	170000	245000
2039	0	75000	170000	245000
2040	0	75000	170000	245000

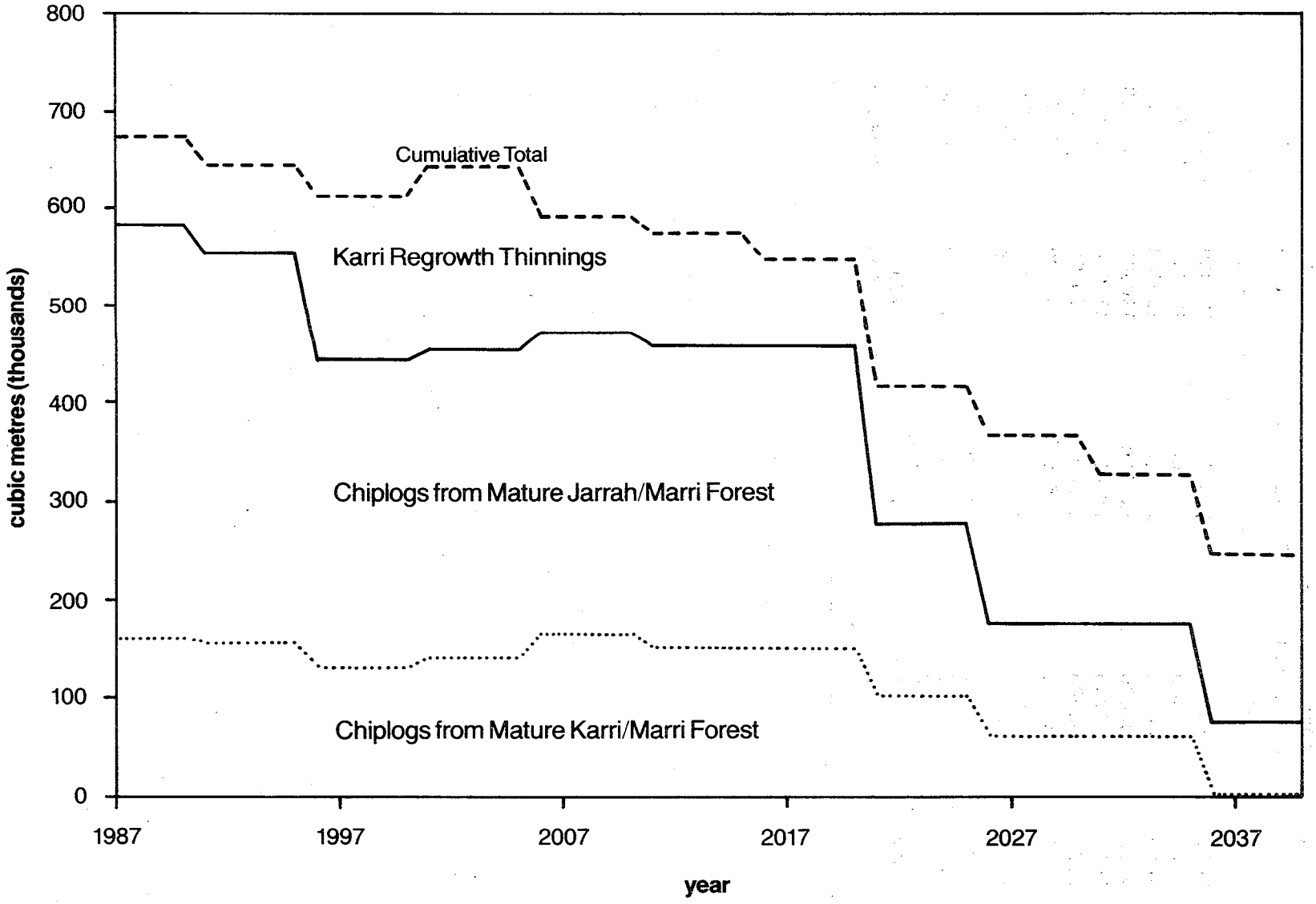

Figure 5
Allowable cut of marri and karri residue (chiplogs)

TABLE 12

ALLOWABLE CUT OF JARRAH SAWLOGS FROM THE CENTRAL AND NORTHERN FOREST REGIONS

(Volume Cubic Metres)

YEAR	1ST GRADE	2ND GRADE	SHORT LOGS	SMALL DIAMETER SAWLOGS	REGROWTH SAWLOGS	TOTAL SAWLOGS
1987	350000	35000	0	0	0	385000
1988	309000	45000	0	0	0	354000
1989	309000	45000	0	0	0	354000
1990	309000	45000	0	0	0	354000
1991	309000	38000	15000	36000	0	398000
1992	309000	38000	15000	36000	0	398000
1993	250000	38000	15000	36000	0	339000
1994	250000	38000	15000	36000	0	339000
1995	250000	38000	15000	36000	0	339000
1996	200000	30000	12000	36000	0	278000
1997	200000	30000	12000	36000	0	278000
1998	200000	30000	12000	36000	0	278000
1999	200000	30000	12000	36000	0	278000
2000	200000	30000	12000	36000	0	278000
2001	180000	26000	11000	36000	0	253000
2002	180000	26000	11000	36000	0	253000
2003	180000	26000	11000	36000	0	253000
2004	180000	26000	11000	36000	0	253000
2005	180000	26000	11000	36000	0	253000
2006	180000	26000	11000	36000	0	253000

TABLE 12 cont...

YEAR	1ST GRADE	2ND GRADE	SHORT LOGS	SMALL DIAMETER SAWLOGS	REGROWTH SAWLOGS	TOTAL SAWLOGS
2007	180000	26000	11000	36000	0	253000
2008	180000	26000	11000	36000	0	253000
2009	180000	26000	11000	36000	0	253000
2010	180000	26000	11000	36000	0	253000
2011	180000	26000	11000	36000	0	253000
2012	180000	26000	11000	36000	0	253000
2013	180000	26000	11000	36000	0	253000
2014	180000	26000	11000	36000	0	253000
2015	180000	26000	11000	36000	0	253000
2016	180000	26000	11000	36000	0	253000
2017	180000	26000	11000	36000	0	253000
2018	180000	26000	11000	36000	0	253000
2019	180000	26000	11000	36000	0	253000
2020	180000	26000	11000	36000	0	253000
2021	140000	21000	8000	0	70000	239000
2022	140000	21000	8000	0	70000	239000
2023	140000	21000	8000	0	70000	239000
2024	140000	21000	8000	0	70000	239000
2025	140000	21000	8000	0	70000	239000
2026	90000	14000	5000	0	140000	249000
2027	90000	14000	5000	0	140000	249000
2028	90000	14000	5000	0	140000	249000
2029	90000	14000	5000	0	140000	249000
2030	90000	14000	5000	0	140000	249000
2031	90000	14000	5000	0	140000	249000
2032	90000	14000	5000	0	140000	249000

TABLE 12 cont...

YEAR	1ST GRADE	2ND GRADE	SHORT LOGS	SMALL DIAMETER SAWLOGS	REGROWTH SAWLOGS	TOTAL SAWLOGS
2033	90000	14000	5000	0	140000	249000
2034	90000	14000	5000	0	140000	249000
2035	90000	14000	5000	0	140000	249000
2036	0	0	0	0	140000	140000
2037	0	0	0	0	140000	140000
2038	0	0	0	0	140000	140000
2039	0	0	0	0	140000	140000
2040	0	0	0	0	140000	140000

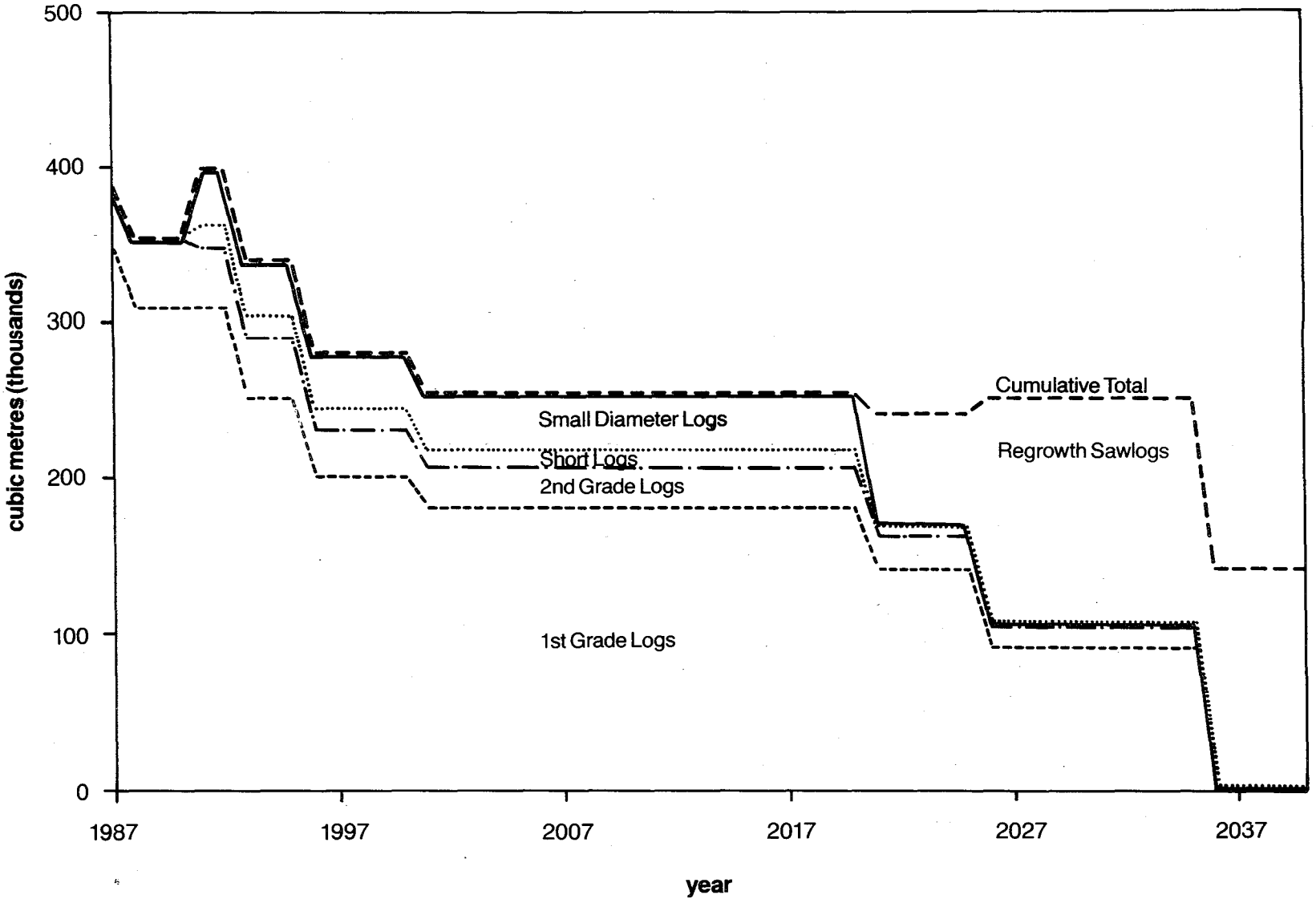

Figure 6
Allowable cut of jarrah sawlogs from the Central and Northern Forest Regions

The major constraints on improving the productivity of jarrah forest are suppression of regrowth forest by degraded old growth trees, and overstocked regrowth stands. The lack of a market for regrowth thinnings makes thinning operations commercially unviable.

Minor forest produce

A large quantity of minor forest products, such as fenceposts are currently available from logging operations and forest clearing during bauxite mining. The supply far exceeds current demand.

Piles, poles and bridge timbers

During the period of the last Working Plan demand for these quality timber items from Government Departments was about 30 000 pieces a year. The main users are the S.E.C., M.R.D. and Department of Marine and Harbours. Demand in the current year has fallen to around 12 000 pieces but is expected to return to about 20 000 pieces a year within two years and continue at 20-25 000 pieces a year into the future. With a range of species now being accepted there is no real difficulty expected in meeting the demand.

ALLOWABLE CUT OF SOFTWOOD (PINE)

The projected availability of first grade pine sawlogs from the State's pine plantations is set out in Table 13 and illustrated in Figure 7. The quantity of small pine logs available is shown in Table 14 and illustrated in Fig 8.

Additional quantities of pine residue up to 150 000 m^3 per annum will be available from the Southern Forest and Albany areas as from 2007.

TABLE 13

ALLOWABLE CUT OF PINE SAWLOGS

REGION	PERIOD	FIRST GRADE LOGS VOLUME (CUBIC METRE/ANNUM)
Central Forest	1987-1991	96 000
	1992-1996	185 000
	1997-2001	250 000
	2002-2005	300 000
Northern Forest	1987-1991	40 000
	1992-1996	70 000
	1997-2001	80 000
	2000+	80 000
Southern Forest	1987-1991	7 000
	1992-1996	8 000
	1997-2001	18 000
	2000+	30 000

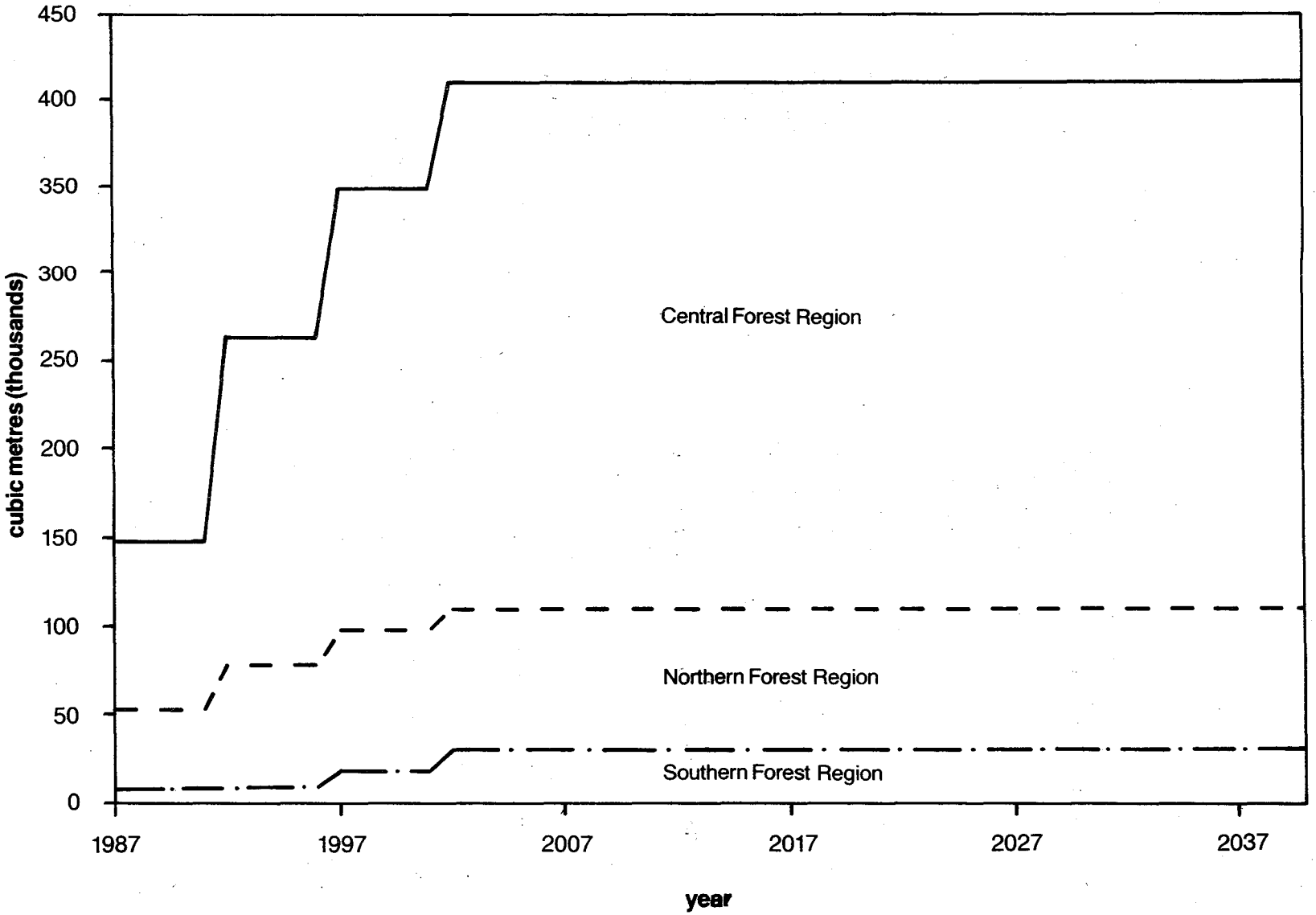

Figure 7
Projected allowable cut of softwood (pine) logs

TABLE 14

ALLOWABLE CUT OF PINE SMALL WOOD (< 20cm Small end diameter)

REGION	PERIOD	SMALLWOOD VOLUME (CUBIC METRE/ANNUM)
Central Forest	1987-1991	300 000
	1992-1996	220 000
	1997-2004	200 000
	2005+	200 000
Northern Forest	1987-1991	100 000
	1992-1996	50 000
	1997-2004	50 000
	2005+	50 000
Southern Forest	1987-1991	7 000
	1992-1996	5 000
	1997-2001	29 000
	2002+	50 000

Note: Private property timber is not included in the tables.

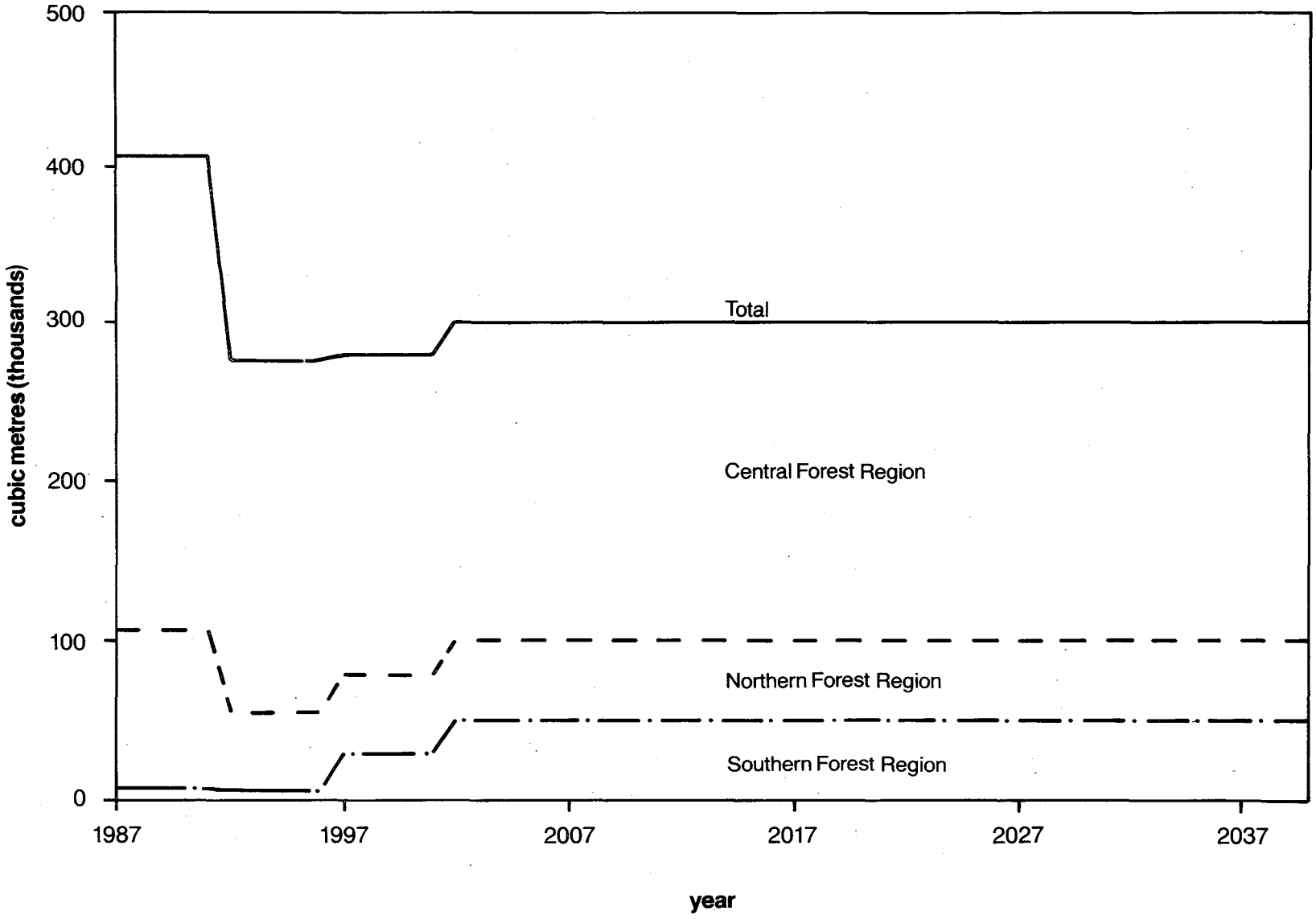

Figure 8
Softwood smallwood allowable cut

7. ALLOCATING THE TIMBER RESOURCE

THE HARDWOOD RESOURCE

The current system

Currently, over 95 per cent of hardwood logs from W.A's State forests are allocated to private companies on an annual licence system. Within the last two years, a small proportion of the resource has been allocated by tender, or at auctions, for periods of between 1 and 15 years.

Over 90 per cent of the resource is currently allocated to three companies.

Approximately 70 small companies depend on hardwood logs obtained from private properties. Some of these companies also obtain a proportion of their resource (usually second grade logs) from State forest.

The current system of log distribution originated from a system that operated between 1918 and 1964 in which defined areas of forest were allocated to specific companies and State Government sawmills under permit. Since 1964 the permit system has been progressively replaced by an annual licence system which guaranteed a volume of timber.

The licence system perpetuated the allocation system that had been developed under the permit system. The total quantity of hardwood logs available, however, has been progressively reduced. The reduced resource was distributed under the annual licence system approximately in proportion to the volume that had been allocated to companies that held permits. There were, however, a number of smaller companies which had access to logs under the permit system or had obtained logs from State forest by other means which were progressively denied any allocation of resource.

During the period of the system of allocation by permits, the sale of the State Government sawmills to the private sector and takeovers and amalgamations of the private companies as a consequence of the operation of market forces led to the progressive concentration of the hardwood log resource into fewer companies. Further concentration of the resource occurred during the period that the annual licence system has operated.

As the allowable cut of hardwood logs has been reduced and as the resource of logs has progressively decreased, the inability of the current system to provide both security of tenure and equity has been highlighted. In addition, it has made it extremely difficult for smaller mills with a low proportion of the intake or for new operators to enter the industry.

The equity/security conundrum

If the timber industry were large enough to sustain disruptions in the supply of its resource, and provided the community was prepared to accept the social consequences of such disruption, a free market system of log resource allocation could be implemented. Such a system could take the form of periodic timber auctions of logs. This free market system of allocating logs would be equitable. It would, however, result in a major disruption to the timber industry in W.A. with undesirable social consequences.

A major deficiency of the annual licence system is that it does not provide any security of access to the resource. This is a major impediment to investment in the timber industry. Security could be achieved by allocating the total resource available to existing licence holders in proportion to their existing allocation. This would maximise the benefits from the existing infrastructure that has been established and minimise social disruption.

However, this system of allocation would disadvantage the small sawmiller. It would inhibit the entrance of new entrepreneurs into the industry, and eliminate or severely reduce the potential for the free market to establish a fair price for the resource. In the process of ensuring security of resource, equity to a significant sector of the timber industry and the community would be sacrificed.

Proposed system of allocation of hardwood sawlogs

The proposed system of resource allocation attempts to minimise disruption of the industry, while providing security of access to the resource in an equitable way, and maintaining an element of free market in the resource allocation system.

First grade logs

It is proposed to introduce four tenure categories for first grade (general purpose) logs:

1. Sixty-five per cent of the available first grade logs will be allocated over periods between 10 to 15 years with a legally binding contract.

2. Twenty per cent of the available first grade logs will be allocated for periods of five years with a legally binding contract.

3. Ten per cent of the available first grade logs will be allocated for periods of two years with a legally binding contract.

4. Five per cent of the available first grade logs will be retained to be auctioned as parcels of logs periodically to top up existing allocations or to blend with second grade logs.

Second grade logs

It is difficult to estimate the quantity of second grade (salvage) logs available for distribution as the capacity of sawmillers to produce sawn material from defective logs is determined primarily by commercial factors which are themselves highly variable. As the differential in price between first grade logs and second grade logs is increased and with the progressive introduction of a totally integrated logging system controlled by CALM is achieved, it is anticipated that there will be a significant increase in the quantity of second grade logs available.

These logs will be allocated under the same system described for first grade logs. Thus a sawmill obtaining a long-term or short-term contract for first grade logs may also include in that contract a proportion of second grade logs.

A number of smaller sawmillers currently operate almost entirely on second grade logs. These operations are of considerable value to the Department as they assist maximum utilisation of the timber resource. It is proposed to encourage the utilisation of salvage logs by including a proportion of first grade logs in parcels of salvage logs. Wherever possible, when parcels of salvage logs are tendered or auctioned,an average of ten per cent of that parcel will be made up of first grade logs.

New resource

As utilisation standards improve, and as the regrowth forest residues become available for utilisation, there will be a progressive increase in the availability of 'new' resource. It is proposed that approximately 80 per cent of this resource will be allocated for contract periods of between 10 to 15 years. It is essential to allocate this resource for these periods to encourage the investment in new technology and marketing required to ensure that this resource is properly utilised.

Hardwood residue

The quantities of hardwood residue that are available for allocation are documented in Chapter 6. Currently, there is a large excess of forest residue, particularly in the jarrah forest, for which there is no market.

Woodchips

Marri and karri chiplogs are derived as a by-product of log harvesting operations. Allocation of chiplogs is determined by an Agreement Act between the W.A. Chip and Pulp Company and the State Government. Subject to the renewal of the export licence for this project, it is proposed to maintain supplies of hardwood to the W.A. Chip and Pulp Company at the existing level.

It is, however, proposed to amend the Agreement Act and the existing administrative arrangements to:

1. provide for CALM to be responsible for the delivery of all residue material from Crown land to the woodchip mill;

2. amend the Agreement Act so that the Company is required to accept from CALM either logs, sawn residue, or processed chips from other sawmillers or private contractors at prices subject to negotiation with the Company;

3. provide for annual review of the royalty for woodchips.

If these proposed amendments are accepted, significant improvements in the utilisation of forest residue could occur. For example, the Department would investigate the viability of using sub-contractors to obtain residue for

woodchips after final operations in clearfelled areas. The viability of such operations can be improved by discounting the current royalty paid for the residue as part of integrated logging operations.

Other residues

Currently, there are a number of proposals to utilise wood residues for a variety of purposes. It is proposed, subject to appropriate statutory environmental review process, that this material be allocated, up to the quantity designated as being available in Chapter 6, for a contractual period of between 10-25 years.

Pile, pole and bridge timbers

There is sufficient resource to meet the demand from other Government agencies for these products. A system of direct sale will be employed.

Minor forest products

This material includes firewood for domestic consumption, fencing material, small building poles and other small industrial uses. It is proposed to allocate the resource to meet the expected demand as follows:

1. seventy per cent on a five-year licence basis obtained initially by tender or auction;

2. twenty per cent on a two-year licence basis obtained initially by tender or auction;

3. ten per cent on a short-term licence basis.

The system will be phased in over a five-year period by making 20 per cent of the resource available annually by tender or auction.

The minimum volume for the short-term licences is expected to be 100 tonnes or 1 000 pieces.

If individuals require less than this volume, they will be expected to obtain their supplies from licensed contractors.

The existing procedure for providing parcels of firewood for personal use will be continued. However, domestic consumers will be directed to specific areas in the field to avoid environmental damage.

The system of allocation (hardwood)

The system of allocation proposed takes into consideration the following factors:

1. The need to provide social stability, and to maximise employment in those towns in the south-west where the timber industry has been either the major, or a significant contributor to the local economy.

2. The need to restructure the industry so that its competitiveness is ensured into the future and it can maximise the potential of the existing resource and the new resource from regrowth forest.

3. The need to allow members of the industry access to the resource, while also ensuring that there are opportunities for new entrepreneurs to compete fairly with existing industry.

4. The need in some regions either to reduce the allowable cut, or to replace the existing resource with regrowth hardwood or pine logs.

5. The need to use price as a method of ensuring that the resource is correctly valued, and as an independent method of allocating the resource.

6. the need to maximise the value of the existing industry's infrastructure.

7. the need to allow the industry time to restructure to cope with changes from the existing allocation systems.

Allocating the resource (hardwood)

It is proposed to allocate the hardwood log resource as follows:

1. Major mills (intake in excess of 20 000 m^3 per annum)

   It is proposed to allocate to seven selected mills between 50 and 90 per cent of their current intake (adjusted proportionately to allow for any reductions in the allowable cut) for 10-15 years with legally binding contracts. These include: two major mills in the Pemberton-Manjimup region; one major mill in the Greenbushes-Kirup region; two major mills in the Bunbury-Busselton-Nannup region; one major mill in the Collie-Yarloop region; one major mill in the Dwellingup-Jarrahdale-Metropolitan region.

The Department will enter into private negotiations with the relevant companies to determine the quantity of the resource to be allocated and contract conditions. The following factors will be taken into consideration in these negotiations:

a) the significance of the mill to the local community and the value of the existing facility;

(b) rationalisation of existing mills in the region;

(c) investment proposals for the mill;

(d) price (see below);

(e) the capacity of the mill to process regrowth logs and or pine logs;

(f) the quantity of log resource currently being allocated;

(g) the quantity of resource necessary to maintain an efficient mill;

(h) any existing resource held by the company as a consequence of previous successful tenders;

(i) the potential to replace hardwood mills with pine mills in the region.

2. Medium mills with existing entitlements to Crown land resource (intake less than 20 000 m^3 per annum)

Existing mills which are not included in 1. above or are affected by rationalisation resulting from 1. and which currently have access to resource under the annual permit system will be allocated between 50 and 90 per cent of their current intake (adjusted proportionately to allow for any reduction in the allowable cut) with a five-year legally binding contract.

The principles on which the allocations will be made are as described above.

3. Salvage mills

All existing salvage mills with an entitlement will be allocated 50 per cent of the existing intakes on a five-year contract. (Note: Parcels of second grade logs will be offered at auctions at regular intervals. Each parcel of second grade logs will include 10 per cent first grade logs).

4. Free market allocation

The remaining resource will be allocated by tender or auction. The auction and tender system will be:

(a) Designed to ensure that parcels of logs (which will include varying mixtures of second and first grade logs) of varying quantities will be placed on the free market at regular intervals. The tender and auction system will permit logs to be obtained for periods of between one and 15 years.

Companies with existing long term contracts as a consequence of 1., 2. and 3. above, will have the option of topping up their allocation using this source.

(b) Provision of high grade and specialty logs

The Department has received submissions from manufacturers of high quality products (eg furniture and craft products) that the development of the industry is being inhibited by the insecurity of supply of resource.

In response to these requests, a provision has been made to direct logs suitable for the development of specialty timbers to local manufacturers. As the proposed system of integrated logging is introduced there will be increased opportunities to provide this resource.

In addition, it is proposed to tender up to 30 000 m^3 per annum, for a contract period of 15 years, a mixture of the highest grade jarrah and karri logs for the purpose of providing an

assured supply of high-grade seasoned timber for the furniture industry. The successful tenderer may choose to establish a new speciality mill or develop appropriate facilities on an existing mill site. A major criterion for allocation of this resource will be the capacity of the tenderer to produce an assured supply of high-grade seasoned hardwood.

In addition to this resource the Department will encourage successful tenderers for the hardwood resource to provide the maximum quantity of sawn products to manufacturers providing high quality value-added products.

5. New resource

Resource obtained from regrowth forests may be allocated according to the principles set out above by tender or auction.

6. Pricing of allocated resource

One of the criterion which will be used to determine allocations of resource is the price paid per unit volume over the allocation period.

The Government has endorsed the target royalties set out in Chapter 8. The quantity of timber allocated to any sawmill will be partly determined by:

(a) The preparedness of the company to pay the target royalties.

(b) In some situations where a contract involving a large quantity of resource is concerned, the Department would consider proposals for the payment of a premium over and above the target royalty.

(c) Payments in lieu of royalties in the form of provision of agents and/or services to assist forest management may also be considered. For example, provision of fertilisers or equipment to conduct silvilcultural operations could be a component of a contract for allocation of resource.

(d) Contract renewal

It is proposed that all long term contracts (10-15 years) will be renewed at least two years prior to expiry subject to the following condition:

- The resource will be tendered on the open market, but where the maximum price is not proferred by the existing sawmiller, they will be given the opportunity to match the maximum price bid.

(e) Forfeiture of resource

It is proposed that a condition of each contract will be that over a 12 month period, resource in excess of 10 per cent of that allocated, which is not utilised, will be forfeited. Where a company has undertaken to accept second grade logs as part of its allocation and where these logs are rejected but subsequently utilised by others at the price offered, they will be deducted from the existing allocation.

ALLOCATION OF HARDWOOD RESIDUE

The quantities of hardwood residue that are available for allocation are documented in Chapter 3. Currently, there is a large excess of forest residue, particularly in the jarrah forest, for which there are no markets.

SOFTWOOD (PINE RESOURCE)

Until 1977, processing of timber from State-owned pine plantations was carried out by Forests Department owned sawmills. That year, the Government negotiated the sale or closure of the sawmills.

Pine from the Central Forest Region was tendered to allow the development of the first major integrated pine sawlog processing industry of 100 00 m^3 capacity. The successful tenderer was Wharncliffe Pty Ltd (subsequently Westralian Forest Industries). The only other substantive tenderer was Softwood Products Pty Ltd, which was a consortium of Hardwood Sawmillers.

Following negotiations with the Government, it was proposed that 50 000 m^3 of sawlogs would be allocated to Westralian Forest Industries in 1982 and that the allocation would subsequently be progressively increased to 100 000 m^3 by 1989. At the same time as this contract was negotiated and signed with Westralian Forest Industries, a Memorandum of Intent was signed with the unsuccessful tenderer, Softwood Products, which indicated that they would be allocated 50 000 m^3 of resource in 1988 rising to 100 000 m^3 by 1990.

For a variety of reasons, the Forests Department did not supply Westralian Forest Industries with resource according to the original schedule proposed. Accordingly, a new schedule with a Contract of Sale was negotiated with the Company as follows:

DATE	VOLUME SAWLOGS (CUBIC METRES/ ANNUM)
1987/88	50 000
1988/89	75 000
1989/90	100 000
1990/2004	100 000

In 1986, a re-evaluation of the pine resource was conducted by CALM and it was concluded that it would not be possible to provide sufficient resource to Softwood Products to meet the original schedule. Accordingly, this Company was advised that until the results of intensive research trials were completed, it would not be possible to advise the Company when the resource would be available.

Westralian Forest Industries successfully tendered for the resource and then established a major sawmilling complex at Dardanup, which involved a major investment. Priority must therefore be given to fulfilling the allocation for that Company. This was endorsed by the Government.

Investigations into increasing the growth rates of existing pine plantations have advanced rapidly and although not complete, the Department is now in a position to provide more detailed information on the quantity of pine logs that can be allocated.

During the last two years, the Department, and the Government, have had representations from the minority shareholders of Softwood Products advising that they had formed a consortium (Western Pine Associates) and were considering withdrawing from Softwood Products. The Department understands there have been a number of negotiations between Western Pine Associates and Softwood Products Pty Ltd, but at this stage is unaware as to whether the original consortium will retain its membership and structure, or restructure, or dissolve. If Western Pine Associates withdraws from Softwood Products, the major shareholder remaining will be Bunnings Pty Ltd. Western Pine Associates represents 38 per cent of the current shareholding of Softwood Products.

SYSTEM OF ALLOCATION

The system of allocation for the pine resource has been based on the following principles:

1. Existing legal contractual obligations will be met.

2. Wherever possible, undertakings to provide resource, even if they are not legally binding, will be met.

3. Allocation of the pine resource will only be made to companies which can build sawmills which can process softwood efficiently. It is anticipated the pine sawlog market will continue to be highly competitive. It is generally assumed in Australia that pine sawmills with intakes of less than 60 000 m^3 per annum, will not be commercially viable in the long term. Consequently, allocations of pine resource will only be made to companies with mills designed for intakes in excess of 60 000 m^3 per annum within 10 years. It is possible that lower levels of maximum intake may be accepted if it can be demonstrated that commercial viability can be maintained by partially integrating hardwood sawmilling complexes with a softwood sawmill.

4. Resource will be allocated to companies prepared to locate sawmills to maximise employment in the existing industry.

Under the previous proposals negotiated by the Forests Department, it was intended that the major pine processing centres would be entirely located in the Bunbury/Dardanup region. One of the significant deficiencies of this strategy was that while the new sawmills would have created employment in the Bunbury region, those members of the hardwood sawmilling industry displaced as a consequence of reduction in the hardwood cut and were located outside the Bunbury region, would not have had access to those jobs.

ALLOCATING THE RESOURCE (SOFTWOOD SAWLOGS)

It is proposed to allocate the softwood sawlog resource as follows:

1. The Department's legally-binding contractual obligation to Westralian Forest Industries will be met as outlined, according to the following schedule.

DATE	QUANTITY OF SAWLOGS (CUBIC METRES/ ANNUM)
1987/88	50 000 + 15 000 small logs
1988/89	75 000 + 15 000 small logs
1989/2004	100 000

2. The capacity of the Department to fulfil the resource requirements of Softwood Products is dependent on the future structure of this Company. (Note: Although a Memorandum of Intent had been signed between the Company and the Department, this was not legally binding and was based on sufficient resource being available).

   The Department's preference would be to allocate the resource to companies or a company which would result in the location of one sawmill in the lower south-west and the Northern Forest Region.

3. The Department has a current contractual obligation with G T and B Y Ryan to supply 5 500 m^3 per annum of pine sawlogs and up to 1 000 m^3 per annum of small pine logs to the year 1995. This contract will be fulfilled.

4. Currently, the Department has a contractual obligation to supply Consolidated Pine Industries with 17 500 m^3 per annum of small pine logs and 2 500 m^3 of pine sawlogs per annum to 1991. This contract will be fulfilled.

5. Currently, the Department is supplying Colli & Sons with up to 4 000 m^3 per annum of pine sawlogs. This arrangement will be terminated at the end of calendar year 1987.

6. Allocations of case log resource. It is estimated that in the year 1990, 20 000 m^3 per annum of small pine sawlogs will be available for allocation from the Central Forest Region. It is proposed that this resource will be tendered for a contract period of 15 years.

7. It is estimated that between 1995 and the year 2000, up to 148 000 m^3 per annum of pine sawlogs will be available in the Central Forest Region for allocation. This resource will be allocated to ensure that the then existing mills have sufficient intake to maximise their commercial viability.

SOFTWOOD RESIDUES

Resource for the panel board industry is managed under the Wesply (Dardanup) Agreement Act 1975.

The Department is committed to supply WESFI Pty Ltd up to 330 000 m^3 of 'pine chiplogs' to the year 2000.

WESFI's major particle board plant at Dardanup is supplied from pine thinnings located in the Central Forest Region. Recent success on export markets by WESFI will probably mean an increased demand for pine chiplogs. The Department anticipates the following supply of chiplogs will be available to WESFI for their Dardanup Plant.

PERIOD	VOLUME (CUBIC METRES/ANNUM)
1987-1991	300 000
1992-1996	220 000
1997-2000	200 000

Note: The reduction in supply of pine chiplogs to the Company is balanced by an increasing proportion of resource suitable for particle board production, which will become available from sawmill residue, and from private plantations.

Dependent on the management practices adopted, it is anticipated that there will not be any significant surplus of softwood residue resource available from State plantations located in the Central and Southern Regions until the year 2005.

Pinaster pine resource

A major resource of small logs suitable for panel manufacturing is available from thinnings in the Northern Forest Region.

Currently, there is no industry developed which can process this softwood residue resource, which is primarily located in Pinus pinaster plantations north of Perth. The Department has a capacity to supply Pinus pinaster residue material according to the following schedule:

PERIOD	VOLUME (CUBIC METRES/ANNUM)
1987-1991	100 000
1992-1996	50 000
1997-2004	50 000
2005+	50 000

The Department is currently discussing proposals to provide this resource for a panel board plant with a W.A. company. If these negotiations are not successful, it is proposed to put this resource up for tender in 1989.

MINOR FOREST PRODUCTS

The Department has available an additional resource of 25 000 m^3 of specialty pine logs (peelers) and minor forest products. It is proposed to enter into private negotiations

with the companies utilising this existing resource to be contracted for five-year periods. A proportion of the resource will be made available through auctions and tenders at periodic intervals.

ALLOCATION OF PINE RESOURCE IN THE ALBANY REGION

Sufficient resource will be available by the year 2010 in the Albany Region for a mill of capacity 30 000 to 40 000 m^3 per annum utilising small and medium sawlogs, increasing to 100 000 m^3 per annum by 2020. This resource will be tendered at a future date when the base log resource has been grown.

8. PRICING LOGS FROM STATE FOREST

The term 'royalty' refers to log prices. Stumpage is another term for log price, but in W.A its use is restricted to softwood logs.

THE IDEAL ROYALTY SYSTEM

It has been suggested that the ideal system should achieve the following objectives:

1. cover the cost of growing the wood;

2. account for relative disabilities in harvesting, processing and marketing different parcels of wood;

3. encourage the development of efficient and competitive forest industries;

4. provide processors with earnings on their investments similar to those in other forms of economic activity of comparable risk;

5. recover the full market value of the timber.

To these could be added other objectives such as:

6. encourage and safeguard long term economic investment in and management of public and private forests;

8. achieve administrative simplicity, flexibility and ease of collection.

CURRENTLY ACCEPTED ROYALTY SYSTEMS

The systems most frequently applied are briefly outlined below. However, none of these fully achieves all the objectives of the ideal system.

Residual pricing

In essence, this system determines the processor's capacity to pay by deducting all log conversion and marketing costs together with an appropriate profit allowance from the selling price of the product. This method is widely used in various forms in America and is the basis, although much outdated, of the New South Wales and Victorian systems. Its major weakness is that it directly relates royalties to existing marketing and industry structures and it can be justifiably claimed that selling price should be the end point not the starting point for royalties.

Recovery of growing costs

Royalties (stumpages) under this system are based directly on management costs including interest charges involved in growing the wood. An allowance for profit is appropriate, but is rarely included. Costs of relevant social values could also be incorporated.

Prices of many public or private goods are based on the cost of producing or providing. The method has the practical advantage when compared with residual pricing in that it does not require detailed information on processing and marketing, although some attention needs to be given to the consequences of ignoring market trends when applying the system.

Free market pricing

Sale by auction or tender is used to establish log prices. This method is widely used in America and Europe, its application in New Zealand has been recommended and its

wider extension has been recommended in Australia provided that a free and competitive market exists. This is not always the case for every type of round wood.

Spot prices so obtained reflect market conditions at time of sale, and over lengthy time scales needed for security of investment, subsequent market variations could seriously disadvantage both the grower and processor.

Resource levy or tax

Natural resources are regarded simply as a source of revenue without any regard to the costs of providing those resources or of market conditions or final selling price. Thus there is no scope for establishing the true market value of a particular raw material. Although still commonly applied to mineral and fishery resources in developing countries, resource levies are at best, only appropriate to non-renewable resources.

Comparative pricing

Wood prices are based on a fixed percentage of the final selling price of the wood product or on the general price levels of competing products such as brick or steel, or of wood from other sources. Whilst movement in wood prices can be objectively related to price movement in these other materials, there is no widely accepted rule for establishing base royalty levels on these other prices or for quantifying the relationship between wood royalties and the selling price of the wood product.

Import parity pricing

Royalties would be derived from the prices of imported wood. As in the case of 'new oil' such pricing would be regarded as reflecting world resource scarcities and signalling the need for appropriate domestic production and for encouraging appropriate consumption patterns.

Computations would, however, involve far more uncertainties than those in residual pricing and local enterprise could be deprived of part of the benefits inherent in a favourable resource situation. Further domestic price instability could be generated by the volatility of world timber prices.

HISTORICAL OUTLINE OF W.A. ROYALTIES

Existing hardwood royalties have been established over the years by auction, tender, and as a result of reviews in 1954 and 1966. These reviews were based on the residual approach giving particular attention to distance from metropolitan markets with some allowance for variation in log quality on an area basis.

Since 1966, the royalties have been adjusted at sporadic intervals. These adjustments were flat rate increases at levels required to meet Departmental needs for finance, percentage increases based on CPI movements, or since 1983 the ABS Price Index for timber produced in W.A.

Radiata sawlog stumpages were set by tenders in 1977 at rates which reflected growing costs at the time. Following failure of a tender operation in 1970, stumpages for the small amounts of pinaster sawlogs currently available have been set administratively with an arbitrary differential for quality. However, there has been no attempt to establish reasonable consistency between hardwood royalties and pine stumpages and to account for the differences in processing economics between hardwood species.

The methods for determining and indexing hardwood and pine chiplog royalties were established by negotiation and incorporated into the special agreements for each industry.

PRESENT ATTITUDES TO TIMBER ROYALTIES

Whilst encouraging development of efficient and profitable industries, Government is anxious that the whole community receives a fair share of the combined proceeds from the use of public assets. Tacit subsidies to industry through low charges, in this case royalties, are therefore unacceptable.

However, commercial reality is that royalties must be set at levels which will sustain an economically viable industry and allow for the research market development and recapitalisation programs needed to promote maximum efficiency in order to ensure adequate supplies of low cost timber to the community at large.

Government has a responsibility to curtail unnecessary public expenditure and, particularly at present, to reduce the overall level of public borrowings. Accordingly, it is necessary that as far as possible capital works should be funded from revenue earned. There are also strong supplementary reasons to support the view that the private sector should at least share the work of providing some of its raw materials.

State financial objectives are necessarily related to Commonwealth attitudes which strongly reflect the view that public sector pricing should, in the long run, reflect the full economic costs of producing or providing services or goods. This view was also expressed by the Coombs Task Force in 1973, with specific reference to public investment in, and revenue from forestry.

In addition to the need to ensure that the overall return to the State from its publicly owned resource is equitable, the pricing structure of different categories of logs (species and quality) should be such that it encourages the most efficient use of the resource. For example, it is

questionable whether the current hardwood royalty system encourages maximum log utilisation, given that the 'salvage' log royalty is higher than the 'quality' log royalty.

THE 1986 REVIEW OF LOG ROYALTIES

In 1986, the most comprehensive review of log royalties was carried out. The principles on which this review was based were:

1. wood should be grown on a sound economic basis;

2. log pricing should take into account both growing costs and industry capacity to pay;

3. realistic public sector royalties are necessary to maintain and promote efficient resource utilisation and to encourage the private sector to contribute to future wood resources;

4. the structure of the royalty system should encourage maximum utilisation of logs.

The method used to derive royalties was based on well established economic and forestry methodology.

Even-aged stands

'Cost of growing' royalties are aimed at making each forest rotation financially viable in its own right.

The royalties are calculated to satisfy the following equation:

Discounted value of all costs required to establish and manage a forest stand over one rotation	=	Discounted value of royalty revenues over the same rotation

These royalties will also satisfy the following equation:

Compounded sum of forest establishment and other forest management costs at the end of a forest rotation	=	Compounded sum or royalty revenues at the end of the same rotation

The data used to calculate the royalties include:

1. effective costs for forest establishment and management, relating to wood production only;

2. a management regime that is consistent with silviculture principles and maximises sawlog production.

New and existing stands

Cost of growing royalties are designed to ensure that each new forest rotation is financially viable in its own right. The royalties are aimed at covering the efficient costs of producing well managed and productive forest stands.

Cost of growing royalties are also designed to ensure that each existing forest rotation continues to be viable, or at least approaches viability. The aim is to ensure that at the end of the existing forest rotation, the compounded sum of all revenues over the whole rotation covers the compounded sum of all wood production costs.

The forest rotation base

One full forest rotation is considered by itself to calculate 'cost of growing' royalties. The reason for this is that in a pure economic context, a forest rotation is a discrete venture or a single investment unit, just as a new factory or a new agricultural crop is a discrete venture or

a single investment unit. Any such discrete venture must be financially viable in its own right to justify the investment of capital into it. Otherwise, capital is better invested elsewhere in the economy in opportunities that are financially viable.

Old clearfelling revenues

Clearfelling revenues from a previous forest crop are not considered in calculating royalties for a forest rotation. This is because:

1. the forest rotation must be viable in its own right to justify the investment of clearfelling revenue or any other capital into it, considering investment opportunities elsewhere in the economy that are financially viable;

2. there is little or no initial clearfelling revenue on degraded forest areas (eg jarrah dieback sites) and cleared farmland. These sites are used for forest development.

Analogies

The principles expressed above have analogies in other industries.

For example, a rational wheat farmer would consider the economics of producing a new wheat crop before planting the wheat. He would not invest in the new wheat crop if a financial loss is likely at the end of the wheat 'rotation'. His decision would be independent of the return he made from the previous wheat crop (rotation).

Similarly, if a private company found that at the end of the financial year one of its stores had yielded a profit of, say $3 million, representing a return on an investment of 20 per cent, then it would be reasonable to expect the Board of Directors of that Company would look favourably on re-investing in that store in the following financial year. If that same store, earning the same profit and rate of return from the past financial year, was confronted with the prospect of a major collapse in its market which would result in that store producing a loss and negative return on investment for the succeeding financial years, then that same Board of Directors would choose not to invest in that store despite its past favourable performance.

Just as the Board of Directors of private companies cannot base their investment decisions on sentiment, neither can public bodies use sentiment as a criteria for investment.

Principles for uneven-aged stands

The method of calculating 'cost of growing' royalties and other principles mentioned above also apply to uneven-aged stands.

However, whereas the appropriate 'investment' period or unit for even-aged stands is the forest rotation, the relevant period/unit for uneven-aged stands can be a cutting cycle or a series of cutting cycles. Each cutting cycle or series of cutting cycles represents one investment option, for scarce capital resources.

CALCULATED TARGET ROYALTIES

The royalties (stumpages) which are described below for each species were calculated to ensure that they were sufficient to cover the cost of production incurred by the Department in the production of logs.

Radiata pine

Present stumpages are:

Logs ex thinnings	$30.19/m^3
Logs ex clearfellings	$46.28/m^3

Growing cost analysis based on current practices using costs current at July 1986 when the Review of Log Royalties was completed, indicated that stumpages should be:

Logs ex thinnings	$31.61/m^3
Logs ex clearfellings	$48.46/m^3

or an increase of about 14 per cent.

These values compare favourably with calculated residual stumpages as follows:

Based on local production costs	$51.00/m^3
Based on Eastern States costs	$85.00/m^3
Based on retail price of imported timber	$59.00/m^3

It is proposed to increase stumpages to their indexed cost of growing values, but a review currently in progress of softwood management costs indicates that they can be reduced.

Pinaster pine

The present pinaster pine sawlog stumpage varies, depending on location, and growing stock.

It is proposed to continue updating these stumpages according to cost index movements, pending a comprehensive review in the future. At present pinaster sawlog production is only a relatively small proportion of total softwood production.

Karri

The present weighted average royalty is $16.84 per m^3 for first grade logs.

Royalties based on an efficient management regime and growing costs as at July 1986 were:

- $22.49/m^3$ average

  or

- $20.44/m^3$ for small logs (20-30cm) and $25.26/m^3$ for large logs (30+ cm).

Residual royalties were:

Using present average recovery of 42.59 per cent (green sawn) -

$29/m^3$ (green sawn residual);

$47/m^3$ (dry dressed residual);

- Using possible higher recovery of 47 per cent (green sawn) -

$34/m^3$ (green sawn residual);

$54/m^3$ (dry dressed material).

Weighted average royalty for all qualities of sawlogs achieved at auction in 1985/86 is $24.61/m^3$.

It is proposed to increase royalties to $21.42/m^3$ and $26.46/m^3$ for small and large (quality) logs respectively. The proposed 'large log' royalty recognises existing market outlets for mill chips which are subject to specific surcharges elsewhere.

The current price for second grade logs is $\$16.26/m^3$. It is proposed to increase the royalty for salvage logs from $\$16.26/m^3$ to $\$18.86/m^3$, consistent with the proposed royalty increase for higher quality logs.

Jarrah

Present weighted average sawlog royalty is $\$16.85/m^3$.

Royalties based on growing costs as at July 1986 on the better sites ranged from $\$24.71-\$42.03/m^3$.

Residual Royalties were as follows:

Based on present local production costs and average recovery	(about 32.4% green sawn $/m^3$)
Green sawn	$17.00
Dry dressed	$32.00
Average weighted by present proportion of dry dressed to green sawn (about 17:73)	$21.32
Average weighted by improved proportion of dry dressed to green sawn (about 40:60)	$25.00
Based on improved sawn recovery (about 36 per cent green sawn) and present proportion of dry dressed	$25.37
Based on improved sawn recovery and improved proportion of dry dressed	$27.40
Weighted average royalty for all qualities of sawlogs achieved at auction in 1985/86	$23.60

In the long term royalties should equate to production costs, but recognising the industry's competitive position in the meantime it is proposed to increase royalties for large jarrah logs to $\$23.58/m^3$ equivalent to the proposed average karri log royalty.

Second grade and small sawlog royalties will be $15.72/m^3$, consistent with the proposed royalty for large logs.

This proposal recognises:

the lower sawn recoveries available from jarrah;
the higher proportion of dry dressed material available from jarrah.

Marri

Present sawlog royalty	$11.69/m^3$
Royalty obtained by public tender	$13.66/m^3$

To encourage utilisation of the species whilst maintaining consistency with increases in karri second grade royalties, it is proposed to increase marri sawlog royalties to $13.20/m^3$. The proposed royalty will be more realistic, bearing in mind the current royalty of $10.29/m^3$ for chiplogs.

SUMMARY

The Government has endorsed the target royalties set out above. It has directed the Department to achieve these royalties subject to the proviso that the rate of increase to the target royalties should not cause economic hardship to the industry.

Hardwood royalties have been increased on average by 22.5 per cent. While the objective of the Department is to achieve the target royalties, it is anticipated that the actual price paid for that proportion of logs which are subject to tender or auction will exceed the target royalties.

As noted above, one criterion proposed for allocating log resource under long term contracts will be the time proposed by the company to achieve the target royalties.

9. THE SUPPLY/DEMAND SCENARIO

SUPPLY/DEMAND SCENARIO

Sawlogs

Any prediction of demand for products beyond a ten-year horizon must be tentative. But in forestry these estimates must be made because of the 15 to 50 year interval between tree establishment and the production of logs suitable for sawn timber production. Although the demand estimates summarised in Fig 9 are subject to uncertainty, they are compatible with the historical trends for timber demand in W.A., and have been made on the basis of the best data that are available.

The Department's predictions are conservative relative to most other estimates of demand that have been made (see Fig 1). Consequently, even if it were assumed that the Department's assumptions of high demand and increased net exports were not correct, actual demand could still be significantly higher than that predicted in Fig 9. The estimated total sawlog supply shown in Fig 9 include reductions of ten and five per cent of the predicted sawlog supply of pine and hardwood respectively to allow for possible losses from fire and disease.

The estimated total supply of sawlogs to the year 2050 lies within the band of CALM demand estimates. The supply curve assumes a plantation establishment rate of 2 000 ha per annum of State plantations to the early part of the twenty-first century. It also assumes that private

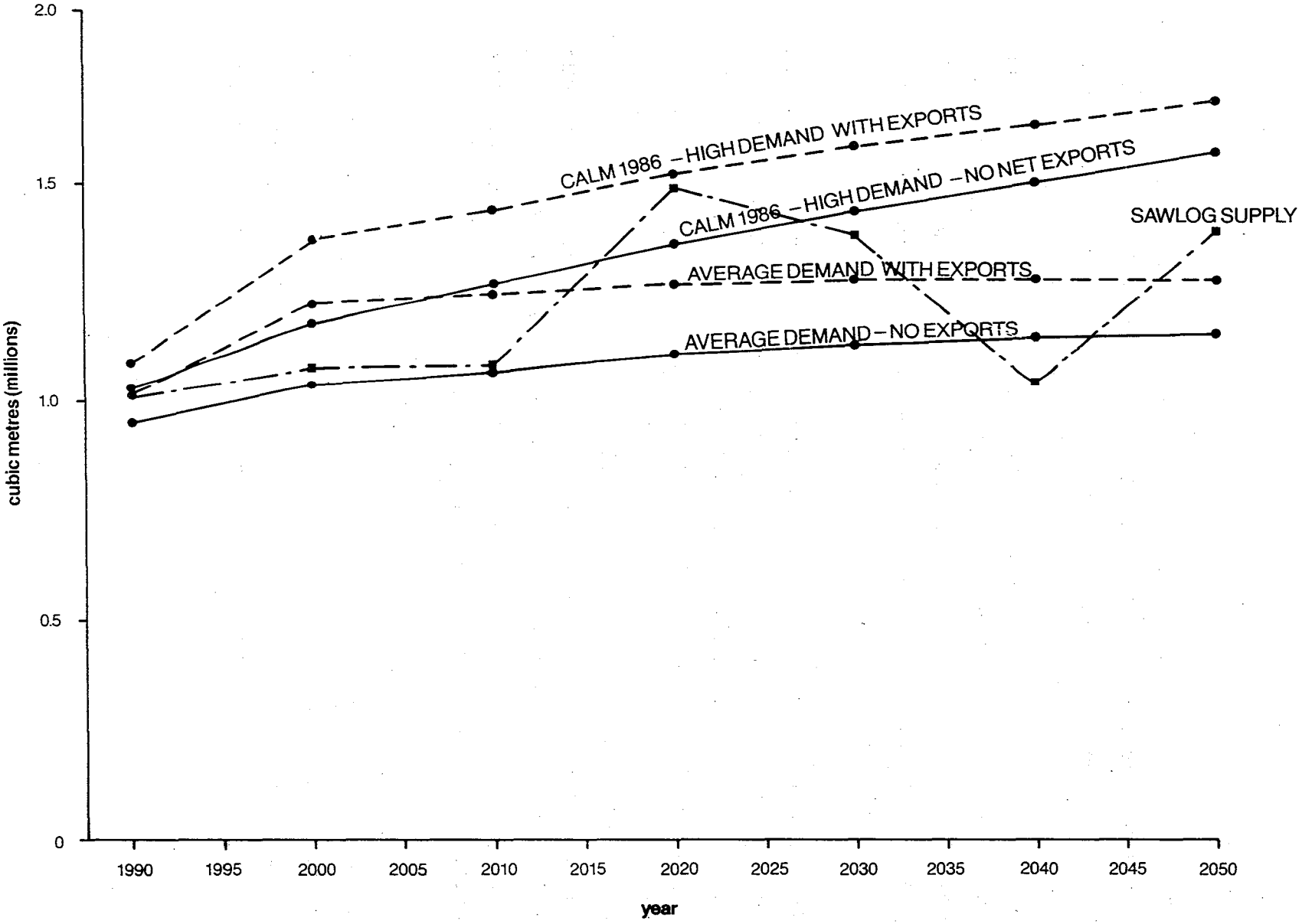

Figure 9
W.A.'s estimated sawlog demand and supply 1990-2050
(millions m^3)

plantation establishment will be 450 ha per annum and continue at this rate to the year 2025. Adjustments in the plantation rate and intensity of management will permit the supply of sawlogs to be adjusted if the demand estimates change over time.

The total sawlog supply estimates have been broken down into three components over the period 1982-2050 in Fig 10. These data, with those illustrated in Fig 9, emphasise three important consequences of this strategy:

1. The overall quantity of sawlogs that can be produced from W.A. forests on a sustained yield basis will be maintained at levels in excess of that currently being produced. This has been achieved notwithstanding the significant area of forest which is proposed to place in areas where timber production will not be permitted.

2. There will be a progressive increase in the proportion of sawlogs derived from pine plantations as a consequence of the reduction in quantity of old growth hardwoods.

3. The actual real value of the sawlogs will increase significantly if the proposals to replace the use of hardwoods for utility uses with pine and to increase significantly the production of higher value products from hardwoods are realised.

Residue for woodchips

It will be possible to maintain existing levels of supply of woodchips to approximately 2020. There is, however, a world demand for short fibred pulp in excess of supply and the projected deficit is expected to increase. The local demand for woodchips would be more than doubled if a pulp mill was established in W.A.

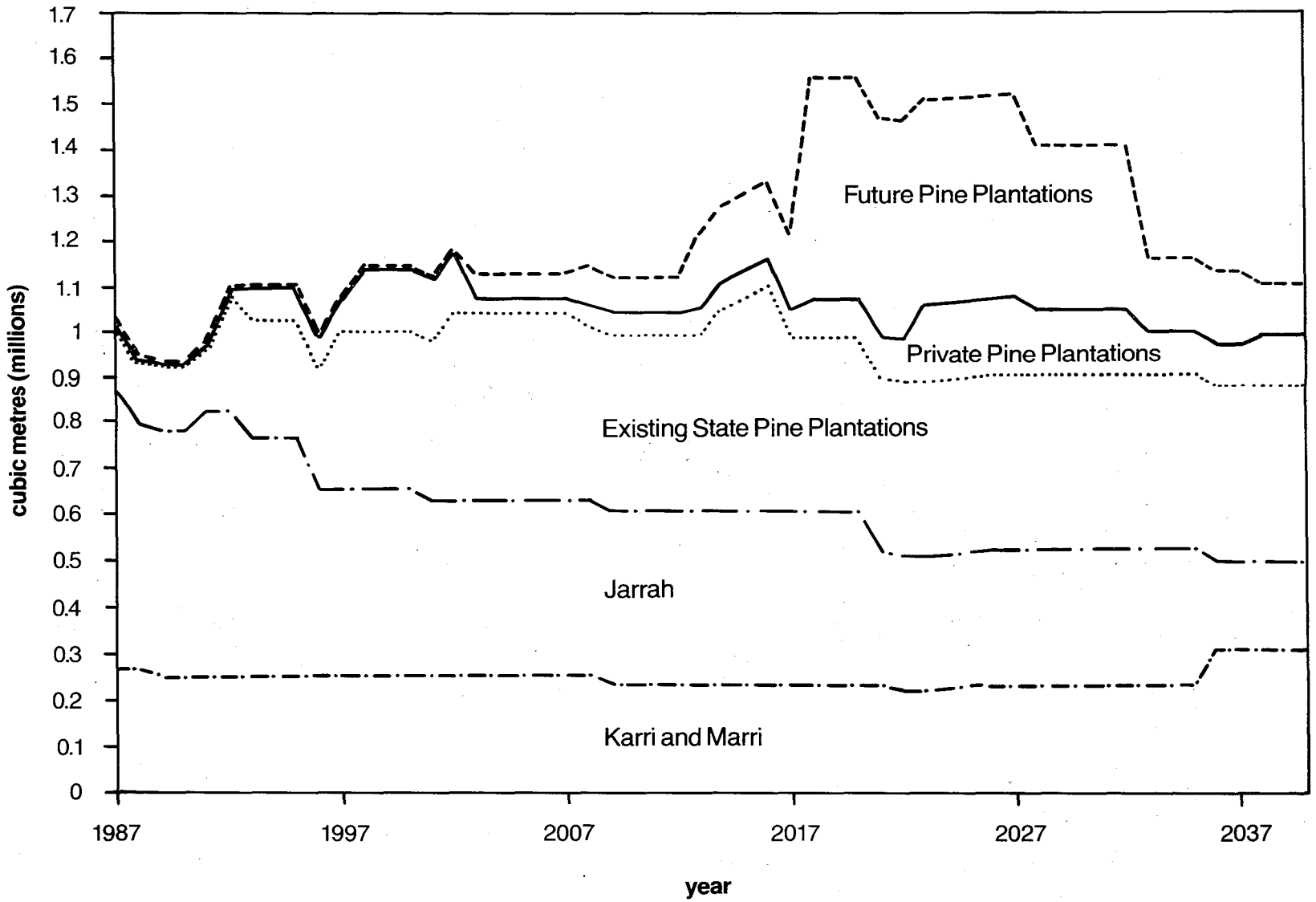

Figure 10
Projected supply of sawlogs from W.A.'s public and private forests

These demands could not be met from W.A. State forests.

It is possible, however, that the additional demand could be met by establishment of short rotation eucalypt plantations on cleared agricultural land.

Jarrah residue

The demand for jarrah residue is negligible relative to the quantities that are available. It is proposed to continue to investigate the potential for utilisation of jarrah residue into commercial producers. The most likely use of this residue is as biofuels.

Pine residue

If a panelboard plant is established and assuming that WESFI continues its current level of utilisation, the demand generated by these two plants will be balanced with supply by the middle of the next decade. It is anticipated that the quantity of small pine logs available for residue will decrease during the next decade. This will be compensated for by the increased quantity of pine sawmill residue.

ALLOCATION SCENARIO

It is in the best interests of the community and the timber industry that as far as is possible the privately owned processing sector has a balanced structure and that there is competition in the resource and product market. The proposals outlined in this strategy are designed to achieve this by:

1. providing security of tenure of the resource which will encourage investment in commercially viable processing units;

2. allocating a proportion of the resource by tender and auction;

3. providing the opportunity for three major commercially viable softwood sawmills;

4. encouraging the use of hardwoods for high value products by ensuring that the furniture manufacturing sector has a secure supply of high grade seasoned timber.

SOCIAL AND ECONOMIC SCENARIO

The proposals contained in this strategy, if implemented, will result in structural change. Inevitably this will result in some social and economic disruption in some regional centres. However, one of the principal objectives of this strategy is to minimise the impact of these changes on local communities.

In previous working plans, it was proposed that the reduction in the hardwood cut would be compensated by the increased availability of pine sawlogs. These plans also envisaged that the softwood sawmills would all be located in the Bunbury region. Consequently, while employment would have been generated in the Bunbury region, employees displaced from mills located outside this region would have had to transfer to Bunbury.

This strategy provides to avoid this type of social disruption by the provision of four major pine sawmilling centres in the Northern, Central, Southern and Albany regions. This, together with the proposals to make available regrowth hardwood logs and to promote value-added hardwood products will, if implemented, increase rather than decrease timber industry employment opportunities throughout the south-west.

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APPENDIX A

LICENCED SAWMILLS IN W.A. - 1986

NAME	LOCATION	NO. OF PERSONS EMPLOYED
BUSSELTON DISTRICT		
Adelaide Timber Co. P/L	East Witchcliffe	17
Cardoso Pty Ltd	Sussex Loc. 161, Busselton	19
House J A	Sussex Loc. 4094 Yallingup	7
S Miles (Portable)	Alexandra Bridge	3
Monier Ltd.	Busselton	19
Nagtegaal T J	Sussex Loc. 2832, Rosa Glen	1
K D Power Sawmilling Co	Queen Elizabeth Ave Busselton	18
G L & E Reynolds (portable)	No. 1 Chapman Hill	2
G L & E Reynolds (portable)	No. 2 Karridale	2
C B Wells	Sussex Loc. 217 Capel	2
N J & J L Whiteland	Sussex Loc. 2357 Busselton	4
Worsley Timber Pty Ltd	Site Lot 35 Margaret River Town	14
COLLIE DISTRICT		
W & N Borlini	Wellington Loc. 1852 Muja via Collie	3
Bunning Bros Pty Ltd	Collie No. 1	58
Bunning Bros Pty Ltd	Collie No. 2	5
Coli Sawmills (G Coli Pty Ltd)	Darkan	6
F Gibbs	Bowelling	2

NAME	LOCATION	NO. OF PERSONS EMPLOYED
R & W Harnett	Raymond Road Roelands	3
Koppers Australia Pty Ltd (Timber Preservation DN)	Dardanup	24
R & N Palmer Pty Ltd	Worsley	7
G W & N L Saunders	Collie	10
G W & N L Saunders	Muja	4
South West Sawmill Co Pty Ltd	Collie AA Lot 2 of Loc. 51 South West Hwy, Waterloo	18
Wesfi Pty Ltd	Lot 2 Moore Road Dardanup	132
Wesfi Pine Pty Ltd	Dardanup	33
Western Colleries Ltd	Collie	3
Worsley Timber Co Pty Ltd (portable)	Mornington	3
DWELLINGUP DISTRICT		
Ashkate Timber Co. No. 1 (R Moore)	Lot 68 Hopelands Road Serpentine	1
Ashkate Timber Co. No. 2 (R Moore)	Summerfield Road Serpentine	1
Bunning Bros Pty Ltd (R Gordon & Sons)	Boddington	5
Bunning Bros Pty Ltd	Dwellingup No. 1	62
Bunning Bros Pty Ltd	Dwellingup No. 2	9
Mandurah Sawmills	Park Road, Mandurah	8
F Muller (portable)	Wandering	7
E.R.C. Turton	Avon Loc. 1194 Wandering	3
HARVEY DISTRICT		
CALM Sawmill (Pine)	Harvey	8

NAME	LOCATION	NO. OF PERSONS EMPLOYED
Bunning Bros Pty Ltd	Yarloop No. 1	107
C V Wood	Logue Street, Waroona	5
JARRAHDALE DISTRICT		
Bunning Bros Pty Ltd	Robinson Road, Mundijong	14
Cardosa Pty Ltd	Lot 2 South West Hwy Mundijong	16
Colli & Son	Brookton Hwy, Kelmscott	15
Dale Timber Co.	West Dale	6
Millars (WA) Pty Ltd	Jarrahdale	55
KIRUP DISTRICT		
Adelaide Timber Co.	Wilga	10
Bedford Bros	Brookhampton	3
Bunning Bros Pty Ltd	Chowerup	5
A Manolini & Sons	Nelson Loc. 9094 Ryans Brook	4
Potter R R & R L	Lot 251 Balingup	9
Preston Timber Co	Boyanup AA Lot 350 Argyle	12
Preston Timber Co	Quarry Road, Donnybrook	5
Softwood Products (WA) Pty Ltd	Grimwade	11
Timber Treaters WA	Hester	7
M J Vitasovic Pty Ltd	Nelson Loc. 8295 Cundinup	7
Wake & Beacham	Nelson Loc. 3117, Dinninup	2
Whittakers Ltd	Railway Reserve, Greenbushes	66

NAME	LOCATION	NO. OF PERSONS EMPLOYED
Whittakers Ltd	Kirup	19
Worsley Timber Co. Pty Ltd.	Nelson Loc. 2780 Orchid Valley	3
MANJIMUP DISTRICT		
Amalgamated Timber Products	Yornup	16
Bunning Bros Pty Ltd	Deanmill	124
Bunning Bros Pty Ltd	Nyamup No. 1	55
Bunning Bros Pty Ltd	Nyamup No. 2	4
A F & M Drake	Nelson Loc. 993, Jardee	3
Gandy Timbers Pty Ltd	Jardee	24
Hanrahan G & D	Ipsen St, Manjimup	1
F & G Hunter	Nelson Loc. 12401 Palgarup	2
J & K Sawmillers	Manjimup/Northcliffe	3
Kilrain Sawmill	Graphite Road West Manjimup	4
Millars (WA) Pty Ltd	Jardee	72
Raper W L (Raper's Sawmill)	Nelson Loc. 9685 Jardee	5
Rijavic & Co	Nelson Loc. 5210 Manjimup	6
S F Tink (portable)	Nelson Loc. 2197 Manjimup	4
WA Chip & Pulp Co. Pty Ltd	Diamond Tree, Manjimup	70
Warnes Timber Mill (portable)	Nelson Loc. 9247 Unicup	3
T Waugh	Nelson Loc. 9666 Manjimup	7
Worsley Timber Co. Pty Ltd	Yanmah Road, Palgarup	18

NAME	LOCATION	NO. OF PERSONS EMPLOYED
MUNDARING DISTRICT		
Ardwick Pty Ltd	Dale West Road, West Dale	6
D'Angelo N G & Son	Herne Hill	3
Pickering Brook Sawmills	Canning Loc. 1188, Lot 9 Carinyah Road Pickering Brook	11
W A Somerville	Avon Loc. 11787, Chidlow	2
Stefanelli Sawmills Pty Ltd.	Gt. Northern Highway Middle Swan	11
NANNUP DISTRICT		
Holroyd S J (portable)	Nannup	5
A P Jensen	Lot 181 Wilson St. Nannup	4
Millars (WA) Pty Ltd	Nannup No. 1	101
NARROGIN DISTRICT		
A.G.K. Quality Woodware	Cuballing	6
Wake and Beacham	5 Forrest Street Narrogin	3
PEMBERTON DISTRICT		
Bunning Bros Pty Ltd	Northcliffe	51
Bunning Bros Pty Ltd	Pemberton	112
A C Rudd	Nelson Loc. 11109 Northcliffe	4
G T & B Y Ryan Pine Mill	Pemberton	12
South West Building Supplies	Nelson Loc. 12215 Northcliffe	5
WALPOLE DISTRICT		
W Bentink	Walpole	3

NAME	LOCATION	NO. OF PERSONS EMPLOYED
Brenton L A "Happy Valley Sawmills"	Happy Valley Road Denmark	3
Bunning Bros Pty Ltd	Walpole	11
Electro Mail Pty Ltd	No. 1 Mill, Scottsdale Road, Denmark	2
Electro Mail Pty Ltd	No. 2 Mill, Scottsdale Road, Denmark	2
Electro Mail Pty Ltd	No. 3 Mill, Scottsdale Road, Denmark	2
Franey & Thompson	Chester Pass Road, Albany	7
Hollingworth M (Kaleema Mills)	Mt Shadford Road Denmark	2
Hollingworth M (Kaleema Mills)	Bow River	3
Holroyd S J	Kojonup	
W R Loxton	Plantagenet Loc. 406 Mt Barker	4
O R McIntosh	Plantagenet Loc. 6713 Denmark	1
McLean Sawmills Pty Ltd	S.W. Highway, Denmark	73
Nelson S R	McLeod Road, Denmark	3
Nornalup Road Mill (B Balatti)	Nornalup Road Rocky Gully	6
Panelli Sawmills	Cnr. Bevan Road & Nornalup Road Rocky Gully	11
C N Pope	Hay Loc. 964, Cranbrook	2
Rizzi P & Co (B Dolzadelli)	Denbarker	1
N & A C Sawyer & Sons	Walpole	2
R A Sawyer	RMB 9232 Robinson Road Albany	2

NAME	LOCATION	NO. OF PERSONS EMPLOYED
D Tapley	Loc. 705 Walpole	1
I J & M E Thompson (portable)	Nelson Loc. 10191 Walpole	2
J E & J F Wilkes	Plantagenet Loc. 6710 Kernutts Road, Denmark	3
Wellstead J F	Plantagenet Loc. 1025 Redmond	3
WANNEROO DISTRICT		
Ashfield Sawmills	29 Katanning Street Bayswater	12
Coli Timber Merchants	104 Crandon Street Gosnells	12
Consolidated Pine Industries	30 Roberts Road Osborne Park	13
Hamilton Sawmills	133 Hamilton Street Osborne Park	9
Jarrah Case Factory	9 Katanning Street Bayswater	5
Morley Park Box & Case Co.	19-21 Hodgson Way Kewdale	4
Wesfi Pty Ltd	80 Sunbury Way Victoria Park	3
Wesfi Pty Ltd	1-27 Somersby Road Welshpool	30
Western Case Manufacturers	11 Howe Street Osborne Park	10
Whittakers Ltd	271 Treasure Road Welshpool	21

APPENDIX B

SELECTED LITERATURE RELEVANT TO THE MANAGEMENT OF FORESTS IN WESTERN AUSTRALIA

A. KARRI FOREST MANAGEMENT AND RESEARCH

1. SILVICULTURE

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