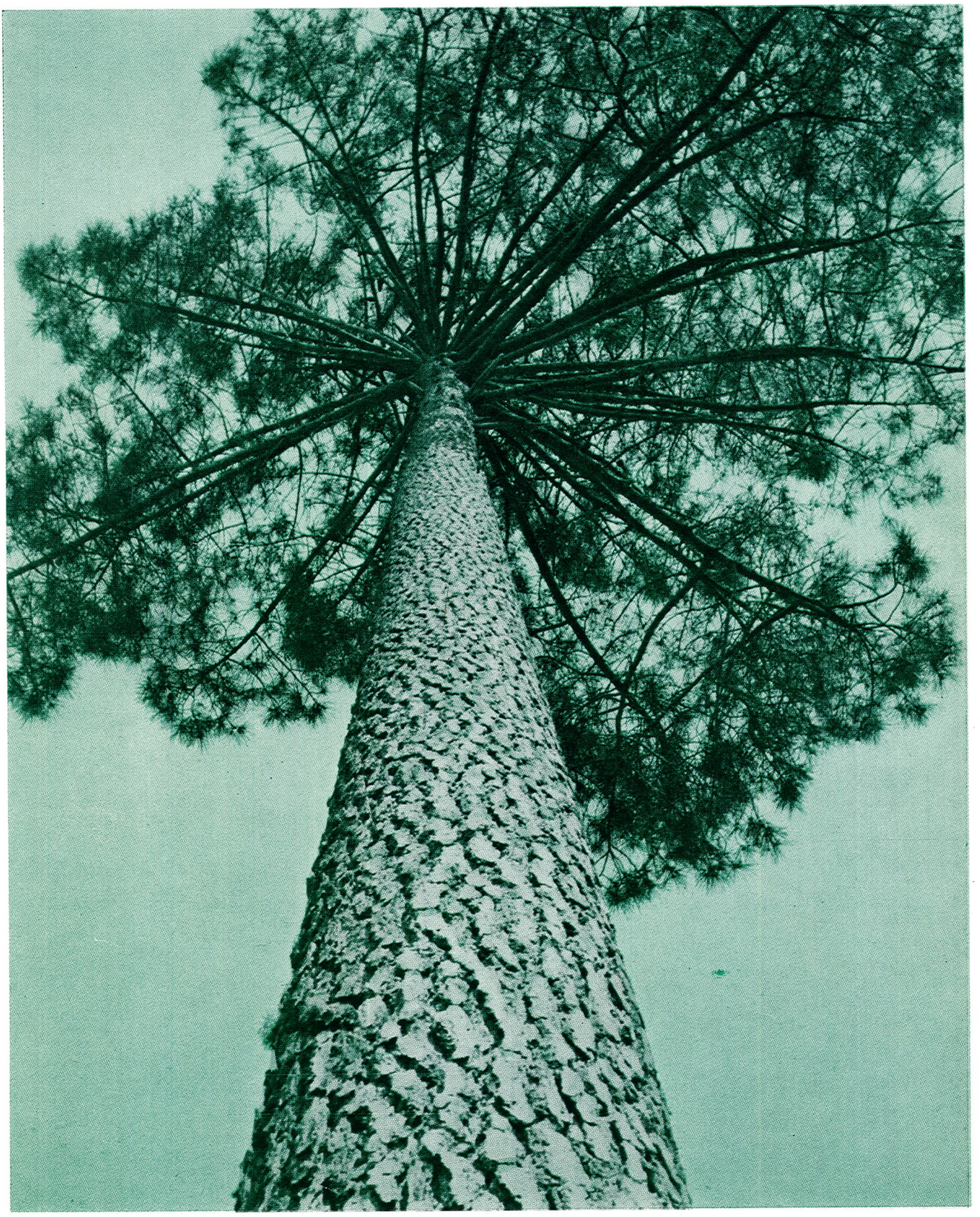
Annual Report 1967

Forests Department Western Australia



Cover

"Ant's-eye" view of a superior or "plus" tree of *Pinus pinaster* growing in the famous forests of Pinhal de Lieria, in Portugal.

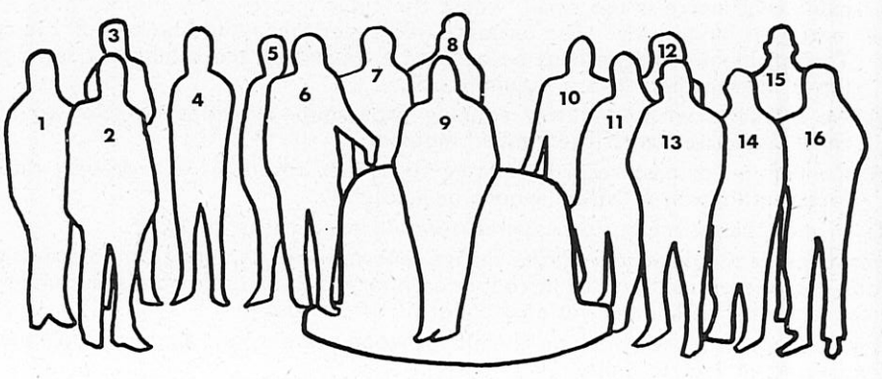
Scions from this and 84 other superior trees located in the same region have been imported into Western Australia and grafts of 78 of these trees are now successfully established in the field.

Sixteen of the 22 delegates to the F.A.O. World Symposium of Man-Made Forests at the "Wishing Well" in King's Park overlooking Perth City.

1.	Pit Hambananda	Thailand
2.	A. Bennouna	Morocco
3.	W. G. Middleton	Australia
4.	R. L. Willan	F.A.O., Rome
5	J Jackson	F A.O., Nigeria
6.	S. C. Mbinda	Kenya
7.	F. Ramanandraitsiory	Malagasy
8.	M. J. Williamson	F.A.O., West Pakistan
9.	D. E. Iyamabo	Nigeria
10.	A. A. Bayoumi	Sudan
11.	M. A. Waheed Khan	F.A.O., Sudan
12.	J. Wyatt-Smith	F.A.O., Nigeria
13.	R. Benetiz Laras	Venezuela
14.	R. G. Bonilla Cruz	Cuba
15.	J. Marion	F.A.O., Tunisia
16.	L. E. Canadas Cruz	Equador

Absent

T. G. Allan	F.A.O., Zambia
J. L. Dubois	F.A.O., Brazil
L. F. Hammond	Australia
E. H. Hinkle	F.A.O., Taiwan
S. Lindegren	Sweden
J. Masson	F.A.O., Malaysia



REPORT

on the operations of the

FORESTS DEPARTMENT

WESTERN AUSTRALIA

for the year ended

30th JUNE, 1967

by

A. C. HARRIS, B.Sc. (Adel.)

Conservator of Forests

PRESENTED TO BOTH HOUSES OF PARLIAMENT

Forests Department,
PERTH,
30th September, 1967

TO THE HONOURABLE THE MINISTER FOR FORESTS

Sir,

I have the honour to transmit herewith my report on the operations of the Department for the year ended 30th June, 1967.

Yours faithfully,
A. C. HARRIS,
Conservator of Forests.

19216—(2)

Dual-mounted, modified Lowther pine planting machines operating on the coastal sands north of Perth.

One of these units can plant up to 30 acres—approximately 24,000 young trees—in one day, and similar units will be employed as the planting rate is increased over the next two years.

CONTENTS

PRINCIPAL OFFICERS

Conservator of Forests	A. C. HARRIS, B.Sc. (Adel.), Associate Member, Australian Institute of Mining and Metallurgy.
Deputy Conservator of Forests	W. R. WALLACE, Dip.For. (Canb.).
Chief of Division	D. W. R. STEWART, B.Sc. (For.), Dip.For. (Canb.), Dip.For. (Oxon.).
Chief of Division	W. H. EASTMAN, B.Sc. (For.), Dip.For. (Canb.), Dip.For. (Oxon.).
Chief of Division	J. C. MEACHEM, D. F. C. B.Sc.(For.), Dip.For. (Canb.)
Chief of Division	B. J. BEGGS, B.Sc.(For.), Dip.For. (Canb.).
Fire Control Superintendent	A. J. MILESI, B.Sc. (Adel.).
Utilization Officer	H. C. WICKETT, M.Sc. (Adel.), B.For.Sc. (N.Z.), A.I.M.E. (Aust.), Dip.For. (Canb.).
Superintendent	P. J. McNAMARA, M.A. (Oxon.).
Superintendent	D. E. GRACE, B.Sc.(For.), Dip.For. (Canb.).
Secretary	E. S. BUDD.
Accountant	E. G. BAKER, A.A.S.A.
Registrar	R. K. REID.

LIST OF COMMON AND BOTANICAL NAMES OF TREES USED IN THIS REPORT

Eucalypts	
Bald Island Marlock	*Euc. lehmanni*
Black-barked Marlock	*Euc. redunca var. melanophloia*
Brown Mallet	*Euc. astringens*
Coastal Blackbutt	*Euc. todtiana*
Coastal Moort	*Euc. platypus var. heterophylla*
Coral-flowered Gum	*Euc. torquata*
Dwarf Sugar Gum	*Euc. cladocalyx var. nana*
Flooded Gum	*Euc. rudis*
Jarrah	*Euc. marginata*
Karri	*Euc. diversicolor*
Marri	*Ruc. calophylla*
Messmate Stringybark	*Euc. obliqua*
River Gum	*Euc. camaldulensis*
Rose Gum	*Euc. grandis*
Silvertop Ash	*Euc. sieberi*
Southern Blue Gum	*Euc. globulus*
Southern Mahogany (Bangalay)	*Euc. botryoides*
Sugar Gum	*Euc. cladocalyx*
Sydney Blue Gum	*Euc. saligna*
Tallowwood	*Euc. microcorys*
Tingle (Red)	*Euc. jacksoni*
Tingle (Yellow)	*Euc. guilfoylei*
Tuart	*Euc. gomphocephala*
Wandoo	*Euc. wandoo*
W.A. Blackbutt (Yarri)	*Euc. patens*
Yellow Stringybark	*Euc. muelleriana*
York Gum	*Euc. loxophleba*
Conifers	
Aleppo Pine	*Pinus halepensis*
Black Cypress Pine	*Callitris calcarata*
Douglas Fir (Oregon)	*Pseudotsuga menziesii*
Loblolly Pine	*Pinus taeda*
Maritime Pine (Pinaster Pine)	*Pinus pinaster*
Monterey Pine (Radiata Pine)	*Pinus radiata*
Slash Pine	*Pinus elliottii*
White Cypress Pine	*Callitris glauca*
Other	
Rottnest Island Tea-tree	*Melaleuca pubescens*
Sandalwood	*Santalum spicatum*
Sheoak	*Casuarina fraseriana*

1. STATISTICAL SUMMARY OF MAJOR OPERATIONS

Timber Production in Cubic Feet.

Total Production Sawn Timber	16,887,742
Exports—Interstate	2,260,446 (13·4 per cent)
Overseas	2,637,975 (15·6 per cent)
Local Consumption	11,989,321 (71·0 per cent)

Recent Trends in Production and Consumption.

Year	Production			Total Export	Local Consumption	Sawmills	Monthly Average of Men Employed
	Sawn	Hewn	Total				
	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	No.	No.
1925–26	14,522,733	6,277,952	20,800,685	12,001,384	8,799,301	....	....
1937–38	11,720,642	2,573,540	14,294,192	7,545,744	6,748,448	134	3,112
1945–46	8,869,847	14,041	8,883,888	3,373,025	5,510,863	128	2,876
1950–51	12,571,635	1,183	12,572,818	2,342,492	10,230,326*	256	4,047
1951–52	14,717,112	....	14,717,112	2,373,553	12,343,559*	280	4,708
1952–53	16,973,332	1,761	16,975,093	3,965,188	13,009,095	306	5,395
1953–54	18,343,974	1,454	18,345,428	3,858,956	14,486,472	299	5,724
1954–55	18,915,967	4,561	18,920,528	3,477,249	15,443,279	279	5,879
1955–56	19,213,771	5,308	19,219,079	4,568,034	14,651,045	274	5,804
1956–57	17,798,984	3,790	17,802,774	4,679,979	13,122,795	261	5,574
1957–58	17,487,573	742	17,488,315	5,671,712	11,816,603	268	5,227
1958–59	17,758,023	1,310	17,759,333	6,465,021	11,294,312	260	5,155
1959–60	16,625,475	....	16,625,475	6,167,132	10,458,343	265	5,037
1960–61	15,783,370	....	15,783,370	5,212,532	10,570,838	238	4,790
1961–62	15,801,067	....	15,801,067	5,660,639	10,140,428	236	4,906
1962–63	15,593,099	....	15,593,099	5,482,513	10,110,586	221	4,725
1963–64	16,088,169	....	16,088,169	5,266,328	10,821,841	214	3,448*
1964–65	17,052,025	....	17,052,025	4,716,296	12,335,729	206	3,615*
1965–66	17,377,858	....	17,377,858	2,432,378	14,945,480	203	3,518*
1966–67	16,887,742	....	16,887,742	4,898,421	11,989,321	202	3,173*

* From 1963-64 these figures exclude persons employed in associated timber yards in the Metropolitan area.

Total Cut

		1966-67	1965-66
Log Volumes (in cubic feet)	Jarrah	39,032,591	39,606,377
	Karri	6,922,488	7,834,423
	Wandoo	2,074,504	2,205,133
	Pine	2,057,204	1,912,817
	Other	822,647	771,778
Total		50,909,434	52,330,608

Made up as follows:—

From State Forest and Crown Land	40,941,527 cubic feet	(80·4 per cent.)
From Private Property	9,967,907 cubic feet	(19·6 per cent.)

Value Produced

	1966-67	1965-66
Total Value of Timber (on mill skids)	$25,690,000	$26,871,250
Total Value of Other Forest Products	$6,711,600	$6,475,600

Forest Area

Additions to State Forest	1,128 acres
Excisions from State Forest	1,273 acres
Land Purchased for Pine Planting	2,142 acres
Total Area of State Forest	4,448,682 acres

Reforestation

Cut-over area treated for regeneration	88,519 acres

Afforestation

Area planted with pines, 1966		4,074 acres
Pinus radiata	1,710 acres	
Pinus pinaster	2,364 "	
Total area of pine plantation established		47,725 "
Pinus radiata	19,932 "	
Pinus pinaster	27,307 "	
Other species	486 "	
Total experiment areas (additional)		1,108 "

Management

Survey:—	
Theodolite surveys	24 miles
Other surveys	133 miles
Topographical mapping	1,305,000 acres
Air Photo Interpretation—	
Complete	325,000 "
Preliminary	2,258,000 "
Assessment—	
Detailed	4,331 "
Area covered	731,686 "
Type maps produced, covering	504,000 "
Engineering, new works:—	
Roads and tracks	269 miles
Telephone lines	14 "
Houses and buildings	7(No.)

Protection

Controlled burning	894,154 acres
Fire Outbreaks:—	
Number	365
Area burnt	5,901 acres

Nurseries (Hamel and Dryandra)

Trees produced for—	
Private buyers	180,533(No.)
Forests Department	189,502 "

Sandalwood

Quantity exported	648 tons

SOURCE AND USE OF FUNDS

	1966-67	1965-66
Source		
Revenue—		
Royalties on Timber, etc.	3,002,379	2,458,322
Departmental Sales of Logs, etc.	1,566,267	1,458,896
	4,568,646	3,917,218
General Loan Fund	400,000	360,000
Federal Aid Road Grant	170,000	170,000
	$5,138,646	$4,447,218
Use:		
Consolidated Revenue Fund	1,401,679	1,296,882
Reforestation Fund	2,896,034	2,730,825
General Loan Fund	400,000	360,000
	$4,697,713	$4,387,707

2. REVENUE AND EXPENDITURE

Revenue from all sources was $4,568,646 compared with $3,917,218 the previous year. The rise in revenue was mainly caused by an increase in log royalties which came into effect on 1st July, 1966. The higher royalties were introduced to cover increased costs incurred since the last royalty re-appraisal on 1st January, 1961.

In the following, figures in brackets refer to 1965/66.

Of the net revenue $2,861,634 ($2,352,665) was transferred to the Forests Improvement and Reforestation Fund. Expenditure charged against this Fund was $2,903,071 ($2,713,194) and the balance in the Fund at the 30th June, 1967 was $659,339 which includes reserves for Building $110,000 and Fire Control $201,000.

The return from thinning operations in Departmental pine plantations was $254,906 ($246,622).

3. THE FOREST AREA

(1) State Forests (Forests Act, 1918-1954)

The total area of State Forest at 30th June, 1967, was 4,448,682 acres which is a decrease of 145 acres compared with the total area at 30th June, 1966.

During the year, additions totalling 1,128 acres where made to State Forest and 1,273 acres were excised and reverted to the Lands Department.

	June, 1967 Acres	June, 1966 Acres
Jarrah	3,190,220	3,190,463
Karri	171,441	171,053
Jarrah and Karri (mixed)	655,980	655,994
Jarrah and Wandoo (mixed)	163,785	163,785
Tuart	6,471	6,471
Tingle Tingle	10,687	10,687
Karri and Tingle (mixed)	13,885	13,885
Sandalwood	1,930	1,930
Pine Planting	177,778	177,762
Mallet	56,353	56,645
Miscellaneous	152	152
	4,448,682	4,448,827

(2) Timber Reserves (Forests Act, 1918-1954)

The area held under Timber Reserve at 30th June, 1967 was 1,860,176 acres which is an increase of 638 acres on the area at 30th June, 1966.

	June, 1967 Acres	June, 1966 Acres
Jarrah	96,653	96,015
Wandoo and Jarrah	61,320	61,320
Jarrah and Karri	78	78
Pine Planting	5,908	5,908
Mallet	475	475
Sandalwood	23,100	23,100
Mining Timber, Firewood, etc.	1,672,642	1,672,642
	1,860,176	1,859,538

(3) Land Alienations, etc.

During the year ended 30th June, 1967, 197 applications for land and road provisions and closures were received covering a total of 222,899 acres.

The Department agreed to the release as follows:—

Alienations			Mineral Claims and Leases (Pastoral-Grazing)		
Timber Zone		Outside Timber Zone	Timber Zone		Outside Timber Zone
State Forest	Crown Land		State Forest	Crown Land	
acres 67	acres 40,399	acres 7,000	acres 2,125	acres 38,297	acres 10,290

No. of alienations approved 67
No. of leases approved 37

4. SAWMILLING, TIMBER INSPECTION AND FOREST PRODUCE

Timber Production

The production of 16,887,742 cubic feet of sawn timber was a decrease of 490,116 cubic feet on last year's figure. Of the total production 3,309,345 cubic feet were from timber from private property which is a decrease of 50,830 cubic feet on last year.

During the year ended 31st December, 1966, 202 sawmills were registered, of which 120 operated on Crown land and 82 on private property. Details of the intake of mill logs and production of sawn timber are given in the accompanying tables.

The annual intake of logs (1829–1967) is shown in Appendix 5.

Departmental pine plantations yielded 2,007,325 cubic feet compared with last year's figure of 1,958,345 cubic feet.

The following quantities of logs were used in local plywood factories :—

	Cubic Feet
Karri	82,612
Jarrah	1,082
Pine	73,822
	157,516

Sawn sleepers produced during the year amounted to 4,576,006 cubic feet of which 1,416,915 cubic feet were from private property.

Timber Inspection and Grading Rules

All sleepers produced were inspected and 105,071 cubic feet were re-inspected. Other sawn timber inspected during the year amounted to 710,474 cubic feet.

Assistance was given by correspondence to committees meeting in Sydney on the preparation of grading rules for poles, piles and joinery items.

TIMBER PRODUCTION

PRODUCTION OF TIMBER FOR YEAR ENDED 30th JUNE, 1967
(EXCLUSIVE OF MINING TIMBER, FIREWOOD, PILES AND POLES)

	Mill Logs in Cubic Feet								Totals	
	Jarrah	Karri	Wandoo	Yarri	Sheoak	Marri	Pine	Other	In Log	Recovery of Sawn Timber
Crown Lands	31,153,676	6,388,752	851,737	298,114	18,130	103,105	2,007,325	120,688	40,941,527	13,578,397
Private Property....	7,878,915	533,736	1,222,767	155,815	....	36,325	49,879	90,470	9,967,907	3,309,345
Total	39,032,591	6,922,488	2,074,504	453,929	18,130	139,430	2,057,204	211,158	50,909,434	16,887,742

In addition to the above, 45,008 tons of Wandoo logs were treated for Tannin Extract.

QUANTITY OF SAWN TIMBER PRODUCED FROM CROWN LANDS AND PRIVATE PROPERTY FOR THE PAST TWO YEARS

Year	From Crown Lands		From Private Property		Total Quantity	Estimated Value of Timber Obtained
	Sawn Timber other than Sleepers	Sawn Sleepers	Sawn Timber other than Sleepers	Sawn Sleepers		
	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	$
1965–66	10,521,201	3,496,482	1,837,980	1,522,195	17,377,858	26,871,250
1966–67	10,419,306	3,159,091	1,892,430	1,416,915	16,887,742	25,690,000

Distribution	Sleepers	Other Sawn Timber		Total
	All Species	Karri	Jarrah and Other Species	
	cub. ft.	cub ft.	cub. ft.	cub. ft.
Interstate	576,818	686,696	996,932	2,260,446
Overseas	2,072,890	206,241	358,844	2,637,975
Local	1,926,298	1,700,981	8,362,042	11,989,321
Total	4,576,006	2,593,918	9,717,818	16,887,742

Distribution of Timber

Outstanding features for the year were the marked recovery in the export trade, particularly to overseas markets, and the decline in the local demand for railway sleepers.

Overseas exports of 2.6 million cubic feet were more than three times greater than the 1965–66 figure of 818,000 cubic feet, which was the lowest for 15 years. Railway sleepers accounted for 1,728,000 cubic feet of this increase, mainly due to the supply of over 1,000,000 cubic feet to Jordan for the rebuilding of the Hejaz railway. The increased demand by South Africa for other sawn jarrah largely accounted for the rise of 159,000 cubic feet in this item, but the overseas market for karri fell by 67,000 cubic feet.

Interstate exports of 2,260,000 cubic feet rose by 646,000 cubic feet when compared with the previous year. Railway sleepers increased by 254,000 cubic feet, karri by 189,000 cubic feet, jarrah by 165,000 cubic feet, and dressed and moulded timber by 34,000 cubic feet. The South Australian market absorbed most of this increase but supplies of flooring to New South Wales and Victoria also rose appreciably.

Local consumption of timber fell by nearly 3,000,000 cubic feet, due largely to a cessation, for the greater part of the year, of supplies of railway sleepers for iron-ore projects in the north-west of the State, and a reduction in the quantity needed for the standard-gauge line from Kwinana to Kalgoorlie. This decreased demand for railway sleepers accounted for 2.4 million cubic feet of the fall in local timber consumption. However, the new Mt. Newman iron-ore project will, in the next 12 months or so, require some 2.7 million cubic feet of sleepers for its 280 miles of railway line.

There was also a reduction in the local use of karri and jarrah, the former decreasing by some 300,000 cubic feet, and the latter by 200,000 cubic feet.

The value of imports of timber and wood manufactures (excluding furniture, which is of *any* material) rose by $644,000 to $3,567,000 when compared with the previous year. Imports from other Commonwealth States increased by $520,000 and from overseas countries by $124,000.

The most significant increase in imports from other States was attributable to the item, re-constituted wood (particle board, etc.) which rose by $421,000. This was due to supplies in quantity being obtained, for the first time, from Victoria ($294,000), Tasmania ($106,000) and Queensland ($64,000). Imports from South Australia and New South Wales for this item were less than in the previous year. However, the recent completion of a new particle board plant in the Metropolitan area should rectify this situation.

The rise of $124,000 in the value of imports from overseas countries came from sawn hardwoods ($98,000), sawn softwoods ($63,000), and plywood and veneer ($18,000). The value of imported hardwood logs remained virtually unchanged, and all other items showed a decrease. Malaysia, Ivory Coast and Singapore, in that order, accounted for the increased value of sawn hardwoods, while imports of Douglas Fir from North America was responsible for the higher value of sawn softwoods. The value of imports of plywood and veneer from Japan increased by $9,000.

Hardwood Chips

During the year Japan made enquiries in Australia regarding the securing of supplies of wood chips for export to their country for the production of paper pulp. Feasibility studies were commenced and later in the year proposals were being studied in New South Wales, Victoria and Tasmania.

In Western Australia, the prospects of establishing a paper-making industry in the near future are not bright and the production of wood chips from the present unmarketable timber and sawmill waste offers a means of obtaining better and more complete utilization of our forest resources. Feasibility studies in respect to supply have now commenced.

Sandalwood

The demand for sandalwood continued and at times difficulty was experienced in meeting orders from overseas.

A total of 741 tons of sandalwood were received at Fremantle during the year as compared with 1,040 tons for the year ended the 30th June, 1966, and this quantity was made up as follows:—

	Tons
Crown Land—	
Logwood (including roots and butts)	625
Pieces	104
Private Property—	
Logwood (including roots and butts)	12
	741

Exports amounted to 648 tons compared with 716 tons for the previous year.

No orders for logwood were placed by distillers but 32 tons of roots and butts severed from the Crown Land logwood at Fremantle were delivered to them for oil distillation purposes.

Western Australian sandalwood was used to produce 3,995 lb. of sandalwood oil during the year and 3,291 lb. were exported interstate and overseas.

Firewood Production and Consumption

The firewood consumption for the State was estimated at 707,340 tons of which 27 per cent. was used for industrial and mining fuel.

The following table accounts for 50 per cent. of the firewood consumed, the balance being obtained from private property for which specific records are not available. Of the total quantity consumed, 46 per cent. was obtained from Crown Land.

	Crown Land Tons	Private Property Tons	Total Tons
Production—			
Domestic Firewood—			
Firewood Permits (South-West)	70,891	....	70,891
Mill Waste sold as firewood (estimated 50 per cent. of total)	40,264	16,160	56,424
Domestic Use on Goldfields	23,728	....	23,728
Total Domestic Firewood as shown by returns	134,883	16,160	151,043
Industrial Firewood—			
Supplied under Licence Nos. 3 to 8 Pumps	19,362	....	19,362
Other Pumps	572	....	572
Factories, etc.	78,987	....	78,987
Mill Waste sold as firewood (estimated 50 per cent. of total)	40,264	16,160	56,424
Mill Waste used as firewood	45,032	735	45,767
	184,217	16,895	201,112
Mining Firewood	2,942	....	2,942
Total Firewood Produced (as shown by returns)	322,042	33,055	355,097

Consumption—	Tons	
Domestic (estimated)	494,200	(at 2 tons per dwelling)
Industrial	190,264	(ex Govt. Statisticians)
Pumping Stations	19,934	(as per F.D. Returns)
Mining	2,942	(as per F.D. Returns)
	707,340	

Other Forest Produce

Piles and poles obtained from Crown Land during the year amounted to 827,801 lineal feet compared with 887,055 lineal feet for the previous year. Of this total, 21,474 lineal feet were produced from Departmental operations. Returns received from private property show 91,223 lineal feet produced as compared with 41,385 lineal feet for the year 1965–66.

There were approximately 421,667 posts and strainers cut from Crown Lands, of which 16,348 were produced by the Department. Records received show 46,568 posts and strainers obtained from private property, but this is only a small percentage of the total production from this source.

The quantity of mallet bark obtained from Departmental plantations was 82 tons with a further seven tons from other Crown Lands. The quantity obtained from private property was 20 tons, making a total of 109 tons.

Apart from the sawn timber supplied by sawmills, 16,630 tons of mining timber were used. This was all from Crown Lands, 10,327 tons being from inland forests.

The number of Christmas trees sold was 7,342, compared with 13,027 the previous year. The revenue from sales was $3,840.

FOREST PRODUCE NOT ELSEWHERE INCLUDED IN PRODUCTION TABLES

Description of Forest Produce	South-West Division and Agricultural Areas			Goldfields Areas	Total
	Supplied by Department	Other Crown Lands	Private Property*		
Mining Timber .... Tons	....	6,303	....	10,327	16,630
Charcoal .... Tons	....	40,926	....	....	40,926
Piles, Poles, Bridge Timbers .... Lin. ft.	21,474	797,059	91,223	9,268	919,024
Fence Posts and Rails .... No.	14,939	164,470	45,298	227,813	452,520
Strainer Posts .... No.	1,409	13,036	1,270	....	15,715
Mallet Bark .... Tons	82	7	20	....	109
Wandoo Timber for Tannin Extract .... Tons	....	29,889	15,119	....	45,008
Bean Sticks, etc. .... No.	....	62,490	....	4,850	67,340
Boronia Blossom .... Lbs.	....	1,878	2,444	....	4,322
Gravel and Stone.... .... Cu. yds.	....	183,636	....	....	183,636
Sand .... Cu. yds.	....	5,331	....	....	5,331
Scout Staves .... No.	400	....	....	....	400
Sawdust consumed as Fuel† .... Tons	....	120,821	....	....	120,821

* Complete figures from Private Property not available, only information furnished to the Department is included.
† Apportionment between Crown Land and Private Property unknown.

5. FOREST MANAGEMENT

Working Plans

The continuous inventory of the hardwood forest was considerably accelerated during the year and covered 745,000 acres. This entailed the detailed measurements of over 2,000 plots totalling 4,382 acres in State Forest. Assessment data were processed by computer giving more complete information more quickly than ever before. Special studies of the reliability of the data obtained and of the optimum assessment plot size accompanied each inventory project, and all assessment was carried out to predetermined reliability specifications. Special projects dealing with the availability of round mining timber near Collie and the long term availability of marri in the southern forests were initiated during the year.

As foreshadowed last year, a new system of pine inventory based upon temporary variable radius plots was developed. Field work was commenced in five major plantations towards the end of the year and work has progressed satisfactorily to date. The field data will be processed by computer to provide the necessary background information for yield prediction and marketing programming.

Standard air photo interpretation covered 325,000 acres, but the main effort in interpretation was directed towards delineating areas affected by *Phytophthora* root rot. This project covered over two million acres in the northern jarrah forests for which complete data at resources level are now available. However, technical problems prohibited the use of black and white photography for this project in the southern forests, but it is anticipated that colour photography will overcome these problems which have already been partly solved by aerial reconnaissance. Results from this project have already been applied to appraise the Management implications of *Phytophthora* root rot in the northern forests.

During the year, a draft revision of the General Working Plan was prepared and the framework for Hardwood Management data was amended to conform to administrative territorial units instead of the former arbitrary planning sections.

Close liaison was maintained with the management research section and the main activities in this field included preparation of local volume tables within set utilisation classes for *P. pinaster* and *P. radiata*; preparation of yield tables for the Leirian strain of *P. pinaster* at Gnangara and for *P. radiata* at Grimwade along with investigation of sampling techniques for the plantation inventory.

The first stage of the revised plantation inventory which will supersede the former site quality system was implemented and a successful symposium was conducted to give selected specialist officers basic instruction in computer data processing to enable them to make best use of existing facilities for handling large amounts of technical data generated by the current high level of management and research activities.

Surveys, Photogrammetry and Mapping

A total of 157 miles of survey traverses was charted during the year. This included 24 miles of mapping control surveys and 77 points of selected control traverses including barometric heighting for use with the Wild Stereo plotter. Standard base plane covering 606,000 acres were produced and other Stereo plotting included the production of topo maps covering 1.3 million acres, forest type maps covering 504,000 acres, and special maps connected with the *Phytophthora* root rot survey covering 1.38 million acres. Revisionary plantation mapping covered 16,500 acres and contour maps were produced covering an additional 10,230 acres mainly in the Blackwood Valley. Several other special contouring projects were also undertaken and sketch mapping covered 3.5 million acres in Rason Lake area, some 70 miles east of Laverton.

In the 40-chain lithographic series, the Perup map sheet was published and the Walpole and Murray River sheets were published in the 80-chain series. Revisions of the Gleneagle and Chudalup sheets were also prepared for printing and a much improved edition of the "Vegetation Map of Western Australia" was published.

A high level of activity was maintained in the general drafting section involving the preparation of 241 special project maps and 8,672 dye-line prints amongst a wide range of sundry other plan preparations, notations and amendments.

Forest Engineering

During the year, 269 miles of new forest roads, tracks and firelines were constructed and 4,343 miles maintained. A total of 13¾ miles of new telephone line was erected.

During the year the Department took the initiative in co-ordinating interested organisations in the planning and construction of an airstrip located 10 miles north-west of Manjimup. Construction is well advanced and the airstrip should be operational by October, 1967, and will be used extensively for the Department's 1967 aerial controlled burning programme of 400,000 acres.

Two Local Authorities and a number of contractors and large timber companies have provided men and equipment free of charge in this co-operative venture.

The strip, of 3,500 feet runway, will supplement another 50 miles distant (14 miles south of Shannon River). These strips are practically at right angles and complement each other for emergency landings due to strong winds. It is expected they will be operational under all weather conditions for light twin-engine aircraft.

Plant and Equipment

All vehicles and items of field equipment were maintained in a satisfactory condition and over 50 items of fabrication were carried out. The latter included fire pumpers and steel tanks, hose reels, a jib crane boom, a mobile sorting and packing table for pine seedlings, two planting machines, a lining-out machine, compressor tanks and fittings, a front mounted blade and a machine for collecting Karri capsules was converted from an agricultural harvester.

A mobile pine sorting and bundling table in the Nannup nursery.
After root cutting the lifted pines are placed on an endless belt, sorted, counted, bagged and transported to the field for hand-planting in steep country.
The unit is capable of handling 13,000 plants per hour.

Three apprentices completed their training during the year and six were engaged, bringing the total number now in training to twenty-three. Of the six engaged, five qualified for the four-year term.

Departmental Buildings

Housing

Five new houses were erected and one purchased, bringing the total number of Departmental houses to 480.

Four houses from the outlying settlement of Gleneagle were transferred to Jarrahdale.

Other Buildings

New offices were built at Hamel and Kelmscott and a small pine mill at Margaret River was completed during the year. One old lookout tower in the Mundaring Division was dismantled.

Communications

Radio

Two new V.H.F. fixed stations at Kelmscott and Jarrahdale were added to the network and the Gleneagle office equipment was withdrawn.

New Single-Side-Band (S.S.B.) equipment was installed at Kalgoorlie, two mobiles fitted, and a fixed station installed at the tree nursery. The installation is not fully completed, but it appears that satisfactory coverage will be achieved.

Sixty-one vehicles were wired for V.H.F. radio and two for H.F. radio.

During the year servicing work and repeater equipment modifications occupied the main portion of the Radio Branch's attention.

Telephones

A complete installation using metallic return circuits was made between Wanneroo and Gnangara. This replaces an old earth return system, which gave widely varying service due to the difficulty of making efficient earths in coastal sand.

Collie office telephone equipment was modified during building alterations and telecommunications there are now grouped to give greater efficiency.

Re-installation work was done at Diamond Tree lookout in anticipation of hiring a P.M.G. private line to improve communications between Manjimup and Shannon River.

6. REFORESTATION

Favourable conditions for natural regeneration are created as a matter of routine as cutting of each annual section is completed. Special attention is being given to the harvesting of karri seed to re-stock areas where natural regeneration is inadequate, and to provide a reserve for emergency regeneration following uncontrolled fire.

The work of thinning jarrah pole stands by the "chemical applied to notch" technique continues. Trials are in progress at Dwellingup to cover—

(a) Stand improvement following trade cutting, by poisoning useless over-storey and competing under-storey trees.

(b) Rehabilitation following logging of areas severely damaged by 1961 fires.

During the year, 51,010 acres of virgin State Forest were cut over under the West Australian selection system of tree marking. This consisted of 40,801 acres of jarrah, 1,802 acres of karri, 8,387 acres of wandoo and 20 acres of other species. In addition 37,509 acres of State Forest, cut over in the past, were again logged.

The total jarrah and karri areas of State Forest treated for regeneration are now as follows :—

	Acres
Jarrah	2,383,341
Karri	119,094

7. AFFORESTATION

Pine Plantations

The Softwoods Forestry Agreements Act, 1967.

This Act, passed by the Commonwealth Parliament on 9th May, 1967, provides financial assistance to all States to enable them to expand the rate of softwood planting. The long-term nature of forestry and the long period between planting and income-earning production is recognised. The loans will be free of interest and repayment of capital for the first 10 years. Thereafter, repayments are to be effected by 50 equal half-yearly instalments. The term of a loan is consequently 35 years.

In Western Australia, the average annual planting rate over the last seven years has been less than 3,000 acres. However, the passing of the new Act will now enable the State to double the rate and it is expected that from 1968, 6,000 acres per annum will be planted. With 48,833 acres already established, the target of 240,000 acres of pine plantation should therefore be achieved by the turn of the century, if sufficient suitable planting land is available.

Establishment, 1966–67

In 1966 a record 4,074 acres of pine were planted, of which 77 acres were for experimental purposes. This brings the total plantation area, including roadside and experimental planting, to 48,833 acres—after allowing for 34 acres of clear felling.

The distribution of these plantations by Divisions as at 30th September, 1966, was as follows:—

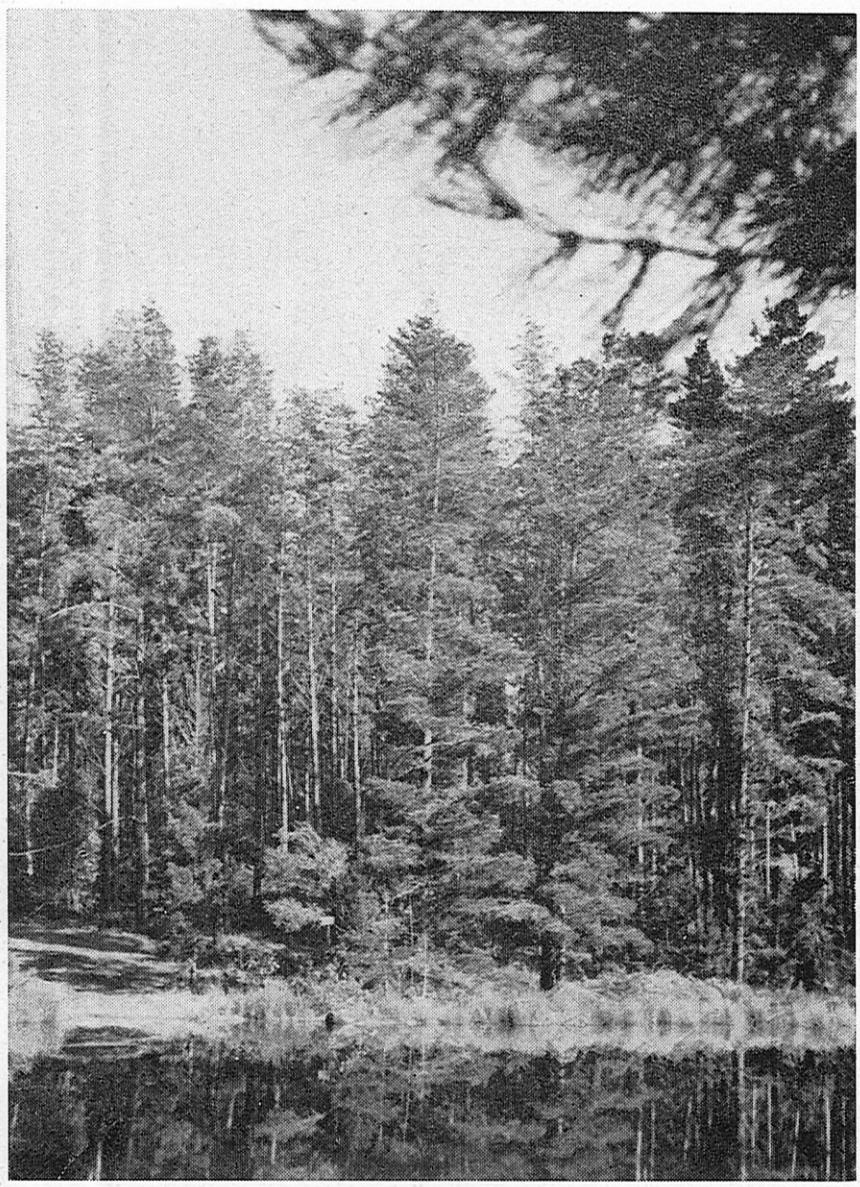
Division	*P. radiata*	*P. pinaster*	Other Species	Total
	acres	acres	acres	acres
Wanneroo	53	16,195	122	16,370
Metropolitan	26	2,397	32	2,455
Mundaring	2,585	1,336	158	4,079
Kelmscott	25	723	24	772
Harvey	2,345	3,639	33	6,017
Collie	3,094	....	....	3,094
Kirup	4,685	193	....	4,878
Nannup	4,665	31	24	4,720
Busselton	1,272	2,735	58	4,065
Manjimup	341	....	....	341
Pemberton	841	58	35	934
Total Established Plantations	19,932	27,307	486	47,725
Experimental Areas	218	819	71	1,108
Grand Total	20,150	28,126	557	48,833

The 1966 planting was distributed over the following Divisions:—

	Pinus radiata	*Pinus pinaster*	Total
	(ac.)	(ac.)	(ac.)
Wanneroo	1	2,075	2,076
Mundaring	85	1	86
Kelmscott	....	60	60
Harvey	284	161	445
Collie	217	....	217
Kirup	376	....	376
Nannup	449	....	449
Busselton	67	....	67
Manjimup	195	....	195
Pemberton	26	....	26
Plantation Total	1,700	2,297	3,997
Experimental Planting	10	67	77
Grand Total	1,710	2,364	4,074

Roundwood Production

The total roundwood production from Departmental plantations, mainly in the form of thinnings, was 2,007,325 cubic feet, underbark. This was a small increase on last year's record figure of 1,958,345 cubic feet (revised) and was double the production in 1959–60.



Pines across the water.
Thinnings from this 33-year-old stand of *Pinus radiata* at Grimwade provide some of the wider boards of longer length for which local demand is increasing.

The following figures show the increase in pine log removals in recent years:—

Year ended 30th June	Cubic feet (Underbark)
1950	298,010
1955	710,845
1960	1,002,619
1965	1,721,951
1966	1,958,345
1967	2,007,325

Removals by category and by species were as follows:—

Category	*P. radiata* cub. ft.	*P. pinaster* cub. ft.	Total cub. ft.
Sawlogs	832,602	746,365	1,578,967
Particle Board Logs	....	313,249	313,249
Peeler Logs	73,822	....	73,822
Fence Posts	....	22,395	22,395
"Woodwool" Logs	....	11,953	11,953
Poles	....	6,939	6,939
Total	906,424	1,100,901	2,007,325

A parcel of pine case logs on the log deck leading to a Metropolitan case factory.

To supplement supplies of case material, these pine flitches or baulks, are cut at a mill near Busselton and air-dried before railing to the case factory in Perth.

Compared with the previous year there was a small increase in the production of sawlogs, while supplies of fence posts, woodwool logs and poles, although relatively small in quantity, practically doubled. Production of particle board logs and peeler logs both decreased slightly. However, the establishment of a second particle board plant in the Metropolitan area is expected to result in a sharp rise in the supply of these logs in the near future.

Roundwood removals from the various plantations were as follows:—

	Cub. ft.	Cub. ft.
Wanneroo (Gnangara)	....	179,202
Metropolitan	....	386,230
Somerville	260,102	
Collier	116,048	
Scaddan	10,080	
Mundaring	....	456,878
Kelmscott*	....	9,399
Harvey	....	202,370
Myalup	110,065	
Harvey Hills	84,210	
Hamel	8,095	
Collie	....	10,363
Kirup (Grimwade)	....	233,130
Nannup	....	656
Busselton	....	512,789
Keenan	304,982	
Ludlow	207,807	
Manjimup	....	1,963
Pemberton (Pimelea)	....	14,345
		2,007,325

* Includes Gleneagle and Carimgah

Sawn Production

The total sawn production from all sources was 603,284 cubic feet, an increase of 20,702 cubic feet on last year's figure. A rise in board production accounted for most of the increase.

Sawn production by species was as follows:—

P. radiata	318,151 cub. ft.
P. pinaster	284,133 cub. ft.
	603,284 cub. ft.

Usage of Plantation Grown Pine

Local pine is in strong demand and finding an increasing usage in the W.A. economy. More than half was used in the case, packaging and crating industry, for a wide variety of produce, including:—

fruit (including export pears and grapes),
bananas,
vegetables (including exports to Singapore),
beer,
soft drinks,
tinned foods,
eggs (including export),
crayfish (for export),

and sundry items of hardware and machine parts for transport to the North-West.

Larger sawlogs yielded material for:—

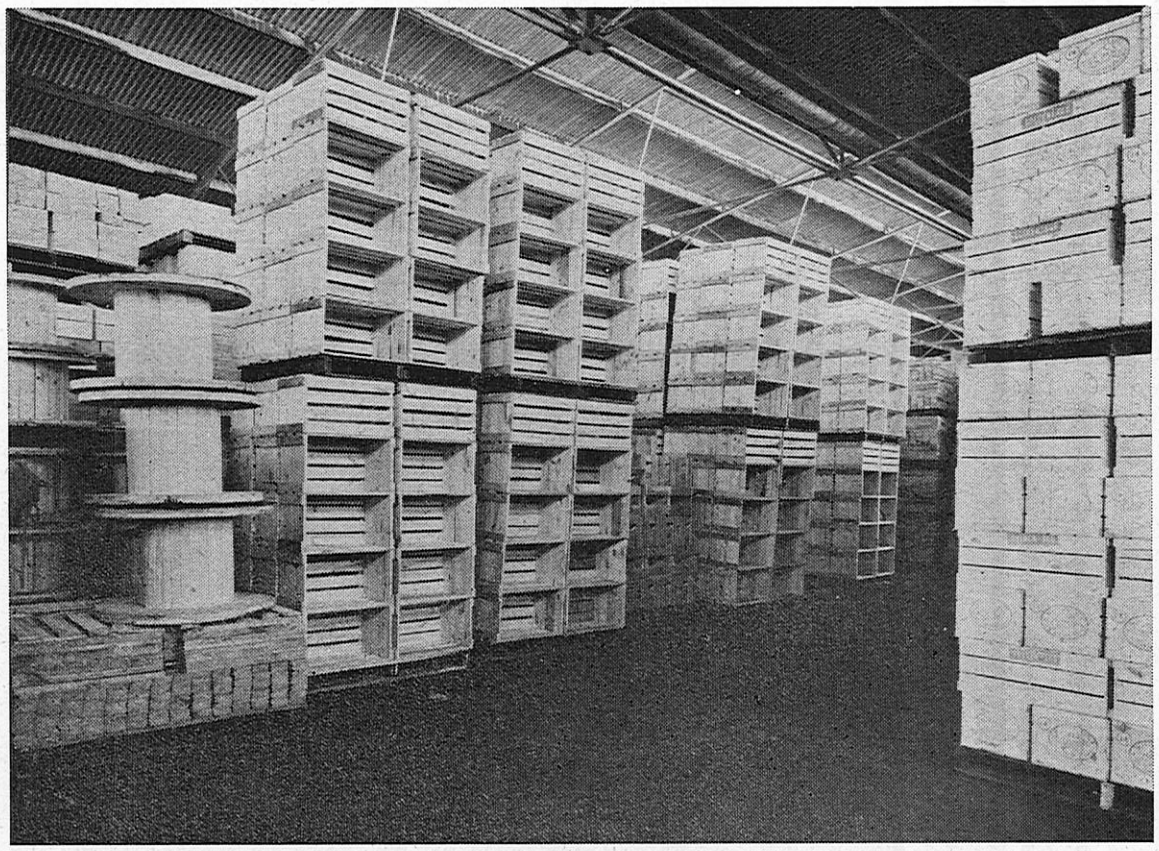
furniture and fittings,
insulated lining of cool rooms,
concrete form work,
"fill" for cooling towers for S.E.C. power stations,
T. and G. boards for interior lining of railway vans,
transportable buildings.

The largest logs available were mostly used by the plywood industry, where much of it was converted to multi-ply flooring in 4 ft. 6 in. squares.

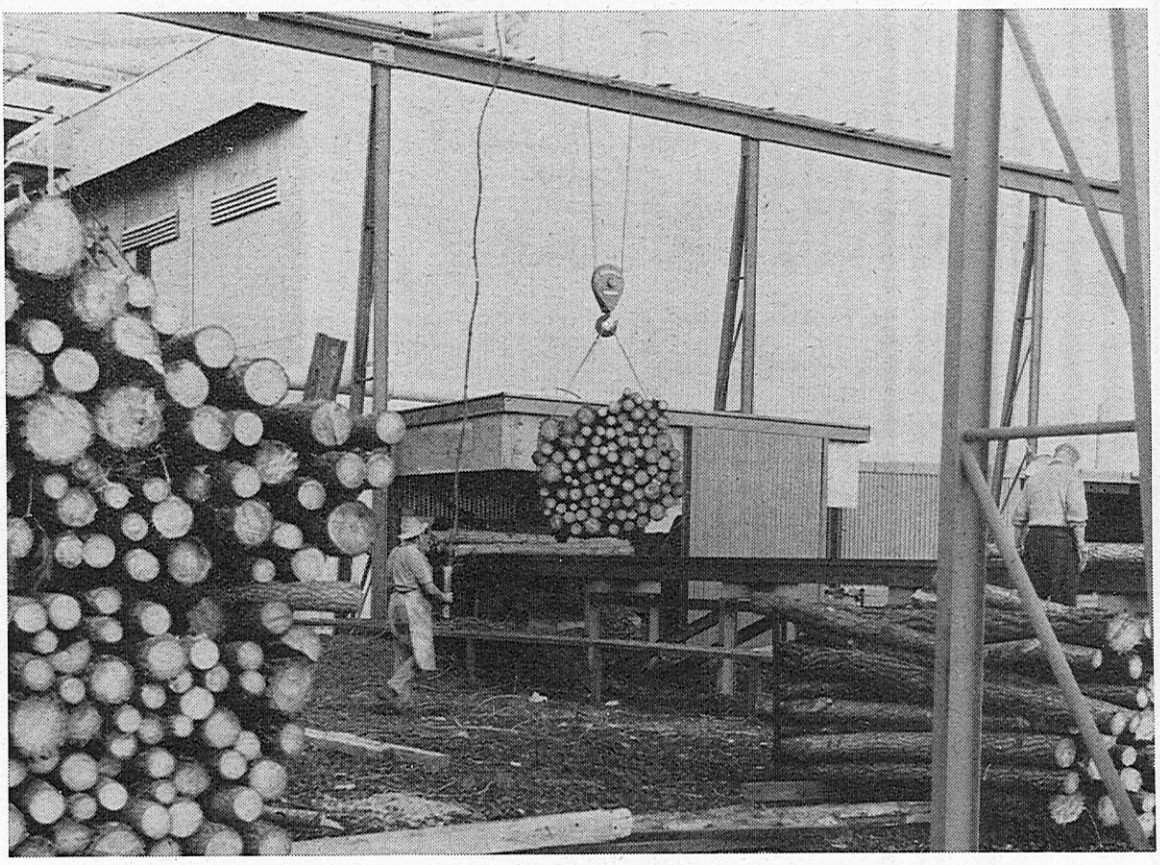
Small dimension logs, mainly less than 4 in. diameter, were supplied in quantity for production of particle boards. Much greater supplies will be consumed in future following the recent opening of a new plant at Kewdale.

Other uses of some significance were:—

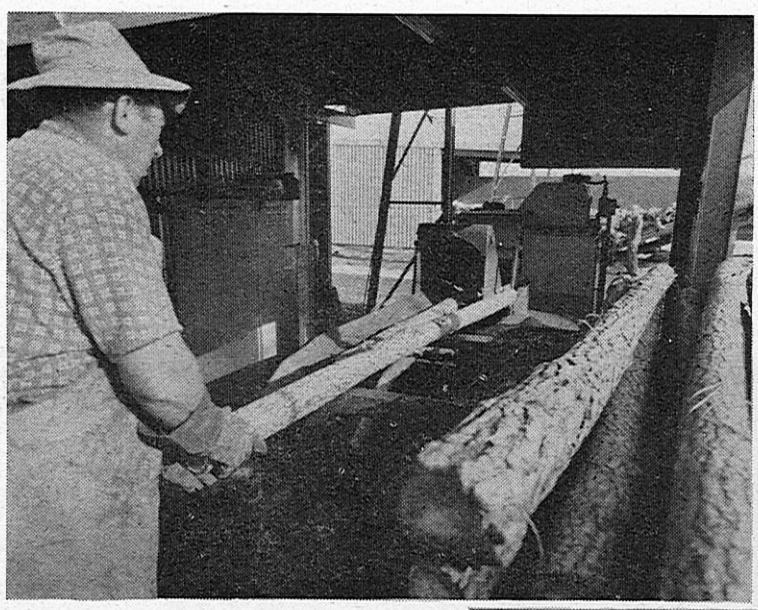
Fence posts to two wood preservation plants.
Lightweight poles for pearl culture rafts.
Woodwool for packing and for production of cement board building sheets.



Some of the end products from pine case logs and flitches.
As well as cable reels, the photograph shows various cases and crates for the packaging of such produce as eggs (export), fruit, vegetables, fish and mineral waters.

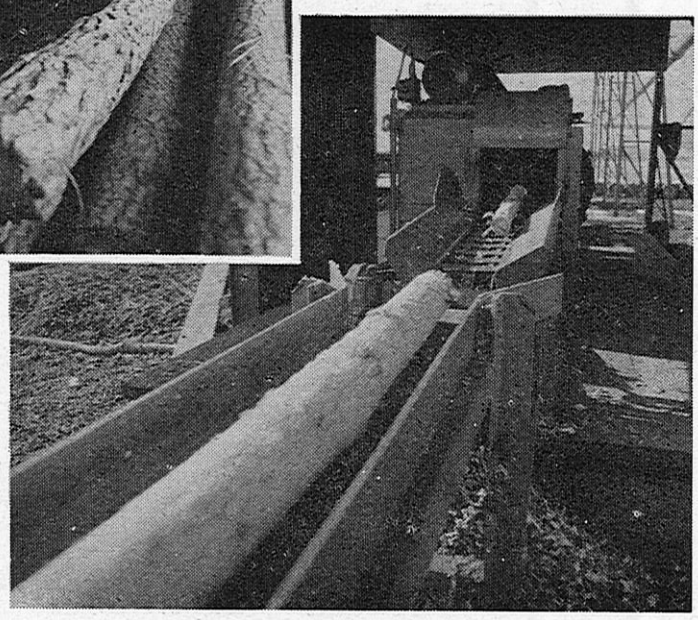


Small logs of *Pinus pinaster*, some down to 2.5 in. underbark crown diameter, at a particle board factory in the Metropolitan area.



(Above) A small particle board log entering the de-barking machine.

(Below) A de-barked log on its way to be docked prior to entering the flaking machine.



Mallet Plantations

No further plantings took place and the total area of plantation remains at 19,111 acres.

During the year, thinnings from plantations yielded 82 tons of mallet bark.

Inland Arboreta

No new aboreta were established and work in the 1966 planting season was confined to extending and /or refilling existing sites.

Planting and Survival

Favourable planting conditions were experienced and initial survival was very good, except for one plot near Merredin which was submerged by a flash flood. However, in the wheatbelt, a particularly dry summer followed, and overall survivals were reduced to 87 per cent. as compared with 92 per cent. the previous season. New plantings gave better survival than refills.

The effect of the severe summer on older trees was also noticeable, quite a number dying out, especially where soils were shallow and moisture reserves had been depleted. Where the initial spacing had been close, the situation was aggravated, and this could explain why many trees planted several years ago in the Ballidu Greater Sports Council Grounds showed signs of great stress towards the end of summer with a number of deaths resulting.

Maintenance

Normal maintenance by the mobile unit was carried out during spring, 1966. The four arboreta in the isolated area of Boxwood Hills some 20 miles south of Jerramungup, were maintained by interested farmers on whose properties they are established. The assistance of these enthusiasts, the Department of Agriculture, and a number of Local Government bodies in maintaining arboreta is greatly appreciated.

School Arboreta

The Shackleton school which started an arboretum last year, had very good results and more trees have been supplied for planting this year.

The Junior Tree Society is interested in this project and it is expected that more schools will avail themselves of the opportunity to establish arboreta.

Insect Damage

Borers in young trees occur in most localities and can cause considerable damage especially around homesteads where trees are needed most. Some promising results have been obtained by breaking open the borer nests and spraying them, the surrounding bark, and the base of the tree with 0.5 per cent. dieldrin solution.

Salt Area Investigation

Two plots have been selected at the Avondale and Wongan Hills research stations respectively, to study the effects of tree growth in areas where salt is showing along creeks and in low lying ground. The Department of Agriculture has undertaken to provide labour and machines to prepare the sites and to attend to all maintenance requirements. Both plots have now been planted.

General

It is eighteen years since the first arboreta were established in the wheatbelt. As these trees and those of later plantings develop, increasing information becomes available as to the suitability of the various species for the particular soil and climatic conditions. Results to date show that, in addition to the popular species being supplied from our nurseries, the following trees have shown adaptability to a variety of soils in the drier areas :—

Euc. platypus var. *heterophylla* (Coastal Moort).
Euc. redunca var. *melanophloia* (Black-barked Marlock).
Melaleuca pubescens (Rottnest Island Tea-tree).
Casuarina dielsiana.
Pinus halepensis (Aleppo Pine).

Tree Nurseries

In 1966, the Hamel and Dryandra nurseries supplied 180,533 young trees to private buyers on farms and in country towns. Although the total was some 37,000 below last year's record figure, distribution to wheatbelt areas from the Dryandra nursery increased by over 8,000 plants.

Once again the popular species were River Gum (30,437 distributed), Dwarf Sugar Gum (9,614), Sugar Gum (9,523), Bald Island Marlock (8,443), Tuart (7,869), Tasmanian Blue Gum (5,388) and Coral-flowered Gum (4,969). It is interesting to note the increasing demand for Bald Island Marlock (*Euc. lehmanni*), a fine bushy low windbreak tree particularly suited to the Esperance Downs region.

The distribution of plants from each nursery is summarised as follows :—

Nursery	Number of Plants Sold			Departmental Use		Number Species
	Potted Stock	Tray Stock	Open Rooted Stock	Pines	Other	
Hamel	62,043	11,524	45,842	107,347	79,522	175
Dryandra	54,024	6,600	....	82	2,551	93
Total	116,567	18,124	45,842	107,429	82,073	....

In addition to the foregoing, 57,050 pines were sold to the public from plantation nurseries, which also supplied 2,457,250 pines and 20,525 other species for Departmental use.

Seed Supplies

Sales of seed to Australian and overseas buyers were valued at $6,211, an increase of $676 on last year's figures.

Seed supplies for the north-west of the State, which the Department handles on behalf of the Department of the North-West, are increasing and seed of 117 species are now held in store.

During the year seed was supplied free of charge to 34 approved schools.

At the end of the year the value of all seed held in store was $26,740.

8. PROTECTION

Fire Protection

State Forests under Protection

Indigenous Forest	4,384,923 acres
Pine Plantations	48,833 acres
Mallet Plantations	19,111 acres

The Fire Season

Figures given are for the Forest Weather Stations at Dwellingup (Jarrah) and Pemberton (Karri).

	Jarrah	Karri
Rainfall	Generally below average except for April.	Generally about average except October, November, which were slightly above.
Temperature	Generally above average. Mean maximum, 78 degrees. Highest Maximum, 103 degrees. 43 days above 90 degrees. 3 days above 100 degrees.	Above average. Mean Maximum, 76 degrees. Highest Maximum, 104 degrees. 12 days above 90 degrees. 1 day above 100 degrees.
Relative Humidity	2 days below 10 per cent. 10 days between 11 per cent. and 15 per cent. 65 days below 25 per cent.	3 days between 11 per cent and 15 per cent. 23 days below 25 per cent.
Fire Hazard	19 days dangerous. 29 days severe summer. Mean Hazard, 5.5. Mean for all seasons, 5.5.	2 days dangerous. 14 days severe summer. Mean Hazard, 4.9. Mean for all seasons, 4.4.

Controlled Burning

The season started early but autumn was generally too hot for safe burning and early rains cut the season somewhat short.

Aerial burning was continued on an experimental scale and approximately 188,000 acres were burned by this method.

A total of 894,154 acres were burnt compared with 735,179 last year.

Prescribed burning—	Acres
General	851,251
Advance Burn and Top Disposal	42,903
	894,154

Detection

A cabin on the TV Micro-wave tower on Mt. Lennard was brought into the detection network for the first time this year and gave excellent coverage.

Arrangements are in hand to improve the coverage for some of the new pine plantations, where very early detection is essential.

Generally the detection system was adequate throughout the year.

Manning of Towers—

	Jarrah	Karri
First Watch	7/10/66	2/11/66
Last Watch	12/4/67	11/4/67

Communications

The V.H.F. radio network gave satisfactory communication during the year.

Extension of S.E.C. Mains throughout the South-West is giving rise to increasing incidence of A.C. noise in the earth-return telephone system. However, the installation of metallic circuits leading out of settlements and the hiring of P.M.G. private lines are overcoming this problem.

Fires and Fire Damage

The total number of fires attended by Departmental gangs during the season was 365 compared with 214 last year and an overall average of 350.

The following table sets out fire causes for the season:—

Escapes from Settlers' burning	83
Deliberately Lit	64
Escapes from Prescribed Burning	52
Travellers and Hunters	34
Children	22
Householders	16
W.A.G.R. Locos	15
Mill Surroundings	12
Bush Workers	7
Lightning	6
Rubbish Tips	5
Tractors	4
Other Government Employees	3
Mine Surroundings	2
Miscellaneous	2
Unknown	38
	365

Escapes from settlers' burning operations were the greatest cause of fires requiring Departmental action with a total of 83 or 23 per cent. which is about average for past years, but below the figure of 27 per cent. for 1965–66.

Sixty-four fires were classed as deliberately lit, 17 per cent. of the total fires and this figure is about average. Of these, 31 were in the Collie Division and 11 at Pemberton but there did not seem to be any fixed pattern of lighting in either Division and some of the fires could have been due to carelessness on the part of travellers.

Hunters and travellers caused 34 known fires, or 8 per cent. as against 10 per cent. last year and 20 per cent. the year before.

The total area burnt was 5,901 acres made up as follows:—

	Area (acres)
Pines—salvageable	20
Pines—scorch only	7
Protected indigenous forest	5,784
	5,901

Date of first fire—22/8/66.
Date of last fire—23/4/67.

During the year Departmental gangs were largely responsible for saving eight houses from bush fires and assisted at two major fires that threatened Northcliffe and Kalamunda.

Public Relations

Public relations generally remain good and continues to improve.

As far as possible all meetings of bush fire control officers and fire advisory committees are attended by Departmental officers; a number of co-operative control burns were carried out in conjunction with local fire brigades and a number of training courses were held for local brigades.

To reach the general public some fire fighting demonstrations were held and patrols made of popular fishing and picnic spots.

Protection from Insects

Sirex

Although no evidence of attack by the Sirex Wasp has been found in the pine plantations of Western Australia, this State co-operates with other States in their research activities.

Early in 1967, a Conference on Sirex attended by Commonwealth and State Ministers responsible for forestry, was held in Melbourne. The meeting felt that the research work and control measures undertaken so far had been money well spent and that the work should be continued. It was agreed that the government and private forestry contributions to the Sirex fund should continue for a further year.

Jarrah Leaf Miner

Severe damage in recent years to the foliage of jarrah over extensive areas on the eastern fringe of commercial forest, has again drawn attention to the small insect (moth) known as jarrah leaf miner.

During autumn the female moth lays its eggs in the leaf and the larvae which develop eat out the leaf tissue. When severe infestations occur almost complete browning of the crown results from this action. After about three months the larvae emerge by cutting typical oval-shaped holes in the leaf, drop to the ground and bury themselves half an inch or more in the soil where they pupate over the summer months. The habit of burrowing into the ground appears to protect the insect from all but very hot fires.

The insect, as yet un-named, has been recorded since 1914, and first attracted serious attention in 1920 when an outbreak in Kings Park, Perth, led to its investigation by entomologists. Since then other outbreaks have occurred from time to time, particularly on the coastal strip between Perth and Bunbury and on the southern coast between Albany and Denmark. It has been reported from the Murchison River in the north, to Augusta in the south, and east to the Stirling Range. In the 1920's it was recorded as far inland as Merredin and Westonia.

The heavier infestations are on jarrah and flooded gum (*Euc. rudis*), although small numbers of the insect have been found on york gum (*Euc. loxophleba*), coastal blackbutt (*Euc. todtiana*) and several other eucalypts. None have yet been collected from karri or marri. However, there is no proof that the same species of leaf miner is responsible for all these infestations.

Since 1959, an entomologist of C.S.I.R.O. has been making a survey of this insect and its damaging activities, and a second officer will be posted to Western Australia shortly. Working in close collaboration with the C.S.I.R.O. officer is a forest entomologist appointed in 1965 to the entomology branch of the State Department of Agriculture.

So far, control measures using stem injection of systemic insecticides have been demonstrated as possible on very small trees, but are well beyond the scope of practical use in commercial forest. Trials in early June, 1967, with aerial spraying of systemic insecticide (di-methoate) at six different strengths per acre, showed that only the maximum concentration gave significant results and were clearly outside the range of economic usage.

The present concentration of research into all aspects of the jarrah leaf miner and its effect on the commercial forests of Western Australia should lead to a much better understanding of the factors involved, and the possibilities of minimising the activities and effects of this forest pest.

Die-back in Jarrah Forest

The term " die-back " has been applied to mortality occurring in parts of the jarrah forest. Small isolated areas of die-back have been observed and reported from time to time since the early 1920's but until relatively recently were not recognised as a problem of significant proportions.

The disorder usually causes a deterioration in crown vigour resulting in the eventual death of the tree. The process may take a few or several years, and more rarely, death may be sudden from an apparently healthy condition. All age and size classes are affected and the disorder has reached its major development in cut-over areas of average to low quality forest, particularly in the heads of shallow gullies. However it has been reported in stands of better quality and in virgin forest.

Investigations into the disorder have been carried out by the Forests Department for the past 20 years, but many lines of investigation failed to give a satisfactory reason for its presence. Since 1960 officers of the Commonwealth Forest Research Institute in this State have been working on the problem and some two years ago fairly conclusive proof was demonstrated that the root-rotting fungus *Phytophthora cinnamomi* was the causal agent.

Since then research activity has greatly expanded, aimed at the prevention of spread of the disorder and the rehabilitation of affected areas. Further specialist staff are being sought, new lines of investigations studied and contact maintained with other countries where the pathogen has been reported as widespread.

Practical field work covers many aspects and includes the location and mapping of affected areas, the controlled logging of such sites to reduce the chance of infection of non-affected sites, and other quarantine measures such as restrictions on the siting of gravel pits for road-making. Pot trials are being carried out to test the resistance of other local species to the fungus and large scale field trials of well-known tree species have been established on affected areas to test their survival potential.

9. RESEARCH

PINE SILVICULTURE

Pinus Pinaster Plantations

Tree Breeding

Grafting.—A total of 188 grafts from six "plus" phenotypes required in the scion arboreta were completed and planted out during the year. All phenotypes selected for the second seed orchard are now established in scion arboreta and grafting for this objective will commence in 1969.

Thirty grafts from each of 16 phenotypes selected for extreme bole defects were also made in September. This material is required for a clonal trial to evaluate inheritance of bole spirality, forking and growth suppression.

Phenotypic Description—Information relating to all plus trees has been recorded within an improved card reference system. Data covering spiral grain, specific gravity and wood fibre length for core samples of the 85 phenotypes selected in Portugal have been obtained from C.S.I.R.O. Forest Products. Complete details of the Portuguese selections will be published in a bulletin at present in press.

Progeny Testing—Twenty thousand tubed plants of full-sib origin (Portuguese), half-sib selections from France, and 7 Corsican provenances were germinated at Wanneroo during the year. Severe losses from the fungus *Macrophomia phaseoli* occurred in the full-sib stock.

Progeny trials planted in 1967 included 14 full-sib groups, 32 half-sib Landes groups and seven Corsican groups. Basic trial design consisted of 10 tree line plots with 10 replications per centre and 20 progeny groups per trial. Trials were established on four different site types. An early season enabled planting to be completed in June.

In the winter of 1966 progeny trials were established in three locations. Thirteen full-sib groups and the final half-sib groups of trees selected in Portugal were included. Sixty-two of the Portuguese selections have been included in replicated progeny trials.

Seed to test 35 full-sib progenies is available for 1968 field tests.

Controlled Pollination.—A total of 760 cross-pollinations incorporating 29 cone parents and 12 pollen parents were made under exclosures in 1966. Take is in the vicinity of only 60 per cent., the lowest recorded to date. The abnormal results can only be attributed to seasonal conditions. Hand pollination of the Joondalup seed orchard was again carried out in 1966.

Seed from 50 crosses, grossing 1,842 gram. weight, was collected from the Neaves Road Arboretum in November.

Provenances.—Provenance groups from Tunisia, Corsica and France were planted out during the past year. A pot trial comparing the drought tolerance of Tunisian and Portuguese origin revealed that survival following droughting was comparable in the two groups and greatly superior to that of *P. radiata*.

Portuguese Selections.—A total of 1,055 grafts representing 78 of the phenotypes selected in Portugal, have been successfully established in the field. Of the seven phenotypes which failed in the grafting programme, six are included in the comprehensive half-sib progeny trials. All selected trees but one can hence be evaluated within Australia.

Grafting of the Portuguese selections was, of necessity, carried out during the lengthy period they were held under quarantine in the glasshouse. As a result, the field grafts are generally spindly, with few buds. Buds for scion distribution will not be collected until 1968.

Details of the importation project will be disseminated to all interested parties in a bulletin at present in press.

Investigation of Potential Planting Country

The investigation of pine planting potential north of the existing plantation on the coastal plain is now finalised.

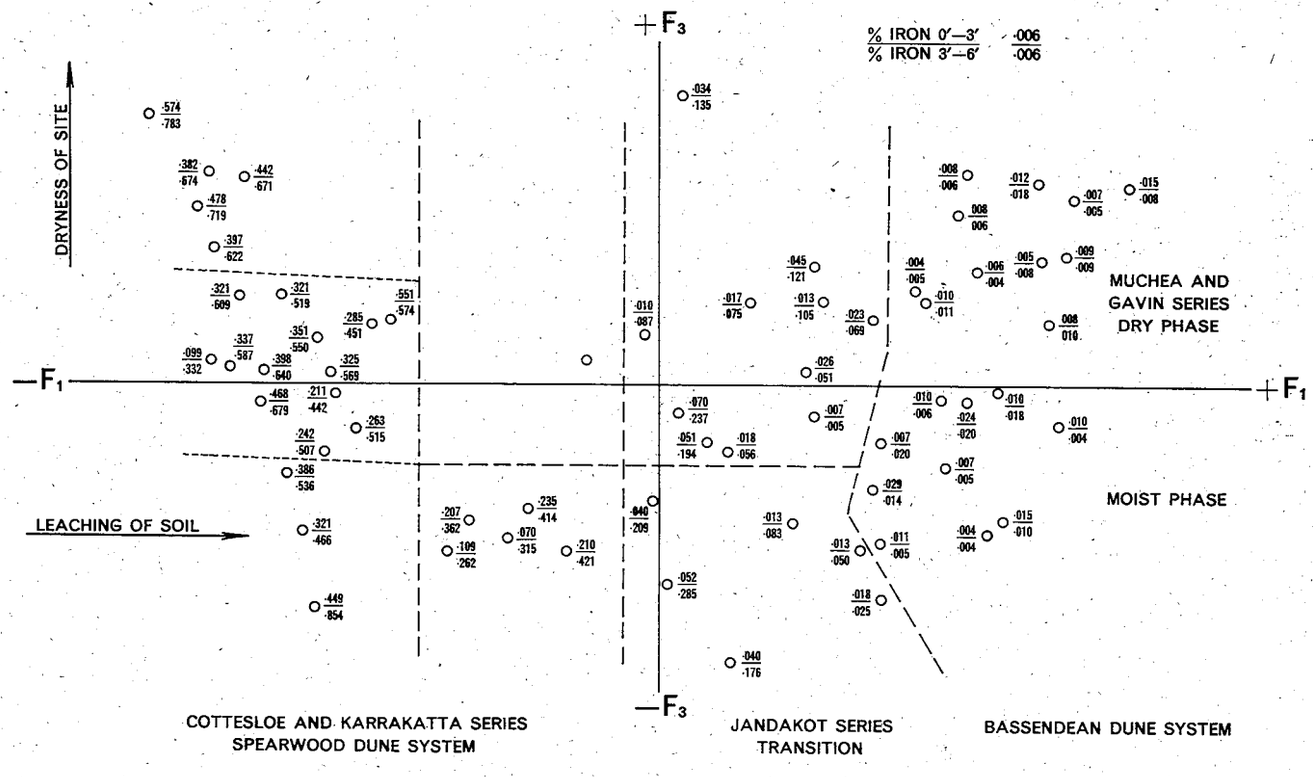
The ecological data accumulated over the past two years were analysed using the factor analysis method, programmed for use on the P.D.P. 6 electronic computer at the University of W.A. The analysis resulted in a two-dimensional frame work, related to the degree of soil leaching and moistness of the site. (Fig. 1)

It is revealed that the initial growth is strongly dependent on the moistness of the site on the strongly leached sands of the Bassendean Dune System, but is relatively independent of it on the Spearwood Dune System. The analysis also revealed a number of reliable plant indicators which can be used to assess the combination of environmental conditions and the pine planting potential of each site. These were tested to assess their efficiency in predicting pine growth potential, and were found to be highly reliable and informative.

TABLE 1—PINE STAND CHARACTERISTICS AT AGE 15 YEARS

Vegetational Type (By Indicator Plants)	North Kendall, Gnangara			
	Top Ht. Ft. (Tallest 30 Trees/Ac.)	Basal Area (Sq. Ft./Ac.)	Volume (Cu. Ft. per Ac.)	Proportion of Defective Stems
				Per cent.
Hypocalymma angustifolia	35.25	70.00	424.3	23.8
Hypocalymma—Xanthorrhoea	43.04	102.50	1312.4	19.6
Xanthorrhoea—Dasypogon	46.21	112.46	1582.5	11.7
Scholtzia—Leucopogon conostephioides—Eremea pauciflora	33.36	68.33	437.0	3.3
Astroloma xerophyllum, *Acacia sphaccellata*	33.68	58.17	459.6	0.0
Mesomelaena stygia, *Conostylis candicans*	38.71	88.57	865.6	2.7

PERCENTAGE IRON IN SOIL AS INDEX OF LEACHING AND SOIL SERIES



Soil characteristics of pilot plots, plotted within the co-ordinate framework established by factor analysis.
F1 corresponds to degree of leaching undergone by the soil.
F3 to moistness of site. The numbers represent percentage of Iron in the soil, the top figure of the fraction referring to depth of 0-3ft., the bottom figure to 3-6ft.

On the basis of these investigations, the dry, strongly or moderately leached sites within the Bassendean Dune System and its transition to the Spearwood Dune System, with five year height intercept of less than 14 ft., appear to offer little prospect of successful plantation establishment.

Additional work was carried out on sites giving satisfactory growth rates but subject to other problems. They are the sites subject to periodic flooding due to high water table, and the sites subject to summer drought deaths. These sites, on which many seedlings die in the early stages of establishment and the remaining trees are frequently of poor form, were defined both in the terms of soil moisture regime and of plant indicators.

The summer drought death incidence was found to result from an imbalance between spring growth potential and summer moisture reserves. (Fig. 2)

The contributing factors appear to be a high colloidal content of surface soil, proximity to limestone out-crops, increasing evapo-transpiration and decreasing rainfall, and high stocking per acre at the time of canopy closure. Two large experiments have been established to study the relationship between site factors, density of pine stands and the resulting moisture patterns.

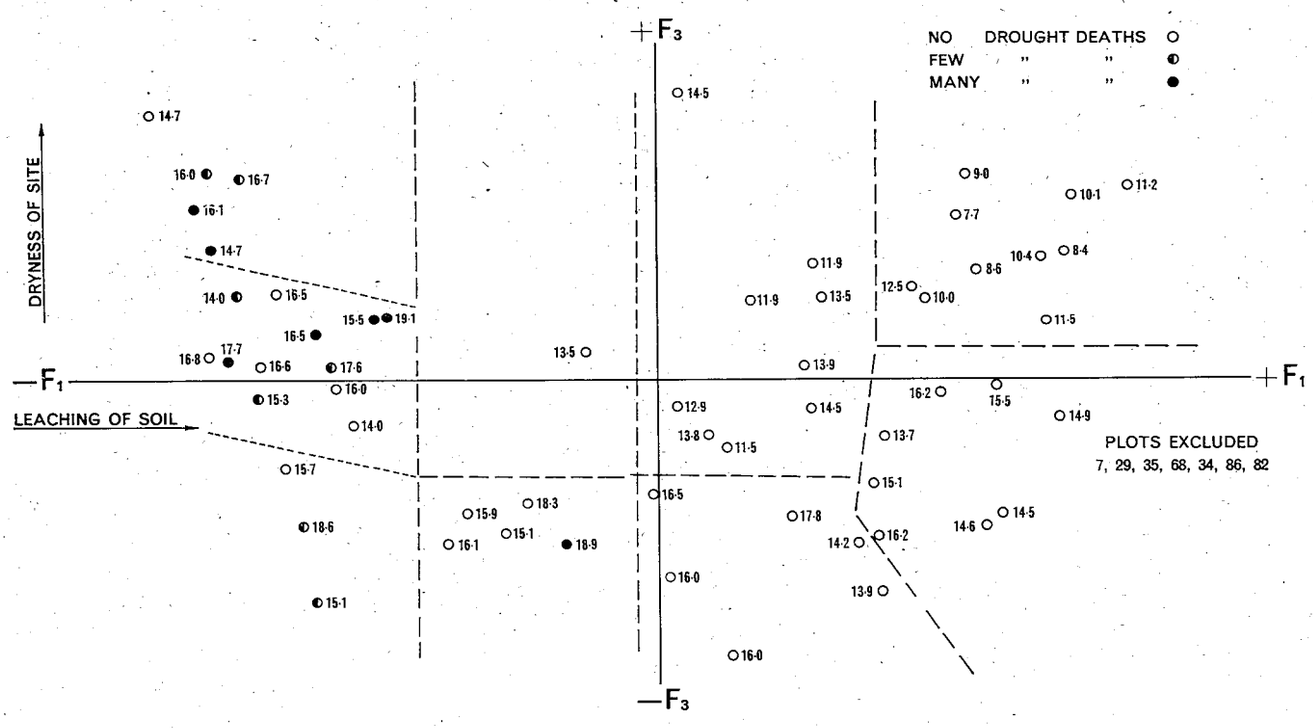
Nursery Investigations

A continuous nursery stocktake, programmed for computer analysis, was carried on throughout the year. The final seedling harvest was carried out in June 1967, but final analysis is incomplete. Earlier data suggested marked differences due to seed stratification and percentage of organic matter in the soil.

Nursery experiments studying the effect of soil sterilization by formalin, of sprinkler irrigation, and of various combinations of fertilizers, indicate that the size of seedlings and their root development can be greatly improved as compared with existing techniques. However, remeasurement and reassessment of experiments on the size of planting stock indicates that there is a definitie limit to the size of stock for machine planting on the coastal plain. Very large plants are given an undesirable slant during planting out and are slower to recover.

Weedicide experiments completed in the current year indicate that adequate weed control of all weeds other than couch grass (*Cynodon dactylon*) can be achieved by mineral spirits, Dacthal and Simazine, to which *Pinus pinaster* seedlings are relatively tolerant.

FIVE YEAR HEIGHT INTERCEPT AND DROUGHT DEATH INCIDENCE



Five year height intercept and drought death incidence in pilot plots, plotted within co-ordinate framework established by factor analysis.
F1 corresponds to degree of leaching undergone by the soil.
F3 to moistness of site. The numbers represent the height intercept, the colouring of the circles represents the severity of summer drought deaths in 1967.

Pinus Radiata Plantations

Tree Breeding

A total of 293 successful grafts were obtained from phenotypes of *P. radiata* selected from failed plantation areas. The phenotypes were selected on the basis of exceptional vigour within the failed stands and constitute the commencement of a selection programme for species establishment on marginal sites.

All were tip grafts and the year's programme provided average successes of the order of 80 per cent. This result is exceptionally good considering the general low vigour of the parent trees.

Thinning

The major project completed during the year has been a comprehensive thinning trial based on basal area control at the time of first commercial thinning. Four levels of basal area are being tested with eight replications of each level. In addition, the complete project is duplicated on a high quality site at Mungalup and on a low quality site at Grimwade. A total of 64 fifth-acre plots was required. A complete volume measurement was carried out, each of the 6,100 trees on the plots being measured underbark at breast height and 15 feet, together with total height. Volumes will be calculated with the new W.A. tree volume table. It is planned to carry out a complete volume remeasurement every two years.

A computer programme to process the data on the W.A. University PDP—6 computer has been written and is now operational.

Some sectional tree volume measurements were carried out on trees felled on these plots for use in compilation of the new tree volume table.

A pre-commercial thinning project has been established at Bussells Brook to study the effect of thinning at age 6 on crop volume and value yield. Eight fifth-acre plots thinned to 300 stems per acre are being compared with eight plots held at planting stocking and subjected to the normal commercial thinning regime.

Pruning:—

Two long term pruning experiments have been established:—

(a) A low pruning project at Brunswick plantation to investigate the effect on tree growth of pruning to 7 feet at ages 4,5 and 6 against a control unpruned until the lower branches have died off. Plots of 0.05 acre each are used in randomised blocks with six replications of each treatment.

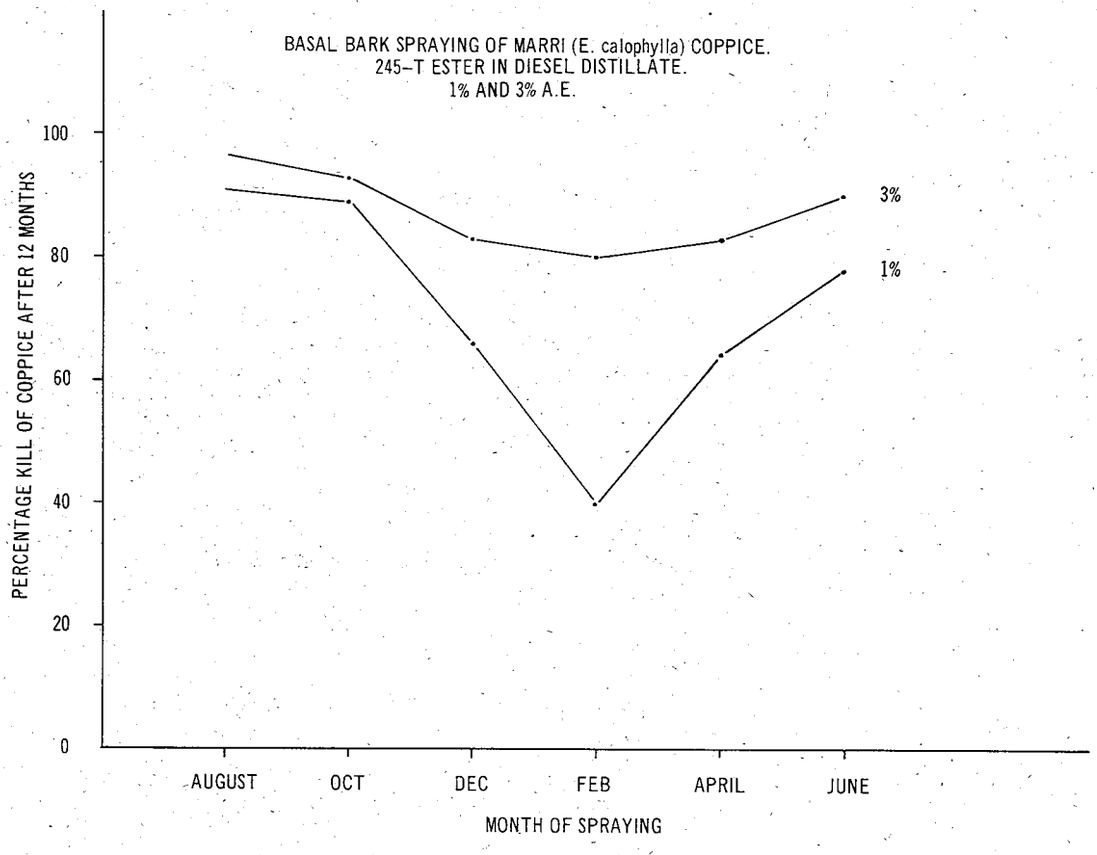
(b) The high pruning project at Bussells Brook, studies tree growth under three levels of pruning—15 feet, 22 feet and 30 feet—against controls not high pruned. In addition, these treatments are imposed on three theoretical core sizes—3½ inch, 4½ inch and 5½ inch diameters. Single tree plots are utilised with 30 replications of each individual treatment.

Weed Control

Work in this field continued during the year but is still far from complete. At this stage it appears that 245—T ester is still the best all-round herbicide for scrub and coppice control, both from the economic and biological viewpoints. The emphasis in this field has now shifted to the development of reliable field techniques.

There have been very pronounced seasonal variations in herbicidal efficiency, best results being obtained in the spring between August and October. The variation in percentage kill of a basal bark spray experiment is shown in Figure 3.

FIGURE 3.



Species Trials

The first planting in the new arboreta will take place at Collie and Nannup this winter. Over the next 4-5 years some 40 new conifer species will be introduced to W.A. on a range of sites.

JARRAH SILVICULTURE

Thinning Research

Routine measurements were continued on two large thinning trials in pole stands. Additional plots were established in areas thinned eight years ago to determine the period between thinning and maximum growth response of the stand. The results gained to the present indicate that the growth rate of individual trees is still increasing two years after thinning but has probably reached its peak by eight years in heavily thinned stands where the stocking had been reduced to 45 sq. ft./acre basal area.

The laying down of a thinning trial in 13 year old pole stands was completed during the year. The object of the trial is to determine the effects of heavy, early thinnings on taper and the height of crown break.

Thinning Technique

Refinements of the injection method of applying hormone poisons in non-merchantable thinnings are still being developed. Current practice is to inject the tree at five inch intervals round the stem. Using picloram, it has proved possible to kill jarrah poles up to 24" girth breast height (gbh) with only one injection of poison. Two injections are required for trees between 24" and 36" gbh.

Effect of Seeding on Stand Increment

Heavy flowering in summer 1965/66 and a heavy seed crop in summer 1966/67 indicated the occurrence of a seed year in the northern jarrah forest. Routine annual measurements of pole thinning plots disclosed a greatly reduced stand increment associated both with flowering and seeding. The figures below are a summary from 8 quarter-acre, thinned plots.

Year	Basal Area Increment (Sq. Ft/Acre)	Remarks
1962–63	5.2532	Normal year
1963–64	3.0356	Normal year
1964–65	4.0940	Normal year
1965–66	2.0364	Flowering
1966–67	1.6664	Seeding

The research implications of these findings are that short term estimates of growth rates must cover a complete seeding cycle to give a reliable figure.

Thinning Pile Stands

A series of trial plots has been established to determine the growth rates of pile and small veteran-aged jarrah at various stockings.

Silviculture Systems

Two plots, of six and fifteen acres, respectively, have been converted to stands to be managed as a two storeyed high forest, and a group selection forest. A rapid conversion to a group selection system was effected by selecting an uneven-aged forest area in which the various girth classes were already present in groups. The stand was reduced to 80 square feet/acre basal area and the number of trees in each 1 foot girth class was reduced to a predetermined level.

Fertilizer Trials

A series of investigations has been started to determine the response of jarrah to the application of artificial fertilizers. The response of a crop of planted seedlings to a range of NPK mixtures was very marked. Both height and diameter increment was doubled in the two years, following an application of 2oz. NPK per plant. The effect of N, P, and K on pole stands is also being investigated.

Species Trials

The establishment of a wide range of hardwood and softwood species on unproductive jarrah forest sites has been proceeding for two years. A total of 53 species has been established in plots of between one sixth and one tenth of an acre. Among the softwoods, *Pinus elliottii* and *P. taeda* are easily established and are growing well, as also are *Callitris calcarata* and *C. glauca*. Of the Eucalypts, *E. sieberi* is outstanding with a second year height increment exceeding seven feet.

Jarrah Die-back Studies

Investigations into the die-back disorder of jarrah, associated with *Phytophthora cinnamomi*, continue to expand.

The association of new infections with moister sites within the forest has been established. Extensive inoculation trials, both in the laboratory and in the field, are now being established. They are to determine the relation of inoculum potential, soil type and soil moisture to the ability of the fungus to establish an infection.

The rate of spread of established infections is being plotted on a wide range of site conditions.

Attempts at control of the spread of established infections include trenching, and creating a band of soil free of live roots. The effect of the destruction of the forest understorey on the rate of spread of the fungus is also being studied.

Rehabilitation of diseased areas is being approached from three aspects. The effect of clearing and ground preparation on *P. cinnamomi* populations in the soil is under investigation. A series of species trials on infected areas is aimed at testing their susceptibility to *P. cinnomomi* under field conditions. Trials are also being conducted in methods of direct seeding *Pinus pinaster*. Investigations are directed toward methods of scrub control and mycorrhizal inoculation of the pine seed.

Karri Blossom and Seeding

Blossom

In two successive years, 1965–66 and 1966–67, karri produced a bumper blossom crop of three million flowers to the acre, by far the heaviest since 1953–54. The blossom was most abundant between September 1965 and August 1966.

Largely due to the honey flow from the karri forest, honey production for Western Australia for 1965–66 was 10,922,628 lb. This was more than double the average production for the previous ten years, and exceeded that of any other State.

Seed Supplies

The current crops are the heaviest since 1956 and seed supply for natural regeneration should be no problem during 1967 and into 1968. At present, prepared seed beds are covered with tens of thousands of germinants per acre. The highest yields for seed collection are expected during the winter and spring of 1967.

Pollination to Increase Seed Production

Investigations were commenced in 1965–66 to determine the effects on seed production of; thorough pollination by the agency of bees; exclusion of all insects from pollination; artificial cross-pollination; artificial self-pollination.

The experiments, for both summer and autumn blossom in 1966–67, gave the following results:—

(i) Artificial cross-pollination yielded the highest production—4.0 seeds per capsule in one instance.

(ii) Pollination with bees produced about 2.0 seeds per capsule.

(iii) Artificial self-pollination gave only 1.3 seeds per capsule.

(iv) The exclusion of all insects gave the lowest yield—1.1 seeds per capsule.

The above figures compare with an average yield in 1963 of 1.5 seeds per capsule and indicate the importance of using bees for increased seed production, particularly during periods of lean blossom.

Observations by apiculturists and officers of the Department of Agriculture, who assisted in these experiments, showed that the activity of the honey bees decreased with the onset of cool weather in May, 1966, even though the trees were still flowering heavily.

Early Thinnings in Karri Regeneration

The diameter growth of karri regeneration thinned at age one and two years has, after four years, shown an increase of nearly fifty per cent. over that for unthinned controls.

In 1962, fifty-four 1/40th acre plots were established, twenty-six in two-year-old regeneration and twenty-eight in one-year-old. Half the plots were on ashbeds and the others on mineral soil off ashbeds. The seedlings were thinned to nine stems per plot by foliar spraying with 2,4,5-T.

In 1966, measurements of the five largest trees in each plot were compared with those of the unthinned controls. The following table gives the results of the measurements.

Age of Regeneration 1966	Mean D.B.H. Thinned inches	Mean D.B.H. Unthinned inches	Mean Height feet
6 years	5.9	4.1	40
5 years	3.1	2.1	25

Trials established in 1964 and 1965 showed that the best results for early thinning by spraying were achieved when the seedlings and competing scrub were at a height of 6–12 inches.

Late Thinning in Second Growth Karri—Lefroy Brook

Over one hundred years ago, an area of 40 acres of mixed karri and marri forest on hilltop country was leased by Mr. G. de Courcey Lefroy, after whom the nearby Lefroy Brook was named. An area of 23 acres was cleared and grew a wheat crop in 1865, but was abandoned two years later. Ring-counts made by Mr. C. E. Lane-Poole—subsequently Conservator of Forests—established that the cleared area regenerated to karri in 1875.

In 1928, at age 53 years, part of the area was thinned by Mr. A. C. Harris—present Conservator of Forests—and in 1967 this section carried 44 stems per acre. The unthinned stand which carried 664 trees in 1916 had by 1967, reduced in number to 71 stems per acre.

The standing volumes per acre are now:—

Unthinned stand	11,150 cubic feet
Thinned stand	8,050 cubic feet

The 16 largest trees in each plot exceed 90 inches in girth, but the standing volumes of these stems are 5,050 cubic feet in the thinned stand and 4,150 cubic feet in the unthinned stand.

Silvicultural Systems

In addition to trials using differing systems to cut karri dominant stands in various conditions of fire damage and maturity, a further two trials have been initiated to deal with the marri dominant stand of mixed marri and karri.

Trials take two forms:—

(i) Conversion of stand to a karri dominant type. Essentially this consists of removing unwanted and unsaleable marri, leaving karri seed trees only to supply seed for regenerations. Four methods of marri removal are listed for trial, each covering 25 acres.
   (a) Removal by bulldozing prior to logging of saleable marri and karri.
   (b) Removal by bulldozing after logging of saleable marri and karri.
   (c) Removal following logging by stem injection (standing), using the herbicide picloram.
   (d) Removal following logging by felling and stump poisoning, using 2,4,5-T.

(ii) Removal of the complete stand following logging and replacement by exotic species.

An area of 100 acres has been delineated, from which all saleable karri and marri will be logged. The remainder will be killed standing by stem injection. After several years of drying out, the slash will be burnt, thus providing a receptive site for the establishment of exotics, both pines and eucalypts, by either planting or artificially seeding.

Trial Plantings by Exotics in Southern Region

Further mixed species trials have been established to observe and compare the establishment and early growth of various pines and eucalypts on the following range of sites:—

1. Treeless flats of various forms.
2. Jarrah sites of both high and low site quality.
3. Pure marri and karri dominant sites.
4. Pure karri and marri dominant sites.

Thorough site preparation, the addition of a general fertilizer, and draining of wet areas has been found to be essential. Such treatments are now standard in all plots.

Species found to be most promising so far are:—

Treeless flats:	*Pinus pinaster*, *pinus elliotti*. *Eucalyptus botryoides*, *Euc. globulus*. *Euc. muelleriana*.
Jarrah types:	*Pinus pinaster*. *Euc. grandis*, *Euc. globulus*, *Euc. saligna*. *Euc. botryoides* and *Euc. muelleriana*.
Karri types:	*Pinus radiata*, *Euc. muelleriana*. *Euc. obliqua*, *Euc. microcorys*, *Euc. globulus*. *Euc. saligna*, *Euc. grandis*.
Marri types:	*Pinus radiata* has so far grown well. *Euc. muelleriana*, *Euc. globulus*. *Euc. microcorys*.

SOILS AND NUTRITION

During the year analytical work was the major function of the section, 3,822 analyses being carried out for six major research projects. In addition a large number of other analyses were made as required.

Other lines of work investigated were:—

Phosphorus Studies—Free Growth Plots—Gnangara

The annual resampling of these plots was carried out during the year, and the foliar phosphorus levels did not show the decline in phosphorus that has been so evident in previous years.

TABLE I—FREE GROWTHS PLOTS—NORTH GIRONDE

Foliar Phosphorus Levels

Treatment	Stocking Stems/Acre	Percent.				
		1963	1964	1965	1966	1967
Initial Application of Superphosphate, 1953	(Unthinned Control)	.082	.044	....	.032	.042
Initial Application of Superphosphate, 1953 plus 4 cwt. Superphosphate, 1962	100	.255	.127	.116	.090	.106
	200	.256	.138	.114	.093	.111
	300	.229	.147	.121	.098	.101
	400	.275	.136	.101	.082	.098
	500	.240	.132	.113	.084	.102
	600	.235	.132	.102	.094	.101
	(Unthinned)	.215	.105	.116	.074	.082

Although the mean values did not show a significant decline in foliar phosphorus levels, it was observed in the field that considerable differences occurred within each thinning grade. On the poorer site qualities (upper slopes and ridges) tree health has markedly declined, whereas sites with more favourable water regimes have tended to maintain a healthier crown cover.

Nutrients Removed in Thinning Operations

As part of a general project on Site Deterioration under pine crops an attempt was made to determine some of the nutrients removed from a site in a thinning operation. In this work only the logs transported from the site were analysed, tops and branched remaining were not sampled.

Six *P. radiata* and *P. pinaster* sites were selected for this work, and the thinnings were sub-divided into butt, mid and top logs. From these groups appropriate samples were collected for analysis. The nitrogen phosphorus and potassium removed from the areas is shown below.

Species	Location	Type of Operation	Vol.* Removed cu. ft./ac.	Nutirents Removed lb./ac.		
				N	P	K
P. radiata	Mundaring Weir	3rd thinning	1,500	22 8	1.4	25.2
P. radiata	Mundaring Weir	1st thinning	1,000	19 2	1.4	21.6
P. radiata	Mundaring Weir	Clear Falling	3,000	48 6	2.8	43.8
P. pinaster	Gnangara	2nd thinning	1,150	16.1	0.9	11.9
P. pinaster	Gnangara	Combined 1st + 2nd thinning	2,250	27.0	2.0	19.8
P. pinaster	Gnangara	2nd thinning	1,000	15.0	0.8	13.8

* Overbark.

This periodic loss of nutrients represents a considerable drain on a site during the course of a crop rotation, and could lead to a definite decline in soil fertility in the extremely poor soils of the coastal plain plantations.

Cyanogenetic Glycosides in Eucalyptus Seedlings

A survey was carried out to determine quantitatively the range of hydrocyanic acid present in the more common Eucalyptus seedlings available for sale to the public, and the following results were obtained.

Species	Hydrocyanic Acid (ppm)
E. cladocalyx	61
E. cladocalyx var. *nana*	93
E. camaldulensis	34
E. globulus	52
E. gomphocephala	34
E. lehmanni	31

According to Jackson (1958), these values are well below the safe limit of 250 ppm hydrocyanic acid.

FIRE RESEARCH

Fire research over the past year has been directed to maintaining and completing existing programmes in the northern jarrah forest and coastal *P. pinaster* plantations, and to establishing a fire research programme for the southern forest region.

Fire Behaviour Studies

During spring 1966 and autumn 1967, more experimental fires were completed in the northern jarrah forest and in the jarrah-marri and karri forests of the southern region. During the winter months data was collected from experimental fires in both *P. pinaster* and *P. radiata* plantations.

In the northern jarrah region investigations were commenced aimed at determining the effect of dense scrub on fire behaviour. A series of tray burning experiments were started to compare the inflammability of different scrub species. Preliminary tests made with three common scrub species; Prickly Moses (Acacia pulchella), Waterbush (Bossiaea aquifolium) and Tea-tree (Leptospermum ellipticum); indicated that there was a marked difference in their burning rates. The difference appeared to be connected with the moisture content of the foliage before lighting and the weight of ash residue left after the fire had burned out.

Data from experimental fires in karri, together with information on drying trends of karri litter, were used to formulate preliminary corrections to the jarrah fire danger tables for use when burning in karri forest.

Information on fire behaviour, weather and fuel, collected from experimental fires in *P. pinaster* plantations, was fitted into the fire danger tables for the northern jarrah forest. Additional data was provided by actual controlled burning in these plantations. This provided preliminary fire danger limits for burning under *P. pinaster* stands. These limits for controlled burning under pines will be tested by matching the prescriptions with the results during the winter of 1967.

Fire Weather Studies

A nest of daily time-temperature curves was compiled to test the possibilities of checking the maximum temperature forecasts made at 7.45 a.m. each day. The reliability of these curves was tested with 270 daily temperature observations from the Pemberton weather station. Using the 10 a.m. dry bulb temperature to predict the maximum temperature for the day, it was found that 82 per cent. of the predictions fell within an error of 6° F.

The concept of basic fire hazard was checked by establishing relationships between the moisture content of 424 samples of jarrah surface leaves, collected in six fire seasons, and the air temperature and relative humidity. Two regressions were calculated expressing the relationship between air temperature and relative humidity respectively, to the surface leaf moisture content.

Scrub Assessment

The scrub assessment programme was completed in the Dwellingup division. The purpose of this assessment was to determine the density and distribution of major species. The results will be related to current fire behaviour studies in scrub to provide fire danger loadings for controlled burning prescriptions and planning of fire suppression.

In addition, a scrub trial was established in the karri forest to study the effect of repeated controlled burning on species regeneration.

Growth Studies

(a) *Northern Jarrah Forest*

(i) *Lignotuberous Advance Growth.*—In 1965, a trial was established to compare the effects of fire, fertilizer and cutting, on the formation of dynamic shoots from lignotuberous advance growth. To date none of the treatments has produced any significant response.

(ii) *Saplings.*—Severe frost damage in late winter 1966 prevented any comparison of height growth between unburnt stands of jarrah saplings and those subjected to controlled burning.

(iii) *Poles.*—Jarrah poles fitted with band dendrometers were subjected to mild and severe fires during spring 1964 and autumn 1965. Since that period there has been no significant difference between the G.B.H.O.B. increment of the surviving burnt trees and the unburnt controls. These results are supported by a second trial established in a jarrah stand protected from fire for over 30 years. Losses due to severe fires were heavy, only one-sixth of the trees surviving the treatment. The remaining stems, however, are now growing at a comparable rate with unburnt controls of similar basal area.

(b) *Karri Forest*

(i) *Small Saplings.*—Karri saplings averaging 12 feet in height were treated by controlled burning in spring 1966. Damage patterns similar to those for jarrah trials were produced and saplings under 10 feet in height were severely affected by crown death.

(ii) *Large Saplings and Poles.*—Controlled burning trials were carried out in spring 1966 and autumn 1967 to measure the effect of fire on girth increment. It is too early to assess the results.

(c) *Pine Plantations*

In 1964 a trial was established in a 15 years old pruned, but unthinned, stand of *P. radiata*.

Two advance burns were applied, the first in October, 1965 and the second in April, 1966. The plots were thinned in May, 1967. In the period to thinning there was no significant difference between the G.B.H.O.B. growth of the burnt trees and the unburnt controls.

Recently, an identical trial was established in *P. pinaster* of the same age and with the same past silvicultural treatment.

Controlled Burning from Aircraft

After the initial trials of controlled burning from aircraft during spring 1965, a much larger programme covering 188,000 acres was completed during spring 1966. The areas burnt from aircraft covered a wide range of forest types from open wandoo near Mundaring to dense karri near Shannon River.

Considerable work was done by C.S.I.R.O. officers on improving both the incendiary dropping and flying techniques used in this operation. These improvements permitted the use of normal "across wind" lighting technique used in the Eucalypt forests of Western Australia. This greatly improved the quality of lighting.

Normal controlled burning preparation procedures were applied to the areas listed in the programme. Inspections were carried out to the requirements of the controlled burning guide, prior edge burning was completed, and the selection of areas and lighting patterns was based on fire danger estimates and the controlled burning guide.

Of the total area covered, at least 80 per cent. was high quality controlled burning. The remaining area was either patch burnt due to variable fuels, or scorched. Scorch in the southern forest was associated with areas carrying dense tea-tree and new inspection and lighting procedures will be adopted during spring, 1967 to try and overcome this problem.

Experience from the 1966 programme indicates that large areas of formerly inaccessible forest in the southern region can fairly readily be brought under rotational controlled burning by the use of aircraft.

MANAGEMENT RESEARCH

Volume Tables

A computer programme has been developed to compute volume under bark to any specified top diameter limit from standard sectional measurement data.

Data from some 600 trees of *P. pinaster*, Leirian strain, were collected from the northern coastal plantations; sectional volumes were computed using this programme.

Weighting techniques were developed to ensure homogeneity of variance in subsequent regression analysis of this sectional volume data. Homogeneity is necessary to ensure efficient estimation of regression coefficients. A computer programme was developed to handle the input of sectional volume data from magnetic tape, weighted conditioned regression analysis, and analysis of homogeneity of the residuals.

Many different combinations of independent variables were tested in these regressions. Three forms have been selected for application. The first equation is intended for general field use, the second for use in management inventory involving temporary plots, and the third will be used for all permanent plots.

Data were also collected and analysed for some 450 trees of *Pinus radiata* from three different plantations. Analysis of covariance showed that significant differences existed between the regressions for these three plantations. Separate volume equations have therefore been prepared for inventory and research use in each plantation.

Yield Tables

Yield tables are being prepared for *Pinus pinaster*, Leirian strain, in the northern coastal plantations and for *Pinus radiata* at Grimwade plantation.

Data from some 369 temporary plots in *Pinus pinaster* have been used to prepare regressions of volume on age, site, and density. Height intercept has proved to be a particularly effective expression of site. Weighting techniques are also necessary in these regressions to ensure homogeneous variance.

Data from some 410 temporary plots in *Pinus radiata* have been collected and preliminary analyses are under way.

Inventory Techniques

A field trial of sampling efficiency in *Pinus pinaster* plantations has been carried out. Some 100 sampling units were randomly selected in the 1951 year of planting. Each sampling unit comprised a cluster of four variable radius plots, established with a prism wedge (basal area factor 20). Superimposed is a cluster of two variable plots established with a prism or basal area factor 10. Analysis of this trial is still proceeding. Preliminary results suggest that a stratified random sampling using single variable radius (basal area factor 10) plots will be the most efficient design.

Pilot trials of permanent variable radius plots have also been established.

Pine Inventory

The latter part of this year has largely occupied with the design and implementation of a new system for pine inventory. Inventory work is in progress of Gnangara, Mundaring, Grimwade, Pimelea and Nannup plantations. Stratified random sampling with temporary variable radius plots is being used. The design for the more important years of planting is based on a desired sampling error, at the 95 per cent. probability level, of $\pm$ 5 per cent. for the estimated total volume of 2.5 in. top diameter level. This level of precision is necessary in order to ensure sufficiently precise estimates of volume available from immediate thinning, which are also obtained from these plots.

This work is the first stage of a system which will supersede the Site Quality system. A combination of both permanent and temporary plots will ultimately be used.

Automatic Data Processing

Training in Fortran programming has been given to five research and management personnel. This has resulted in the development of computer programmes for processing hardwood inventory data, research thinning plots, nursery stocktaking data and various statistical calculations.

A number of programmes have also been developed in connection with management research activities. A programme for processing pine inventory data has also been developed.

UTILIZATION RESEARCH

Sleeper Tests

The biennial examination of the C.S.I.R.O. test of treated jarrah, karri and marri sleepers near Bowelling and Merredin was carried out in conjunction with the Division of Forest Products. After about 12 years exposure there has been some destruction of oil-penta and also creosote treated karri and marri by termites suggesting a need to include arsenic in the creosote and an organic arsenical in the oil-penta.

Marine Borer Tests

The results of the first test having indicated some shortcomings in the preservative loadings used and in the structural design of the specimens and test frames, a second Australia-wide test has now been set up by the Division of Forest Products. Test sites in Western Australia are at Carnarvon and Port Hedland.

10. LIBRARY

There has been a considerable increase in the number of journal loans, the number rising from 6,234 last year to 7,651 this year. Otherwise there has only been a slight variation in other phases of work, as indicated by the following statistics :—

	1966–67	1965–66
Journal Loans	7,651	6,234
Accession List Requests	2,922	2,756
Loans and Queries	3,560	3,813
Publications received	1,124	1,008

A display shelf for new titles has proved to be a useful addition to the library.

11. EDUCATION AND PUBLICITY

Education

The State Government Forestry Scholarships were replaced this year by Forestry Cadetships granted through the Public Service Commissioner's office. Three Cadetships were awarded in 1967. The present position is as follows:—

	Commonwealth Scholarship	State Scholarship	Forestry Cadetship
4th Year—Canberra*	1	2	....
3rd Year—Canberra	3	....	....
2nd Year—University of W.A.	....	1	....
1st Year—University of W.A.	....	†2	3

* To graduate in 1967. † Suspended scholarships.

A further 15 lads were selected to undergo preliminary training prior to acceptance for the Forest Field Cadet Course scheduled to commence in August, 1967.

Of the 13 Forest Trainees who commenced the two-year course in 1965, eight remain and it is possible that only six will be available for staff appointments later in the year.

Publicity

During the year the Conservator of Forests, Mr. A. C. Harris, was re-appointed to the reconstituted Board of Management for the Charcoal Iron and Steel Industry at Wundowie, and in August 1967 was elected a Councillor of the Australian Conservation Foundation.

The Conservator also represented the State on the Water Research Foundation of Australia and served on a committee appointed by the State Government to recommend on policy for the National Parks and Reserves Board.

In September 1966 the Minister for Forests, the Hon. W. A. Bovell, M.L.A., accompanied by the Conservator of Forests attended the Sixth All-Australia Timber Congress held in Queensland. The next Congress will be held in Western Australia in October 1969.

The Department contributed to the Technical Training Year, 1966, by assisting in the organisation and preparation of various displays.

Assistance was given the Timber Development Association and the University Extension Service in the presentation of a seminar on "New Ideas and Developments in Timber Construction."

The revised edition of Bulletin 63 "Forestry in Western Australia" was published, and Bulletin No. 74, "A Fire Danger Rating and Controlled Burning Guide for the Northern Jarrah (*Euc. marginata* Sm.) Forest of Western Australia" is in the hands of the printer.

Senior officers of the Department again gave lectures and talks to various societies and Public Bodies.

12. TIMBER INDUSTRY REGULATIONS ACT, 1926-1950

The number of mills registered under the provisions of the Act at 31st December, 1966, totalled 202 (120 Crown Land and 82 Private Property).

The average number of persons employed in timber mills each month throughout the year was 3,173, a reduction of 345 on last year's figure of 3,518.

The District and Workmen's Inspectors made 1,425 inspections of timber holdings. There were 791 notifiable accidents, two of which were fatal. The number of accidents per 100 persons employed was 25 compared with 28 for the previous year.

The Timber Industry Regulation Act and Regulations have been redrafted. They will be submitted for approval as early as possible.

The cost of administering the Timber Industry Regulation Act for the year ending 30th June, 1967, was as follows:—

Salaries	$6,872
Mileage, Travelling Allowances, Office Rent, Plant Costs and Sundries	$4,858
	$11,730

13. FOREST OFFENCES

A total of 40 forest offences were reported during the year. Legal proceedings were taken in six cases and all resulted in conviction. Fines and costs amounted to $270 and $89.81 respectively.

Warnings were issued in 17 instances and the remainder dealt with by charging royalty, forfeiture of deposits, collection of damages or confiscation and sale of timber illegally cut. The amount received by the Department in this way totalled $2,197.24.

14. EMPLOYMENT IN FORESTRY AND THE TIMBER INDUSTRY

The number of wage earners directly employed in Forestry and the Timber Industry was estimated as 4,990, made up as follows :—

Forestry—		
Professional Officers	53	
General Field Staff	216	
Clerical and Drafting	73	
Wages Employees	620	
Contractors and Employees (estimated)	20	
		982
Timber Industry—		
Sawmill employees, including bush workers at 31st December, 1966		*3,173
Firewood cutters and pole getters, working under permit		311
Sandalwood workers		104
Apiarists, estimated (840 sites registered)		420
Total		4,990

* Includes employees of registered sawmills only and excludes persons employed in associated yards in the Metropolitan area.

RECRUITMENT OF LABOUR FROM UNITED KINGDOM

Due to the extreme shortage of labour and more especially of skilled forestry workers it was decided to recruit suitable labour from the United Kingdom. An officer of this Department, on Long Service Leave in England, carried out interviews with some 85 applicants for positions with this Department. As a result 33 applicants were accepted for nomination. Of these 15 have already arrived and have been absorbed into the work force of the Department, and 13 either were not eligible for nomination or later withdrew their applications. The number of migrants, including wives and children, arriving in this State in this way, to date totals 65.

Reports indicate that these selected employees are quite up to expectations and will prove an asset to the Department.

Following the success of this means of recruitment, arrangements are in hand for a further selection of applicants for positions with this Department, through the Agent-General's office in London.

15. STAFF MATTERS

Public Service Act

It is with deep regret that I have to record the death of Mr. D. R. Moore who passed away on the 2nd October, 1966, approximately six months before the date he was due to retire.

Mr. Moore obtained his B.Sc. (Forestry) at the University of Adelaide in 1922 and joined the Department in January 1926. He was stationed for many years at Collie and later at Harvey. At the time of his death he was Chief of Division of Plantations.

Promotions during the year included Messrs. B. J. Beggs and J. C. Meachem to Chief of Division, D. E. Grace and P. J. McNamara to Superintendent, and F. J. Campbell, A. R. Hill, S. J. Quain and P. N. Hewett to Inspector.

Appointments included five A.D.F.O.'s, Messrs. T. B. Butcher, H. Campbell, G. Journeaux, C. E. Peaty and S. R. Shea, and two Draftsmen who successfully completed their cadetships (Messrs. M. Day and G. Hoare).

One cadet draftsman (cartographic) G. Weir, commenced duty during the year.

Mr. R. W. Stewart transferred from the Chief Secretary's Department on promotion to the position of Staff Clerk.

Resignations included A.D.F.O. M. Clark and Draftsman G. Flegg.

The Librarian, Miss J. Bull, commenced 32 weeks leave without pay on the 27th February and is being relieved by Mrs. A. G. Gartrell.

Assistant Divisional Forest Officer R. J. Underwood returned to duty on 4th January, 1967, after study leave in America, with the qualification M.F. (Washington).

After lengthy negotiations between the Civil Service of Western Australia (Incorporated) and the Public Service Commissioner, the Public Service (Professional Division) Salaries Agreement, 1966, and the Public Service (General Division) Salaries Agreement, 1966, were signed on the 21st October, 1966, to have application from the 7th January, 1966. Adjustments due to a Federal Basic Wage increase and an interim increase in margins prescribed by the Metal Trades Award were applied from the 22nd July, 1966, and the 3rd February, 1967, respectively. The resultant increases were also paid to officers employed under the Forests Act in accordance with the Forests Act Field Staff Agreement, 1963.

Forests Act

The W.A. State Government Forestry Scholarships were replaced this year by Forestry Cadetships granted through the Public Service Commissioner's office.

Additions to the staff during the year included the following:—

1 Clerical Assistant; 1 Technical Assistant (F–II–1/2); 1 Technical Officer, Grade 1; 1 Assistant Forester; 6 Forest Guards.

Promotions included four officers to Forest Ranger and one to Assistant Forester.

Seven officers were reclassified from Technical Assistant F–IV to Technical Assistant F–II–1/2.

Resignations accounted for one Trainee, seven Technical Assistants, F–IV, one Technical Assistant, F–II–1/2, one Research Assistant, two Forest Guards and one Publicity Officer.

Forest Ranger H. Clively reached the retiring age and retired on the 24th April, 1967.

It is with profound regret that I have to report that Assistant Forester C. M. Murphy and his wife were both fatally injured in a road accident on the 5th June, 1967.

16. AUSTRALIAN FORESTRY COUNCIL

One meeting of the Council was held in Melbourne in March 1967.

The Standing Committee met in Canberra on two occasions, November 1966 and June 1967. Now that loans to the State Governments for softwood planting have been accepted and authorised by legislation, two other important items are being considered by the Committee. These are: private forestry, particularly in relation to taxation, and the need for more intensified management of native forests to bring them to full productive capacity.

17. THE F.A.O. WORLD SYMPOSIUM ON MAN-MADE FORESTS AND ROW PLANTATIONS

This symposium, in association with the Third World Eucalyptus Conference, was held in Canberra from 14th to 25th April, 1967. A total of 170 recognised delegates and observers, representing 51 countries, attended.

A number of tours were conducted prior to and following the Symposium and Western Australia was host to 22 delegates who visited the State from 28th April to 5th May, 1967.

During the successful eight-day tour, the delegates inspected the dry area forests near Norseman, the tingle, karri, tuart and jarrah forests of the South-West, and also visited the plantations of *P. radiata* at Grimwade and Nannup and *P. pinaster* north of Perth.

18. THE METRIC SYSTEM OF WEIGHTS AND MEASURES

In May, 1967, a Senate Select Committee was appointed to, *inter alia*, " inquire into and determine the practicability of the early adoption by Australia of the Metric System of Weights and Measures . . ."

Discussions have been held in Western Australia with a representative appointed by the Committee and this Department is in favour of the principle of adopting the Metric System.

It is appreciated that a number of disadvantages are involved in a change over from the Imperial to the Metric System. Some of the more obvious would be:—

(a) A new unit for the volumetric measurement of sawn timber could be necessary. The cubic centimetre is too small, whilst the cubic metre—one million times a cubic centimetre—is far too big. For example, 100 super feet would be only 0.236 cubic metres. This problem could perhaps be overcome by pricing and selling the sawn product on a lineal basis rather than a volume basis.

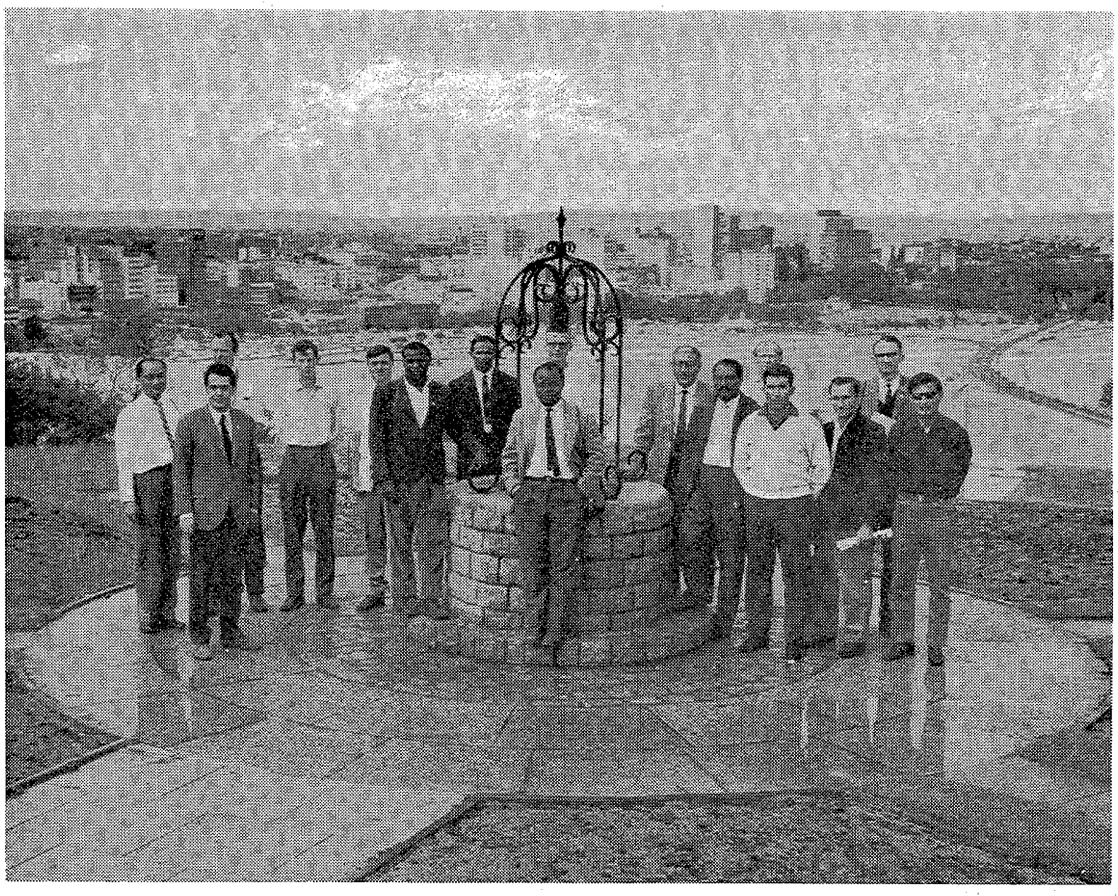
(b) An intensive within-industry training programme would be needed to re-educate all those associated with the timber industry.

(c) Conversion of past records relating to timber resources and growth rates, on which forest utilisation is based, would be necessary.

(d) In most cases, measuring apparatus would need to be replaced.

However, benefits should arise from the change over and one of the most important is that it would provide a long-overdue opportunity to introduce a uniform system of wood measurement throughout the nation concurrently with more rational codes of timber usage.

Furthermore, most research work on chemistry, wood anatomy and timber properties in Australia is already expressed in Metric units.

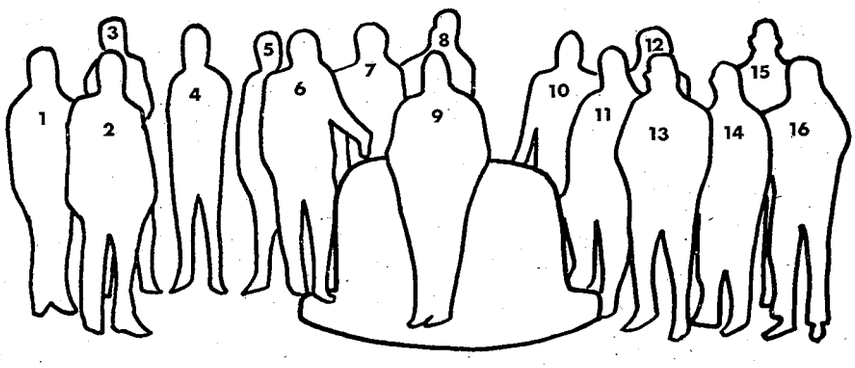


Sixteen of the 22 delegates to the F.A.O. World Symposium of Man-Made Forests at the "Wishing Well" in King's Park overlooking Perth City.

1. Pit Hambananda .... Thailand
2. A. Bennouna .... Morocco
3. W. G. Middleton .... Australia
4. R. L. Willan .... F.A.O., Rome
5 J Jackson .... F A.O., Nigeria
6. S. C. Mbinda .... Kenya
7. F. Ramanandraitsiory .... Malagasy
8. M. J. Williamson .... F.A.O., West Pakistan
9. D. E. Iyamabo .... Nigeria
10. A. A. Bayoumi .... Sudan
11. M. A. Waheed Khan .... F.A.O., Sudan
12. J. Wyatt-Smith .... F.A.O., Nigeria
13. R. Benetiz Laras .... Venezuela
14. R. G. Bonilla Cruz .... Cuba
15. J. Marion .... F.A.O., Tunisia
16. L. E. Canadas Cruz .... Equador

Absent

T. G. Allan .... F.A.O., Zambia
J. L. Dubois .... F.A.O., Brazil
L. F. Hammond .... Australia
E. H. Hinkle .... F.A.O., Taiwan
S. Lindegren .... Sweden
J. Masson .... F.A.O., Malaysia



APPENDIX 1A

Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the Year ended 30th June, 1967

1965/66	Revenue	1966/67	1965/66	Expenditure	1966/67
$	*Royalties*	$	$		$
2,061,200	Logs	2,608,431	431,268	Salaries	484,080
145,420	Sleepers	177,236	122,316	Incidentals	117,613
3,771	Sawn Timber	5,725	3,944	Timber Industries Regulations Act	4,011
145,428	Piles and Poles	110,885	165,811	Hardwood Conversion	176,319
16,509	Mining Timber	23,042	434,670	Pine Conversion	469,219
34,666	Firewood	33,406	79,473	Recoupable Projects	87,388
14,830	Posts	11,984	39,777	Tree Nurseries	36,288
16,613	Sandalwood	12,386	19,623	Aboreta	21,018
4,205	Miscellaneous	3,287	2,352,665	Excess of Revenue over Expenditure distributed as follows:—	
2,442,642		2,986,382		9/10 to Reforestation Fund	2,861,634
			267,671	Transferred to Treasury	311,076
	Pine Conversion				
425,298	Pine Logs	436,897			
255,994	Sawn Pine	287,228			
681,292		724,125			
	Hardwood Conversion				
105,095	Sawn Hardwood	132,625			
133,784	Logs	99,569			
16,465	Piles and Poles	13,688			
255,344		245,882			
	Other Sales and Trees				
46,843	Seeds and Trees	60,965			
86,417	Inspection Fees	78,487			
31,312	Rent and Leases	46,805			
268,277	Miscellaneous	333,403			
432,849		519,660			
	Recoupable Projects				
66,493	Specific Roads	73,462			
38,598	Other	19,135			
105,091		92,597			
3,917,218		4,568,646	3,917,218		4,568,646

APPENDIX 1B

Forest Improvement and Reforestation Fund Account for Year ended 30th June, 1967

1965/66	Source of Funds	1966/67	1965/66	Expenditure	1966/67
$		$	$	*Divisional*	$
412,904	Balance as at 1st July	270,303	1,155,398	Wages, Materials, etc.	1,379,189
2,352,665	9/10 Revenue	2,772,858		*Head Office*	
....	Bauxite Areas Compensation	88,776	602,370	Salaries and Allowances	684,709
47,928	Rents	59,473	45,403	Incidentals	54,495
170,000	Federal Aid Road Grant	170,000	319,260	Plant and Vehicles	215,644
201,000	Reserve Fire Fighting	201,000	436,076	Plant Operations	520,442
			94,090	Purchase of Land	91,043
			23,404	Fire Equipment	19,571
			107,487	Como Buildings	49
			16,093	Como Headquarters	19,221
			25,443	Communications	14,292
			36,530	Research	45,420
			6,908	Drafting	9,569
			4,484	Surveys	3,279
			23,510	Training Staff	14,352
			88,868	Insurances	64,727
			44,648	Payroll Tax	50,444
			19,953	Utilisation	53,522
			1,894,527		1,860,779
			3,049,925	Total	3,239,968
			336,731	*Less* Recoups	336,897
			2,713,194		2,903,071
			201,000	Reserve Fire Control	201,000
			270,303	Balance Working Account	458,339
3,184,497		3,562,410	3,184,497		3,562,410

APPENDIX IC

Statement of Afforestation Expenditure for the Year ended 30th June, 1967

1965/66	Source of Funds	1966/67	1965/66	Expenditure	1966/67
$		$	$		$
360,000	General Loan Fund	400,000	331,227	Plantation Establishment	414,216
154,656	Reforestation Fund	222,150	206,777	Plantation Management	237,157
681,292	Sale of Pine Logs and Timber	724,125	74,391	Houses and Buildings	75,896
			30,964	Road Construction and Maintenance	23,607
			34,245	Fire Prevention and Suppression	51,830
			17,929	Research	24,658
			1,973	Surveys and Plans	1,917
			23,419	Essential Services and Communications	36,154
			40,353	Administration	11,621
			434,670	Direct Conversion of Pine	469,219
1,195,948		1,346,275	1,195,948		1,346,275

APPENDIX ID

Statement Showing Distribution of Forests Department Expenditure

	$
Consolidated Revenue Fund	1,401,679
Reforestation Fund	2,896,034
General Loan Fund	400,000
	$4,697,713

Distribution of Expenditure—	
1. Busselton	420,232
2. Mundaring	238,029
3. Dwellingup	406,455
4. Collie	274,321
5. Kirup	343,609
6. Manjimup	362,847
7. Narrogin	55,848
8. Kelmscott	190,471
9. Metropolitan	117,785
10. Harvey	465,343
11. Pemberton	272,564
12. Nannup	347,567
13. Shannon River	200,140
14. Kalgoorlie-Esperance	25,452
15. Wanneroo	320,106
Head Office	656,944
	$4,697,713

APPENDIX 2A

Exports *from Western Australia of Timber, Furniture, Tanning Substances and Essential Oils for the Year ended 30th June, 1967*

	Item and Destination	Quantity	Value
	TIMBER	cub. ft.	$
1	*Softwood Logs*—		
2	*Hardwood Logs (including poles, posts, piling and other wood in the rough)*—		
	Cocos Island	1,195	2,290
	Australian States: cub. ft. $		
	New South Wales 1,884 2,623		
	Victoria 1,625 1,723		
		3,509	4,346
	Total	4,704	6,636
3	*Sleepers*—		
	Christmas Island	600	1,152
	India	27,959	49,630
	Jordan	1,071,931	1,525,082
	New Zealand	219,274	290,242
	Pakistan	364,096	598,941
	South Africa	236,350	317,806
	United Kingdom	152,680	331,309
		2,072,890	3,114,162
	Australian States: cub. ft. $		
	South Australia 556,660 841,302		
	Northern Territory 20,158 29,429		
		576,818	870,731
	Total	2,649,708	3,984,893
4	*Hardwoods, Sawn, Undressed*—		
	Jarrah:		
	Belgium-Luxembourg	1,498	3,115
	Christmas Island	541	544
	Cyprus	186	422
	France	1,004	2,300
	Hong Kong	616	1,224
	Jordan	356	664
	Mauritius	3,348	5,336
	Netherlands	18,613	20,783
	New Zealand	24,492	56,462
	Pakistan	1,717	3,197
	Sierra Leone	806	1,341
	South Africa	174,456	285,262
	United Kingdom	88,459	175,908
	United States of America	4,050	9,512
		330,142	566,070
	Australian States: cub. ft. $		
	New South Wales 269 488		
	Victoria 100,919 181,683		
	South Australia 687,994 909,158		
	Northern Territory 7,808 11,709		
		796,990	1,103,038
	Total	1,127,132	1,669,108
5	*Karri:*		
	Belgium-Luxembourg	753	1,215
	Germany, Federal Republic of	17,815	31,625
	Italy	500	661
	Netherlands	25,271	48,415
	New Zealand	95,907	168,781
	Rhodesia, South	3,323	5,472
	South Africa	47,777	84,381
	South-West Africa	525	1,155
	United Kingdom	12,444	25,540
	United States of America	1,926	5,025
		206,241	372,270
	Australian States: cub. ft. $		
	New South Wales 7,223 9,630		
	Victoria 9,465 15,827		
	South Australia 616,605 782,059		
	Northern Territory 53,403 94,770		
		686,696	902,286
	Total	892,936	1,274,556
6	*Other:*		
	Malaysia	4	30
	Australian States: cub. ft. $		
	New South Wales 5,309 23,788		
	Victoria 2,210 8,277		
	Queensland 107 450		
	South Australia 1,707 4,173		
	Northern Territory 113 322		
		9,446	37,010
	Total	9,450	37,040
		cub. ft.	$
7	*Timber, Dressed or Moulded*—		
	Flooring:		
	Greece	337	1,403
	United Kingdom	6	22
		343	1,425
	Australian States: cub. ft. $		
	New South Wales 67,792 146,659		
	Victoria 40,696 103,207		
	Queensland 355 2,464		
	South Australia 68,780 136,168		
	Northern Territory 5,036 20,050		
		182,659	408,548
	Total	183,002	409,973
8	*Other:*		
	Christmas Island	2,431	4,010
	Fiji	17	747
	Greece	567	1,402
	Italy	56	469
	Netherlands	478	902
	New Zealand	19	84
	Trucial States	1,023	3,231
	United Kingdom	17,065	48,001
	United States of America	5,504	14,241
		27,160	73,087
	Australian States: cub. ft. $		
	South Australia 2,791 8,498		
	Northern Territory 1,537 2,328		
		4,328	10,826
	Total	31,488	83,913
9	*Plywood and Veneers—(a)*	sq. ft.	$
	Christmas Island	224	101
	Fiji	3,956	465
	Singapore	2,056	115
	New Zealand	19,285	896
	Total	25,521	1,577
	Total, Timber Exports	**4,898,421**	**7,467,696**
	WOOD MANUFACTURES	cub. ft.	$
10	*Casks, Vats, Barrels, etc., empty—(b)*		
	United Kingdom	....	7,152

APPENDIX 2A—*continued*

Exports *from Western Australia of Timber, Furniture, Tanning Substances and Essential Oils for the Year ended* 30th *June,* 1967

	Item and Destination			Quantity	Value
	WOOD MANUFACTURERS				
11	*Manufacturers of Wood (except furniture) N.E.I.*—				
	Christmas Island			....	98
	Malaysia			....	20
	Singapore			....	18,065
	Thailand			....	1,352
	United Kingdom			....	18
	United States of America			....	354
	Destination Unknown			....	284
				....	20,201
	Australian:		$		
	New South Wales		271		
	Victoria		36,319		
	Queensland		7,023		
	South Australia		1,219		
	Northern Territory		42		
				....	44,874
	Total			....	65,075
12	*Furniture of any Material*—(c)				
	Bahrein			....	1,705
	Brunei			....	57
	Christmas Island			....	1,251
	Kenya			....	103
	Libya			....	486
	Malaysia			....	23,414
	Mauritius			....	12,792
	New Zealand			....	28
	Philippines			....	100
	Singapore			....	20,205
	Thailand			....	32,087
	United Kingdom			....	215
	United States of America			....	261
				....	92,704
	Australian States:		$		
	New South Wales		315,073		
	Victoria		327,091		
	Queensland		227,182		
	South Australia		217,078		
	Tasmania		31,934		
	Northern Territory		52,583		
				....	1,170,941
	Total			....	1,263,645

	Item and Destination			Quantity	
13	*Tanning Substances of Natural Origin*—			cwt.	
	Austria			100	739
	Canada			1,000	6,945
	Denmark			428	3,140
	Germany, Federal Republic of			768	2,479
	India			20	140
	Italy			3,479	27,179
	Jamaica			51	368
	Netherlands			1,000	3,081
	New Zealand			762	5,420
	Trinidad and Tobago			380	2,848
	United Kingdom			586	3,865
	United States of America			27,398	180,414
				35,972	236,618
	Australian States:	cwt.	$		
	New South Wales	1,008	11,127		
	Victoria	246	2,518		
	Queensland	366	3,132		
	South Australia	889	8,762		
	Tasmania	100	640		
	Northern Territory	1	11		
				2,610	26,190
	Total			38,582	262,808
				lb.	$
14	*Essential Oils, Natural, Non-spirituous*—				
	Ceylon			450	384
	China—Formosa			112	1,120
	France			10,920	19,098
	Germany, Federal Republic of			11,323	5,776
	Hong Kong			644	5,965
	Indonesia			2,204	556
	India			1,135	1,119
	Italy			25,078	51,786
	Japan			2	710
	Malaysia			180	161
	Netherlands			2,722	637
	New Zealand			3,891	3,767
	Switzerland			13,578	2,405
	Thailand			3,344	3,331
	United Kingdom			16,703	8,193
	United States of America			39,921	59,208
				133,790	168,013
	Australian States:	lb.	$		
	New South Wales	61,464	42,659		
	Victoria	28,494	42,775		
	Queensland	1,673	1,223		
	South Australia	5,961	14,306		
	Northern Territory	145	68		
				97,737	101,031
	Total			231,527	269,044
	Total Value of all Exports on this Return			....	**9,335,420**

(*a*) Interstate Exports not recorded separately.
(*b*) Interstate Exports included in item 11.
(*c*) Only a small proportion of wooden furniture involved.
N.E.I.—Not elsewhere included.
Basis of Value—F.O.B. port of Shipment.
(Information supplied by Commonwealth Bureau of Census and Statistics.)

APPENDIX 2B

Imports *into Western Australia of Timber, Furniture, Tanning Substances and Essential Oils for the Year ended 30th June, 1967*

	Item and Origin	Quantity	Value
		cub. ft.	$
1	*Hardwood Logs (including posts, poles, piling and other wood in the rough)*—		
	Cameroon	256	706
	France	899	3,625
	Ghana	5,381	11,525
	Gabon	499	1,252
	Indonesia	8,000	7,000
	Ivory Coast	5,650	20,232
	Malaysia	621,139	459,822
	Thailand	3,559	27,248
	Germany, Federal Republic of	15	574
	Total	645,398	531,984
2	*Softwoods, Sawn, Undressed (excluding Shooks and Staves)*—		
	Redwood and Western Red Cedar (a)	....	....
	Total	....	....
3	*Douglas Fir (a):*		
	Canada	54,405	13,068
	New Zealand	2,838	3,033
	United States of America	86,441	153,938
	Total	143,684	170,039
4	*Other:*		
	United States of America	5,170	11,365
	Australian States: cub. ft. $		
	New South Wales 59 418		
	Tasmania 974 2,921		
		1,033	3,339
	Total	6,203	14.704
5	*Hardwoods, Sawn, Undressed (excluding Shooks and Staves)*—		
	Ghana	3,497	8,341
	Hong Kong	408	547
	Ivory Coast	4,133	13,945
	Malaysia	654,090	795,431
	Singapore	8,551	10,602
	Thailand	952	8,357
	United Kingdom	1,671	2,120
		673,302	839,343
	Australian States: cub. ft. $		
	New South Wales 5 16		
	Queensland 790 2,620		
	Tasmania 24,705 41,247		
		25,500	43,883
	Total	698,802	883,226
6	*Shooks and Staves, Undressed—(b)*		
	Malaysia	3,013	2,520
	New Zealand	288	478
	Total	3,301	2,998
7	*Beadings and Mouldings—(b)*		
	Malaysia	....	875
	Netherlands	....	122
	United Kingdom	....	792
	Total	....	1,789

	Item and Origin	Quantity	Value
		cub. ft.	$
8	*Sawn Timber, Dressed or Moulded—*		
	Flooring (b):		
	Sweden	1,494	2,201
9	*Other:*		
	Australian States: cub. ft. $		
	Queensland 983 3,502		
	South Australia 26 94		
		1,009	3,596
10	*Plywood and Veneers—*		
		sq. ft.	
	Belgium-Luxembourg	7,242	477
	China—Formosa	18,168	828
	China—Mainland	107,640	4,132
	Gabon	47,981	2,556
	Japan	573,745	59,653
	Netherlands	303,086	4,617
	United Kingdom	305,735	11,678
		1,363,597	83,941
	Australian States: sq. ft. $		
	New South Wales 293,857 66,379		
	Victoria 201,830 29,943		
	Queensland 2,479,425 394,174		
	South Australia 92,153 17,014		
		3,067,265	507,510
	Total	4,430,862	591,451
11	*Reconstituted Wood, also known as Particle Board, Chip Board, Sliver Board, etc.—*		
	Surinam	19,968	873
	Sweden	45,024	1,085
		64,992	1,958
	Australian States: sq. ft. $		
	New South Wales 1,085,465 139,689		
	Victoria 3,443,655 294,246		
	Queensland 974,197 64,244		
	South Australia 887,097 141,837		
	Tasmania 1,656,399 105,846		
		8,046,813	745,862
	Total	8,111,805	747,820
	Total Timber Imports	....	**2,949,808**
12	*Match Splints—(c)*		
	Finland	....	49,736
13	*Rulers, any material—*		
	Switzerland	....	17
	United Kingdom	....	1,253
	United States of America	....	76
	Total	....	1,346
14	*Table Mats, Wooden (d):*		
15	*Wood Flour (e):*		
16	*Manufactures of Wood (except Furniture), N.E.I.—*		
	Bulgaria	....	26
	Canada	....	2,831
	China—Formosa	....	5,378
	China—Mainland	....	1,021
	Czechoslovakia	....	152
	Denmark	....	121
	France	....	231
	Germany, Federal Republic of	....	268
	Hong Kong	....	3,841
	Indonesia	....	111
	Italy	....	513
	India	....	773
	Ireland	....	123
	Japan	....	34,017
	Kenya	....	2,864
	Korea—North	....	15
	Malaysia	....	155
	New Zealand	....	57
	Netherlands	....	1,105
	Norway	....	348
	Philippines	....	999
	Singapore	....	39
	Spain	....	889
	Sweden	....	29,848
	Switzerland	....	74
	Thailand	....	894
	United Kingdom	....	6,838
	United States of America	....	2,878
		....	96,409
	Australian States: $		
	New South Wales 118,474		
	Victoria 199,175		
	Queensland 15,898		
	South Australia 37,649		
	Tasmania 273		
	Northern Territory 273		
		....	371,742
	Total	....	468,151

APPENDIX 2B—*continued*

Imports *into Western Australia of Timber, Furniture, Tanning Substances and Essential Oils for the Year ended 30th June, 1967*

	Item and Origin	Quantity	Value
17	*Furniture of any Material*—		$
	Canada	....	58
	China—Formosa	....	301
	China—Mainland	....	948
	Cyprus	....	10
	Czechoslovakia	....	695
	Denmark	....	483
	France	....	2,002
	Germany, Federal Republic of	....	4,223
	Hong Kong	....	46,032
	India	....	1,016
	Ireland	....	724
	Italy	....	11,705
	Japan	....	28,913
	Morocco	....	15
	Netherlands	....	338
	New Zealand	....	84
	Norway	....	5,707
	Philippines	....	582
	Poland	....	799
	Singapore	....	3,275
	Spain	....	5,516
	Sweden	....	1,092
	Switzerland	....	47
	Yugoslavia	....	628
	United Kingdom	....	73,093
	United States of America	....	13,324
		....	201,610
	Australian States:	$	
	New South Wales	898,100	
	Victoria	828,937	
	Queensland	106	
	South Australia	952,199	
	Tasmania	11,341	
		....	2,690,683
	Total	....	2,892,293
18	*Clothes Pegs, Wooden*—	N.r.s.	$ N.r.s.
19	*Tool Handles, Wooden*—		
	France	....	1
	Germany, Federal Republic of	....	3
	Italy	....	1
	Sweden	....	184
	Switzerland	....	6
	United Kingdom	....	99
	United States of America	....	1,471
		....	1,765
	Australian States:	$	
	New South Wales	55,701	
	Victoria	23,658	
	Queensland	12,786	
	South Australia	6	
	Tasmania	3,659	
		....	95,810
	Total	....	97,575

	Item and Origin	Quantity	Value
20	*Tanning Substances, Natural*—		$
	Wattle Bark Extracts:	cwt.	
	South Africa	4,987	34,873
	Australian States:	N.r.s.	N.r.s.
21	*Other Extracts:*		
	Norway	1,378	3,048
	Australian States:	N.r.s.	N.r.s.
22	*Tanning Substances, Natural and Synthetic Origin*—		
	United Kingdom	277	11,796
	Australian States: cwt. $		
	New South Wales 402 3,692		
	Victoria 944 13,211		
	South Australia 172 2,308		
		1,518	19,211
		1,795	31,007
23	*Essential Oils, Natural, Non-spirituous*—	lb.	
	China—Formosa	5,555	1,610
	China—Mainland	58,798	19,836
	France	1,256	1,635
	India	1,588	2,180
	Indonesia	336	1,334
	Italy	1,693	6,821
	Malagasy	2,425	2,583
	Malaysia	300	2 102
	Netherlands	127	163
	Seychelles	446	476
	South Africa	3,503	2,011
	Spain	224	647
	Swaziland	179,443	92,592
	United Kingdom	6	3
	United States of America	6,502	37,352
		262,202	171,345
	Australian States: lb. $		
	New South Wales 4,333 5,577		
	Victoria 4,253 14,874		
		8,586	20,451
	Total	270,788	191,796
	Total Value of all Imports on this Return	....	**6,719,633**

(*a*) Interstate Imports included in item 4.
(*b*) Interstate Imports included in item 9.
(*c*) Interstate Imports included in item 16.
(*d*) Included in item 16.
(*e*) Interstate Imports included in item 11. Nil Overseas Imports.
N.E.I.—Not elsewhere included.
N.r.s.—Not recorded separately.
Basis of Value—
Oversea—F.O.B. Port of Shipment.
Interstate—Landed Cost in Western Australia.
(*f*) Only a small proportion of wooden furniture involved.
(Information supplied by Commonwealth Bureau of Census and Statistics.)

APPENDIX 3

Summary of Exports of Forest Produce since 1836

Year	Timber		Year	Timber		Wood Manufactures	Tanning Materials	Essential Oils
	Cub. ft.	Value		Cub. ft.	Value	Value	Value	Value
		£			£	£	£	£
1836 (a)....	10,000	2,500	1901	7,150,600	572,354	....	....	....
1837	....	....	1902	6,256,750	500,533	....	....	....
1838	....	....	1903	7,748,450	619,705	....	859	....
1839	....	....	1904	8,072,300	654,949	....	32,876	....
1840	....	....	1905	8,709,500	689,943	....	154,087	....
1841	....	....	1906	(c) 8,830,700	708,993	....	140,720	....
1842	....	....	1907	(c) 6,409,550	511,923	....	98,773	....
1843	....	....	1908	(c) 9,869,509	813,591	....	79,934	....
1844	(b)	163	1909	(c) 10,830,450	867,419	....	59,633	....
1845	....	....	1910	(c) 12,074,100	972,698	....	93,733	....
1846	2,550	255	1911	(c) 12,449,500	986,341	....	83,470	....
1847	12,200	1,120	1912	(c) 11,297,100	903,396	....	49,004	....
1848	3,350	333	1913	(c) 13,619,850	1,089,481	....	47,377	....
1849	....	....	1914 (d)	(c) 6,279,750	502,153	....	18,197	777
1850	10,500	1,048	1915 (e)	(c) 9,968,500	808,392	....	6,127	381
1851	1,250	268	1916 (e)	5,432,100	441,991	....	10,208	1,102
1852	7,050	806	1917 (e)	3,890,650	310,893	....	18,959	2,060
1853	52,200	5,220	1918 (e)	3,436,250	274,141	....	16,886	3,995
1854	58,500	7,023	1919 (e)	4,135,750	332,584	11,535	18,875	3,987
1855	76,900	12,076	1920 (e)	5,065,300	465,731	21,935	22,121	3,704
1856	70,500	9,671	1921 (e)	9,816,250	1,137,819	24,916	23,073	10,107
1857	69,200	9,449	1922 (e)	8,309,750	1,041,047	22,248	13,328	6,878
1858	29,250	2,340	1923 (e)	7,911,310	997,454	12,377	21,161	20,075
1859	67,250	6,051	1924 (e)	11,126,861	1,367,517	11,505	29,606	39,877
1860	54,800	4,932	1925 (e)	11,844,303	1,477,997	13,298	40,136	42,057
1861	27,750	2,497	1926 (e)	12,001,384	1,522,958	10,072	15,056	47,819
1862	68,800	7,151	1927 (e)	12,580,262	1,651,149	8,727	15,818	26,544
1863	32,900	2,963	1928 (e)	10,384,784	1,265,383	7,783	27,662	39,131
1864	58,300	5,508	1929 (e)	7,635,237	960,435	6,603	35,850	63,307
1865	183,950	15,693	1930 (e)	6,579,743	807,425	4,687	40,628	77,510
1866	85,650	6,849	1931 (e)	4,127,856	507,382	26,615	35,333	56,170
1867	56,750	4,541	1932 (e)	3,062,673	361,700	85,488	42,016	59,301
1868	8,000	638	1933 (e)	2,235,540	262,617	80,332	33,352	26,331
1869	179,900	14,273	1934 (e)	4,060,830	487,248	76,107	20,904	26,720
1870	157,200	17,551	1935 (e)	5,326,117	636,466	65,494	15,284	35,363
1871	218,500	15,304	1936 (e)	5,598,180	697,522	50,665	12,237	27,526
1872	37,000	2,590	1937 (e)	5,673,903	699,684	52,338	14,491	38,185
1873	68,150	4,771	1938 (e)	7,545,744	932,420	47,934	13,865	35,128
1874	345,600	24,192	1939 (e)	5,704,250	722,310	43,518	17,842	25,550
1875	342,350	23,965	1940 (e)	5,049,585	634,859	62,796	19,485	47,736
1876	219,050	23,743	1941 (e)	6,091,187	790,876	74,935	13,686	59,867
1877	336,150	26,979	1942 (e)	5,244,634	700,474	64,454	6,896	74,904
1878	580,900	63,902	1943 (e)	3,516,566	605,327	32,426	1,598	70,523
1879	627,250	69,742	1944 (e)	3,645,354	613,994	25,324	1,294	72,704
1880	662,550	66,252	1945 (e)	2,851,475	570,028	27,307	2,795	103,055
1881	792,750	79,277	1946 (e)	3,373,025	722,061	(f) 2,618	4,872	128,050
1882	936,500	93,650	1947 (e)	3,458,628	865,255	(f) 13,118	12,056	151,768
1883	997,000	79,760	1948 (e)	3,584,405	1,099,073	(f) 6,572	9,556	116,465
1884	861,700	68,936	1949 (e)	3,198,212	993,152	(f) 6,639	5,112	75,395
1885	848,150	67,850	1950 (e)	2,857,946	974,493	(f) 13,525	8,243	78,550
1886	626,150	50,902	1951 (e)	2,342,492	(g) 918,485	(f) 25,101	16,581	125,833
1887	354,800	28,384	1952 (e)	2,373,553	(g) 1,032,909	(f) 47,689	19,120	119,109
1888	525,570	42,060	1953 (e)	3,965,188	(g) 2,074,421	(f) 120,095	34,136	70,852
1889	788,500	63,080	1954 (e)	3,858,956	(g) 2,248,320	(f) 59,360	80,248	55,273
1890	1,172,200	82,052	1955 (e)	3,477,249	(g) 1,935,019	(f) 79,893	37,338	80,822
1891	1,273,950	89,179	1956 (e)	4,568,034	(g) 2,818,716	(f) 119,459	554,760	90,928
1892	1,082,650	78,419	1957 (e)	4,684,017	(g) 3,256,719	(f) 78,934	588,544	58,993
1893	512,950	33,888	1958 (e)	5,572,681	(g) 3,875,705	(f) 39,762	337,655	101,814
1894	1,063,700	74,804	1959 (e)	6,461,535	(g) 4,373,218	(f) 41,612	259,046	52,843
1895	1,255,250	88,146	1960 (e)	6,133,240	(g) 4,160,354	(f) 20,549	366,606	63,905
1896	1,545,600	116,420	1961 (e)	5,533,847	(g) 3,838,387	(f) 25,305	201,957	95,475
1897	2,393,300	192,451	1962 (e)	5,660,937	(g) 3,993,663	(f) 194,380	281,364	81,506
1898	4,086,150	326,195	1963 (e)	5,484,259	(g) 3,966,697	(f) 255,190	254,726	70,402
1899	6,913,550	553,198	1964 (e)	5,266,329	(g) 3,686,732	(f) 272,187	322,916	88,666
1900	5,725,400	458,461	1965 (e)	4,716,296	(g) 3,545,627	(f) 523,596	326,156	76,019
			1966 (e)	2,431,248	(g) $4,361,278	(f) $1,365,441	$289,841	$314,817
			1967 (e)	4,898,421	7,467,696	1,335,872	262,808	269,044
			Total	461,909,126	$187,786,912	$8,536,935	$10,925,283	$6,443,681

(a) The exports up to the year 1834 consisted only of supplies to shipping, of which no record is kept.
(b) Not available.
(c) Approximate figures only.
(d) Six months ended 30th June.
(e) Year ended 30th June.
(f) Excludes Casks (principally empty returns) previously included in this item.
(g) Includes items for which the quantity in cub. ft. is not available.

APPENDIX 4

Summary of Imports of Timber, Furniture, Tanning Materials and Essential Oils, since 1848

Year	Timber, Woodware, etc.	Tanning Materials	Essential Oils	Year	Timber, Woodware, etc.	Tanning Materials	Essential Oils
	£	£	£		£	£	£
1848	464	....	....	1900	56,266	1,416	1,105
1849	....	....	....	1901	80,134	1,740	1,546
1850	189	....	....	1902	97,810	3,418	1,751
1851	3,216	....	....	1903	102,383	3,556	1,348
1852	2,479	....	....	1904	157,856	1,322	2,122
1853	790	....	....	1905	98,494	582	1,592
1854	831	....	....	1906	95,229	1,412	1,915
1855	1,464	....	....	1907	122,016	2,767	1,549
1856	1,124	....	....	1908	93,205	2,392	4,584
1857	744	....	....	1909	90,502	4,129	4,033
1858	1,528	....	....	1910	171,280	3,531	3,686
1859	690	....	....	1911	152,133	2,912	4,938
1860	2,005	....	....	1912	167,244	3,089	4,598
1861	1,459	....	....	1913	202,640	2,651	5,392
1862	1,920	....	....	1914	78,736	629	2,823
1863	1,568	....	....	1914–15	107,763	2,082	4,988
1864	894	....	....	1915–16	76,849	3,313	4,788
1865	548	....	....	1916–17	75,681	2,848	3,848
1866	1,442	....	....	1917–18	58,305	2,020	4,358
1867	1,727	....	....	1918–19	62,824	1,181	4,168
1868	1,451	....	....	1919–20	100,083	3,748	10,043
1869	1,408	....	....	1920–21	171,654	*4,899	6,106
1870	1,518	....	....	1921–22	92,448	5,865	6,577
1871	736	....	....	1922–23	109,428	6,991	4,033
1872	1,660	....	....	1923–24	133,983	2,790	3,301
1873	1,008	....	....	1924–25	161,893	2,670	4,429
1874	1,774	....	....	1925–26	144,989	5,826	4,449
1875	2,707	....	....	1926–27	162,193	8,971	4,254
1876	3,098	....	....	1927–28	183,196	9,648	6,955
1877	2,036	....	....	1928–29	241,601	6,894	4,413
1878	2,947	....	....	1929–30	197,532	10,825	3,980
1879	2,340	....	....	1930–31	76,533	4,145	3,160
1880	3,061	....	....	1931–32	164,496	4,705	3,505
1881	3,639	....	....	1932–33	197,916	4,903	3,421
1882	3,692	....	....	1933–34	183,944	4,310	3,888
1883	6,667	....	....	1934–35	211,056	4,076	5,040
1884	2,930	....	....	1935–36	228,451	5,401	3,921
1885	11,479	....	....	1936–37	257,164	5,267	4,810
1886	17,888	....	....	1937–38	270,126	4,777	6,560
1887	8,136	....	....	1938–39	254,315	3,974	7,014
1888	4,461	....	....	1939–40	259,399	6,802	23,027
1889	7,686	....	....	1940–41	249,111	3,798	32,399
1890	14,979	....	....	1941–42	283,611	15,846	33,828
1891	18,406	....	....	1942–43	163,480	6,250	47,718
1892	26,713	....	....	1943–44	149,928	7,883	68,871
1893	14,493	....	....	1944–45	148,838	9,264	75,449
1894	17,964	....	....	1945–46	†219,466	19,573	56,295
1895	47,128	....	....	1946–47	386,465	12,395	78,091
1896	5,381	....	....	1947–48	345,508	8,019	96,769
1897	164,552	....	....	1948–49	470,755	8,662	42,926
1898	55,566	....	....	1949–50	521,815	24,923	51,197
1899	45,689	....	....	1950–51	640,059	21,147	161,358
				1951–52	1,037,499	18,494	167,697
				1952–53	509,667	21,493	69,804
				1953–54	923,367	45,202	58,019
				1954–55	816,052	27,395	76,464
				1955–56	839,581	27,315	131,758
				1956–57	830,700	35,403	99,863
				1957–58	873,520	28,310	101,680
				1958–59	815,300	9,365	62,983
				1959–60	895,845	14,608	74,199
				1960–61	1,203,641	12,621	60,942
				1961–62	1,236,106	13,853	130,876
				1962–63	1,978,937	9,868	63,739
				1963–64	1,903,772	19,412	37,494
				1964–65	2,289,999	21,677	69,741
				1965–66	$4,856,090	$60,963	$132,862
				1966–67	6,458,909	68,928	191,796
				Total	$63,937,163	$1,334,397	$4,600,226

* This and subsequent years include tanning extracts, not previously recorded.
† This and subsequent years include values for furniture, bamboo, cane, etc., not previously included.

APPENDIX 5

SUMMARY OF LOG VOLUMES PRODUCED IN WESTERN AUSTRALIA SINCE 1829

Year	*Crown Land	Private Property	Total	Year	*Crown Land	Private Property	Total
	Cubic feet	Cubic feet	Cubic feet		Cubic feet	Cubic feet	Cubic feet
1829–1916†	....	....	663,267,850	1939 (c)	29,247,650	11,086,000	40,333,650
1917 (a)	19,333,100	2,144,500	21,477,600	1940 (c)	27,660,100	9,139,550	36,799,650
1918 (b)	7,665,550	504,950	8,170,500	1941 (c)	28,089,200	10,289,000	38,378,200
1919 (c)	19,987,050	3,390,450	23,377,500	1942 (c)	26,636,650	5,633,400	32,270,050
1920 (c)	28,292,200	5,762,900	34,055,100	1943 (c)	23,604,900	4,322,950	27,927,850
1921 (c)	29,308,950	7,018,450	36,327,400	1944 (c)	22,252,500	4,456,200	26,708,700
1922 (c)	36,122,400	15,640,150	51,762,550	1945 (c)	21,970,000	4,309,550	26,279,550
1923 (c)	26,807,300	9,867,050	36,674,350	1946 (c)	21,126,500	5,482,350	26,608,850
1924 (c)	42,004,450	9,342,800	51,347,250	1947 (c)	21,948,550	7,831,950	29,780,500
1925 (c)	43,832,900	18,142,250	61,975,150	1948 (c)	22,251,350	8,871,900	31,123,250
1926 (c)	48,823,750	25,037,600	73,861,350	1949 (c)	20,261,800	9,814,300	30,076,100
1927 (c)	46,887,600	31,356,100	78,243,700	1950 (c)	21,081,150	9,932,650	31,013,800
1928 (c)	42,781,250	23,334,450	66,115,700	1951 (c)	25,391,450	10,713,050	36,104,500
1929 (c)	32,289,750	11,098,950	43,388,700	1952 (c)	28,942,550	11,938,300	40,880,850
1930 (c)	31,654,150	11,653,600	43,307,750	1953 (c)	34,223,400	13,021,400	47,244,800
1931 (c)	18,822,600	12,148,500	30,971,100	1954 (c)	37,485,950	13,562,000	51,047,950
1932 (c)	11,742,850	4,115,950	15,858,800	1955 (c)	37,467,650	15,195,450	52,663,100
1933 (c)	13,165,650	2,456,650	15,622,300	1956 (c)	39,811,350	13,773,350	53,584,700
1934 (c)	21,263,100	6,330,400	27,593,500	1957 (c)	39,426,100	11,585,350	51,011,450
1935 (c)	27,458,250	11,451,750	38,910,000	1958 (c)	39,069,500	12,397,450	51,466,950
1936 (c)	31,400,600	13,436,150	44,836,750	1959 (c)	40,533,471	13,756,198	54,289,669
1937 (c)	31,703,850	15,902,200	47,606,050	1960 (c)	38,882,048	12,017,553	50,899,601
1938 (c)	31,737,450	15,928,950	47,666,400	1961 (c)	37,752,774	10,818,790	48,571,564
				1962 (c)	39,243,552	9,789,268	49,032,820
				1963 (c)	38,671,715	9,831,552	48,503,267
				1964 (c)	39,431,089	10,220,000	49,651,089
				1965 (c)	41,430,800	9,815,867	51,246,667
				1966 (c)	42,224,817	10,105,791	52,330,608
				1967 (c)	40,941,527	9,967,907	50,909,434
				Total	....	....	2,779,156,519

* Includes State Forest Timber Reserves, Crown Land and Private Property (Timber Reserved).
† Estimated.
(a) Year ended 31st December.
(b) Six months ended 30th June.
(c) Year ended 30th June.

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ALEX. B. DAVIES, Government Printer, Western Australia