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Report

on the operations of the

FORESTS DEPARTMENT

WESTERN AUSTRALIA

for the

YEAR ENDED

30th JUNE, 1960

by

W. R. WALLACE
Deputy
Conservator of Forests

Cover ; Virgin jarrah forest - Dwellingup.

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W. R. WALLACE
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PRESENTED TO BOTH HOUSES OF PARLIAMENT

Forests Department,
PERTH,
30th September, 1960.

TO THE HONOURABLE MINISTER FOR FORESTS

Sir,

In the absence of the Conservator of Forests, Mr. A. C. Harris, who is a member of the official Australian delegation attending the Fifth World Forestry Congress at Seattle, U.S.A., I have the honour to transmit herewith my report on the operations of the Department for the year ended 30th June, 1960.

Yours faithfully,
W. R. WALLACE,
Deputy Conservator of Forests.

CONTENTS

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

Brown Mallet	*Eucalyptus astringens*
Bullich	*Eucalyptus megacarpa*
Jarrah	*Eucalyptus marginata*
Karri	*Eucalyptus diversicolor*
Marri	*Eucalyptus calophylla*
Maritime Pine	*Pinus pinaster*
Monterey Pine	*Pinus radiata*
Peppermint	*Agonis flexuosa*
River Banksia	*Banksia verticillata*
Sandalwood	*Santalum cygnorum*
Sheoak	*Casuarina fraseriana*
Tuart	*Eucalyptus gomphocephala*
Western Australian Blackbutt (Yarri)	*Eucalyptus patens*
Wandoo	*Eucalyptus redunca var. elata*
Warren River Cedar	*Agonis juniperina*
Yate	*Eucalyptus cornuta*

FORESTS DEPARTMENT

Annual Report on the Operations of the Department for the Year ended 30th June, 1960

I. STATISTICAL SUMMARY OF MAJOR OPERATIONS

Timber Production (in cubic feet)

Total production in square	16,625,475	
Exports—Interstate	3,212,630	(19·3 per cent.)
Overseas	2,954,502	(17·8 per cent.)
Local Consumption	10,458,343	(62·9 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	13,009,905	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

Total cut

Log Volumes (in cubic ft.)	50,899,601	Jarrah	37,926,330
		Karri	8,457,371
		Wandoo	2,558,409
		Pine	1,392,421
		Other	565,070

Made up as follows :—

From State Forest and Crown Land	38,882,048	(76·4 per cent.)
From Private Property	12,017,553	(23·6 per cent.)

Value Produced

Total Value Sawn Timber	£11,115,900
Total Value of Other Forest Products	£2,658,000

Departmental Expenditure and Source of Funds

Gross Revenue :—	£	£
Royalties—Timber, etc.	923,035	
Departmental	315,269	
		1,238,304
General Loan Fund	100,000	
Federal Aid Road Grant	76,000	
		176,000
		1,414,304

Gross Expenditure —	
Consolidated Revenue Fund	404,700
Reforestation Fund	923,283
General Loan Fund	100,000
	1,427,983

(Details appear under " Revenue and Expenditure " within the Report.)

Forest Area

Additions to State Forest	6,022	acres
Excisions from State Forest	410	,,
Land purchased for pine planting	83	,,
Total area of State Forest	4,329,514	,,
Area of National Parks (approx.)	320,900	,,

Reforestation

Cut-over area treated for regeneration	97,243	,,

Afforestation

Area planted with pines, 1959	2,379	,,
Area cleared for pines	2,553	,,
Area soil surveyed for pines :—		
Detailed surveys	10,550	,,
Total area of pine plantation established	28,467	,,
Total experimental area	851	,,

Management

Survey :—		
Theodolite Surveys	156	miles
Other Surveys	306	miles
Map sheet compilation	6,000	sq. miles
Assessment :—		
Air Photo Interpretation	1,486,000	acres
Engineering, new works :—		
Roads and Tracks	714	miles
Telephones	36	,,
Houses and other buildings	5	

Protection

Fire outbreaks :—		
Number	232	
Area burnt	2,640	acres
Controlled burning	503,472	,,

Nurseries

Hamel and Dryandra :—		
Trees produced for—		
Forests Department	192,416	
Private buyers	75,921	
Plantation Nurseries :—		
Pine plantation stock	approx. 2·5	million

Sandalwood

Quantity exported	533	tons

2. REVENUE AND EXPENDITURE

Revenue

Revenue for the year ended 30th June, 1960 was £1,238,304 as compared with £1,225,373 for the previous year.

The following tabulation shows a comparison of the two years.

	Year Ended 30th June, 1959	Year Ended 30th June, 1960
	£	£
Timber Royalties, etc.	911,711	923,035
Pine Conversion Sales	145,307	154,988
Hardwood Conversion Sales	93,295	93,935
Other Departmental	45,799	43,247
Recoupable Projects	29,261	23,099
	£1,225,373	£1,238,304

Details appear in Appendix 1A.

Expenditure

The total expenditure charged against Consolidated Revenue Fund amounted to £404,700 and was expended as follows :—

	£
Salaries, Incidentals and Refunds of Royalty	199,275
Direct Conversion of Pine	100,517
Hardwood Conversion	72,392
Recoupable Projects	25,528
Forests Improvements—Collie Area, special fund	6,988
	£404,700

Details appear in Appendix 1A.

APPORTIONMENT OF NET REVENUE OF DEPARTMENT

	£	£	£
Gross Revenue for year 1959–60			1,238,304
Less Revenue from Recoup			23,098
			1,215,206
Consolidated Revenue Fund Expenditure		404,700	
Plus Treasury Charges		4,156	
		408,856	
Less Expenditure on :—			
Recoupable Projects	25,528		
Timber Industry Regulation Act Salaries and Incidentals	3,827		
Forests Improvement, Collie Area	6,988		
		36,343	
			372,513
Net Revenue			842,693
Nine-tenths of Net Revenue Credited to Reforestation Fund			758,420

FOREST IMPROVEMENT AND REFORESTATION FUND

	£	£
Balance, 1st July, 1959	235,702	
Nine-tenths, Net Revenue	758,420	
Direct Credits	18,370	
		1,012,492

	£	£
Less Expenditure :—		
General Account	971,287	
Less Recoups	124,004	
	847,283	
Reserve for Plant Depreciation and Pine Stabilisation	104,000	
		951,283
Balance in Fund as at 1st July, 1960		61,209

Details appear in Appendix 1B.

LOAN FUND EXPENDITURE

	£
Plantations	94,716
Administration	5,284
	£100,000

Details appear in Appendix 1C.

GROSS EXPENDITURE

The total expenditure of the Department charged against all funds was as follows :—

	£
Consolidated Revenue Fund	404,700
Reforestation Fund including Federal Aid Roads Grants *less* recoups	923,283
General Loan Fund	100,000
	£1,427,983

3. THE FOREST AREA

(i) State Forests

Of the 375,000 acres of timbered Crown Land recommended in the last two years for dedication as State Forest, only 155,053 acres were approved in 1959 and 6,022 acres this year.

The total area of State Forest as at 30th June, 1960, was 4,329,514 acres which is an increase of 5,612 acres compared with the total at 30th June, 1959.

(ii) Timber Reserves Under the Forests Act

The total area held under Timber Reserve at 30th June, 1960, was 1,768,303 acres, a decrease of 4,307 acres on the area as at 30th June, 1959. An additional 3,584 acres were reserved and 7,891 acres were excised. The decrease was mainly due to the release of an area of 4,005 acres held originally for Sandalwood purposes.

Areas Reserved For—	June, 1959 acres	June, 1960 acres
Jarrah	57,844	57,542
Pine	5,521	5,521
Mallet	1,140	1,140
Sandalwood	27,105	23,100
Mining Timber, Firewood, etc. (Goldfields)	1,681,000	1,681,000
	1,772,610	1,768,303

(iii) Land Acquisitions

In the furtherance of the policy of acquiring suitable areas for the growing of *Pinus radiata*, a total of 83 acres were purchased at a cost of £234.

To consolidate irregular blocks, to eliminate potential fire hazards and to preserve valuable regrowth, 6,728 acres were purchased for inclusion in State Forest.

(iv) Land Released

Two hundred and seventy-seven applications for land were received during the year for a total of 196,427 acres.

The Department concurred in the release of land and the issue of pastoral and other leases as follows :—

Alienations			Leases		
Timber Zone		Outside Timber Zone	Timber Zone		Outside Timber Zone
State Forest	Crown Land	Crown Land	State Forest	Crown Land	Crown Land
acres 410	acres 33,321	acres 40,247	acres 311	acres 8,650	acres 44,551

4. SAWMILLING, HEWING, TIMBER INSPECTION AND FOREST PRODUCE

(i) Timber Production and Distribution

The production of 16,625,475 cubic feet of sawn timber was a decrease of 1,133,858 or 6·4 per cent. on last year's figure. Of the total production 3,925,350 cubic feet were obtained from private property, a decline of 574,433 cubic feet on last year.

During the year ended the 31st December, 1959, 265 mills were registered. Of these 141 operated on Crown Land and 124 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 (1829–1960) is shown in Appendix 5.

Departmental plantations yielded 1,336,825 cubic feet of pine thinnings, which was an increase of 6·3 per cent. on last year's figure.

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

	cubic feet
Karri	107,782
Pine	57,127
Jarrah	3,119
Other	2,087
Total	170,115

Sawn sleepers produced during the year amounted to 3,622,351 cubic feet of which 1,290,656 cubic feet were from private property.

Of the sleepers produced 3,269,207 cubic feet were inspected and a further quantity of 170,074 cubic feet were re-inspected during the year.

Other sawn timber inspected totalled 797,317 cubic feet, of which 49,330 cubic feet were from private property.

The total of sawn timber inspected during the year showed a decrease of approximately 25 per cent. on the previous year.

Of the 33,776 (868,882 lineal feet) piles and poles produced, 76 (2,474 lineal feet) were inspected.

The distribution of timber was as follows :—

Distribution	Sleepers		Other Sawn Timber		Total
	Karri	Jarrah and Other Species	Karri	Jarrah and Other Species	
	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.
Interstate	*Nil*	524,218	992,371	1,696,041	3,212,630
Overseas	*Nil*	1,906,486	274,202	773,814	2,954,502
Local	*Nil*	1,191,094	1,570,079	7,697,170	10,458,343
Total	*Nil*	3,621,798	2,836,652	10,167,025	16,625,475

QUANTITY OF SAWN AND HEWN 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	Hewn Sleepers	Sawn Timber other than Sleepers	Sawn Sleepers	Hewn Sleepers		
	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	£
1958–59	9,930,557	3,326,615	....	2,535,868	1,964,983	1,310	17,759,333	11,327,513
1959–60	10,368,983	2,331,142	....	2,634,694	1,290,656	....	16,625,475	11,115,891

TIMBER PRODUCTION

PRODUCTION OF TIMBER FOR YEAR ENDED 30th JUNE, 1960 (EXCLUSIVE OF MINING TIMBER, FIREWOOD, PILES AND POLES)

	Mill Logs								Totals	
	Jarrah	Karri	Wandoo	Yarri	Sheoak	Pine	Marri	Other	In Log	Recovery of Sawn Timber
	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.	cub. ft.
Crown Lands	27,966,322	7,888,607	1,223,515	372,787	35,852	1,336,825	18,571	*39,569	38,882,048	12,700,125
Private Property	9,960,008	568,764	1,334,894	86,901	4,091	55,596	963	†6,336	12,017,553	3,925,350
Grand Total	37,926,330	8,457,371	2,558,409	459,688	39,943	1,392,421	19,534	45,905	‡50,899,601	§16,625,475

* Comprises—Tuart, 38,525 cub. ft. ; Peppermint, 303 cub. ft. ; Bullich, 23 cub. ft. ; Warren River Cedar, 304 cub. ft. ; River Banksia, 321 cub. ft. ; Yate, 93 cub. ft.

† Comprises—Tuart, 6,197 cub. ft. ; Poplar, 139 cub. ft.
In addition to the above, a total of 46,566 tons of Wandoo Logs were treated for Tannin Extract.

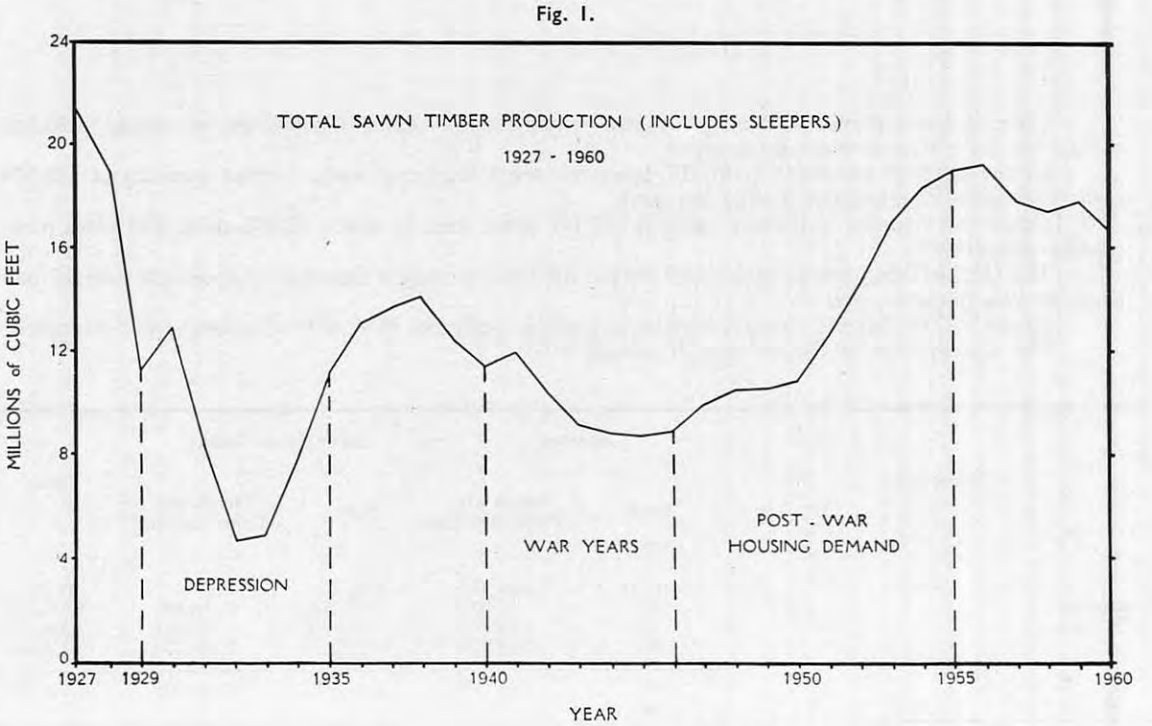
‡ Production less logs from Departmental Pine Plantations = 49,562,776 cub. ft.

§ Production less sawn pine from Departmental Mills = 16,520,907 cub. ft.

TRENDS IN PRODUCTION AND DISTRIBUTION OF SAWN TIMBER

Production.—The following graph (Fig. 1) shows how the depression, the war years and the subsequent housing demand affected the State's sawn timber production. For the last four years the annual output has remained around 17 million cubic feet.

Fig. 1.



Distribution.—The two graphs below show the increase in local consumption (Fig. 2) and reduction in exports (Fig. 3) over the years. Since 1955 the exports have risen from 18·4 per cent. of the State's sawn production to 37·1 per cent. this year.

Fig. 2.

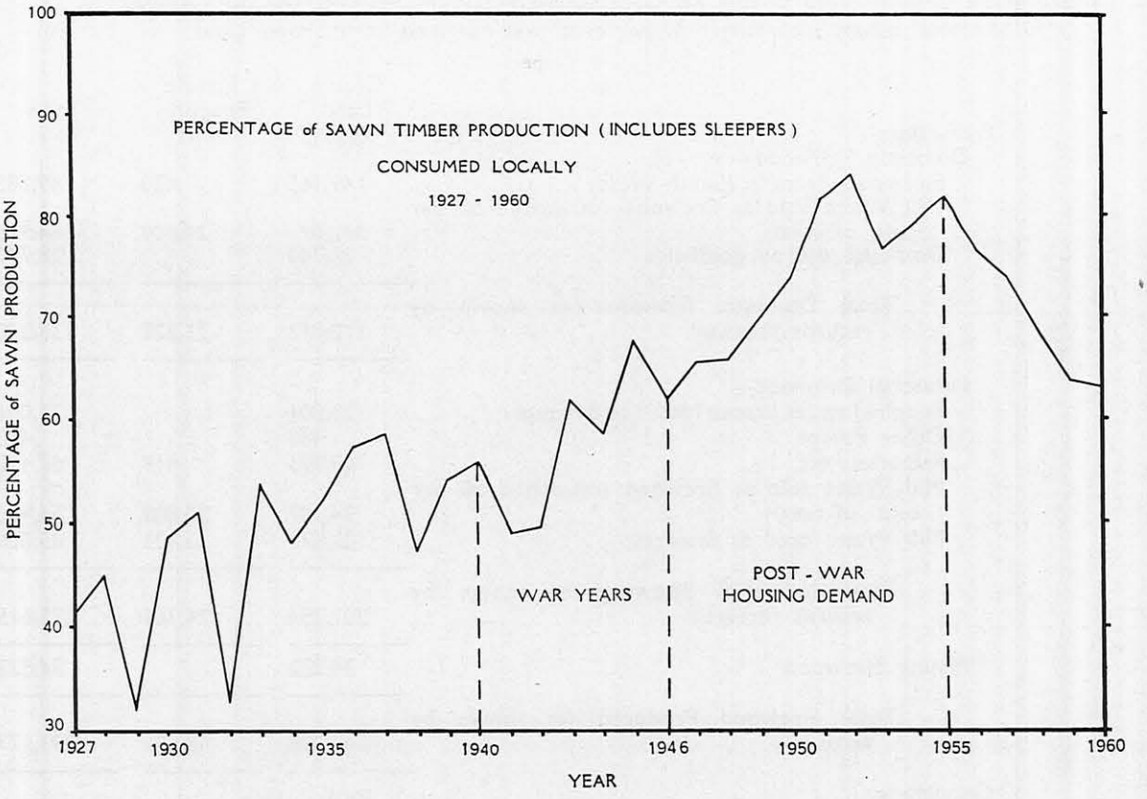
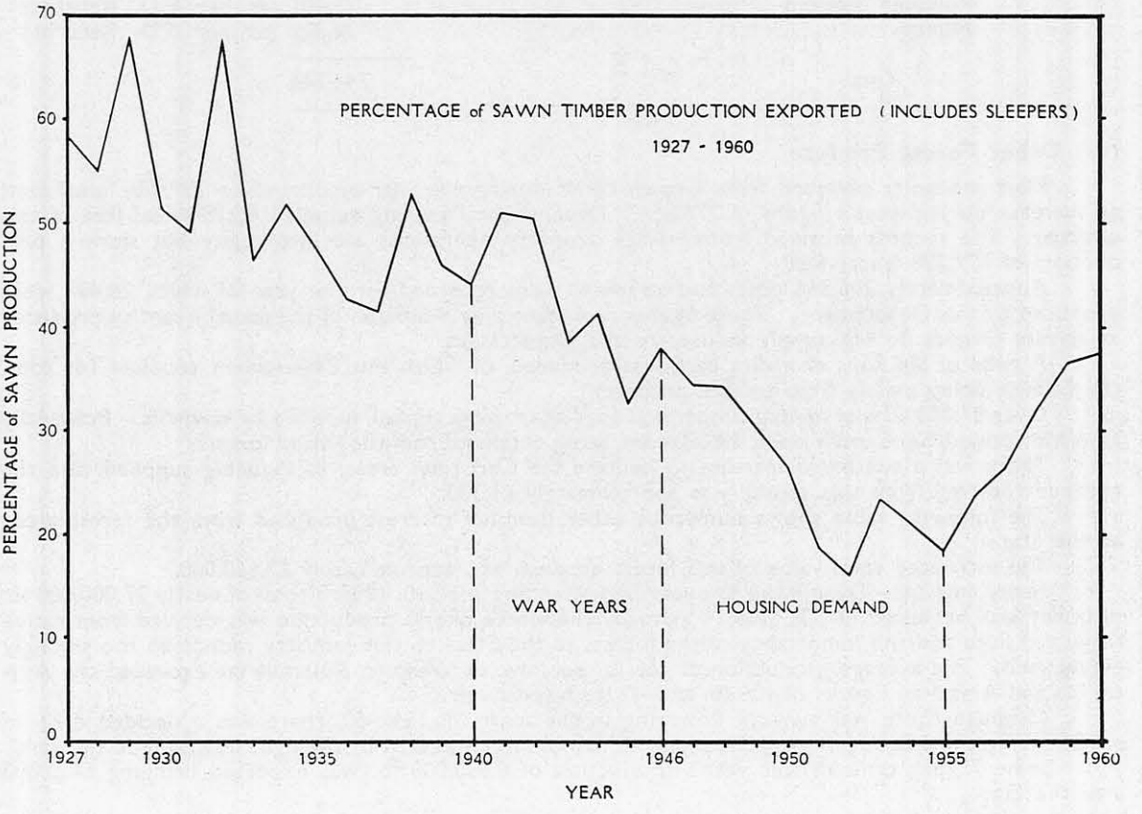


Fig. 3.



(ii) Firewood Production and Consumption

The firewood consumption for the State was estimated at 744,144 tons, almost half of which was used for industrial and mining fuel. The quantity of sawdust burnt as fuel increased from 97,621 tons to 107,289 tons.

The following table accounts for approximately 53 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 47 per cent. was obtained from Crown Land.

	Crown Land tons	Private Property tons	Total tons
Production			
Domestic Firewood—			
Firewood Permits (South-West)	49,165	420	49,585
Mill Waste sold as firewood (estimated 50 per cent. of total)	34,107	20,808	54,915
Domestic use on goldfields	28,740	....	28,740
Total Domestic Firewood as shown by returns received	112,012	21,228	133,240
Industrial Firewood—			
Supplied under license Nos. 3 to 8 Pumps	23,001	....	23,001
Other Pumps	480	....	480
Factories, etc.	60,993	419	61,412
Mill Waste sold as firewood (estimated 50 per cent. of total)	34,107	20,809	54,916
Mill Waste used as firewood	82,673	3,133	85,806
Total Industrial Firewood as shown by returns received	201,254	24,361	225,615
Mining Firewood	34,322	....	34,322
Total Firewood Produced (as shown by returns)	347,588	45,589	393,177

Consumption	tons	
Domestic (estimated)	404,500	(at 2 tons per dwelling)
Industrial	281,841	(ex Govt. Statistician)
Pumping Stations	23,481	(as per F.D. Returns)
Mining	34,322	(as per F.D. Returns)
Total	744,144	

(iii) Other Forest Produce

Piles and poles obtained from Crown Lands during the year amounted to 291,084 lineal feet, an increase on last year's figure of 276,654. Departmental cutting supplied 6,215 lineal feet of this quantity. The records received from private property operations are incomplete but show a production of 577,798 lineal feet.

Approximately 296,366 posts and strainers were recorded for the year of which 28,497 were produced by this Department. These figures represent only a portion of the actual quantity produced as private owners do not supply returns to the Department.

A total of 504 tons of mallet bark was produced, of which this Department supplied 146 tons, the balance being mainly from private property.

Over 37,000 tons of mining timber was used apart from timber supplied by sawmills. Practically all of this came from Crown lands, 14,000 tons being obtained from the inland forests.

There was a continued increase in demand for Christmas trees, 8,715 being supplied, and the revenue received from this source was approximately £1,300.

The following table shows numerous other items of interest produced from the forest areas of the State.

The estimated total value of this forest produce was approximately £2,660,000.

Honey Industry.—During the five year period ending June 30, 1959, a total of nearly 27,000,000 lb. of honey was produced in this State. Virtually the whole of this production was derived from native trees and flora and the importance of the forests of the State to this industry cannot be too strongly emphasised. The average production of 166 lb. per hive in Western Australia far exceeded the Australian and American figures of 106 lb. and 40 lb. respectively.

Although there was a heavy flowering in the marri in 1959–60, there was a decided drop of 620,000 lb. in the State's honey production. This was largely caused by the light flowering in the karri.

Some 75 per cent. of this year's production of 6,680,000 lb. was exported bringing £170,000 into the State.

(iv) Availability of Forest Waste

In Western Australia emphasis is usually placed on the main product from our forests, sawn timber. Little comment has been made on the tremendous amount of raw material available for other wood-using industries such as those which produce wood pulp, wrapping papers, container board, hardboard, chipboard, tanning substances and charcoal-iron.

Over 2,000 million cubic feet of log timber has been obtained from Crown land and private property since records have been kept. An equivalent amount of wood, mainly in heads or crowns, has been left in the forest because limitations of shape, size, quality, species or location render it unsuitable for the production of sawn timber. At the present level of trade cutting some 50 million cubic feet of forest waste becomes available to industry each year. To this figure can be added a considerable volume of raw material from thinnings. There is ample scope, therefore, for the establishment of other types of wood-using industries in the State.

The Wood Pulp Potential.—There is little doubt that eventually a wood pulp industry will be established in Western Australia. It is expected that marri (*Eucalyptus calophylla*) will be the main source of raw material, but an excellent market will also be provided for karri thinnings, while pine thinnings from our plantations can be used for the production of long-fibred pulp for strengthening purposes.

Marri is a large tree attaining its maximum development south of the Blackwood River, in the lower south-west of the State. Although the sawn timber is strong and of good grain and colour, it has not been favoured by the sawmilling industry because of the incidence of gum veins in the wood. Pulping tests, however, have shown it to be suitable for the manufacture of kraft papers, container board and hardboard. Without taking into account the natural increment of the forest, it is estimated

Marri forest in the Pemberton District

that within a 35 mile radius of Pemberton, 825 tons of marri per day could be supplied for 100 years—without interfering with the sawmilling industry.

As an economic pulp mill is expected to require some 400 tons of wood per day, it is obvious that there is adequate raw material available for the establishment of a wood-pulp industry in this State.

Charcoal.—Integration of industry can help in the more complete utilisation of our forest wealth. This is illustrated at Wundowie, 41 miles east-north-east of Perth, where a charcoal-iron industry has been established.

An extract from the report by Mr. F. C. Ford Robertson, Director, Commonwealth Forestry Bureau, Oxford, of his world tour in 1957 is of interest. Commenting on the Wundowie charcoal-iron plant, he states :—

> "The Wundowie charcoal-iron plant (1948), the only completely integrated plant of this type in the world, which logs the forest within a 15 mile radius, at the rate of 50,000 tons a year and produces (a) sawn timber, (b) dry-distillation products (methanol, acetic acid, wood tar, etc) and charcoal from both the sawn waste and forest slash, (c) sawdust (8,000 tons/year) for raising steam. The charcoal is fed to the blast furnace where the State's iron ores are reduced to high-grade pig-iron : without the charcoal, coke would have to be imported at great cost. The whole plant is a model of integrated economy, both in itself and in its relation to the forest ; but more are needed in the State if the present immense waste of unconverted and unsaleable material (with its consequent fire hazard) is to be stopped."

Assessment has shown that there is adequate raw material available further south to supply the timber requirements of other charcoal-iron plants.

Tannin.—The tannin industry is well established in Western Australia and in 1958–59 tanning substances to the value of over £250,000 were exported. These are obtained mainly from the logwood and branchwood of wandoo and the bark of brown mallet. Only material not suitable for poles or sawmilling are utilised from the wandoo forest. Following the stripping of the mallet bark, some of the wood is used in the mining industry and the surplus would form excellent fence posts if treated with preservatives.

The bark of other eucalypts may attract industry in the future especially that of karri and Dundas Mahogany (*Eucalyptus Brockwayi*). The latter tree, indigneous to the Eastern Goldfields has a tannin content equal to that of brown mallet.

Other Products.—First thinnings of pine and eucalypt stands are uneconomic unless a market can be found for them. A pulp mill would take large quantities, especially of the long-fibred pine.

Preservative treatment of pine and hardwood thinnings for use as fence post also offers great possibilities.

The common blackboy (*Xanthorrea preissii*), simply by crushing and heating, forms a strong bonding substance. During the war years charcoal briquettes were produced by mixing this with sawdust.

Much of our forest wealth is being wasted today. Only by placing facts and figures before the wood-using industries will they become aware of the potential of raw material in this State.

FOREST PRODUCE NOT ELSEWHERE INCLUDED IN PRODUCTION TABLES
OBTAINED DURING YEAR ENDED 30th JUNE, 1960

Description of Forest Produce	South-West Division and Agricultural Areas			Northern, Central and Eastern Goldfields	Totals
	Supplied by Department	Other Crown Lands	Private Property*	Crown Lands	
Mining Timber .... Tons	55	19,500	3,817	13,779	37,151
Sleepers for Goldfields Wood Line .... Cub. ft.	....	....	....	7,463	7,463
Charcoal (includes 38,783 tons ex Wundowie) Tons	....	38,874	....	....	38,874
Piles and Poles .... Lin. ft.	6,215	284,869	577,798	....	868,882
Fence Posts and Rails .... No.	27,797	86,032	15,638	164,484	293,951
Strainer Posts .... No.	700	1,715	....	....	2,415
Mallet Bark .... Tons	146	20	338	....	504
Wandoo Timber for Tannin Extract .... Tons	....	23,811	22,755	....	46,566
Bean Sticks, etc. .... No.	....	7,000	....	2,620	9,620
Boronia Blossom .... Lb.	....	1,128	1,070	....	2,198
Stone .... Cub. yds.	....	13,043	....	....	13,043
Sand .... Cub. yds.	....	48	....	....	48
Loam .... Cub. yds.	....	8	....	....	8
Scout Staves .... No.	288	....	....	....	288
Sawdust consumed as fuel, etc.† .... Tons	....	107,289	....	....	107,289

* Complete figures for private property are not available. Only information furnished to the Department has been included.

† The apportionment between Crown Land and Private Property is unknown.

SANDALWOOD

The demand for sandalwood from overseas continued and supplies received at Fremantle were barely sufficient to meet current orders.

The quantity delivered during the year (including deliveries from orders placed during the previous year) was 610 tons, compared with 252 tons to 30th June, 1959, and was made up as follows :—

	Tons
Crown Lands—	
Logwood (including roots and butts)	560
Pieces	50
Private Property	*Nil*
Total	610

The total export was 533 tons as compared with 428 tons for the previous year and it is of interest to note that owing to the difficulty in obtaining sufficient supplies of logwood, Hong Kong came into the market for sandalwood pieces—the first time for many years.

No orders for logwood were placed by the oil distillers, but 110 tons of roots and butts severed from the logwood at Fremantle were delivered to them for distillation.

The quantity of sandalwood oil distilled was 6,956 lb. and this was exported interstate and overseas.

5. TIMBER UTILISATION

Further tests on the strength properties of Western Australian timbers have been carried out by the Commonwealth Scientific and Industrial Research Organisation, Division of Forest Products. The following table includes the data obtained during the year for W.A. blackbutt (yarri) and tuart.

Mechanical Properties of Jarrah, Karri, Marri, W.A. Blackbutt and Tuart

These data were obtained from small clear specimens in a green condition.

	Jarrah lb./cu. ft.	*Karri* lb./cu. ft.	*Marri* lb./cu. ft.	*W.A. Blackbutt* lb./cu. ft.	*Tuart* lb./cu. ft.
Density	73	73	76	70	78
Static Bending—	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.
Fibre stress at limit of proportionality	6,440	6,600	7,630	6,990	8,290
Modulus of rupture	9,880	10,600	11,300	9,500	11,800
Modulus of elasticity	1,480,000	2,070,000	1,960,000	1,670,000	1,780,000
Compression Parallel to Grain—					
Stress at limit of proportionality	4,240	4,180	4,130	4,560	5,290
Maximum crushing strength	5,190	5,250	5,880	5,300	6,680
Modulus of elasticity	1,700,000	2,200,000	2,270,000	1,810,000	1,980,000
Compression Perpendicular to Grain—					
Stress at limit of proportionality—					
Radial	1,160	956	1,550	1,140	2,120
Tangential	1,290	1,260	1,360	1,120	2,120
Hardness—	lb.	lb.	lb.	lb.	lb.
Radial	1,300	1,400	1,490	1,250	2,110
Tangential	1,270	1,320	1,480	1,220	2,120
End Grain	1,310	1,370	1,420	1,230	1,890
Shear—	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.	lb./sq. in.
Radial	1,330	1,210	1,330	1,240	1,650
Tangential	1,320	1,460	1,330	1,300	1,840
Cleavage—	lb./in.	lb./in.	lb./in.	lb./in.	lb./in.
Radial	360	366	319	349	369
Tangential	385	460	399	383	504
Izod Impact (Toughness)—	ft./lb.	ft./lb.	ft./lb.	ft./lb.	ft./lb.
Radial	9·2	15·2	14·2	9·3	12·0
Tangential	10·2	15·4	15·5	10·4	13·8

Clear Finish Exposure Tests

Of the 78 treatments set up 26 months ago, there now remains only two without blemish. A further test, which will compare 27 proprietary finishes, has now been exposed for three months.

Marine Borer Tests

The Department co-operated with the C.S.I.R.O., the Public Works Department and British Petroleum in experiments to test the resistance to marine borers of a variety of timbers pressure

treated with different preservatives. Jarrah and karri poles were exposed at Bunbury, Fremantle and Port Hedland, and pine and other hardwoods at Kwinana and Port Hedland. The first annual examination is due in October.

Seasoning of Poles

Tests were started at Pemberton and Ludlow to determine the time required and suitable methods for seasoning karri poles prior to pressure impregnation with preservatives. Results to date indicate that checking and end-splitting in this species are likely to prove difficult to control.

Equilibrium Moisture Content of Timber

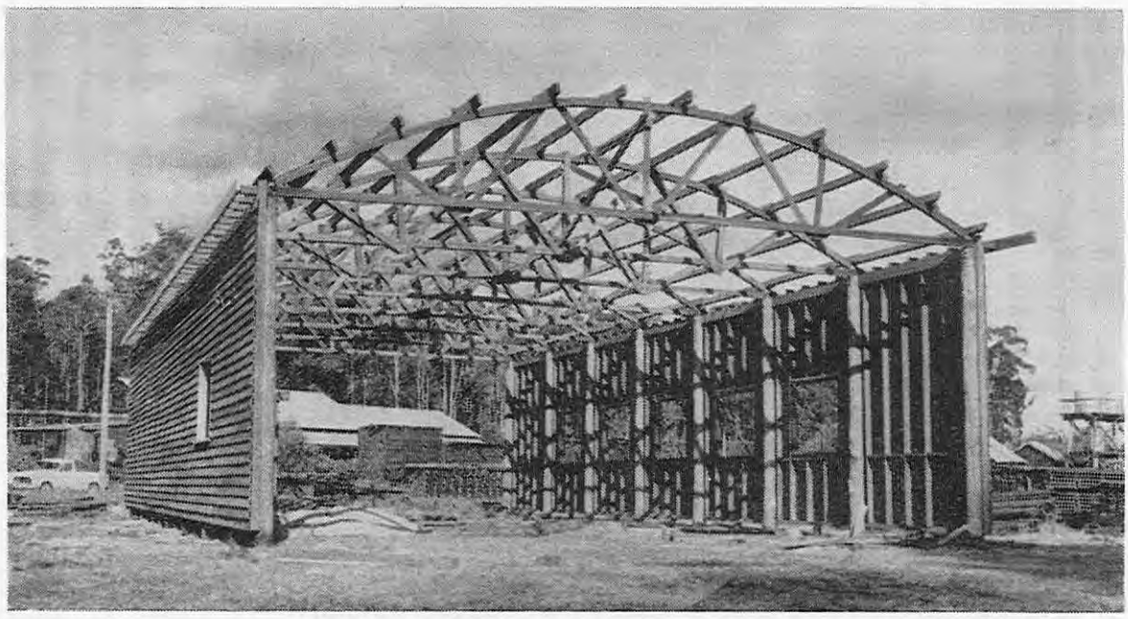
Experiments are being undertaken at Como Headquarters to determine :

(1) The change in equilibrium moisture content of Western Australian species exposed under sheltered outdoor conditions.

(2) The change in moisture content of flooring *in situ*.

Design and Construction

Timber storage sheds with nailed bowstring roof trusses of 35 feet and 52 feet span have been built at Dwellingup and Harvey respectively.



35 ft. span bowstring trusses in building—Dwellingup

The bowstring is a design that lends itself well to timber construction as it makes use of nailed laminations of relatively short small-section timber. The stresses in the web are low and allow timber to be used for both the tension and compression members with only nailed fastenings. Furthermore, since the carpentry and erection are simple it is very suitable for farmers, orchardists, sawmillers, etc., wishing to build large-span sheds for their own use. If hardwood timber is used, the nail holes must be pre-drilled but with pine this is not necessary. Roofing iron does not need to be pre-curved to fit this type of truss.

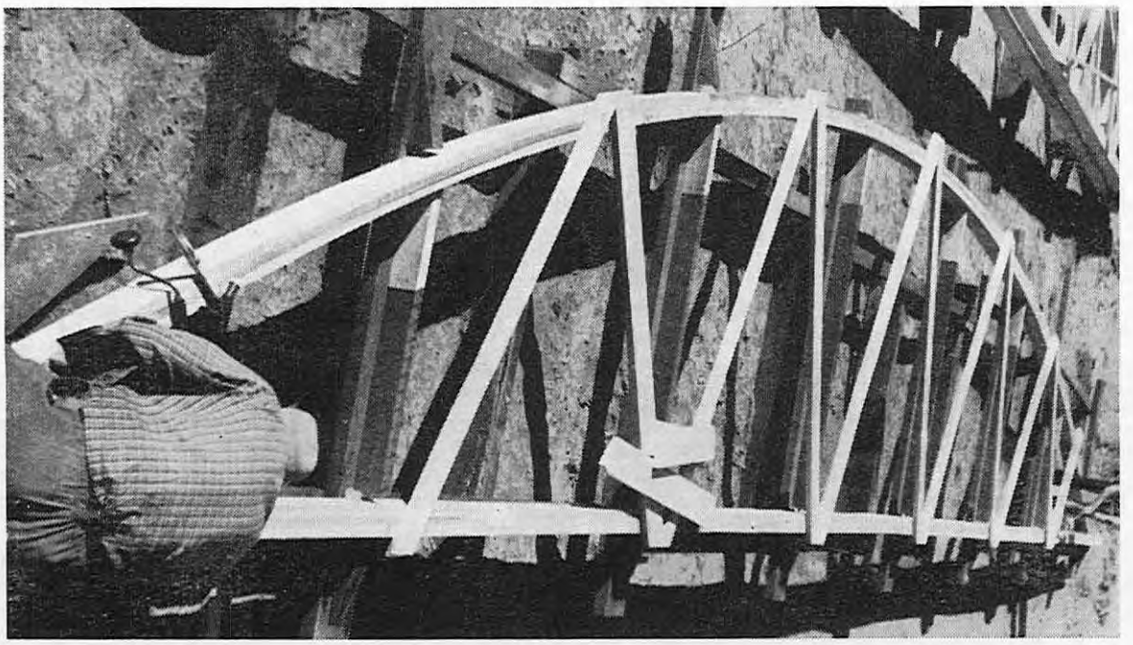
A modified McCashney sawdust burner using a steel outer shell has been built at Harvey.

Preservation of Western Australian Timbers

An interesting development during the year has been the installation by State Building Supplies at Pemberton of the first commercial timber treatment plant in the world using the high pressure of 1,000 lb./sq. in. This treats karri cross arms for supply to the Postmaster-General's Department. Some 6,600 lineal feet can be treated each day on a single shift operation of the plant.

Grading Rules

Prepared by the West Australian Joint Timber Committee, Australian Standard No. 0·46—1960, Round Section Stringers, was published during the year. This committee held one meeting dealing with grading rules for sleepers.



52 ft. span bowstring truss being assembled at Harvey

6. FOREST MANAGEMENT

(i) Surveys and Map Production

Major surveys for mapping control were extended by 156 miles this year. Lower order surveys carried out by Divisional staff totalled 306 miles.

Theodolite surveying for mapping control

Base sheets covering about 1,400 square miles for use in charting surveys were compiled. In addition skeleton sheets covering about 4,600 square miles were prepared for basic control in " laying down " photogrammetric work.

For the first time an " 80 " scale plan was produced in three colours for the Shannon River Division. The plan has brought favourable comment from the field staff.

Air Photo Interpretation.—Air Photo interpretation, which is now partly decentralised to Working Plans Offices at Manjimup and Harvey reached a record figure as follows :—

	acres
Head Office	783,500
Manjimup	172,500
Harvey	530,000
Total	1,486,000

Standard Mapping.—The area now covered by standard 20 ch. to 1 inch maps was increased by 759,000 acres bringing the net total area to 8,276,250 acres.

(ii) Working Plans

Accumulation of data relating to the growth and distribution of size classes will provide valuable information on which to base the forthcoming revision of the Working Plans for the indigenous forest. These plans which are revised every five years, govern the long term continuity of sawmilling and other forest industries and at the same time provide for areas of forest to be witheld from trade operations to permit the accumulation of increment.

Forest Inventory Data.—Work on this project has reached the stage where a preliminary inventory will be possible by December, 1960.

It is believed that Western Australia is now ahead of other Australian States in this work.

Aerial Reconnaissance.—Test flights in a small reconnaissance aircraft during the year indicated that very useful information could be gained by periodic flights over the forests. Aerial inspections for specific projects in certain cases could well be justified.

It is surprising and disturbing, in an " air-minded " age, to find so few suitable landing strips in the south-west of this State. In view of the initial cost of their establishment and their value to the district concerned, it is to be deplored that the airstrips at Busselton and Pinjarra have been alienated.

To permit rapid reconnaissance of the karri forest region and encourage tourist traffic to the surrounding area, an airstrip near Manjimup would be an asset to the development of the south-west.

Regional Workshops—Manjimup

(iii) Forest Engineering

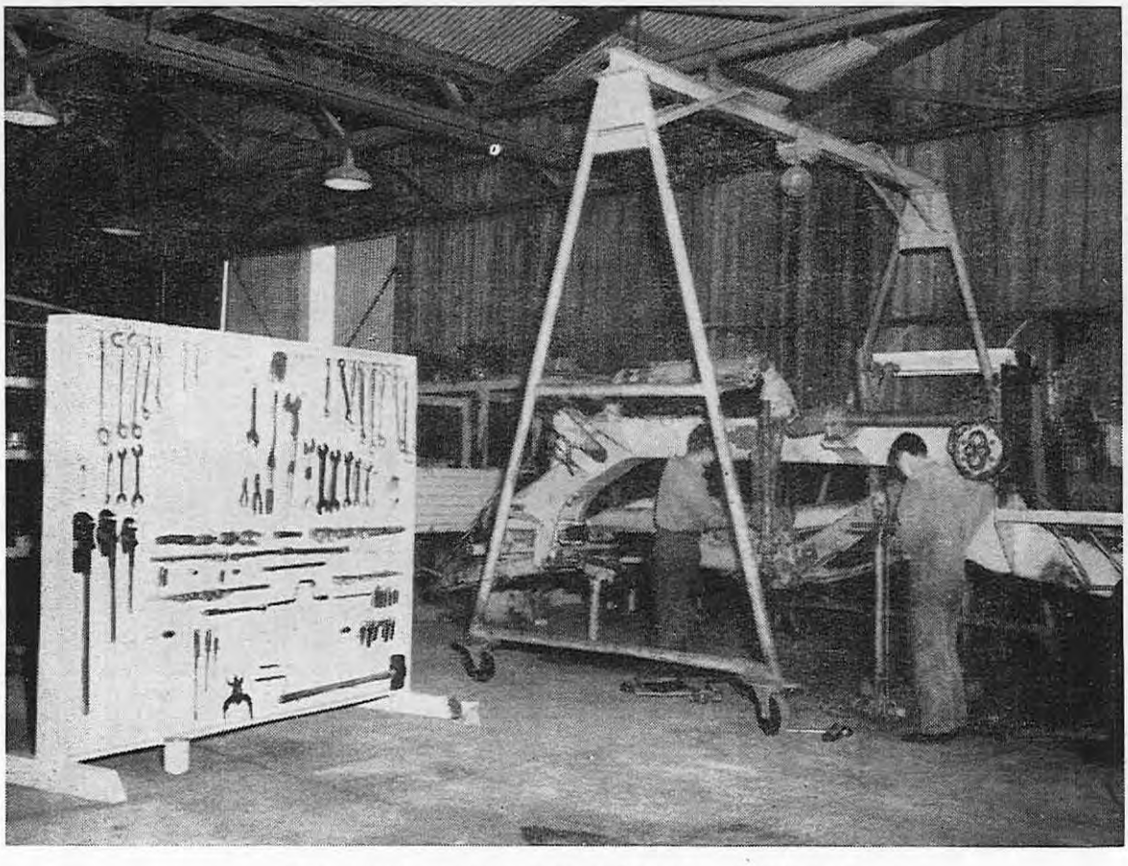
Engineering projects completed during the year are set out in the following table :—

Item	Completed in Current Year	Present Total
Construction of Roads, Firelines and Tracks	714	17,681
Maintenance of Roads, Firelines and Tracks	5,199	....
Telephone Lines	36	1,798
Houses	5	447

Heavy bulldozer constructing road—Blackwood Valley

Heavy grader forming road—Blackwood Valley

Departmental logging road—Dwellingup



Major overhaul of heavy grader in Departmental Workshops

In view of the change over from fire-break burning only, to mostly broadcast controlled burning, many tracks and firelines no longer warrant maintenance. For this reason the total mileage of roads, firelines and tracks to be retained in the older protected forest areas is under review.

(iv) Housing

The number of Departmental houses was increased by five during the year.

Maintenance of existing buildings was continued and in certain cases amenities were added such as provision of garages.

All houses at Collie have been connected to deep sewerage and all Departmental houses on an adequate water supply are now provided with septic systems. The only centre now where septic systems are not installed is the town of Nannup, which lacks a reticulated water supply.

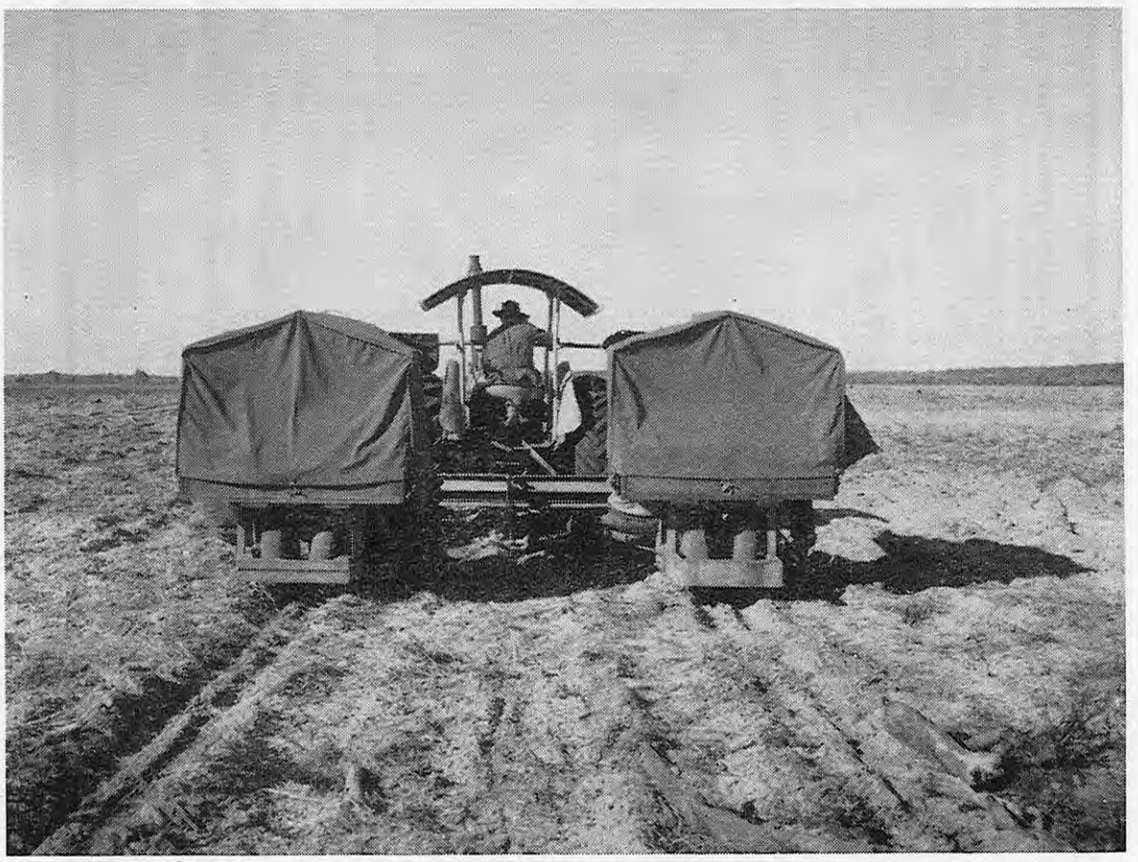
(v) Plant and Equipment

During the year one Assistant Maintenance Engineer was appointed and four mechanics resigned. The number of apprentice motor mechanics remained at five throughout the year. The possibility of increasing the apprentice intake is now being studied.

Despite the decrease in staff, all equipment was maintained at a satisfactory standard.

Departmental officers, over the years, have improved the design and operation of pine planting machines.

Two of the more recent machines—one for dual operation—are considered to have reached a high level of efficiency. Trials have shown that a dual machine with a five man team is able to plant up to 24 acres per day, or a total of 25,000 plants. A single machine, operated by three men, under good conditions can plant 12 acres or approximately 12,600 plants in one day.



Pine Establishment. A " Lowther " dual operation planting machine in action

(vi) Communications

Radio.—New ground station equipment type F TI-FRI was installed at Dwellingup, Harvey, Kirup, Collie and Mundaring and modifications were incorporated in all other FTI ground stations.

Gleneagle fixed station was re-installed in the new radio room.

Extensive testing was carried out of a radio frequency 2,580 Kc/s to ascertain range and suitability for our network. Tests indicated a range not reliable in daylight over 15 miles.

The reserve of spare mobile sets, type FS6 was increased by 3, made up from material on hand.

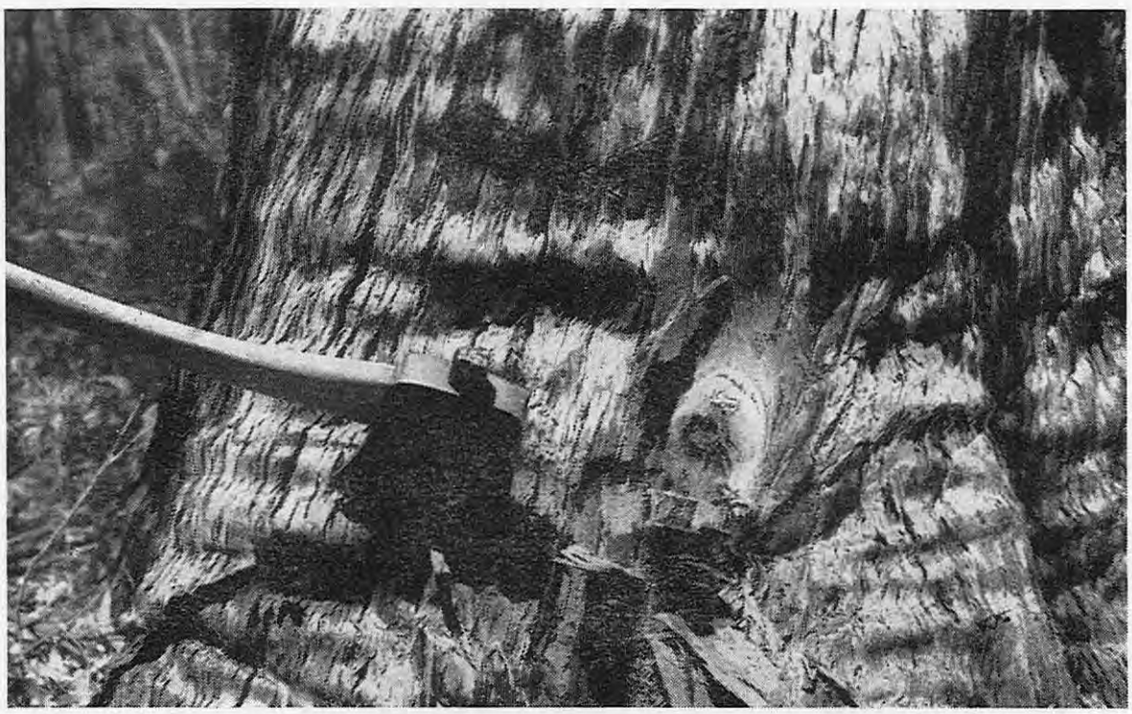
Telephones.—The metallic return circuit system at Dwellingup was completed and tested, with encouraging results. The re-installation of indoor equipment at Gleneagle, Gunjin and Eagle Hill towers has been planned and part completed. Twenty-three switchboards of various types were made up. A commencement has been made on the re-organisation of the telephone system at Mundaring.

Electrical.—An installation for water reticulation by electrically motor driven pump was planned and specifications made up for Hamel nursery.

Ten vehicles were fitted with additional wiring for radio and two wiring kits made up for Willeys Jeeps.

7. REFORESTATION

The continued silvicultural control of felling under the West Australian system of tree marking ensured that trees were removed in such a way as to protect existing immature growth and encourage regeneration. The selection and branding of trees to be felled by an authorised officer of the Department is exercised over all permits in State Forest. After felling, a top disposal operation assists to protect the young growing trees and also provides a good seed bed for future crops.



Tree-Marking. To avoid damage to growing stock, trees are marked to indicate the direction of felling. The photograph depicts the tree-marking axe with its brand and the branded " toe-mark " over which the tree is to be felled

During the year 97,243 acres of State Forest were cut over under this system and treated for regeneration.

Tornado Damage

Tornadoes have been reported from forest areas from time to time, but the damage was not extensive. However, one of extra severity affecting a greater area of forest country occurred south of Collie in the early hours of 6th April, 1960. Commencing about a mile west of the Wellington Dam and approximately three miles north of the wall, it proceeded in a more or less straight path in an east-south-easterly direction.

For the first 17 miles it cut a practically continuous swathe through the forest varying in width up to 30 chains, with in places, side effects for a further 15 chains. Beyond this the tornado started to skip or bounce causing damage to farms further east. In the main swathe the majority of trees were either blown over or snapped off at varying heights, whilst those that remained standing were stripped of their foliage and most of their limbs.

It is estimated that nearly 500,000 cubic feet of millable timber will be salvaged as well as a large number of poles and piles.

Following the removal of the salvageable material from this strip a form of regeneration cleaning will be undertaken to ensure the satisfactory restocking of the area.

Tornado damage—Collie area—June, 1960

8. AFFORESTATION

The ever increasing need for large areas of pine plantations in Western Australia, envisaged in the 1956 Pine Plantation Working Plan, has been borne out by the steadily increasing demand for pine over the years. The time has now been reached where the demand from the metropolitan area is such that it will have to be met in part from more remote plantations.

With the continued rise in population, the time cannot be too far distant when a paper pulp industry will be established in this State. Such a plant would of necessity require large quantities of long-fibred pine for mixing with the shorter-fibred eucalypt pulp.

The above Working Plan stressed the importance of planting the fast growing *Pinus radiata* and to this end areas of land suitable for this species have been acquired by the Department.

Two new plantations, suitable for the growing of *P. radiata* were established at Brunswick River and Bussell's Brook and planting commenced during the current year.

The target of 11,000 acres of new plantations to be established in the period 1956 to 1960 will, it is expected, fall short of this total by some 500 acres, unless it is possible to step up the planting rate during the 1960 planting season.

The 1959 planting was distributed as follows :—

	acres
Blackwood	638
Gnangara	445
Grimwade	282
Pinjar	274
Myalup	176
Collie	160
Mundaring	97
McLarty	97
Bussells Brook	80
Brunswick	68
Ludlow	38
Gleneagle	24
	2,379

During the year 105 acres were clear felled, making the present net area of plantation 29,318 acres, including experimental areas of 851 acres.

Ground preparation in readiness for future planting was continued and the position after the above planting was as follows :—

	acres
Cleared awaiting initial burn	4,147
Part cleared	2,156
Part cleared following initial burn	717
Cleared awaiting cultivation	409
Cleared and cultivated	363

Soil Surveys

The establishment of pine plantations is only possible after land suitable for this purpose has been carefully selected and intensive soil surveys and chemical analyses have been carried out. The work was continued during the year as follows :—

Detailed Surveys	10,550 acres
Chemical Analyses	197 samples

Since this standard of survey was initiated in September, 1954, the following areas have been covered :—

	acres
Reconnaissance Surveys	148,670
Detailed Surveys	50,470
Coastal Plain Reconnaissance	111,390

Site Quality Mapping

Due to the restricted planting programme in the late war years, only small areas reached the age limits for site quality work during the year, and a total of 355 acres was mapped.

Production of Pine Timber

Timber production from plantations, consisting largely of thinnings, amounted to 1,336,825 cubic feet.

Pine sawmills and case factories, in addition to Departmental mills, are largely supported by this supply.

The quantity of local pine logs suitable for peeling and slicing amounted to 57,127 cubic feet. This was supplied to two plywood factories in the metropolitan area.

Logs produced by the various plantations were as follows :—

	Cubic Feet
Metropolitan—	
Gnangara	192,525
Somerville	117,200
Collier	26,982
Scaddan	13,350
Mundaring	413,527
Gleneagle	1,524
Harvey—	
Harvey Weir	107,017
Myalup	80,860
Hamel	6,300
Collie	135,325
Grimwade	144,409
Busselton—	
Keenan	60,354
Ludlow-Willcock	36,695
Manjimup	697
Pimelia	60
Total	1,336,825

The Growing Importance of Pine

The demand for pine continues to increase and its importance in the industrial life of this State is becoming more apparent.

Confidence in the future of pine manufactures is illustrated by the merging of three companies to construct a large case factory equal to any of similar type in Australia. The anticipated annual intake of this mill, when in full production, will be in the vicinity of 750,000 cubic feet in the round.

The supply of pine peeler and slicer logs, on a limited scale, is now possible and all available logs of this type are eagerly sought by the two plywood manufacturers in this State. The production this year of 57,127 cubic feet represents 4·3 per cent. of the total log production as against 2·6 per cent. in 1950. This not only points to the increasing availability of supply but also to a saving of imports.

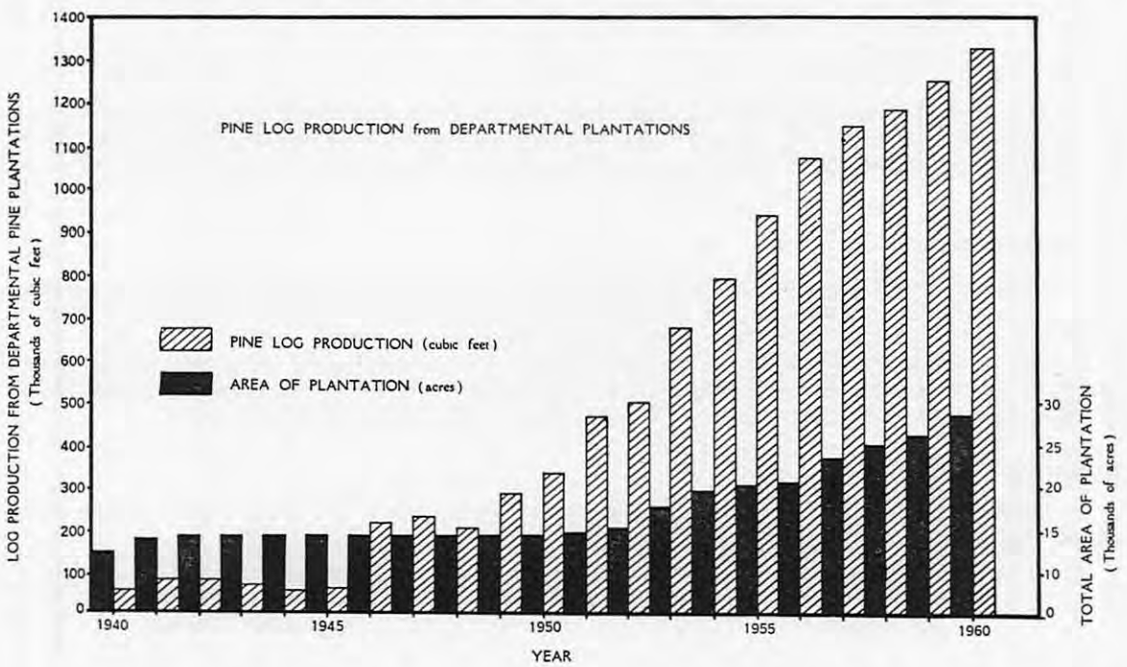
The manufacture of wood-wool from pine logs continues to increase and 12,200 cubic feet were supplied for this purpose. This industry uses the smaller sized logs which aids in the more complete utilization of each tree, and the product, apart from use as packing and filler, can also be used as a base for concrete wall boards.

The Education Department again used 3,800 cubic feet of locally grown sawn pine in their manual training classes.

The growing pearl culture industry in the North-West is calling for increased supplies of pine poles, which are used in the construction of rafts for culture pots. The number of poles supplied this year was 600.

Future Pine Production

In the last 20 years the net area of plantations has more than doubled but the production of pine logs is nearly 21 times greater than it was in 1940. In 1940 the net area of plantation was 12,494 acres and in 1960, 28,467 acres. The production of pine logs for these years was 63,944 cubic feet and 1,336,825 cubic feet respectively, all of it from stands which are not yet mature.



Assuming the target of 2,000 acres of new pine plantations per annum is achieved, the area planted by 1980 will have reached 68,500 acres. The production of pine logs, however, will rise sharply as early plantings reach maturity and clear felling takes place.

It is estimated that in 20 years the annual production of pine will be in the vicinity of 12,500,000 cubic feet, or 1/3rd of the present output of hardwoods from our State Forests. A large proportion of this production will be in the form of high quality logs.

Seed Procurement—Pinus pinaster

Experience in Western Australia has shown the superiority of the Leiria strain of *Pinus pinaster* for plantations established on our coastal sands. Considerable difficulty has been experienced both here and in other States of the Commonwealth in obtaining adequate pine seed from reliable sources. In an endeavour to improve this position and at the request of the Director General, Forestry and Timber Bureau, Canberra, the Conservator of Forests, Mr. A. C. Harris, visited Portugal in November, 1959, where he was able to make satisfactory arrangements with the Portuguese Forest Service for an augmented supply of seed of this variety to meet Australia's requirements.

9. FIRE PROTECTION

State Forest Under Protection

	acres
Indigenous Forest	4,054,250
Pine Plantation	29,318
Mallet Plantation	19,048

Surrounding and adjacent to this protected forest, are some 1,700,000 acres of private property, Crown land and areas of State Forest being held for pine planting. Fires in this region can be a serious menace to the managed forest and must be attended to promptly.

The Fire Season

	Jarrah	Karri
Rainfall	Over average October to January and March. February driest. General deficit 9 inches	Under average except November, January, and March. General deficit, 11 inches.
Temperature—		
Number of days over 90°	11	1
" " " " 95°	0	0
Relative Humidity—		
Number of days below 25 per cent.	30	8
Fire Hazard—		
Number of days " Dangerous "	2	0
Number of days " Severe Summer "	10	0
Mean Fire Hazard	5·1	4·1

The above figures show that the season was mild without the temperature reaching 100°F. in any part of the protected forest. The first day of Dangerous hazard occurred on 21st December in the jarrah forest region, but there were no days of Dangerous or Severe Summer hazard recorded in the karri areas.

Controlled Burning

Good controlled burning conditions obtained in the jarrah forest during spring and early summer. Mild weather in autumn and early winter permitted widespread burning in the eastern section but prolonged rains restricted operations in the western portion.

The uncommonly dry winter in the karri forest region allowed early broadcast burning of flats and open jarrah forest. Above average rains in November and January considerably curtailed late spring and earlier summer operations and heavy falls in March stopped autumn burning.

Detection

No new towers were brought into operation and because of the mild season there was no necessity to man the towers at George and Granite Peak.

Manning of Towers—	Jarrah	Karri
First Watch	13/10/59	13/11/59
Last Watch	8/5/60	2/4/60

Fires and Fire Damage

The total number of fires attended by Departmental gangs during the year was 232 which is well below average and the lowest since the 1950–51 Season when 217 fires were attended.

The following table sets out the principal causes :—

Children	34
Travellers	33
Mill Locomotives	26
Escapes from Prescribed burns	26
Escapes from Settlers fires	22
Hunters and fishermen	19
Tractor	15
Householders	10
Deliberately lit	9
Miscellaneous (chiefly other Government employees, Mill surroundings and W.A.G.R. Locomotives)	23
Unknown	15
Total	232

The list of causes shows a very different pattern from previous years with Travellers, Hunters, and Fishermen combined, heading the list with 52 fires, or 22·4 per cent. as against 12·4 per cent. last year, although the actual number of fires was about the same.

The biggest change was escapes from settlers burning-off with a drop of 77 fires from 99 to 22 and the percentage falling from 23 per cent. to 9·5 per cent.

The large number of tractor fires was due to one tractor with a burnt-out exhaust pipe lighting a string of 12 fires on the one day.

Points of Origin of Fires—	
State Forest	108
Private Property	74
Crown Lands	40
Pine Forests	10
Total	232

Total Area Burnt—	Protected Forests	Waste Land
Indigenous forest	2,619	4,981
Pine Plantations	13	
Mallet Plantations	8	
Summary of Damage—		
Slight	1,482	
Medium	482	
Severe	676	
Total	2,640	

Size of Fires—	
Less than 1 acre	104
1– 5 acres	50
6– 10 acres	20
11– 20 acres	14
21– 50 acres	15
51–100 acres	10
101–200 acres	8
Over 200 acres	11
Total	232

Departmental gangs were responsible for saving the local Hall at Shannon River, a small sawmill in the Busselton district, and a truck on which a load of lime bags caught fire. On several occasions fires menacing small settlements were brought under control.

Publicity and Public Relations

More " Slogan " type notices were erected on roads leading to picnic and fishing spots and officers visited these spots from time to time to discuss fire prevention with travellers.

District Officers have taken positions on local bush fire advisory committees thus bringing the Department into closer touch with bush fire organisations on a good neighbour basis.

Assistance was given the Local Authorities in the detection and investigation of breaches of the Bush Fires Act and there are heartening signs that more Local Authorities are taking a greater interest in policing the Act.

Youth Camps and schools were visited for talks on fire prevention and fire fighting demonstrations given at Agricultural shows.

10. SILVICULTURE AND SOILS RESEARCH

(i) KARRI SILVICULTURE

The karri forest experienced its driest year for 47 years. Pemberton recorded only 3,477 points of rain against the average of 4,994 points.

Karri Flowering

Flowering was irregular and generally light. In the period April to November, 1959, blossoms appeared north of the Warren River from buds initiated in 1959. A second flowering commenced in April this year from 1958 buds. No blossoms appeared South of the Warren River.

A bud weevil (*Curculionidae*) has been observed attacking large buds, causing a drop of about 45 per cent. The insect operates along similar lines to the better known Tuart Bud weevil, laying its egg on the bud then nipping the stems and so causing the buds to drop to the ground either singly or in bunches.

Seed Crops

Adequate seed shed occurred only in a small area in the Gardner River Valley. However, satisfactory seed fall in 1961 is forecast for most stands along the Donnelly River and South of Walpole.

The number of viable seed per pound of seed vessels was only 17,000 as against 70,000 recorded in 1956. The reduction was due in part to the activities of borers (*Bruchidae*) which occupied some 25 per cent. of the seed vessels. With the limited seed available the activities of seed-destroying insects on the ground assumed greater significance.

Karri Regeneration

This was satisfactorily achieved on a small scale in limited areas in the Gardner River Valley, where seed vessels formed from the 1958 flowering provided adequate seed.

(ii) JARRAH SILVICULTURE

Research work has shown that the successful regeneration of jarrah depends largely on the presence of well developed ligno-tuberous advance growth at the time of the cut, and that the development of this advance growth is extremely slow. Projects to further study factors influencing the natural development of jarrah seedlings, and their development, have been initiated this year.

Flowering

A general flowering in 1958 resulted in a fairly heavy crop of fruit on most mature jarrah trees this year. The 1959 flowering was light, and the heavy fall of buds this year indicates that there will be little blossom in the jarrah forest in 1960.

Seed Crops

During the summer, seed fall from the fairly heavy crop of fruit was very light with no pronounced peak. Experimental burns show that a mild burn with no scorching of the crown is sufficient to bring down a considerable amount of seed. Tests have shown that jarrah seed is viable less than 12 months after flowering. Germination is usually slow at from three to seven weeks but stratification of the seed gives faster and more uniform results. Trial plots indicate that ashbeds and cultivated unburnt ground form the best seed beds.

Artificial Establishment of Jarrah

Early application of fertilisers has caused deaths in artificially established jarrah plots. Tests are being continued applying the fertilisers nine months after the date of planting.

Jarrah Regrowth—Stand Development and Tending

Studies in stand behaviour have been continued. Permanent sample plots were established 16 years ago in dense, high quality jarrah regrowth, 25 to 30 years old.

With a stocking of more than 300 stems per acre, initial growth rates were rapid with a height increment of three feet per annum and a mean annual increment of 50 cubic feet for the first 25 years.

Differentiation into canopy classes which was evident by age 25 has become more pronounced in the past 16 years. No trees have died and the persistence of this high stocking has led to mutual suppression and a decline in production per acre of more than 50 per cent. Growth rates of both overstorey and understorey trees have slowed down considerably.

A heavy thinning has been carried out on one half of an overstocked regrowth plot in an endeavour to ascertain the effect of overstocking with the decline in productivity of the site.

A report on the behaviour of regrowth stands, based on sample plot data, has been prepared.

Trials to examine methods of controlling coppice following thinning, have been established. Weedicides used as a foliage spray on young coppice have proved effective, but expensive. Spraying the freshly cut stumps may be a more economical method and this is being investigated.

In co-operation with Working Plans Officers, a code of sample plot procedure to standardize methods of establishment, measurement and maintenance of permanent sample plots, has been prepared.

An article entitled " Development of Jarrah Regeneration " has been written for publication as a Departmental Bulletin.

(iii) PINE SILVICULTURE

Tree Breeding

Preliminary work on the variation in *Pinus pinaster* in local plantations has been submitted for publication. The information obtained will serve as a basis for selection and propagation work over the next few years.

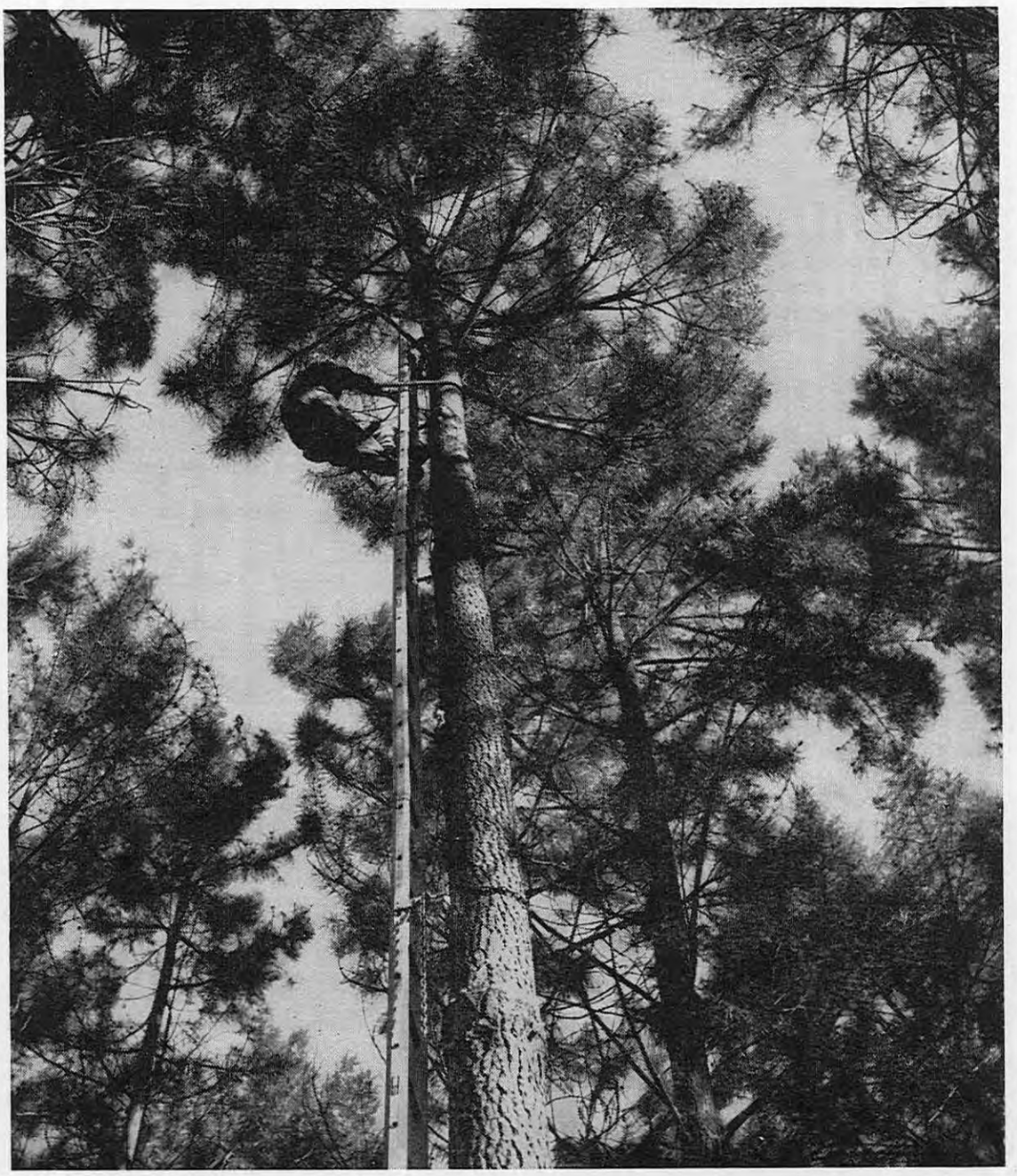
Four geographic races of the species have been planted in Western Australia. These are native to the forests of Leira in Portugal, French Landes, French Esterel and Corsica. Of these, the Portuguese race has proved the most suitable for our conditions. The major aim for selection work with this race is to breed out the undesirable traits of stem forking and upright branching.

Of the other three races available for study, the Corsican is the only one offering possibilities in breeding work with this species. This race lacks the vigour of the Portuguese but has superior stem form and horizontal branching.

It appears that the most desirable planting stock may result from a cross between the Portuguese and Corsican material.

Vegetative Propagation

In October, 1959, 352 bottle grafts were carried out. These were mainly from trees over 20 years of age. Results were poor and only 50 per cent. are available for planting out in the Neaves Road Arboretum.



Obtaining material for cuttings from a " Plus " tree of Pinus pinaster

Steps have been taken to provide improved glass house and lath house facilities at Wanneroo and it is expected that future results will be satisfactory.

Neaves Road Arboretum

At present 260 successful grafts covering 13 possible parent trees have been planted out in the arboretum at Neaves Road. During the next two years a further 30 trees will be established in the arboretum.

Half of the grafts will be permitted to develop normally to serve as a stud record for the range of parent trees selected. The other half will be cut back to provide shoot material for seed orchard establishment, controlled crossing studies and progeny testing work.

Establishment in the arboretum has been excellent and to date only one death has occurred. This was due to mechanical damage.

Soil Moisture Investigations

Soil moisture studies have been carried out at Gnangara for the past 12 months to provide an indication of the seasonal variations under pine stands of different stockings and topographic situations.

Five different areas were sampled at monthly intervals using a Veihmeyer tube sampler and a "Speedy" moisture meter. Each area consisted of three separate measurement points at which five random holes were sampled at 12 inch intervals to a depth of six feet. A uniformity test shows that this system gives a maximum sampling error of five per cent.

The study has shown :

(i) On the four areas sampled to cover high dune, mid dune and flat locations, water is limiting in the drier months of the year in all except the flat sites.

(ii) Pines deplete the profile of water to a depth of at least six feet during the summer.

(iii) Thinning has a marked effect in relieving the moisture stress found in unthinned pine stands.

(iv) Natural vegetation at Gnangara completely removes soil water to a depth of at least six feet for three to four months of the dry season.

This work will determine whether or not the project will be continued and extended. It is intended that the initial work will be published as a Departmental Bulletin.

Pine Site Quality Investigations

Investigations to determine whether site quality can be correlated with topographic and soil profile factors have been commenced.

Topography has little or no effect on site quality on the flats at Gnangara but is significantly correlated on the more undulating dune areas.

Soil profile investigations indicates a close correlation between depth of the leached horizon and pine growth. The deeper the profile to a yellow sand or coffee rock horizon, the poorer is the pine growth.

Further work is warranted and it is highly probable that future pine site quality will be estimated reasonably well from an initial study of natural vegetation types occurring on an area.

Nutrition

A summary of the nutrition work carried out up to 1960 with *Pinus pinaster* on the sands of the Swan Coastal Plain has been completed and is in course of publication.

Stimulation of Germination

Considerable improvement in the germination of *Pinus pinaster* seed by using a treatment combining both cold soaking and stratification techniques has been achieved.

In recent trials both the rate of germination and total germination have been significantly increased. Seed treated in 1958 gave 80 per cent. of the total germination in 28 days as compared with a 38 per cent. germination for untreated seed under the same conditions. Comparable values for 1959 trials over a 23 day period were 86 per cent. and 55 per cent. respectively.

(iv) SOILS RESEARCH

Several new projects were commenced at the Dwellingup Research Station this year, the main activities being centred around soil and plant nutrition studies.

The Jarrah Forest

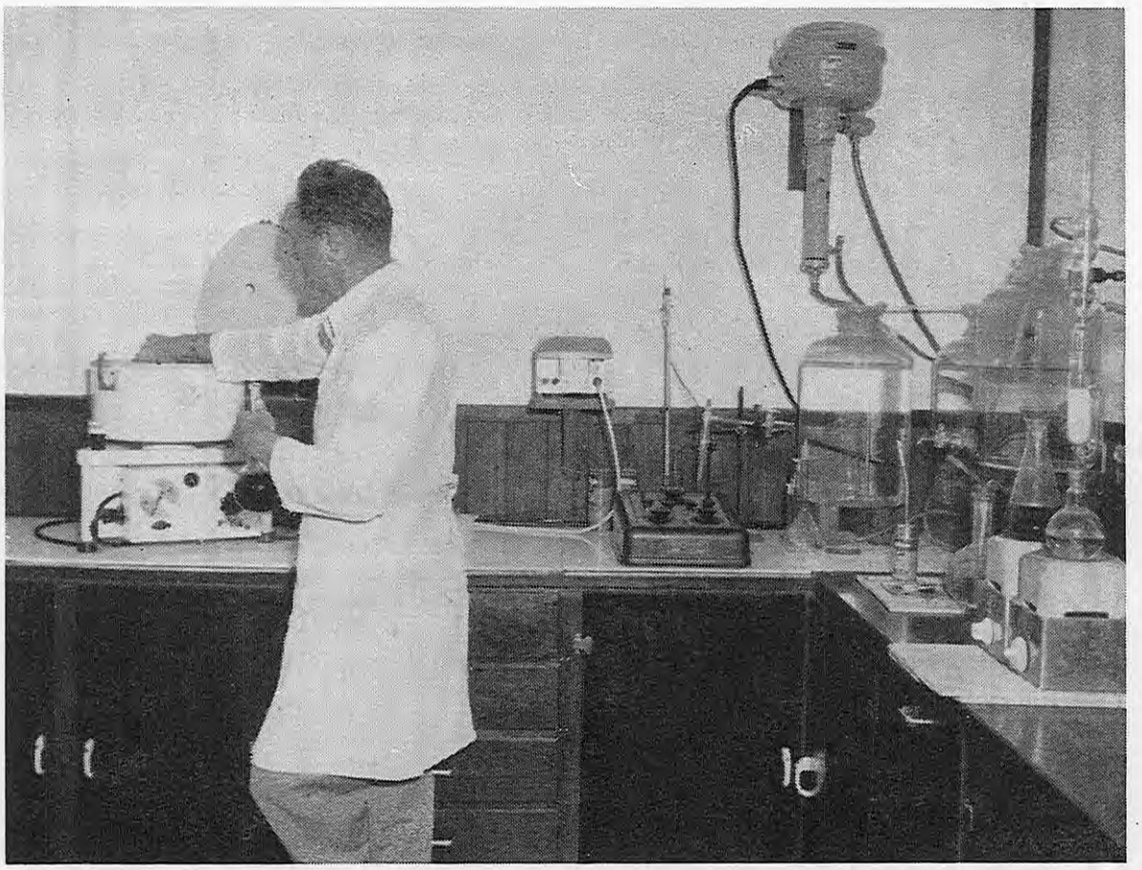
Investigations were made into the water soluble leachates of jarrah leaf litter. The readily soluble inorganic constituents have been determined and a brief study of the complex organic substances has been commenced.

A paper, "The Effect of Frequent Burning on the Jarrah Forest Soils of Western Australia" was published in the Journal of the Royal Society of Western Australia during the year.

Work on ash beds continued and a paper was presented to the 1959 ANZAAS Conference in Perth, on some aspects of this project. The additional data confirmed the findings quoted in an earlier report, and also showed that periods of at least twenty years are required to restore the ash beds to the condition of a normal forest soil.

Pine Plantations

Soil Moisture.—The investigation into the establishment of *Pinus radiata* on lateritic soils has been expanded with several new lines of research. Studies of samples collected at monthly intervals will determine the range of soil moisture content over a number of site qualities on both lateritic and basic soils.



A section of the Research Laboratory at Dwellingup

In conjunction with this study an irrigated plot has been established at Gleneagle. This small plot was watered with the equivalent of three inches of rain per week during the summer period, to observe the effect of the water on pine growth. At the end of summer the pines showed no material benefit from these waterings.

Tree Injections.—Two series of tree injections of pines were carried out. In one, a complete fertiliser mixture was applied to the tree, but the small doses used had no immediate marked effects.

In the second series a heavier application of NPK mixture was used, resulting in marked needle scorch on the lower limbs. It is still too early to see if this treatment has caused permanent injury to the plants.

Soil Fertility

In co-operation with the C.S.I.R.O., a large scale field trial of soil fertility as it affects pine growth, has been established near Carinyah. The area has been given a basal dressing of superphosphate and minor elements, and clover and lupins are being used to build up the soil nitrogen levels prior to the establishment of *P. radiata*.

A large number of soil and plant analyses have been carried out on samples collected from both lateritic and basic soils. The general trends of this data indicate that the good basic soils are much higher in plant nutrients, and pine needles sampled from these areas show similarly high values.

A preliminary series of physical and chemical analyses were made of soils from Gnangara in an attempt to relate these properties to site quality in *P. pinaster* stands. This study is still in the very early stages and will be continued in the coming year.

A study of the chemistry of nursery soils was concluded during the year, and the data is being prepared for publication.

Detailed analyses of soil samples taken from arboreta at Port Hedland, Koorda, Eneabba and Mendels-Wongoondy were completed.

In addition a brief examination was made of some Rottnest Island soils, from a proposed seed orchard and arboretum site.

II. LIBRARY

Demand for information and loans from both within and outside the Department continues to increase. Constant use is being made of the very limited space available for readers, and in fact on a number of occasions, the table space has been insufficient to meet their needs.

During the year two lectures were given on the organization of the library, one to the junior professional officers of the Department and the other to a class studying for the Registration Library Examination.

Advice has been given to several Government Departments on the establishment and organization of their technical libraries. The library services have been further extended to cover editing and proof-reading of research bulletins, and the checking of references for technical papers.

An interesting sidelight on the standing of the library is given in reports of his world tour of the British Commonwealth by Mr. Ford Robertson, Director, Commonwealth Forestry Bureau, Oxford. In discussing the forest libraries which he visited during the tour he states :—

> " Very varying levels of performance were noted from the antiquated and quite inadequate to the truly efficient and up-to-date. In this connection I must award a blue riband to the first class little unit organised at Perth, Western Australia, by Miss Leila Roberts, which is giving that Forests Department quite exceptional documentary service and could stand as a model for any other, particularly in the intelligent way it uses the 'Abstracts.' "

12. EDUCATION AND PUBLICITY

Education

One meeting of professional staff was held during the year and a field day was organised to inspect operations in the Busselton and Nannup divisions.

A discussion group for Senior Assistant Divisional Forest Officers, was held at Dwellingup and in addition a general school for junior A.D.F.O.'s was held at the same centre.

Short duration schools, to augment the training of junior members of the field staff were held as follows :—

Survey School	1
Fire School	1
Pumper School	1
Telephone Communication School	1

Enrolments for the Forestry course at the University of Western Australia and the Australian Forestry School, Canberra, have been maintained. The present position is as follows :—

	Commonwealth Scholarship	State Scholarship	Independent
4th Year—Canberra—To graduate, 1960	1	2	....
3rd Year—Canberra	3	....	....
2nd Year—University of W.A.	2	3	....
1st Year—University of W.A.	2	....	3

Publicity

Departmental exhibits were displayed at Perth and Manjimup during Timber Week activities at these centres, and for the Australian Inland Mission at Kalgoorlie.

13. TIMBER INDUSTRY REGULATION ACT, 1926-1950

The number of mills registered under the provisions of the Act at the close of the year totalled 265 (141 Crown Land, 124 Private Property).

The average number of persons employed on timber holdings each month throughout the year was 5,037 compared with 5,155 last year.

The District and Workman's Inspectors made 1,832 inspections of timber holdings.

There were 1,060 notifiable accidents, three of which were fatal.

The number of accidents per 100 persons employed was 21·04 compared with 15·61 for last year.

The cost to the Forests Department of administering the Timber Industry Regulation Act for the year ending 30th June, 1960, was as follows :—

	£
Salaries	2,542
Mileage, travelling allowances and sundries	1,284
Total	£3,826

14. FOREST OFFENCES

Sixty-nine forest offences were reported during the year. Legal proceedings were taken in five cases and resulted in conviction. In one case, of a very serious nature, a penalty of three years' imprisonment was imposed. Fines and costs amounted to £45 and £16 6s. 6d., respectively.

Warnings were issued in 33 instances and the remainder were 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 £762 2s. 2d.

15. EMPLOYMENT IN FORESTRY AND TIMBER INDUSTRY

The number of wage earners directly employed in Forestry and the Timber Industry was estimated at 6,426, made up as follows :—

Forestry—		
Professional Officers	34	
General Field Staff	140	
Clerical and Drafting	68	
Wages employees	539	
Contractors and employees (estimated)	22	
		803
Timber Industry—		
Sawmill employees including bush workers at 31st December, 1959*		5,037
Firewood cutters, pole getters, etc., on permits		306
Goldfields firewood cutters, contractors, and woodline employees and carters		85
Sandalwood Workers		35
Apiarists, estimated (400 sites are registered)		160
Total		6,426

* Includes employees of registered sawmills.

16. STAFF MATTERS

Three graduates of the Australian Forestry School and one graduate of the University of Aberdeen were appointed to the permanent staff under the Public Service Act as Assistant Divisional Forest Officers during the year and one Assistant Divisional Forest Officer resigned.

Three Assistant Divisional Forest Officers were reclassified Divisional Forest Officers.

Following action by the Public Service Commissioner to increase margins, similar adjustments were made to officers employed under the Forests Act.

New appointments under "The Forests Act" during the year included—2 Assistant Maintenance Engineers ; 2 Technical Assistants, Grade II ; 1 Forest Assessor, Grade II ; 1 Forest Ranger, Grade II ; and 2 Forest Guards. One Forest Ranger, Grade I was appointed to the permanent staff and promotions included—1 officer to Forest Assessor, Grade II ; 2 to Forest Ranger, Grade II ; and 1 to Assistant Forester, Class 5. A Technical Assistant, Grade II and a Forest Guard resigned and Forest Assistant J. M. Leeds reached the retiring age and retired on the 18th March, 1960, after more than 20 years' service.

An officer of the Department was seconded to the Agricultural Economics Section of the University of W.A. for 12 months. He will assist in a study of land use and linear programming in the forest and agricultural areas of the south-west.

It is with deep regret that the death of Forest Assessor T. J. Dinneen who passed away on the 5th June, 1960, following a car accident, is recorded.

APPENDIX 1A

Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the Year ended 30th June, 1960

Revenue

	£	£
Territorial—		
Log and Sawn Timber Royalties	784,780	
Piles and Poles	23,020	
Mining Timber	21,134	
Miscellaneous and Rents, etc.	94,101	
		923,035
Departmental—		
Inspection Fees	24,216	
Trees ex Nurseries	6,690	
House Rents	9,729	
Miscellaneous Sales	2,612	
Pine Conversion Sales—		
Logs	91,683	
Milled Timber	63,305	
Hardwood Conversion Sales—		
Logs, etc.	31,645	
Milled Timber	26,983	
Contract Logging	35,307	
Recoupable Projects	23,099	
		315,269
		£1,238,304

Expenditure

	£
Salaries	145,297
Incidentals	52,693
Timber Industry Regulations	1,285
Pine Conversion	100,517
Hardwood Conversion	72,392
Recoupable Projects	25,528
Forests Improvements, Collie	6,988
Excess of Revenue over Expenditure	833,604
	£1,238,304

APPENDIX 1B

Statement of Reforestation Fund Expenditure for the Year ended 30th June, 1960

Expenditure	£	£
Division 1—		
Busselton	3,823	
Keenan	610	
		4,433
Division 2—		
Mundaring		40,510
Division 3—		
Dwellingup		57,811
Division 4—		
Collie		58,316
Division 5—		
Kirup		31,362
Division 6—		
Manjimup		89,147
Division 8—		
Gleneagle		33,694
Division 9—		
Gnangara	5,561	
Julimar	1,158	
		6,719
Division 10—		
Harvey		36,668
Division 11—		
Pemberton		52,304
Division 12—		
Nannup		39,219
Division 13—		
Shannon River		33,161
Denmark		1,262
Total Divisional Expenditure		484,606
Plantation Expenditure—		
Mundaring		5,598
Collie		12,445
Grimwade		16,846
Narrogin		8,447
Gleneagle		1,061
Brunswick		3,037
Esperance		1,247
Nannup		33,304
Total Plantation Expenditure		81,985
Total Divisions and Plantations		566,591
Head Office Expenditure—		
Training of Staff		2,432
Research		3,298
Working Plans		1,735
H.O. Salaries		168,305
Incidentals		16,025
Manjimup Drawing		59
Insurances		24,022
Special Surveys		1,974
Communications		7,487
Plant and Machinery		135,783
Purchase of Land		21,113
Como Buildings		4,242
Wundowie Firewood		6,185
Pay Roll Tax		12,036
Total Head Office		404,696
Total Reforestation Expenditure		£971,287

Source of Funds	£
Reforestation Fund General Account	847,282
Federal Aid Road Grant	76,000
Miscellaneous Recoups of Overheads, Refunds, Sale of Equipment, etc.	48,005
	£971,287

Note.—A large part of Head Office expenditure, viz., such items as Salaries, Workers' Compensation, Insurances, Plant and Machinery, etc., would have been a legitimate charge to Divisions but was charged to H.O. items for convenience.

APPENDIX 1C

Statement of General Loan Fund Expenditure for the Year ended 30th June, 1960

	£		£
Expenditure on Pine Plantations—			
Keenan	11,054	By General Loan Fund	100,000
Ludlow	24,919		
Applecross	4,637		
Collier	3,748		
Gnangara	32,737		
Scaddan	44		
Harvey Weir	5,930		
McLarty	3,886		
Myalup	7,745		
Hamel	16		
Total Plantation Expenditure	94,716		
Head Office Expenditure—			
Salaries and Incidentals	5,284		
	£100,000		£100,000

APPENDIX 1D

Statement of Afforestation Expenditure for the Year ended 30th June, 1960

Direct Expenditure on Plantations— To—	Loan £	Refn. £	Total £		£
Keenan	11,054	....	11,054	By General Loan Fund	100,000
Ludlow	24,919	....	24,919	By Reforestation Fund	143,145
Mundaring	....	5,598	5,598		
Collie	....	12,445	12,445		
Grimwade	....	16,846	16,846		
Narrogin	....	8,447	8,447		
Gleneagle	....	1,061	1,061		
Applecross	4,637	....	4,637		
Collier	3,748	....	3,748		
Gnangara	32,737	....	32,737		
Scaddan	44	....	44		
Harvey Weir	5,930	....	5,930		
McLarty	3,886	....	3,886		
Myalup	7,745	....	7,745		
Hamel	16	....	16		
Brunswick	....	3,037	3,037		
Nannup	....	33,304	33,304		
Esperance	....	1,247	1,247		
Total Plantations	94,716	81,985	176,701		
Head Office Charges—					
Prop. Salaries	5,284	20,616	25,900		
Prop. Incidentals	....	19,714	19,714		
Equipment and Vehicles	....	13,000	13,000		
Purchase Land	....	7,830	7,830		
	5,284	61,160	66,444		
	£100,000	£143,145	£243,145		£243,145

APPENDIX 2A

Exports from Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1960

Item No.	Item and Destination	Quantity	Value
63000	*Wicker, Bamboo and Cane and all Manufactures, N.E.I.* *	Cubic ft.	£
	China (Mainland)	....	5
	Australian States :		£
	New South Wales		90
	Victoria		729
	South Australia		130
	Tasmania		22
	Northern Territory		18
		....	989
		....	994
	TIMBER		
63490	*Logs—Hardwoods—*		
	Cocos Islands	40	54
	Christmas Island (Indian Ocean)	870	1,045
	Australian States : cub. ft. £		
	South Australia 5,574 2,624		
		5,574	2,624
		6,484	3,723
	*Undressed Timber, N.E.I.—**		
	Sleepers :		
63521	*Jarrah :*		
	United Kingdom	584,681	390,328
	India	551,009	346,332
	Mauritius	595	320
	New Zealand	190,300	135,113
	Pakistan	475,089	333,593
	South Africa, Union of	68,094	39,431
	Iran	10,759	6,694
	Iraq	3,542	2,434
	Japan	22,417	14,365
	Australian States :		
	South Australia	524,218	296,899
		2,430,704	1,565,509
63522	*Karri :*		
	Cocos Islands	222	367
	Germany, Federal Republic of	5,696	4,350
	Netherlands	9,109	7,659
	Australian States :		
	South Asutralia	4,272	2,203
		19,299	14,579
63529	*Other :*		
	United Kingdom	12	7
	Cocos Islands	179	170
	India	304,786	187,966
	South Africa, Union of	1,697	1,124
	Australian States :		
	South Australia	33,216	20,527
		339,890	209,794
63540	*Undressed Timber, N.E.I.—**		
	Fence Posts :		
	South Africa, Union of	683	396
63550	*Girders, Hewn :*		
	South Africa, Union of	1,335	1,300
64100	*Softwoods :*		
	Christmas Island (Indian Ocean)	148	148
	Ceylon	(a)	436
	Australian States :		
	Northern Territory	860	1,998
		....	2,582
64260	*Hardwoods, N.E.I.—**		
	Jarrah :		
	United Kingdom	117,581	93,667
	Cocos Islands	152	140
	Christmas Island (Indian Ocean)	638	896
	Canada	834	679
	Ceylon	8,607	6,256
	Cyprus	206	145
	India	105,541	72,196
	Mauritius	15,879	10,693
	New Zealand	69,374	46,829
	South Africa, Union of	17,491	12,126
	Belgium-Luxemburg	6,524	4,301
	Germany, Federal Republic of	243	329
	Iran	4,056	3,322
	Iraq	32,866	24,982
	Italy	369	308
	Netherlands	1,662	1,055
	Mozambique	1,107	949
	United States of America	1,308	1,082
	Other Countries	44	35
	Australian States : cub. ft. £		
	New South Wales 5,031 3,521		
	Victoria 274,954 174,814		
	South Australia 1,117,280 640,564		
	Northern Territory 6,403 5,876		
		1,403,668	824,775
		1,788,150	1,104,765

Item No.	Item and Destination	Quantity	Value
64280	*Karri :*		
	United Kingdom	21,211	16,208
	Cocos Islands	113	100
	Christmas Island (Indian Ocean)	687	518
	New Zealand	78,827	53,522
	South Africa, Union of	60,378	43,688
	Belgium-Luxemburg	6,640	4,702
	Germany, Federal Republic of	40,174	30,000
	Italy	100	78
	Korea, Republic of	1,170	666
	Netherlands	45,559	34,549
	Mozambique	2,919	2,154
	United States of America	1,397	896
	Australian States : cub. ft. £		
	New South Wales 4,199 2,715		
	Victoria 41,795 28,506		
	South Australia 913,339 463,752		
	Northern Territory 28,766 23,652		
		988,099	518,625
		1,247,274	705,706
64290	*Other :*		
	United Kingdom	35,647	23,683
	Cocos Islands	165	259
	Christmas Island (Indian Ocean)	42	64
	Tanganyika	....	1
	India	....	20
	South Africa, Union of	2,104	1,900
	Italy	2,919	2,360
	Australian States : cub. ft. £		
	New South Wales 2,814 3,211		
	Victoria 5,327 3,719		
	South Australia 9,287 5,894		
	Northern Territory 5,317 4,483		
		22,745	17,307
		63,622	45,594
64300	*Shooks and Staves—*		
	United Kingdom	8	300
	Australian States : cub. ft. £		
	New South Wales 4,747 4,848		
	Queensland 2,378 2,577		
	Northern Territory 542 508		
		7,667	7,933
		7,675	8,233
64410	*Sawn Timber, Dressed or Moulded, N.E.I.—**		
	Flooring :		
	United Kingdom	2,023	2,210
	Cocos Islands	253	267
	Christmas Island (Indian Ocean)	2,307	3,159
	Mauritius	165	352
	Gilbert and Ellice Islands	139	205
	United States of America	126	175
	Hawaiian Islands	249	375
	Australian States : cub. ft. £		
	New South Wales 50,327 52,653		
	Victoria 29,478 26,860		
	South Australia 132,352 118,057		
	Northern Territory 3,284 4,575		
		215,441	202,145
		220,703	208,888
64490	*Other :*		
	Cocos Islands	110	188
	Christmas Island (Indian Ocean)	291	306
	Gilbert and Ellice Islands	150	203
	Australian States : cub. ft. £		
	New South Wales 102 81		
	South Australia 4,710 4,575		
	Northern Territory 2,058 4,176		
		6,870	8,832
		7,421	9,529
64610–64690	*Veneer—*	sq. ft.	
	United Kingdom	60,000	1,100
	United States of America	5,767	95
	Australian States : sq. ft. £		
	New South Wales 762,648 11,017		
	Victoria 454,326 5,857		
	Queensland 51,695 758		
	South Australia 151,827 3,105		
		1,420,496	20,737
		1,486,263	21,932
6479	*Plywood—*		
	Australian States : sq. ft. £		
	New South Wales 421,367 15,399		
	Victoria 1,997,456 77,878		
	Queensland 1,563 118		
	South Australia 3,544,523 146,055		
	Tasmania 2,050 75		
	Northern Territory 378,648 18,299		
		6,345,607	257,824
	Total Timber Exports	....	4,160,354

* N.E.I. means Not Elsewhere Included.

(a) Quantity not recorded.

APPENDIX 2A—*continued*

Exports from Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1960

Item No.	Item and Destination	Quantity	Value
65050	WOOD MANUFACTURES, N.E.I.*		
	Casks and Vats—	No.	
	United Kingdom	615	2,752
65290	*Manufactures of Wood, N.E.I.** (except Furniture)—		
	United Kingdom		10
	Cocos Islands		67
	Christmas Island (Indian Ocean)		1,114
	Malaya, Federation of		14
	Denmark		2
	Australian States :	£	
	New South Wales	1,850	
	Victoria	748	
	South Australia	1,264	
	Tasmania	379	
	Northern Territory	6,324	
			10,565
			11,782
65400	*Furniture of Wood*—		
	United Kingdom		33
	Cocos Islands		495
	Christmas Island (Indian Ocean)		1,675
	Malaya, Federation of		102
	New Zealand		500
	Australian States :	£	
	New South Wales	997	
	Victoria	396	
	South Australia	22	
	Northern Territory	1,795	
			3,210
			6,015
	Total Wood Manufactures		20,549
	Total Wood and Wicker, Raw and Manufactures		4,181,897

Item No.	Item and Destination			Quantity	Value
16000	*Tanning Substances of Natural Origin*—			cwt.	
	United Kingdom			1,091	3,262
	India			11	34
	New Zealand			2,555	9,483
	Jamaica			20	64
	Austria			903	2,016
	Denmark			5,171	14,877
	France			418	1,130
	Germany, Federal Republic of			4,546	11,244
	Greece			244	721
	Indonesia			2,091	8,104
	Netherlands			5,313	11,271
	Norway			545	1,645
	Philippines			22	74
	Portugal			98	283
	United States of America			103,377	267,161
	Destination not disclosed			604	1,000
	Australian States :	cwt.	£		
	New South Wales	3,876	12,773		
	Victoria	3,342	10,341		
	Queensland	626	1,884		
	South Australia	2,247	8,011		
	Tasmania	409	1,228		
				10,500	34,237
				137,509	366,606
87100–87290	*Essential Oils, Natural, Non-spirituous*—			lb.	£
	United Kingdom			10,959	9,248
	Canada			113	284
	Ceylon			2,119	858
	Hong Kong			1,764	4,523
	India			1,508	1,416
	New Zealand			76	111
	Pakistan			1,400	110
	Singapore			561	1,114
	South Africa, Union of			228	152
	Cuba			154	415
	France			4,800	3,675
	United States of America			12,399	2,711
	Australian States :	lb.	£		
	New South Wales	56,488	19,830		
	Victoria	23,854	17,669		
	Queensland	244	408		
	South Australia	1,190	1,381		
				81,776	39,288
				117,857	63,905
	Total Value of all Exports on this Return				4,612,408

* N.E.I. means Not Elsewhere Included

APPENDIX 2B

Imports into Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended 30th June, 1960

Item No.	Item and Origin	Quantity	Value
63010–63090	*Wicker, Bamboo and Cane and Manufactures thereof*—		£
	United Kingdom		4
	Hong Kong		9,836
	Malaya, Federation of		16,296
	Singapore		469
	Burma		59
	Japan		3,361
	Netherlands		
	Australian States :	£	
	New South Wales	492	
	Victoria	1,003	
	South Australia	1,498	
			2,993
			33,018
	TIMBER		
63400	*Logs, not Sawn*—	Cubic ft.	£
	Hardwood :		
	Borneo, British	616,079	170,935
	Malaya, Federation of	126	39
	Dominican Republic	39	168
	Philippines	10,829	4,939
		627,073	176,081
64110	*Undressed Timber, N.E.I.*—*		
	Softwoods, N.E.I.—*		
	Redwood and Western Red Cedar : (a)		
	United States of America	421	488
64120	*Douglas Fir : (a)*		
	Canada	8,002	6,268
	United States of America	38,224	31,040
		46,226	37,308
54190	*Other Softwoods : (a)*		
	Sweden	794	492
	United States of America	2,530	2,909
		3,324	3,401

Item No.	Item and Origin			Quantity	Value
64200	*Composite Item covering Interstate Imports of Sawn, Undressed, Softwoods, N.E.I.*—*				£
	Australian States :	cub. ft.	£		
	New South Wales	1,225	565		
	Victoria	52	85		
	Queensland	2,788	3,498		
	South Australia	2,235	2,566		
	Tasmania	6,529	5,220		
				12,829	11,934
64240	*Hardwoods, N.E.I.*—*				
	Hickory : (b)				
	United States of America			276	468
64290	*Other Hardwoods : (b)*				
	Borneo (British)			205,524	124,775
	Hong Kong			5,443	3,071
	Malaya, Federation of			79,952	52,364
	Singapore			483	252
	Thailand			27	152
				291,429	180,614
64300	*Composite Item covering Interstate Imports of Sawn, Undressed Hardwoods, N.E.I.*—*				
	Australian States :	cub. ft.	£		
	New South Wales	447	585		
	Victoria	198	198		
	Queensland	4,963	6,370		
	Tasmania	24,706	21,501		
				30,314	28,654
64310	*Box Shooks*—				
	Malaya, Federation of			7,724	3,062
64350	*Cask and Vat Shooks and Staves*—				
	Australia (Re-imported)			6	72

APPENDIX 2B—*continued*

Imports into Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended 30th June, 1960

Item No.	Item and Origin	Quantity	Value
64410	*Sawn Timber, Dressed or Moulded, N.E.I.—**		£
	Flooring :		
	Finland	2,448	2,268
	Sweden	5,085	4,051
		7,533	6,319
64420	*Lining :*		
	Sweden	1,264	846
64490	*Other :*		
	Australia (Re-imported)	223	143
	Germany, Federal Republic of	20	260
	Sweden	1,536	922
		1,779	1,325
64500	*Composite Item covering Interstate Imports of Timber, Dressed or Moulded—*		
	Australian States : £		
	New South Wales 3,791		
	Victoria 31,235		
	Queensland 1,059		
	South Australia 756		
	Tasmania 496		
		....	37,337
64690	*Veneers—*	sq. ft.	
	Borneo, British	12,307	60
	Australian States : sq. ft. £		
	New South Wales 129,557 5,022		
	Victoria 28,720 918		
		158,277	5,940
		170,584	6,000
64790	*Plywood :*		
	New Guinea	31,267	1,857
	Australian States : sq. ft. £		
	New South Wales 401,558 26,412		
	Victoria 47,095 3,026		
	Queensland 1,211,118 76,278		
	South Australia 13,320 513		
		1,673,091	106,229
		1,704,358	108,086
	Total Timber Imports	....	601,995
	WOOD MANUFACTURES		
65050	*Casks and Vats, Empty—*	No.	
	Australia (Re-imported)	210	1,361
65080	*Clothes Pegs of any Material—*	Gross	
	Hong Kong	540	119
	Belgium-Luxemburg	2,020	268
	Czechoslovakia	7,356	833
	Denmark	2,530	452
	Sweden	20,975	1,937
	Australian States : gross £		
	New South Wales 5,539 1,827		
	Victoria 7,445 2,869		
	Queensland 979 338		
	South Australia 184 74		
	Tasmania 17,563 6,220		
		31,710	11,328
		65,131	14,937
65010	*Bobbins, Cones, Reels, Spools and the like—(c)*	No.	
	United Kingdom	780	37
65110	*Blockboard (Corestock)—*		
	Australian States : sq. ft. £		
	New South Wales 33,446 6,173		
	Victoria 27,372 2,718		
	Queensland 18,256 3,033		
	South Australia 17,583 2,505		
		96,657	14,429
65150	*Last Blocks and Lasts—(c)*	Dozen	
	United Kingdom	11	228
	Italy	8	50
		19	278
65160	*Match Splints—(c)*		
	Finland	....	20,826
65170	*Rules and Rulers, Wooden—(c)*		
	United Kingdom	....	6,638
	Japan	....	41
	Netherlands	....	552
		....	7,231
65180	*Tool Handles, Unattached of any Material—*		
	United Kingdom	1,351	2,101
	Canada	24	188
	Germany, Federal Republic of	13	54
	Sweden	60	77
	United States of America	186	537
	Australian States : £		
	New South Wales 21,683		
	Victoria 12,035		
	Queensland 870		
	South Australia 774		
	Tasmania 1,975		
		....	37,337
		....	40,294

Item No.	Item and Origin	Quantity	Value
65190	*Table Mats, Wooden—(c)*		£
	United Kingdom	....	249
	Germany, Federal Republic of	....	43
		....	292
65290	*Manufactures of Wood (except Furniture, N.E.I.,* whether partly or wholly finished)—*		
	United Kingdom	....	1,329
	Hong Kong	....	487
	Malaya, Federation of	....	5
	Belgium-Luxemburg	....	13
	Czechoslovakia	....	33
	Denmark	....	61
	Finland	....	47
	France	....	83
	Germany, Federal Republic of	....	650
	Italy	....	91
	Japan	....	5,974
	Norway	....	117
	Sweden	....	126
	Switzerland	....	26
	United States of America	....	280
	Australian States : £		
	New South Wales 26,047		
	Victoria 22,271		
	Queensland 2,781		
	South Australia 6,097		
	Tasmania 170		
		....	57,366
		....	66,693
65410	*Furniture, N.E.I., of Wood or partly of Wood—*		
	United Kingdom	....	3,939
	Hong Kong	....	1,165
	India	....	3
	Malta	....	1
	New Zealand	....	2
	Singapore	....	2
	Australia (Re-imported)	....	100
	China (Mainland)	....	22
	Germany, Federal Republic of	....	91
	Italy	....	112
	Japan	....	538
	Netherlands	....	285
	Sweden	....	4,726
	Switzerland	....	18
	United States of America	....	152
	Australian States : £		
	New South Wales 13,588		
	Victoria 40,899		
	Queensland 213		
	South Australia 28,598		
		....	83,298
		....	94,454
	Total Wood Manufactures	....	260,837
	Total Wood and Wicker, Raw and Manufactured	....	895,845
	TANNING SUBSTANCES—NATURAL ORIGIN		
16010–16190	*Extracts—*	Cwt.	
	South Africa, Union of	3,188	10,85
	Germany, Federal Republic of	39	7
	Norway	491	45
	Australian States : cwt. £		
	New South Wales 126 760		
	Victoria 73 521		
		199	1,28
		3,917	12,67
16200	*Other Tanning Substances—*		
	India	1,116	1,73
	Sweden	200	20
		1,316	1,93
87010–87290	*Essential Oils, Natural, Non-spirituous—*	Lb.	
	United Kingdom	126	1
	Malaya, Federation of	150	4
	Rhodesia and Nyasaland	347	2
	Australia (Re-imported)	1,699	1,0
	China (Mainland)	2,640	1,2
	Formosa	3,200	1,0
	France	1,340	9
	Malagash	3,283	1,9
	Indonesia	200	4
	Italy	224	2
	Spain	....	
	United States of America	2,007	3,6
	Australian States : Lb. £		
	New South Wales 266,498 54,371		
	Victoria 12,629 3,980		
	South Australia 12,770 4,423		
		291,897	62,7
		307,118	74,
	Total Value of all Imports on this Return	....	984,

* N.E.I. means "Not Elsewhere Included." (*a*) See Item 64200. (*b*) See Item 64300. (*c*) See Item 64500.

(*c*) Interstate Imports (if any) included in Item 65290.

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	1899	6,913,550	553,198	....	....	....
1837	....	....	1900	5,725,400	458,461	....	....	....
1838	....	....						
1839	....	....	1901	7,150,600	572,354	....	....	....
1840	....	....	1902	6,256,750	500,533	....	....	....
			1903	7,748,450	619,705	....	859	....
1841	....	....	1904	8,072,300	654,949	....	32,876	....
1842	....	....	1905	8,709,500	689,943	....	154,087	....
1843	....	....	1906	(c) 8,830,700	708,993	....	140,720	....
1844	(b)	163	1907	(c) 6,409,550	511,923	....	98,773	....
1845	....	....	1908	(c) 9,869,509	813,591	....	79,934	....
1846	2,550	255	1909	(c) 10,830,450	867,419	....	59,633	....
1847	12,200	1,120	1910	(c) 12,074,100	972,698	....	93,733	....
1848	3,350	333						
1849	....	....	1911	(c) 12,449,500	986,341	....	83,470	....
1850	10,500	1,048	1912	(c) 11,297,100	903,396	....	49,004	....
			1913	(c) 13,619,850	1,089,481	....	47,377	....
1851	1,250	268	1914 (d)	(c) 6,279,750	502,153	....	18,197	777
1852	7,050	806	1915 (e)	(c) 9,968,500	808,392	....	6,127	381
1853	52,200	5,220	1916 (e)	5,432,100	441,991	....	10,208	1,102
1854	58,500	7,023	1917 (e)	3,890,650	310,893	....	18,959	2,060
1855	76,900	12,076	1918 (e)	3,436,250	274,141	....	16,886	3,995
1856	70,500	9,671	1919 (e)	4,135,750	332,584	11,535	18,875	3,987
1857	69,200	9,449	1920 (e)	5,065,300	465,731	21,935	22,121	3,704
1858	29,250	2,340						
1859	67,250	6,051	1921 (e)	9,816,250	1,137,819	24,916	23,073	10,107
1860	54,800	4,932	1922 (e)	8,309,750	1,041,047	22,248	13,328	6,878
			1923 (e)	7,911,310	997,454	12,377	21,161	20,075
1861	27,750	2,497	1924 (e)	11,126,861	1,367,517	11,505	29,606	39,877
1862	68,800	7,151	1925 (e)	11,844,303	1,477,997	13,298	40,136	42,057
1863	32,900	2,963	1926 (e)	12,001,384	1,522,958	10,072	15,056	47,819
1864	58,300	5,508	1927 (e)	12,580,262	1,651,149	8,727	15,818	26,544
1865	183,950	15,693	1928 (e)	10,384,784	1,265,383	7,783	27,662	39,131
1866	85,650	6,849	1929 (e)	7,635,237	960,435	6,603	35,850	63,307
1867	56,750	4,541	1930 (e)	6,579,743	807,425	4,687	40,628	77,510
1868	8,000	638						
1869	179,900	14,273	1931 (e)	4,127,856	507,382	26,615	35,333	56,170
1870	157,200	17,551	1932 (e)	3,062,673	361,700	85,488	42,016	59,301
			1933 (e)	2,235,540	262,617	80,332	33,352	26,331
1871	218,500	15,304	1934 (e)	4,060,830	487,248	76,107	20,904	26,720
1872	37,000	2,590	1935 (e)	5,326,117	636,466	65,494	15,284	35,363
1873	68,150	4,771	1936 (e)	5,598,180	697,522	50,665	12,237	27,526
1874	345,600	24,192	1937 (e)	5,673,903	699,684	52,338	14,491	38,185
1875	342,350	23,965	1938 (e)	7,545,744	932,420	47,934	13,865	35,128
1876	219,050	23,743	1939 (e)	5,704,250	722,310	43,518	17,842	25,550
1877	336,150	26,979	1940 (e)	5,049,585	634,859	62,796	19,485	47,736
1878	580,900	63,902						
1879	627,250	69,742	1941 (e)	6,091,187	790,876	74,935	13,686	59,867
1880	662,550	66,252	1942 (e)	5,244,634	700,474	64,454	6,896	74,904
			1943 (e)	3,516,566	605,327	32,426	1,598	70,523
1881	792,750	79,277	1944 (e)	3,645,354	613,994	25,324	1,294	72,704
1882	936,500	93,650	1945 (e)	2,851,475	570,028	27,307	2,795	103,055
1883	997,000	79,760	1946 (e)	3,373,025	722,061	(f) 2,618	4,872	128,050
1884	861,700	68,936	1947 (e)	3,458,628	865,255	(f) 13,118	12,056	151,768
1885	848,150	67,850	1948 (e)	3,584,405	1,099,073	(f) 6,572	9,556	116,465
1886	626,150	50,902	1949 (e)	3,198,212	993,152	(f) 6,639	5,112	75,395
1887	354,800	28,384	1950 (e)	2,857,946	974,493	(f) 13,525	8,243	78,550
1888	525,570	42,060						
1889	788,500	63,080	1951 (e)	2,342,492	(g) 918,485	(f) 25,101	16,581	125,833
1890	1,172,200	82,052	1952 (e)	2,373,553	(g) 1,032,909	(f) 47,689	19,120	119,109
			1953 (e)	3,965,188	(g) 2,074,421	(f) 120,095	34,136	70,852
1891	1,273,950	89,179	1954 (e)	3,858,956	(g) 2,248,320	(f) 59,360	80,248	55,273
1892	1,082,650	78,419	1955 (e)	3,477,249	(g) 1,935,019	(f) 79,893	37,338	80,822
1893	512,950	33,888	1956 (e)	4,568,034	(g) 2,818,716	(f) 119,459	554,760	90,928
1894	1,063,700	74,804	1957 (e)	4,684,017	(g) 3,256,719	(f) 78,934	588,544	58,993
1895	1,255,250	88,146	1958 (e)	5,572,681	(g) 3,875,705	(f) 39,762	337,655	101,814
1896	1,545,600	116,420	1959 (e)	6,461,535	(g) 4,373,218	(f) 41,612	259,046	52,843
1897	2,393,300	192,451	1960 (e)	6,133,240	(g) 3,381,196	(f) 20,549	366,606	63,905
1898	4,086,150	326,195						
			Total	427,917,789	68,168,705	1,647,153	3,799,198	2,517,842

(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, Tanning Materials and Essential Oils, since 1848

Year	Timber, Woodware, etc.	Tanning Materials	Essential Oils
	£	£	£
1848	464	....	....
1849	....	....	....
1850	189	....	....
1851	3,216	....	....
1852	2,479	....	....
1853	790	....	....
1854	831	....	....
1855	1,464	....	....
1856	1,124	....	....
1857	744	....	....
1858	1,528	....	....
1859	690	....	....
1860	2,005	....	....
1861	1,459	....	....
1862	1,920	....	....
1863	1,568	....	....
1864	894	....	....
1865	548	....	....
1866	1,442	....	....
1867	1,727	....	....
1868	1,451	....	....
1869	1,408	....	....
1870	1,518	....	....
1871	736	....	....
1872	1,660	....	....
1873	1,008	....	....
1874	1,774	....	....
1875	2,707	....	....
1876	3,098	....	....
1877	2,036	....	....
1878	2,947	....	....
1879	2,340	....	....
1880	3,061	....	....
1881	3,639	....	....
1882	3,692	....	....
1883	6,667	....	....
1884	2,930	....	....
1885	11,479	....	....
1886	17,888	....	....
1887	8,136	....	....
1888	4,461	....	....
1889	7,686	....	....
1890	14,979	....	....
1891	18,406	....	....
1892	26,713	....	....
1893	14,493	....	....
1894	17,964	....	....
1895	47,128	....	....
1896	5,381	....	....
1897	164,552	....	....
1898	55,566	....	....
1899	45,689	....	....
1900	56,266	1,416	1,105
1901	80,134	1,740	1,546
1902	97,810	3,418	1,751
1903	102,383	3,556	1,348
1904	157,856	1,322	2,122
1905	98,494	582	1,592
1906	95,229	1,412	1,915
1907	122,016	2,767	1,549
1908	93,205	2,392	4,584
1909	90,502	4,129	4,033
1910	171,280	3,531	3,686
1911	152,133	2,912	4,938
1912	167,244	3,089	4,598
1913	202,640	2,651	5,392
1914	78,736	629	2,823
1914–15	107,763	2,082	4,988
1915–16	76,849	3,313	4,788
1916–17	75,681	2,848	3,848
1917–18	58,305	2,020	4,358
1918–19	62,824	1,181	4,168
1919–20	100,083	3,748	10,043
1920–21	171,654	*4,899	6,106
1921–22	92,448	5,865	6,577
1922–23	109,428	6,991	4,033
1923–24	133,983	2,790	3,301
1924–25	161,893	2,670	4,429
1925–26	144,989	5,826	4,449
1926–27	162,193	8,971	4,254
1927–28	183,196	9,648	6,955
1928–29	241,601	6,894	4,413
1929–30	197,532	10,825	3,980
1930–31	76,533	4,145	3,160
1931–32	164,496	4,705	3,505
1932–33	197,916	4,903	3,421
1933–34	183,944	4,310	3,888
1934–35	211,056	4,076	5,040
1935–36	228,451	5,401	3,921
1936–37	257,164	5,267	4,810
1937–38	270,126	4,777	6,560
1938–39	254,315	3,974	7,014
1939–40	259,399	6,802	23,027
1940–41	249,111	3,798	32,399
1941–42	283,611	15,846	33,828
1942–43	163,480	6,250	47,718
1943–44	149,928	7,883	68,871
1944–45	148,838	9,264	75,449
1945–46	†219,466	19,573	56,295
1946–47	386,465	12,395	78,091
1947–48	345,508	8,019	96,769
1948–49	470,755	8,662	42,926
1949–50	521,815	24,923	51,197
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
Total	17,698,627	529,822	1,774,992

* 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	1938 (c)	31,737,450	15,928,950	47,666,400
1917 (a)	19,333,100	2,144,500	21,477,600	1939 (c)	29,247,650	11,086,000	40,333,650
1918 (b)	7,665,550	504,950	8,170,500	1940 (c)	27,660,100	9,139,550	36,799,650
1919 (c)	19,987,050	3,390,450	23,377,500	1941 (c)	28,089,200	10,289,000	38,378,200
1920 (c)	28,292,200	5,762,900	34,055,100	1942 (c)	26,636,650	5,633,400	32,270,050
1921 (c)	29,308,950	7,018,450	36,327,400	1943 (c)	23,604,900	4,322,950	27,927,850
1922 (c)	36,122,400	15,640,150	51,762,550	1944 (c)	22,252,500	4,456,200	26,708,700
1923 (c)	26,807,300	9,867,050	36,674,350	1945 (c)	21,970,000	4,309,550	26,279,550
1924 (c)	42,004,450	9,342,800	51,347,250	1946 (c)	21,126,500	5,482,350	26,608,850
1925 (c)	43,832,900	18,142,250	61,975,150	1947 (c)	21,948,550	7,831,950	29,780,500
1926 (c)	48,823,750	25,037,600	73,861,350	1948 (c)	22,251,350	8,871,900	31,123,250
1927 (c)	46,887,600	31,356,100	78,243,700	1949 (c)	20,261,800	9,814,300	30,076,100
1928 (c)	42,781,250	23,334,450	66,115,700	1950 (c)	21,081,150	9,932,650	31,013,800
1929 (c)	32,289,750	11,098,950	43,388,700	1951 (c)	25,391,450	10,713,050	36,104,500
1930 (c)	31,654,150	11,653,600	43,307,750	1952 (c)	28,942,550	11,938,300	40,880,850
1931 (c)	18,822,600	12,148,500	30,971,100	1953 (c)	34,223,400	13,021,400	47,244,800
1932 (c)	11,742,850	4,115,950	15,858,800	1954 (c)	37,485,950	13,562,000	51,047,950
1933 (c)	13,165,650	2,456,650	15,622,300	1955 (c)	37,467,650	15,195,450	52,663,100
1934 (c)	21,263,100	6,330,400	27,593,500	1956 (c)	39,811,350	13,773,350	53,584,700
1935 (c)	27,458,250	11,451,750	38,910,000	1957 (c)	39,426,100	11,585,350	51,011,450
1936 (c)	31,400,600	13,436,150	44,836,750	1958 (c)	39,069,500	12,397,450	51,466,950
1937 (c)	31,703,850	15,902,200	47,606,050	1959 (c)	40,533,471	13,756,198	54,289,669
				1960 (c)	38,882,048	12,017,553	50,899,601
				Total	....	....	2,428,911,070

* 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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