

CHAPTER XXV.

FORESTRY.

§ 1. Introduction.

1. **Source of Statistics.**—Statistics relating to forestry are, in general, provided by the various authorities concerned with forestry administration. In each State, suitable areas of Crown Land have been reserved for forestry purposes, either as State forests or other reserves and the administration of these is the responsibility of the respective State Government forestry authorities. In addition, in some States, areas of forests on Crown Lands dedicated as National Parks and the like are administered by Government Departments other than the forestry authorities. There are timber resources on private land in each State but details concerning these areas and production therefrom are not complete for all States. Forestry activities in the Northern Territory and the Australian Capital Territory are administered by the Commonwealth Government.

Particulars of forested areas contained in this chapter have been collected by the Statisticians of the several States, mainly from information provided by the State Forestry authorities. The Commonwealth Forestry and Timber Bureau has provided figures for the Northern Territory and the Australian Capital Territory and in addition, has made available certain other data.

Statistics of timber by-products have been compiled from the annual factory collections undertaken by the Statisticians in the several States. Figures of production of eucalyptus oil, gums and resins, and tanning barks have been provided by the State Forestry Authorities.

Data of imports and exports of forest products and timber and timber products have been compiled in the Commonwealth Bureau of Census and Statistics as part of the overall statistics of oversea trade.

All figures shown are for the financial years ending 30th June.

Forested areas shown in this chapter relate to areas administered by the State or Commonwealth authorities or to those reserved by government legislation. They are not based on any inventory of forest resources using standard and uniform definitions throughout the Commonwealth. It should be noted therefore that the figures are not comparable between States owing to the lack of uniformity in the interpretation of the definition of what constitutes a forest.

2. **Objects of Forestry.**—The main object of forestry authorities is to manage the forests of the country in a manner that will provide the maximum benefits, both direct and indirect. Direct benefits include the provision of essential commercial commodities such as structural timber, pulpwood, plywood, veneers, firewood, bark products, tars, oils and resins. Indirect benefits include protection of soil and stock from wind and exposure, regulation of stream flow, and aesthetic effects. Forestry also aims at improving existing forests and woodlands and at providing a partial tree cover on denuded lands.

§ 2. The Forestry Industry.

1. **General Account of Forests and Timbers.**—The area of land in Australia suitable for the production of commercial timber as the primary crop is very small in comparison with the size of the continent. It is concentrated mainly around the wetter coastal belts and the eastern highlands and it includes the bulk of the land also suitable for intensive development by agricultural or pastoral undertakings.

The trees which make up the forests of Australia are mainly evergreen hardwoods. The characteristic genus is *Eucalyptus*. There are over six hundred different kinds of eucalypts and with few exceptions the natural occurrence of all of them is restricted to Australia. The genus includes species such as the mountain ash (*Eucalyptus regnans*) of Victoria and Tasmania, the world's tallest growing hardwood, and the karri (*E. diversicolor*) of Western Australia, another forest giant. At the other end of the scale, there are many eucalypts which do not grow to tall trees, including the species collectively known as the "mallees". The mallees develop a number of small stems from an underground structure called the "mallee root". Less than 100 species of eucalypts are used for sawmilling and not more than 40 are exploited extensively. The main commercial eucalypts are listed in Official Year Book No. 39 and earlier issues.

A large number of other genera represented in the Australian forest flora also produce commercial hardwoods. Among the outstanding furniture, cabinet and veneer timbers are red cedar (*Cedrela toona* var. *australis*), Queensland maple (*Flindersia brayleyana*), Southern and Northern silky oak (*Grevillea robusta* and *Cardwellia sublimis*, respectively), Queensland walnut (*Endiandra palmerstoni*), blackwood (*Acacia melanoxylon*), rose mahogany (*Dysoxylum fraserianum*), etc. Turpentine (*Syncarpia laurifolia*) ranks with the world's best as a harbour piling timber. Coachwood (*Ceratopetalum apetalum*) came into prominence for rifle furniture and for aircraft plywood during the 1939–45 War.

The most important indigenous softwood resources of Australia were in the forests of hoop pine (*Araucaria cunninghamii*) of Queensland and New South Wales. The greater part of the original hoop pine forest has gone but some of the areas have been replanted with this species in Queensland and, to a lesser extent, in New South Wales. There are still considerable areas of the useful white-ant-resisting cypress pine (*Callitris* spp.) in the inland areas of Queensland and New South Wales. They have been seriously overcut but are gradually being brought under management.

Other native softwoods which have played a useful but minor part in the Australian timber industry include bunya pine (*Araucaria bidwillii*) and kauri (*Agathis* spp.) of Queensland, and huon pine (*Dacrydium franklinii*), celerytop pine (*Phyllocladus rhomboidalis*) and King William pine (*Arthrotaxis selaginoides*) of Tasmania.

The savannah woodlands of the interior of Australia yield commercial commodities such as sandalwood, tan-barks and essential oils. They also have an important function in providing fuel and rough timbers for the development of agricultural and pastoral holdings.

2. **Extent of Forests.**—According to data assembled for the Seventh British Commonwealth Forestry Conference held in Australia and New Zealand in 1957, the total area of forest in Australia is estimated at 186,791 square miles, or about 6.3 per cent. of the total land area of the continent. The estimated forest area is distributed amongst the States as follows (the proportion of forest land to the total area of each State is shown in parentheses):—New South Wales and the Australian Capital Territory, 37,942 square miles (12 per cent.); Victoria, 26,222 (30 per cent.); Queensland, 28,000 (4 per cent.); South Australia, 36,000 (including 25,000 square miles of mallee suitable for firewood only) (10 per cent.); Western Australia, 41,826 (4 per cent.); Tasmania, 12,301 (47 per cent.) and the Northern Territory, 4,500 (1 per cent.). The areas given are rough estimates only and are considerably in excess of those which are both suitable for reservation and likely to be maintained for timber production. Included in the figures are considerable areas of low grade forest which, in many cases, are suitable for little more than the production of firewood. It is doubtful if the remaining prime native forest area of Australia exceeds 30,000 square miles. Further particulars are set out in the table hereunder.

CLASSIFICATION OF FOREST AREA(a): AUSTRALIA.

Class of Forest.	Area (Square Miles).				Proportion of Total Forest Area.
	State Forest.	Communal Forest.	Private Forest.	Total.	
Exploitable—					Per Cent.
Softwood	10,512	5	2,808	13,325	7.1
Mixed Wood	754	..	..	754	0.4
Hardwood	41,691	75	13,129	54,895	29.4
<i>Total</i>	<i>52,957</i>	<i>80</i>	<i>15,937</i>	<i>68,974</i>	<i>36.9</i>
Potentially Exploitable—					
Softwood	58	..	100	158	0.1
Mixed wood	100	..	..	100	0.1
Hardwood	13,002	..	12,200	25,202	13.5
<i>Total</i>	<i>13,160</i>	<i>..</i>	<i>12,300</i>	<i>25,460</i>	<i>13.7</i>
Other Lands Classed as Forest	81,023	450	10,884	92,357	49.4
Grand Total ..	147,140	530	39,121	186,791	100.0

(a) Based on the 1955 classification of forests.

State forests accounted for 78.8 per cent. of the total forest area, private forests for 20.9 per cent. and communal forests for 0.3 per cent.

The bulk of the softwood area of approximately 13,325 square miles is in Queensland and New South Wales and consists principally of slow-growing cypress pine (*Callitris spp.*) in low rainfall areas. The total area has been increased in comparison with previous estimates by the inclusion of a large area of crown land carrying scattered cypress pine. The volume of this species per acre is comparatively low.

Further particulars of forested areas are set out in § 3, page 1009.

3. **Persons Engaged.**—In the following table, which shows particulars collected in the Population Censuses of Australia at 30th June, 1947 and 1954, the numbers of persons whose "industry" was stated to be "forestry (excluding sawmilling)" are shown, together with the numbers engaged in all primary industries and the total work force.

PERSONS ENGAGED, AUSTRALIA.

Particulars.	At 30th June.	
	1947.	1954.
Persons engaged in—		
Forestry (excluding sawmilling) No.	24,793	15,468
All Primary Industries No.	563,607	560,100
Total Work Force No.	3,196,431	3,702,022
Persons employed in Forestry (excluding sawmilling) as a proportion of—		
All Primary Industries %	4.4	2.8
Total Work Force %	0.8	0.4

The number of persons engaged in forestry operations, excluding those engaged in the sawmilling industry, represents about three or four per cent. of the total number of persons engaged in all primary industries and less than one per cent. of the total workforce of Australia.

Particulars of the number of persons employed by Forestry Departments and in Saw-mills are included in § 5, page 1014.

4. Value of Production.—(i) *General.* Statistics of both the gross value (at principal market) and local value (at place of production) of the forestry industry are available. Particulars of the value of materials used in the process of production are not available for all States, so that values cannot be stated on a net basis, as has been done with most other industries.

In 1958–59, the local value of forestry production amounted to £52,273,000. The most important States were New South Wales, Victoria and Queensland with £15,574,000, £14,063,000 and £8,356,000 respectively.

(ii) *Gross and Local Values, 1957–58 and 1958–59.* Values of forestry production for each State are shown for 1957–58 and 1958–59 in the following table. A more detailed reference to the value of production of forestry and other industries in Australia, as well as a brief explanation of the terms used, will be found in Chapter XXX.—Miscellaneous.

GROSS AND LOCAL VALUE OF FORESTRY PRODUCTION.

(£'000.)

State or Territory.	Gross Value (Gross Production Valued at Principal Markets).	Marketing Costs.	Local Value (Gross Production Valued at Place of Production).
1957–58.			
New South Wales	15,766	425	15,341
Victoria	14,109	1,021	13,088
Queensland	10,335	921	9,414
South Australia	3,711	124	3,587
Western Australia	5,523	411	5,112
Tasmania	5,234	687	4,547
Northern Territory	38	(a)	38
Australian Capital Territory	190	11	179
Australia	54,906	3,600	51,306
1958–59.			
New South Wales	15,863	289	15,574
Victoria	15,441	1,378	14,063
Queensland	9,256	900	8,356
South Australia	4,227	124	4,103
Western Australia	5,451	384	5,067
Tasmania	5,631	744	4,887
Northern Territory	44	(a)	44
Australian Capital Territory	193	14	179
Australia	56,106	3,833	52,273

(a) Not available.

(iii) *Local Values, 1954-55 to 1958-59.* In the following table, the local value of forestry production and the local value per head of population are shown by States for the years 1954-55 to 1958-59.

LOCAL VALUE OF FORESTRY PRODUCTION.

Year.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
LOCAL VALUE (£'000).							
1954-55	13,686	9,987	7,895	4,427	3,850	4,037	44,047
1955-56	15,343	11,823	8,660	4,596	4,877	4,591	50,059
1956-57	16,758	12,297	9,487	4,051	4,779	4,523	52,099
1957-58	15,341	13,088	9,414	3,587	5,112	4,547	51,306
1958-59	15,574	14,063	8,356	4,103	5,067	4,887	52,273

LOCAL VALUE PER HEAD OF POPULATION (£).

1954-55	4.0	4.0	6.0	5.5	5.9	12.9	4.8
1955-56	4.3	4.6	6.4	5.5	7.3	14.4	5.4
1956-57	4.7	4.7	6.9	4.7	7.0	13.9	5.5
1957-58	4.2	4.8	6.7	4.0	7.3	13.6	5.3
1958-59	4.2	5.0	5.9	4.5	7.1	14.3	5.3

(a) Includes Northern Territory and Australian Capital Territory.

§ 3. Forested Areas.

1. *Forest Reservations.*—The first attempt to determine the forest areas which should be reserved solely for purposes of timber production was made at an Interstate Forestry Conference held at Hobart in 1920. This Conference decided that an area of 24½ million acres of indigenous forest should be permanently reserved. According to statements furnished by State and Commonwealth authorities, reservations of forest areas in Australia as at 30th June, 1959, totalled 33,647,000 acres, of which 22,980,000 acres were Dedicated State Forests and 10,667,000 acres were Timber and Other Reserves. The distribution of those areas is shown by States in the following table:—

AREA OF FOREST RESERVATIONS, 30TH JUNE, 1959.

(Acres.)

State or Territory.	State Forests.	Timber Reserves (Forest Acts).	Other Reserves.	Total.
New South Wales	6,363,854	1,443,648	..	7,807,502
Victoria	4,845,415	710,541	(a)169,302	5,725,258
Queensland	5,104,923	3,027,238	(b)838,134	8,970,295
South Australia	267,858	981	222,000	490,839
Western Australia	4,323,902	1,772,610	(a)883,950	6,980,462
Tasmania	2,073,567	137,028	(c)972,147	3,182,742
Northern Territory .. ..	..	..	(d)358,900	358,900
Australian Capital Territory .. ..	..	..	(e)131,000	131,000
Australia	22,979,519	7,092,046	3,575,433	33,646,998

(a) Timber reserves under the Land Act. (b) National Parks. (c) Consists of 612,000 acres of pulp concessions over Crown land and 360,147 acres of exclusive forest permits not elsewhere included. (d) Gazetted areas with timber potential. (e) Forest land not specifically reserved.

If the permanently reserved areas were all of good quality, accessible, and fully productive forests supplying the class of timber required, they could be regarded as adequate for a much larger population than exists in Australia at the present time. Actually, however, a considerable proportion is in inaccessible mountainous country and many of the forests contain a mixture of species, only some of which are at present of commercial value; much of the area consists of inferior forest and a large proportion of the whole has been seriously degraded by recurrent fires. Also, the indigenous forest does not contain adequate supplies of softwoods producing commercial timbers and Australia's requirements of these have to be met largely by imports from other countries.

It is freely acknowledged by Australian forestry authorities that information on forest resources is very imperfect. It is not possible at present to give a reliable estimate of the forest areas needed to meet all future demands because of the number of unknown variables involved—in particular, the yield capacity per acre, future consumption of different classes of timber per head, and the future population. It appears, however, that all available potentially good forest country, including adequate areas for plantations of conifers, will need to be reserved, protected and systematically managed, if Australia is to approach the goal of self-sufficiency in timber supplies in the future. One of the most urgent requirements in this connexion is a comprehensive estimate of forest resources.

2. **Plantations.**—Reference has been made to the inadequacy of indigenous softwood supplies, but as a result of the planned policy of the forest services of the States and the Commonwealth and, to a lesser extent, of several private commercial organizations, the area of softwood plantations, mainly of exotic species, is steadily increasing. It was natural that this aspect of forestry received earliest attention in South Australia as it is the State most poorly endowed with natural forest. South Australia now has a larger area of planted softwoods than any other State in Australia, and for some years has been exploiting considerable quantities of timber from these plantations. The total production is now over 130,000,000 superficial feet per annum and is expected to be increased substantially during the next decade. Production is also increasing in the other States and first thinnings from their plantations are already supplying a significant portion of the requirements of the case-making industry.

The extent of existing softwood plantations as at 30th June, 1959, is set out in the following table:—

SOFTWOOD PLANTATIONS, 30TH JUNE, 1959.
(Acres.)

State or Territory.	Government.			Private (mainly <i>P. radiata</i>).	Total.
	<i>Pinus radiata</i> .	Other species.	Total.		
New South Wales	59,020	18,339	77,359	12,000	89,359
Victoria	34,113	10,985	45,098	48,693	93,791
Queensland	1,455	83,607	85,062	2,300	87,362
South Australia	99,106	7,779	106,885	35,133	142,018
Western Australia	7,544	19,501	27,045	300	27,345
Tasmania	12,738	827	13,565	4,528	18,093
Australian Capital Territory ..	20,059	2,084	22,143	100	22,243
Australia	234,035	143,122	377,157	103,054	480,211

A special article giving a detailed account of the history and development of softwood plantations and of the characteristics of individual species, prepared by the Commonwealth Forestry and Timber Bureau, is included in Official Year Book No. 45, pages 975 *et seq.*

Hardwood plantations (mainly *Eucalyptus spp.*) comprise a much smaller area and the total acreage is about 30,789 acres, nearly two-thirds of which is mallet (*Eucalyptus astringens*) which has been established in Western Australia for tan-bark production.

§ 4. Forestry Production.

1. Timber.—Particulars of logs treated and the production of sawn, peeled and sliced timber by sawmills and other woodworking establishments are shown in the following table, by States, for the year 1958-59. These figures have been compiled from the annual factory collections in each State which cover virtually all sawmills. The only omissions are some small portable mills operated by itinerants, e.g. sleeper cutters.

(NOTE.—The volumes of logs treated shown in the following tables are recorded in terms of hoppus measure which is approximately only three quarters of the true volume. The volume of a log in super. feet hoppus measure is calculated by squaring the girth (under bark at the centre of the log) and multiplying this by three quarters of the length of the log, all measurements being in feet. A cubic foot equals 12 super. feet.)

OUTPUT OF AUSTRALIAN GROWN TIMBER : ALL MILLS, 1958-59.

Particulars.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	Aust.(a)
LOGS TREATED ('000 SUPER. FEET HOPPUS MEASURE.)							
Hardwood ..	483,825	535,494	316,595	5,875	511,133	289,854	2,142,776
Softwood ..	115,098	55,611	131,399	205,118	12,228	12,754	532,208
Total ..	598,923	591,105	447,994	210,993	523,361	302,608	2,674,984

SAWN, PEELLED OR SLICED TIMBER PRODUCED FROM LOGS ABOVE ('000 SUPER. FEET.)

Hardwood ..	307,835	316,626	185,385	2,938	205,566	140,449	1,158,799
Softwood ..	65,680	27,392	76,648	119,518	6,377	5,560	301,175
Total ..	373,515	344,018	262,033	122,456	211,943	146,009	1,459,974

(a) Excludes the Australian Capital Territory and the Northern Territory, details for which are not available.

The following table shows logs used, and sawn, peeled and sliced timber produced, in Australia for the years 1954-55 to 1958-59.

OUTPUT OF AUSTRALIAN GROWN TIMBER : ALL MILLS, AUSTRALIA.(a)

Particulars.	1954-55.	1955-56.	1956-57.	1957-58.	1958-59.
LOGS TREATED ('000 SUPER. FEET HOPPUS MEASURE.)					
Hardwood	2,101,306	2,139,337	2,107,781	2,062,360	2,142,776
Softwood	444,536	463,213	447,409	456,453	532,208
Total	2,545,842	2,602,550	2,555,190	2,518,813	2,674,984
SAWN, PEELLED OR SLICED TIMBER PRODUCED FROM ABOVE LOGS ('000 SUPER. FEET.)					
Hardwood	1,184,992	1,180,936	1,151,428	1,127,150	1,158,799
Softwood	264,296	268,786	267,431	264,027	301,175
Total	1,449,288	1,449,722	1,418,859	1,391,177	1,459,974

(a) Excludes the Australian Capital Territory and the Northern Territory, details for which are not available.

The next table shows the sawn, peeled and sliced output of Australian grown timber from sawmills and other wood-working establishments in each State for the years 1954-55 to 1958-59.

OUTPUT(a) OF AUSTRALIAN GROWN TIMBER : ALL MILLS.
(⁰⁰⁰ super. feet.)

State.	1954-55.	1955-56.	1956-57.	1957-58.	1958-59.
New South Wales	372,920	362,709	365,548	359,737	373,515
Victoria	362,334	351,271	342,288	346,473	344,018
Queensland	264,914	261,730	275,936	268,200	262,033
South Australia	82,942	100,983	94,869	84,541	122,456
Western Australia	225,794	222,397	204,474	201,664	211,943
Tasmania	140,384	150,632	135,744	130,562	146,009
Australia(b)	1,449,288	1,449,722	1,418,859	1,391,177	1,459,974

(a) Total production of sawn, peeled and sliced timber. (b) Excludes the Australian Capital Territory and Northern Territory, details for which are not available.

In addition to the sawn timber shown in the preceding table, a large amount of hewn and round timber, e.g., sleepers, piles, poles, fencing material, timber used in mining, and fuel, is obtained from forest and other lands. Complete information in respect of the volume of this output is, however, not available.

2. Veneers, Plywood, etc.—Cutting of timber for the manufacture of veneers, plywood etc., has been carried out in most States for a number of years. In later years, however, this has been considerably extended, and much greater use has been made of locally-grown timbers, both hardwoods and softwoods. Special attention has also been paid to the selection of logs suitable for peeling.

The following table shows the production of plywood for each of the years 1954-55 to 1958-59.

PLYWOOD PRODUCED.

(⁰⁰⁰ square feet— $\frac{3}{8}$ -in. basis.)

State.	1954-55.	1955-56.	1956-57.	1957-58.	1958-59.
New South Wales	35,039	39,256	41,921	45,647	56,378
Queensland	130,330	133,230	118,647	131,205	139,743
Other States	21,235	28,213	33,797	35,784	40,083
Australia	186,604	200,699	194,365	212,636	236,204

Of the total plywood produced in 1958-59, 180,144,000 square feet ($\frac{3}{8}$ -in. basis) was classed as "Commercial", 32,881,000 as "Waterproof", 2,668,000 as "Case" and 20,511,000 as "Sliced Fancy".

During 1958-59, 583.6 million square feet ($\frac{1}{8}$ -in. basis) of veneers were produced by the rotary process for the manufacture of plywood, and 204.0 million square feet ($\frac{1}{8}$ -in. basis) were sold or added to stock, the bulk of which would eventually be used in the production of plywood. In addition, 63.2 million square feet of sliced veneers were produced.

3. Hardboard.—The production of hardboard for building purposes from pulped wood has increased considerably in Australia in recent years. There were four factories producing hardboard during 1958-59 (two in New South Wales, one in South Australia and one in Tasmania) and during the three years ended 30th June, 1959, the following quantities were produced:—1956-57, 22,456,000 square yards; 1957-58, 24,504,000 square yards; and 1958-59, 29,067,000 square yards.

Most of this hardboard enters into usage in the condition in which it leaves the producing factories. The remainder is further treated and surfaced to a variety of finishes and in 1958-59 this production accounted for 1,592,000 square yards valued at £792,000.

4. Wood Pulp and Paper.—(i) *Wood Pulp.* The manufacture of wood pulp from Australian-grown timber was established in Australia in 1939, after years of experimentation with eucalypt hardwoods. During 1958-59, four wood pulp mills were operating in three States and production was 144,757 tons of chemical pulp and 62,069 tons of mechanical pulp, a total of 206,826 tons. During the previous year, production was 131,740 tons of chemical pulp and 75,855 tons of mechanical pulp.

(a) *Victoria.* In Victoria, Australian Paper Manufacturers Limited produce wood pulp at Maryvale in Gippsland by a chemical process known as the kraft or sulphate process. The pulpwood used at this mill consists mainly of eucalypt timber below sawmilling quality together with a quantity of plantation pine thinnings.

During the year 1958-59, 300,578 tons of eucalypt and pine pulpwood and 19,382 tons of chipped sawmill waste were supplied to Maryvale Mill. Plantations of both pines and eucalypts are being established in Gippsland at the rate of approximately 2,500 acres a year by A.P.M. Forests Proprietary Limited.

(b) *South Australia.* In South Australia, a paper board mill operates near Millicent, using raw material in the form of logs from the State Forests in the south east of South Australia. During 1958-59, a total quantity of 6,993,000 super. feet of pulpwood were supplied to this mill.

The forests of South Australia also supplied large quantities of pulpwood in log form to Australian Paper Manufacturers Ltd., Victoria, and during 1958-59 delivered 11,602,000 super. feet.

Continued progress has been made in establishing a new tissue paper mill near Millicent which commenced pilot operations early in 1960. An agreement has already been completed whereby this mill undertakes to purchase from 10 to 20 million super feet of pulpwood annually.

(c) *Tasmania.* In Tasmania, two large mills are making pulpwood from indigenous hardwoods. At Burnie, on the north-west coast, Associated Pulp and Paper Mills Ltd. use a chemical method, the soda process, to produce wood pulp for fine writing parchment and printing papers from eucalypt hardwoods. This plant is of the most modern design and pulp and paper manufacture are combined with sawmilling and hardboard production. Offcuts and rejects from the company's and other firms' timber mills are used for pulping and the manufacture of hardboard. A continuous digester has been installed at the Burnie mill, making it the only one in Australia using a continuous pulping process. The company holds freehold and concession forest areas which are managed on a permanent yield basis with regeneration of the eucalypts in all suitable areas. Pine plantations are being established to provide softwoods for pulping.

Australian Newsprint Mills Ltd. at Boyer, 20 miles from Hobart, is the only producer of newsprint in Australia. Wood pulp is produced from hardwoods drawn from State timber concession areas. A mechanical process only was used until 1957 when additional plant was installed for the manufacture of semi-chemical pulp using the cold soda process which allows the utilization of additional species not suitable for ground wood pulp. Eucalypts provide about 80 per cent. of the mill's requirements for wood pulp, the remainder being imported long fibre softwood pulp. To secure more complete bush utilization, the company has established sawmills to convert understorey species, principally myrtle and sassafras, to sawn timber. The forests are managed on a sustained yield basis. Forest utilization and management are designed to obtain eucalypt regeneration. Experimental work into the problems involved is being carried out by the company and the Tasmanian Forestry Commission.

(ii) *Paper and Paper Board.* Paper and paper board are manufactured in all States but the industry is centred mainly in New South Wales, Victoria and Tasmania. During 1958-59, seventeen paper mills were operating, seven in Victoria, four in New South Wales, three in Tasmania and one each in Queensland, South Australia and Western Australia. A wide variety of papers and paper boards is produced in Australian mills, the quantity and value of paper produced in 1958-59 being as follows, with comparable figures for

1957–58 in brackets:—newsprint, 83,071 (81,085) tons valued at £6,304,189 (£6,227,529); blotting, 832 (537) tons, £145,224 (£94,571); duplicating, 4,870 (4,305) tons, £830,224 (£694,960); printing and writing, 63,200 (47,521) tons, £10,496,789 (£8,154,766); kraft wrapping, 57,668 (50,613) tons, £7,437,943 (£6,569,533); other wrapping, 12,362 (14,669) tons, £2,092,727 (£2,434,014); felt and carpet felt, 4,439 (4,553) tons, £448,339 (£464,406); and other paper, 35,043 (34,289) tons, £3,709,471 (£3,675,831). In addition, 200,339 (181,123) tons of paper boards valued at £17,437,412 (£16,471,576) were produced.

5. **Other.**—(i) *Eucalyptus Oil*. Oil may be distilled from the foliage of all varieties of *Eucalyptus*, and several of them furnish a product widely known for its commercial and medicinal uses. Complete information regarding Australian production and consumption of eucalyptus oil is not available, but considerable quantities are manufactured, particularly in New South Wales and Victoria. The value of oversea exports of eucalyptus oil distilled in Australia was £198,572 in 1956–57; £131,485 in 1957–58; and £77,083 in 1958–59. The quantities exported in the years 1956–57 to 1958–59 were 547,435 lb., 354,434 lb. and 209,541 lb. respectively.

(ii) *Gums and Resins*. Gums and resins are produced in most States of Australia, the main product being grass tree or yacca gum. This gum, which is used in the preparation of varnishes and lacquers, comes chiefly from South Australia, while small quantities are also produced in New South Wales and Western Australia. In 1958–59, the recorded production for Australia of gums and resins was 10,386 cwt. Exports of acaroid resin, grass-tree and yacca gum from Australia during the same period amounted to 7,014 cwt. valued at £14,914.

(iii) *Tanning Barks*. The forests of Australia are capable of yielding a wealth of tanning materials; many species of *Eucalyptus* and other genera contain varying proportions of tannin, chiefly in the bark, but also in the wood and twigs. Scattered distribution, however, has resulted in only the richest tan-bearing species being used in Australia. These are:—Golden wattle (*Acacia pycnantha*), green or black wattle (*Acacia decurrens* or *mollissima*), and mallet (*Eucalyptus astringens*). Mallet (*E. astringens*), of Western Australia, is not extensively used in Australian tanneries, but is exported to Europe and other countries. References to oversea trade in tanning substances are made in § 7, pages 1017 and 1018.

The production of extract from the bark of karri (*E. diversicolor*), of which very large quantities are available at karri sawmills, has passed the experimental stage, and private enterprise has started production on a commercial scale. The experimental work in kino impregnated marri (*E. calophylla*) bark is not yet complete. The total production of tanning bark in Australia approximated 25,000 tons per annum in the years prior to 1939, but since then production has declined and in 1958–59 was only 7,338 tons. However, this decrease is offset by the increased use of vegetable tanning extracts and synthetic tanning agents.

§ 5. Employment in Forestry.

1. **Persons Engaged in Forestry Activities.**—Particulars of the number of persons who, at the population censuses at 30th June, 1947 and 1954, stated that they were engaged in “forestry (excluding sawmills)” are shown in § 2, para. 3, page 1007.

2. **Employment by Forestry Departments.**—In the table below, details are shown of the number of persons employed by State Forestry Departments, and by the Forestry and Timber Bureau in the Australian Capital Territory and the Northern Territory, as at 30th June, 1959.

PERSONS EMPLOYED BY FORESTRY DEPARTMENTS, AS AT 30TH JUNE, 1959.

Occupational Group.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Professional Staff	185	189	81	79	52	30	2	7	625
Non-professional									
Field Staff ..	207	259	87	5	133	82	..	1	774
Clerical Staff ..	334	268	176	103	43	79	..	6	1,009
Extraction of									
Timber ..	1,245	97	119	76	32	..	..	16	5,643
Milling of Timber			22	812	27	..	..	..
Labour (Forest Workers, etc.)			652	1,496	203	545	250	2		49
Total ..	1,971	1,487	1,959	1,278	832	441	4	79	8,051

3. **Employment in Milling Operations.**—Details of the average number of persons employed, including working proprietors, in sawmills during the year 1958-59 are shown in the next table. Further details regarding the operations of these mills are shown in Chapter VII.—Manufacturing Industry.

SAWMILLS: NUMBER AND NUMBER OF PERSONS EMPLOYED, 1958-59.

Particulars.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
Number of Sawmills	983	549	557	92	242	314	2,737
Average number of Persons Employed during Year—							
Males	9,066	6,957	6,272	2,253	4,012	2,507	31,067
Females	394	237	293	183	38	96	1,241
<i>Total</i>	<i>9,460</i>	<i>7,194</i>	<i>6,565</i>	<i>2,436</i>	<i>4,050</i>	<i>2,603</i>	<i>32,308</i>

(a) Excludes Northern Territory and Australian Capital Territory, details for which are not available.

§ 6. Forest Administration, Protection and Research.

1. **Commonwealth Forestry and Timber Bureau.**—When the Commonwealth of Australia was established on 1st January, 1901, forestry was not included among the matters transferred from the States to the control of the Commonwealth. In 1925, the Commonwealth Forestry Bureau was instituted and under an Act of 1930 the Bureau received statutory powers. Its functions included the advising of the various Territorial Administrations on forestry matters, the management of forests placed under its control, the establishment of experimental forest stations, the training of students in forestry, etc. In 1946, the title of the Bureau was altered to Forestry and Timber Bureau. The powers and functions of the Bureau were extended to embrace the collection of statistics and information, and advising the Government of the Commonwealth and the States or other interested bodies on matters relating to the supply, production, imports and exports and distribution of timber in Australia.

The activities of the Bureau under its statutory functions are summarized below:—

(a) *Forestry Education.* The Australian Forestry School, located in Canberra, trains students as professional officers to manage the forests of Australia. Training at the School covers the third and fourth years of a four-year course. The first two years are spent at an Australian university in a study of prescribed science subjects. Courses at the School lead to Commonwealth Diplomas in Forestry and in Forest Technology and, in the case of the former, can lead further to a degree in forestry of an Australian university.

In addition to students nominated by State Governments and other Australian and overseas authorities and organizations, private students, including those from overseas, are accepted at the School. The normal capacity of the School is 40.

(b) *Silvicultural Research.* Research head-quarters and a Central Experimental Station have been established at Canberra. Other Forest Experimental Stations have been established at Mount Burr in the south-east of South Australia, in Tasmania, and at Dwellingup in Western Australia, on a co-operative basis with the Forest Services of those States. It is proposed to establish similar co-operative experimental stations in other States and Territories.

With its present limited staff, the research work of the Bureau has been concentrated largely upon studies of forest and climatic conditions, the genetic relationships and requirements of various species, forest nutrition and the improvement of forest yields. A considerable expansion in the research activities is planned for the next few years as suitable trained staff becomes available.

(c) *Forest Management Research.* A national forest stocktaking is being carried out by the Bureau in co-operation with the Forest Services of the States and, to assist in the work of forest assessment, special consideration is being given to the development of the use of aerial surveys.

Consideration is also being given, in co-operation with the State Forest Services, to the establishment of increased areas of plantations of exotic pines with a view to providing additional supplies of softwood timber.

The general economics of forest management are also being studied.

(d) *Timber Supply.* Advice is currently provided to government departments and "the trade" in matters pertaining to timber supply, including—(i) the availability of total quantities and quantities of particular grades and specifications required to meet Australia's needs; (ii) the quantity of timber that should be imported; (iii) the extent to which exports of timber and related products might be allowed without detriment to local needs; and (iv) *distribution of timber within Australia.*

(e) *Management of Forests.* The Bureau manages the forests of the Australian Capital Territory and maintains a forestry officer in the Northern Territory. In addition, it is responsible for advising the administrations of the Northern Territory and the External Territories on the management of the forests under their charge.

2. **Commonwealth Forest Products Research.**—Fundamental investigations connected with the properties and uses of timber and forest products generally are carried out by the *Forest Products Division of the Commonwealth Scientific and Industrial Research Organization.* These investigations cover a very wide field, e.g., pulp, paper, seasoning, structure and chemistry of wood, tans, etc.

3. **Forestry Activities of the States.** The powers and functions of State forest authorities are laid down under Forestry Acts and Regulations. In each State, there is a department or commission to control and manage the forests of the State. The functions of these administrations can be summarized as follows:—(a) the securing of an adequate reservation of forest lands; (b) the introduction of proper measures for scientific control and management of forest lands; (c) the protection of forests; (d) the conversion, marketing and economic utilization of forest products; and (e) the establishment and maintenance of coniferous forests to remedy the existing deficiency in softwoods. Annual reports are issued by each State forest authority. Victoria maintains a forestry school at which recruits are trained for the forestry service of that State.

In addition to the work of permanently reserving areas in each State, foresters are endeavouring to survey all timbered lands with a view to the elimination of those unsuitable for forestry. Considerable areas have been revoked in certain States, while dedications of new areas have resulted in gains to the permanent forest estate. The Forestry Departments or Commissions also usually control all timber on open Crown lands as well as over 10 million acres of timber reserves, national parks, etc., but, while these areas contain some land of high value for forestry purposes, the greater part does not fulfil these requirements.

4. **Fire Protection.**—Fire control measures in Australia are the responsibility of the individual State Governments, and the provision of adequate fire protection is one of the main problems facing forest authorities. The forest services are responsible for fire protection measures over an area of some 40 million acres of dedicated and reserved forest areas throughout Australia, including some 10 million acres of Crown land in Victoria.

The responsibility for the protection of private property outside urban areas rests with volunteer bush fire brigade organizations which are co-ordinated in each State by a committee or board carrying out functions of an advisory or educational nature and fostering the growth and organization of the bush fire brigade movement. Throughout the main agricultural and forest areas of Australia there are over 4,500 registered volunteer bush fire brigades with a membership approaching 200,000. Although both forest and rural fire organizations are entirely separate entities, a high degree of co-operation and liaison is maintained.

In addition to the forest service and rural organizations, various private and semi-Governmental bodies in each State maintain fire protection organizations, which are generally concerned with the protection of private forestry operations and hydro-electric and water catchment areas.

Over the five-year period 1955–59, the annual cost of protecting from fire the 40 million acres of forest land for which State Forest Services are directly responsible is estimated at £1,500,000 or about 8½d. an acre. The cost of rural fire control as a whole cannot be estimated with any degree of accuracy, owing to the fact that by far the greatest contribution comes from the personal efforts of volunteer brigade members.

The Australian fire season is very variable, with an average of a particularly bad fire season every seven years or so. Such years as 1926, 1939, 1944, 1952 and 1957 account for a large proportion of the average annual burn which, for the 3-year period 1957–59, amounted to 2,695,000 acres or 2.2 per cent. per annum of the forest area requiring protection. The variability of the Australian fire season is shown in the following table.

NUMBER OF FIRES AND FOREST AREAS BURNT: AUSTRALIA.

Season.				Number of Fires.	Forest Areas Burnt.	Burnt Areas as a Proportion of Total Forest Areas.
				No.	Acres.	Per cent.
1956-57	..	..	..	1,999	344,400	0.86
1957-58	..	..	..	2,908	2,078,340	5.11
1958-59	..	..	..	1,175	456,438	1.10

Source: Forestry and Timber Bureau.

Since the 1939-45 War, forest services have greatly expanded their fire detection facilities and big advances have been made in the use of power water-pumping equipment. Radio communication is now being used extensively by both forest services and rural organizations, and considerable progress has been made in the provision of legislative power for the rural bush fire movement, although the volunteer movement itself dates back to the turn of the century.

Intensive research work is being undertaken on fire problems and several governmental groups are working on such projects as the study of fire behaviour and associated fuel and meteorological conditions; the use of chemical aids in fire suppression; the development of protective clothing and devices to aid fire-fighters and of more efficient fire-fighting equipment. The fire weather service of the Bureau of Meteorology is being continually expanded to provide both the rural and forest fire-fighting authorities with improved fire weather forecasts.

Recognizing that fire prevention is one of the most important aspects of the problem, intensive campaigns have been conducted to reduce the incidence of man-caused fires. A study of fire causes in recent years reveals that human agencies account for 95 per cent. of all fires, and of this figure at least 80 per cent. are preventable. It is estimated that "burning-off" (much of which is started illegally) accounts for 35 per cent. of all fires; smokers, hunters, fishermen and travellers cause 13 per cent. of all fires; while only 5 per cent. of fires in Australia are caused by lightning.

§ 7. Oversea Trade in Forest Products, Timber and Timber Products.

1. Imports.—Quantities and values of timber, veneers and plywood imported into Australia during the years 1956-57 to 1958-59 are shown in the following table:—

IMPORTS OF FOREST PRODUCTS, TIMBER AND TIMBER PRODUCTS:
AUSTRALIA.

Particulars.	Unit of Quantity.	Quantity.			Value (£A.f.o.b. Port of Shipment).		
		1956-57.	1957-58.	1958-59.	1956-57.	1957-58.	1958-59.
Logs not sawn—							
Softwoods (a)	'000 sup. ft.	3,905	3,090	4,969	109,870	85,026	150,781
Hardwoods (b)	"	36,911	40,659	50,212	861,323	998,324	1,253,733
Undressed timber—							
Sleepers	"	269	200	(c)	19,915	14,777	26
Dunnage	"	..	..	..	5,643	5,360	4,204
Softwoods (a), n.e.i.—							
Douglas Fir	'000 sup. ft.	171,526	158,087	147,647	7,849,648	6,495,877	5,533,649
Radiata Pine	"	28,270	28,578	33,700	999,461	1,011,408	1,196,846
Other	"	25,323	19,224	15,370	1,375,989	1,111,148	936,697
Hardwoods (b), n.e.i.	"	44,726	54,977	55,412	2,217,777	3,031,477	2,892,734
Box shooks, n.e.i.	"	2,399	1,013	633	148,170	60,520	41,471
Dressed timber	"	21,900	20,830	14,906	1,460,116	1,417,683	996,659
Veneers	'000 sq. ft.	9,495	12,007	14,035	114,732	130,750	137,808
Plywood	"	19,562	22,869	24,680	750,384	936,538	885,742
Tanning substances	wt.	154,742	162,238	137,847	536,237	471,349	383,020
Sandalwood oil	lb.	1,583	1,687	1,206	4,867	6,486	5,717

(a) Non-pored woods.

(b) Pored woods.

(c) Less than 500 super. feet.

Imports of softwood logs in recent years have come almost exclusively from British Borneo and the Solomon Islands, while 90 per cent. of the imports of hardwood logs have also come from British Borneo. Imports of undressed timber comprise mainly Douglas Fir (Oregon Pine) from Canada and the United States of America and Radiata Pine from New Zealand. Timbers from Scandinavian countries provide most of the dressed timber imports.

Imports of timber products are mainly of veneers and plywoods. The Australian Trust Territory of New Guinea provides most of the plywood imports and a substantial proportion of veneer imports.

Tanning substances are the only other forest products imported in significant quantities. The most important of these is wattle bark produced in the Union of South Africa.

2. Exports.—The quantities and values of timber, railway sleepers, veneers, plywood and other timber and forest products exported during the years 1956–57 to 1958–59 are shown in the following table:—

**EXPORTS OF FOREST PRODUCTS AND TIMBER AND TIMBER PRODUCTS
FROM AUSTRALIA.**

Particulars.	Unit of Quantity.	Quantity.			Value (£A.f.o.b. Port of Shipment.)		
		1956–57.	1957–58.	1958–59.	1956–57.	1957–58.	1958–59.
Logs not sawn . . .	'000 sup. ft.	6,233	6,145	4,257	366,724	389,721	258,732
Undressed timber (a)—							
Sleepers . . .	"	22,609	38,393	39,842	1,366,209	2,283,158	2,287,676
Fence posts, girders and pole blocks (b) . . .	"	2,303	2,679	1,501	106,175	114,516	83,932
Softwoods (c), n.e.i. . .	"	647	444	387	55,470	33,876	32,014
Hardwoods (d), n.e.i. . .	"	16,620	16,002	14,682	1,144,251	1,108,371	981,036
Dressed timber . . .		889	603	863	96,559	62,727	110,982
Veneers . . .	'000 sq. ft.	5,724	4,268	7,789	133,588	104,560	219,251
Plywood . . .	"	933	776	701	57,300	61,062	60,879
Tanning substances . . .	cwt.	183,172	100,836	79,983	546,778	293,478	218,649
Charcoal . . .	"	5,715	7,406	4,232	13,201	18,362	18,660
Eucalyptus oil . . .	lb.	547,435	354,434	209,541	198,572	131,485	77,083

(a) Excludes stumps and the like woods.

(d) Pored woods.

(b) Excludes pole blocks in 1956–57.

(c) Non-pored woods.

Sleepers make up the largest single item of forest products, timber and timber products exported from Australia. In 1958–59, India received more than half of Australia's sleeper exports while New Zealand, The Union of South Africa, Iraq and Pakistan each received quantities of more than a million superficial feet. Western Australia was the dominant exporting State.

Most of Australia's log and timber exports are of hardwoods. New Zealand received the greater part of exports of logs as well as of undressed timber. The United Kingdom received most of Australia's exports of plywood and veneers.

Exports of tanning substances in 1958–59 were mainly to the United States of America and that country also was the largest importer of eucalyptus oil. Exports of charcoal were all to New Zealand.