

CHAPTER XXV.

FORESTRY.

NOTE.—For further details on subjects dealt with in this chapter *see* the annual bulletins *Primary Industries, Part II.—Non-Rural Industries and Value of Production* and *Secondary Industries* (sawmills, etc., operations).

§ 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 Forestry and Timber Bureau of the Commonwealth has provided figures for the Northern Territory and the Australian Capital Territory and, in addition, has made available certain other data.

Statistics of timber and by-products have been compiled from the annual factory collections undertaken by the Statisticians in the several States. Figures of production of gums, 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 overseas trade.

The figures shown relate, in general, to 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 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, provision of recreational facilities and aesthetic effects. Forestry also aims at improving existing forests and woodlands by properly controlled exploitation, by protection from such destructive agencies as fire and insect attack, and by inducing regeneration where it is desirable. The provision of a partial tree cover on denuded lands where such cover is necessary for protective purposes, and a complete cover when the land is better under forest than under any other land use, is a further aim of forestry.

§ 2. Forestry in Australia.

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 in the eastern highlands and includes the bulk of the land suitable for intensive development by agricultural or pastoral undertakings or other forms of closer settlement.

The trees which make up the forests of Australia are mainly evergreen hardwoods. The characteristic genus is *Eucalyptus*. There are over 600 different species 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 been exploited, but considerable areas have been replanted with this species in Queensland and, to a lesser extent, in New South Wales. There are considerable areas of the useful termite-resisting cypress pine (*Callitris* spp.) in the inland areas of Queensland and New South Wales, which have not been cleared for grazing. These cypress pine areas are gradually being brought under systematic 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 lower quality forests of inland Australia yield such commercial commodities 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.). These areas are considerably in excess of those which are both suitable for reservation and likely to be maintained for timber production, for they include considerable areas of low-grade forest suitable only for the production of poles, fencing timbers and firewood. It is doubtful if the residual prime native forest area exceeds 30,000 square miles. Further particulars are set out in the table following.

CLASSIFICATION OF FOREST AREA: AUSTRALIA.

(Based on the 1955 Classification of Forests.)

Class of Forest.	Area.				Proportion of Total Forest Area.
	State Forest.	Communal Forest.	Private Forest.	Total.	
Exploitable—	Sq. Miles.	Sq. Miles.	Sq. Miles.	Sq. Miles.	Per Cent.
Softwood	10,512	5	2,808	13,325	7.1
Mixed Wood	754	..	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

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 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 per acre of this species is comparatively low.

Further particulars of forested areas are set out in § 3, page 1005.

3. Persons Engaged.—In the following table, which shows particulars collected in the Population Censuses of Australia of 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

Particulars of the number of persons employed by Forestry Departments and in Saw-mills are included in § 5, para. 2, page 1010.

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; for this reason values cannot be stated on a net basis, as has been done with most other industries.

In 1959–60, the local value of forestry production amounted to £53,859,000. The most important States were New South Wales, Victoria and Queensland with £15,169,000, £15,476,000 and £8,469,000 respectively.

(ii) *Gross and Local Values, 1959–60.* The following table shows gross and local values of forestry production for each State in 1959–60. 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, 1959–60.
(£'000.)

State or Territory.	Gross Value (Gross Production Valued at Principal Markets).	Marketing Costs.	Local Value (Gross Production Valued at Place of Production).
New South Wales	15,390	221	15,169
Victoria	16,969	1,493	15,476
Queensland	9,397	928	8,469
South Australia	4,033	104	3,929
Western Australia	5,460	375	5,085
Tasmania	6,276	720	5,556
Northern Territory	25	(a)	25
Australian Capital Territory	150	(a)	150
Australia	57,700	3,841	53,859

(a) Not available.

(iii) *Local Values, 1955–56 to 1959–60.* 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 1955–56 to 1959–60.

LOCAL VALUE OF FORESTRY PRODUCTION.

Year.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
LOCAL VALUE (£'000).							
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
1959–60	15,169	15,476	8,469	3,929	5,085	5,556	53,859

LOCAL VALUE PER HEAD OF POPULATION (£).

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
1959–60	4.0	5.4	5.8	4.2	7.0	16.0	5.3

(a) Includes Northern Territory and Australian Capital Territory.

§ 3. Forested Areas.

1. **Forest Reservations.**—The first estimate of the forest area 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 dedicated to timber production. According to statements furnished by State and Commonwealth authorities, reservations of forest areas in Australia as at 30th June, 1960, totalled 33,791,000 acres, of which 23,088,000 acres were Dedicated State Forests and 10,703,000 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, 1960.

(Acres.)

State or Territory.	State Forests.	Timber Reserves (Forest Acts).	Other Reserves.	Total.
New South Wales	6,420,005	1,441,542	..	7,861,547
Victoria	4,860,056	709,794	(a) 169,302	5,739,152
Queensland	5,118,483	3,055,740	(b) 843,054	9,017,277
South Australia	268,667	981	(c) 491,874	761,522
Western Australia	4,329,514	1,768,303	(a) 780,678	6,878,495
Tasmania	2,091,544	137,028	(e) 814,709	3,043,281
Northern Territory .. ..	..	..	(f) 358,900	358,900
Australian Capital Territory .. ..	..	..	(g) 131,000	131,000
Australia	23,088,269	7,113,388	3,589,517	33,791,174

(a) Timber reserves under the Land Act. (b) National Parks. (c) Includes some fauna and flora areas for which figures were not previously available. (d) Includes 464,984 acres of State Forests under pulpwood concession. (e) Consists of 612,000 acres of pulpwood concessions over Crown land and 202,709 acres of exclusive forest permits not elsewhere included. (f) Comprises mainly a fauna and flora reserve on Coburg Peninsula. (g) Forest land not specifically reserved.

If the permanently reserved areas were all of good quality, accessible, and fully productive, and if they supplied the class of timber required, they could be regarded as adequate for a larger population than exists in Australia at the present time. Actually, 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. Moreover, the indigenous forest does not contain adequate supplies of softwoods and Australia's requirements have had to be met largely by imports.

It is freely acknowledged by Australian forest authorities that information on forest resources is imperfect. It is not possible to give a reliable estimate of the forest area needed to meet future demands because of the unknown variables involved, in particular, the yield capacity per acre, future consumption of different classes of timber, and the future population.

It appears, however, that all available good forested country and an adequate area suitable for plantations of coniferous timber must be reserved, protected and systematically managed if Australia is to approach the goal of self-sufficiency in timber supplies in the future.

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 and 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 should receive earliest attention in South Australia, as this 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 200,000,000 super. feet per annum and is expected to be increased substantially during the next decade. Production is also increasing in the other States and the thinnings from their plantations are already supplying a significant volume of timber.

Data relating to areas of plantations for past years have been shown as at 30th June. As new areas are being planted in most States at this time of the year, the following table has been compiled by the Forestry and Timber Bureau as at 30th September, 1960.

SOFTWOOD PLANTATIONS, 30TH SEPTEMBER, 1960.
(Acres.)

State or Territory.	Government.			Private: (mainly <i>P. radiata</i>).	Total.
	<i>Pinus radiata</i> .	Other species.	Total.		
New South Wales	64,372	18,646	83,018	12,000	95,018
Victoria	38,742	15,056	53,798	55,500	109,298
Queensland	1,852	88,566	90,418	5,169	95,587
South Australia	105,400	9,700	115,100	(a) 36,200	151,300
Western Australia	10,692	21,330	32,022	584	32,606
Tasmania	14,837	397	15,234	5,446	20,680
Australian Capital Territory ..	21,157	2,096	23,253	100	23,353
Australia	257,052	155,791	412,843	114,999	527,842

(a) Excludes plantings during 1960.

A special article giving a detailed account of the history and development of softwood plantations and of the characteristics of individual species has been prepared by the Forestry and Timber Bureau, and 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 at 30th June, 1960, was 30,924 acres, nearly two-thirds of which was mallet (*Eucalyptus astringens*). Plantations of this species have 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 1959–60. 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.

OUTPUT OF AUSTRALIAN-GROWN TIMBER : ALL MILLS, 1959-60.
(’000 super. feet.)

Particulars.	N.S.W.	Vic.	Q’land.	S.A.	W.A.	Tas.	Aust.(a)
LOGS TREATED.							
Hardwood ..	650,900	687,483	415,750	6,476	601,676	428,130	2,790,415
Softwood ..	154,139	68,272	164,567	290,836	15,131	12,716	705,661
Total ..	805,039	755,755	580,317	297,312	616,807	440,846	3,496,076
SAWN, PEELED OR SLICED TIMBER PRODUCED FROM LOGS ABOVE.							
Hardwood ..	326,810	323,321	196,872	3,159	193,538	164,895	1,208,595
Softwood ..	71,917	27,137	77,829	125,283	5,521	4,764	312,451
Total ..	398,727	350,458	274,701	128,442	199,059	169,659	1,521,046

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

The following table shows logs used and sawn, peeled and sliced timber produced, in Australia for the years 1955-56 to 1959-60.

OUTPUT OF AUSTRALIAN-GROWN TIMBER : ALL MILLS, AUSTRALIA.(a)
(^{'000} super. feet.)

Particulars.	1955-56.	1956-57.	1957-58.	1958-59.	1959-60.
LOGS TREATED.					
Hardwood	2,723,376	2,683,205	2,625,384	2,727,754	2,790,415
Softwood	589,670	569,552	581,065	677,501	705,661
Total	3,313,046	3,252,757	3,206,449	3,405,255	3,496,076

SAWN, PEELED OR SLICED TIMBER PRODUCED FROM LOGS ABOVE.

Hardwood	1,180,936	1,151,428	1,127,150	1,158,799	1,208,595
Softwood	268,786	267,431	264,027	301,175	312,451
Total	1,449,722	1,418,859	1,391,177	1,459,974	1,521,046

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

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 1955-56 to 1959-60.

OUTPUT(a) OF AUSTRALIAN-GROWN TIMBER : ALL MILLS.
(^{'000} super. feet.)

State.	1955-56.	1956-57.	1957-58.	1958-59.	1959-60.
New South Wales	362,709	365,548	359,737	373,515	398,727
Victoria	351,271	342,288	346,473	344,018	350,458
Queensland	261,730	275,936	268,200	262,033	274,701
South Australia	100,983	94,869	84,541	122,456	128,442
Western Australia	222,397	204,474	201,664	211,943	199,059
Tasmania	150,632	135,744	130,562	146,009	169,659
Australia(b)	1,449,722	1,418,859	1,391,177	1,459,974	1,521,046

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

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 timber, timber used in mining and fuel, is obtained from forest and other areas. 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 recent years, however, this has been considerably extended, since plywood manufacture has allowed the use of some species unsuitable for sawing. Special attention has been paid to ensure that logs suitable for peeling are diverted to ply factories. However, the supply of Australian-grown logs is inadequate and greater use is being made of imported logs.

The following table shows the production of plywood for each of the years 1955–56 to 1959–60.

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

State.	1955–56.	1956–57.	1957–58.	1958–59.	1959–60.
New South Wales	39,256	41,921	45,647	56,378	62,701
Queensland	133,230	118,647	131,205	139,743	134,824
Other States	28,213	33,797	35,784	40,083	40,627
Australia	200,699	194,365	212,636	236,204	238,152

Of the total plywood produced in 1959–60, 180,869,000 square feet ($\frac{3}{8}$ -in. basis) were classed as “Commercial”, 36,514,000 as “Waterproof”, 2,660,000 as “Case” and 18,109,000 as “Sliced Fancy”.

During 1959–60, 602.4 million square feet ($\frac{1}{8}$ -in. basis) of veneers were produced by the rotary process for the manufacture of plywood, and 248.7 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, 41.3 million square feet of sliced veneers were produced.

3. Hardboard.—The production of hardboard from pulped wood for building purposes has increased considerably in Australia in recent years. There were five factories producing hardboard during 1959–60 (two in New South Wales, and one in each of Victoria, Queensland and Tasmania) and during the three years ended 30th June, 1960, the following quantities were produced:—1957–58, 24,504,000 square yards; 1958–59, 29,067,000 square yards; and 1959–60, 31,645,000 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 1959–60 this production accounted for 2,650,000 square yards valued at £948,000.

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 1959–60, four wood pulp mills were operating in three States and production was 144,872 tons of chemical pulp and 58,061 tons of mechanical pulp, a total of 202,933 tons. During the previous year, production was 144,757 tons of chemical pulp and 62,069 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 1959–60, 323,487 tons of eucalypt and pine pulpwood were supplied to Maryvale Mill. Plantations of both pines and eucalypts are being established in Gippsland at the rate of approximately 3,000 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 1959–60, a total quantity of 7,800,000 super. feet of pulpwood were supplied to this mill.

A new tissue paper mill near Millicent commenced operations in May, 1960. When in full production, it will use approximately 20 million super. feet of pulpwood annually.

(c) *Tasmania.* In Tasmania, two large mills are making pulp and paper 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. A continuous digester at the Burnie mill makes it the only one in Australia to use a continuous pulping process. In addition, a semi-chemical pulp plant was brought into operation in 1959. In 1959–60, 71,000 tons of paper were

produced. The company holds freehold and State 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 was used until 1957 when additional plant was installed for the manufacture of semi-chemical pulp. This plant uses the cold soda process which allows the utilization of additional species not suitable for ground wood pulp. The components of Boyer newsprint average 60 per cent. of ground-wood pulp, 22 per cent. of cold soda pulp (both made at Boyer from hardwoods) and 18 per cent. of imported Kraft pulp made from *Pinus radiata* in New Zealand. Newsprint production capacity is 85,000 long tons per annum. To secure more complete bush utilization, the company has established sawmills to convert understory species, principally myrtle and sassafras, to sawn timber. The forests are managed on a sustained yield basis. Forest utilization and management are designed to promote 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 1959-60, twenty paper mills were operating, nine in Victoria, four in New South Wales, three in Tasmania, two in Queensland and one each in South Australia and Western Australia. A wide variety of paper and paper board is produced in Australian mills. The quantity and value of paper produced in 1959-60, with comparable figures for 1958-59 in brackets, are as follows.—newsprint, 88,510 (83,071) tons valued at £6,682,005 (£6,304,189); blotting, 800 (832) tons, £144,685 (£145,224); duplicating, 5,804 (4,870) tons, £916,420 (£830,224); printing and writing, 67,825 (63,200) tons, £11,507,234 (£10,496,789); kraft wrapping, 66,451 (57,668) tons, £9,000,408 (£7,437,943); other wrapping 12,600 (12,362) tons, £2,275,045 (£2,092,727); felt and carpet felt, 4,145 (4,439) tons, £472,668 (£448,339); and other paper, 37,486 (35,043) tons, £4,329,530 (£3,709,471). In addition, 221,338 (200,339) tons of paper boards valued at £18,724,122 (£17,437,412) 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 quantity and value of exports of eucalyptus oil distilled in Australia were 354,434 lb., £131,485 in 1957-58; 209,451 lb., £77,083 in 1958-59; and 256,888 lb., £94,760 in 1959-60.

(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, but small quantities are also produced in New South Wales and Western Australia. In 1959-60, the recorded production for Australia of gums and resins was 10,682 cwt. Exports of acaroid resin, grass-tree and yacca gum from Australia during the same period amounted to 9,068 cwt. valued at £18,058.

(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. Their scattered distribution, however, has resulted in the use of only the richest tan-bearing species 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. References to overseas trade in tanning substances are made in § 8, pages 1013 and 1014.

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 1959-60 was only 5,076 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 numbers of persons who, at the population censuses of 30th June, 1947 and 1954, stated that they were engaged in "forestry (excluding sawmills)" are shown in § 2, para. 3, page 1003.

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, 1960.

PERSONS EMPLOYED BY FORESTRY DEPARTMENTS, AS AT 30TH JUNE, 1960.

Occupational Group.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Professional Staff	197	197	83	72	58	30	3	6	646
Non-professional									
Field Staff ..	198	244	90	9	140	83	3	1	768
Clerical Staff ..	336	241	179	100	44	77	1	5	983
Extraction of Timber ..	1,255	136	115	73	35	..	..	..	5,681
Milling of Timber		21	..	758	27	..	..	..
Labour (Forest Workers, etc.)		621	1,614	247	499	225	9	46	
Total ..	1,986	1,460	2,081	1,259	803	415	16	58	8,078

3. **Employment in Milling Operations.**—Details of the average number of persons employed, including working proprietors, in sawmills during the year 1959-60 are shown in the next table. Further details regarding the operations of these mills are shown in Chapter VII.—Manufacturing Industry.

NUMBER OF SAWMILLS AND NUMBER OF PERSONS EMPLOYED, 1959-60.

Particulars..	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
Number of Sawmills ..	946	521	578	92	235	346	2,718
Average number of Persons Employed during Year—							
Males	9,117	6,809	6,329	2,251	3,777	2,759	31,042
Females	418	215	321	181	41	93	1,269
Total	9,535	7,024	6,650	2,432	3,818	2,852	32,311

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

§ 6. Forest Administration 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 functions transferred from the States to the Commonwealth. In 1925 the Commonwealth Forestry Bureau was instituted and in 1930 received statutory powers. Its functions included advising the various Territorial Administrations on forestry matters, the management of forests placed under its control, the establishment of experimental forest stations, the training of professional foresters, etc. In 1946, the title of the Bureau was changed to "The Forestry and Timber Bureau" and its powers and functions were extended to embrace the collection of statistics and other information. In addition, its advisory functions were extended to the Governments of the Commonwealth and the States, or other interested bodies, on such matters as supply, production, imports and exports and distribution of timber in Australia.

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

(a) **Forestry Education.** The Australian Forestry School, located in Canberra, trains professional foresters. Training at the school covers the third and fourth years of a four-year degree course in forestry. The first two years of the course are spent in a study of prescribed science subjects at one of the Australian universities. The third and fourth years

are spent at the Forestry School studying specialized forestry subjects. Students who satisfactorily complete the course graduate in Forestry at their home university and are awarded the Commonwealth Diploma in Forestry. The Commonwealth Diploma in Forestry or the Diploma in Forest Technology may also be awarded to suitable graduates from Australia or overseas who complete an appropriate course at the Australian Forestry School.

(b) *Silvicultural Research.* Research headquarters and a Central Experimental Station have been established in 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 Service of those States. An experimental station is also operating at Traralgon, Victoria in conjunction with A.P.M. Forests Pty. Ltd. It is proposed to establish similar co-operative experimental stations in other States and Territories.

The research work being carried out covers a wide field of studies of forest conditions; the genetic relationships and soil and climatic requirements of various species; forest nutrition; factors affecting the growth of trees; and the improvement of forest yields. Studies in fire protection, watershed management, forest entomology and pathology are also being actively pursued. Considerable expansion in research activities is planned as suitable trained staff becomes available.

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

Research in the fields of forest management and mensuration is being carried out and further investigations into the economics of management are proposed.

A research station has been established at Darwin for the Northern Territory Administration.

(d) *Timber Supply Economics.* Advice is currently made available to government departments and private enterprise on timber supply matters. Research is undertaken on logging methods and machines and on matters associated with the marketing of timber products.

(e) *Management of Forests.* A Division of the Bureau manages the forests of the Australian Capital Territory, while the Darwin research station advises on the management of the forests of the Northern Territory. In addition, advice is made available to the Administrations of the Australian External Territories on the management of the forests in those Territories.

2. Commonwealth Scientific and Industrial Research Organization, Division of Forest Products.—Fundamental investigations connected with the properties and uses of timber and forest products generally are carried out by the Division of Forest Products of the Commonwealth Scientific and Industrial Research Organization. These investigations cover a very wide field, e.g., structure and chemistry of wood, tans, etc.; properties and uses of wood; methods of production of sawn timber, pulp, paper, 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 State forests, etc. Its functions are summarized as follows: (a) the introduction of proper measures for the control and management of forest land; (b) the protection of forest land; (c) the conversion, marketing and economic utilization of forest products; (d) the securing of an adequate and permanent reservation of State forests; (e) the establishment and maintenance of coniferous forests to remedy the existing deficiency of softwoods in Australia. All State forest services are actively engaged on research programmes involving problems of a more applied nature as opposed to the basically fundamental biological research being carried out by the federal authorities.

Annual reports are issued by each State forest authority. The Forestry Commission of Victoria maintains a Forestry School at Creswick, where recruits are trained for employment in the Commission or in other avenues of forestry.

In addition to developing permanent forest reserves in each State, foresters are surveying all timber lands with a view to obtaining dedications of new State forests to add to the permanent forest estate or to release areas unsuitable for forestry for other uses. State forest authorities also usually control all timber on unoccupied Crown lands as well as over 10 million acres of timber reserves, national parks, etc.

4. **Private Forestry.**—A number of private forestry companies are now operating in Australia. They are mainly concerned with the supply of raw materials to specific wood processors (often parent companies). The majority have professional foresters on their staff, several being engaged on research.

An estimate of the area of softwood plantations established by private companies and individuals is included in the table in § 3, para. 2, page 1006.

§ 7. 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-Government 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 1956–60, 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 £1,600,000 or about 9d. an acre. The cost of rural fire control as a whole cannot be estimated with any degree of accuracy because 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. Over 80 per cent. of the area burnt carries little commercial timber, being mainly firewood and protection forest. The number of fires and the forest area burnt during the last four years is shown in the following table :—

NUMBER OF FIRES AND FOREST AREAS BURNT: AUSTRALIA.

(Source: Forestry and Timber Bureau.)

Year.	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
1959–60	1,407		1,297,301	3.25

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. Lightning accounts for a little over 5 per cent. of all fires in Australia, although the incidence of fires caused by lightning is much higher in certain areas, especially the Southern Highlands region in New South Wales and Victoria. Although lightning is a relatively small numerical cause of fire, the percentage area burnt from this cause would be around 20 per cent. This high percentage is due to the multiple fire outbreaks causing fire fighting difficulties and to the general inaccessibility of the areas in which such fires generally occur.

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

1. **Imports.**—Quantities and values of forest products, timber and timber products imported into Australia during the years 1957–58 to 1959–60 are shown in the following table:—

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

Particulars.	Unit of Quantity.	Quantity.			Value (£A.Co.b. Port of Shipment).		
		1957–58.	1958–59.	1959–60.	1957–58.	1958–59.	1959–60.
Logs not sawn—							
Softwoods (a) ..	'000 sup. ft.	3,090	4,969	3,703	85,026	150,781	117,068
Hardwoods (b) ..	"	40,659	50,212	60,010	998,324	1,253,733	1,585,362
Undressed timber—							
Sleepers ..	"	200	(c)	..	14,777	26	..
Dunnage ..	"	..	..	..	5,360	4,204	4,822
Softwoods (a), n.e.i.—							
Douglas Fir ..	'000 sup. ft.	158,087	147,647	182,265	6,495,877	5,533,649	8,365,462
Radiata Pine ..	"	28,578	33,700	43,500	1,011,408	1,196,846	1,630,525
Other ..	"	19,224	15,370	19,741	1,111,148	936,697	1,723,063
Hardwoods (b), n.e.i. ..	"	54,977	55,412	67,387	3,031,477	2,892,734	3,651,162
Box shooks, n.e.i. ..	"	1,013	633	610	60,520	41,471	38,702
Dressed timber ..	"	20,830	14,906	11,711	1,417,683	996,659	729,825
Veneers ..	'000 sq. ft.	12,007	14,035	13,192	130,750	137,808	146,835
Plywood ..	"	22,869	24,680	29,523	936,538	885,742	1,074,189
Tanning substances ..	cwt.	162,238	137,847	148,542	471,349	383,020	435,348
Sandalwood oil ..	lb.	1,687	1,206	1,402	6,486	5,717	8,050

(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, and more than 90 per cent. of the imports of hardwood logs have also come from British Borneo. Imports of undressed softwood timber comprise mainly Douglas Fir (Oregon Pine) from Canada and the United States of America and Radiata Pine from New Zealand. Imports of undressed hardwood timber come mainly from Malaya and British Borneo. Timbers from Scandinavian countries provide most of the dressed timber imports.

Imports of timber products are mainly veneers and plywoods. The Australian Trust Territory of New Guinea provides most of the plywood imports and, together with the United Kingdom, over 75 per cent. 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 1957–58 to 1959–60 are shown in the following table:—

**EXPORTS OF FOREST PRODUCTS, TIMBER AND TIMBER PRODUCTS:
AUSTRALIA.**

Particulars.	Unit of Quantity.	Quantity.			Value (£A.f.o.b. Port of Shipment.)		
		1957–58.	1958–59.	1959–60.	1957–58.	1958–59.	1959–60.
Logs not sawn ..	'000 sup. ft.	6,145	4,257	4,099	389,721	258,732	237,416
Undressed timber (a)—							
Sleepers ..	"	38,393	39,842	32,090	2,283,158	2,287,676	1,775,477
Fence posts, girders and pole blocks ..	"	2,679	1,501	614	114,516	83,932	42,584
Softwoods (b), n.e.i. ..	"	444	387	536	33,876	32,014	47,621
Hardwoods (c), n.e.i. ..	"	16,002	14,682	13,948	1,108,371	981,036	954,300
Dressed timber ..	"	603	863	1,471	62,727	110,982	193,576
Veneers ..	'000 sq. ft.	4,268	7,789	4,037	104,560	219,251	112,888
Plywood ..	"	776	701	757	61,062	60,879	86,045
Tanning substances ..	cwt.	100,836	79,983	138,132	293,478	218,649	351,196
Charcoal ..	"	7,406	4,232	7,049	18,362	18,660	31,103
Eucalyptus oil ..	lb.	354,434	209,541	256,888	131,485	77,083	94,760

(a) Excludes stumps and the like.

(b) Non-pored woods.

(c) Pored woods.

Sleepers make up the largest single forestry item exported from Australia. In 1959–60, India received more than 40 per cent. of Australia's sleeper exports while the United Kingdom, New Zealand and Pakistan each received more than three 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 and almost 40 per cent. of the exports of all undressed timber, other than railway sleepers. The United Kingdom received most of Australia's exports of plywood and veneers.

Exports of tanning substances in 1959–60 were mainly to the United States of America and that country also was the largest importer of eucalyptus oil. More than 90 per cent. of the charcoal exports were shipped to New Zealand, Japan receiving the remainder.