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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 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 definition of 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 this 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 melanoxyton*), 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 bidwilli*) and kauri (*Agathis* spp.) of Queensland, and huon pine (*Dacrydium franklinii*), celerytop pine (*Phyllocladus asplenifolius*) 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 Eighth British Commonwealth Forestry Conference held in Kenya in 1962, the total area of forest in Australia was estimated at 800,263 square miles, or about 27.2 per cent. of the total land area of the continent. The large apparent increase in forested land area, when compared with the previous (1955) land classification, is due to altered definitions which have resulted in the inclusion of approximately 625,000 square miles of land carrying only stunted tree growth. It has not been possible to show the distribution of the forested areas by States as this information is not available. Of the total forested area, it is estimated that approximately only 30,000 square miles consists of residual prime native forest. Further particulars are set out in the following table.

CLASSIFICATION OF FOREST AREA(a): AUSTRALIA.

(Source.—Forestry and Timber Bureau.)

Forested Area.	Area in Square Miles.
LANDS.	
Accessible Forests—	
Productive Forests in Use—	
Coniferous (softwood)	769
Non-coniferous (broadleaved)	38,050
Mixed Woods	8,806
Open Areas	383
Total	48,008
Productive Forests not in Use	(b) 49,939
Unproductive Accessible Forests	(c) 402,636
<i>Total Accessible Forests</i>	(d) 500,583
Inaccessible Forests	299,680
Total Forested Area	800,263
OWNERSHIP OF ACCESSIBLE FORESTS.	
Publicly-owned Forests—	
State Forests	36,772
Other Forests	234,889
<i>Total</i>	271,661
Privately-owned Forests	227,402
Ownership not yet Determined	1,520
Total Accessible Forests	500,583

(a) Based on the 1960 classification of forests. (b) Includes approximately 39,062 square miles capable of producing fuelwood only. (c) This area carries only sparse, stunted trees. (d) Includes approximately 400,000 square miles of land carrying only stunted trees.

Further particulars of forested areas are set out in § 3, page 1017.

3. Persons Engaged.—Previous issues of this Year Book contained particulars collected in the Population Censuses of Australia of 30th June, 1947 and 1954, showing the numbers of persons whose "industry" was stated to be "forestry (excluding sawmilling)", together with the numbers engaged in all primary industries and the total work force. Corresponding information for the Census of 30th June, 1961, is not yet available.

Particulars of the number of persons employed by Forestry Departments and in Saw-mills are included in § 5, para. 2, page 1022.

4. Value of Production.—(i) *General.* Statistics of both the gross value (at principal markets) 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 1960–61, the local value of forestry production amounted to £52,057,000. The most important States were New South Wales, Victoria and Queensland with £15,300,000, £14,795,000 and £7,149,000 respectively.

(ii) *Gross and Local Values, 1960–61.* The following table shows gross and local values of forestry production for each State in 1960–61. 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, 1960–61.
(£'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	15,816	516	15,300
Victoria	16,314	1,519	14,795
Queensland	9,670	2,521	7,149
South Australia	3,756	27	3,729
Western Australia	5,541	374	5,167
Tasmania	6,566	831	5,735
Northern Territory	24	(a)	24
Australian Capital Territory	158	(a)	158
Australia	57,845	5,788	52,057

(a) Not available.

(iii) *Local Values, 1956–57 to 1960–61.* 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 1956–57 to 1960–61.

LOCAL VALUE OF FORESTRY PRODUCTION.

Year.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
LOCAL VALUE (£'000).							
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
1960–61	15,300	14,795	7,149	3,729	5,167	5,735	52,057

LOCAL VALUE PER HEAD OF POPULATION (£).

1956–57	4.7	4.7	6.8	4.7	7.0	13.9	5.5
1957–58	4.2	4.9	6.6	4.0	7.4	13.7	5.3
1958–59	4.2	5.1	5.8	4.5	7.2	14.4	5.3
1959–60	4.0	5.5	5.7	4.2	7.1	16.1	5.3
1960–61	3.9	5.1	4.8	3.9	7.1	16.4	5.0

(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, 1961, totalled 36,928,000 acres, of which 23,307,000 acres were Dedicated State Forests and 13,621,000 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, 1961.

(Acres.)

State or Territory.	State Forests.	Timber Reserves (Forest Acts).	Other Reserves. (a)	Total.
New South Wales	6,581,788	1,406,322	(b) 1,557,468	9,545,578
Victoria	4,860,170	(c) 861,276	(b) 366,888	6,088,334
Queensland	5,124,220	3,048,339	848,196	9,020,755
South Australia	271,108	981	760,500	1,032,589
Western Australia	4,343,153	(d) 2,554,920	321,015	7,219,088
Tasmania	(e) 2,126,744	137,028	(f) 1,266,679	3,530,451
Northern Territory	8,620	(g) 352,000	360,620
Australian Capital Territory	(h) 131,000	131,000
Australia	23,307,183	8,017,486	5,603,746	36,928,415

(a) Includes National Parks and Scenic Reserves. (b) Reserved under the Lands Acts.
 (c) Includes 151,499 acres reserved under the Lands Acts. (d) Includes 775,339 acres reserved under the Lands Acts.
 (e) Includes 464,984 acres of State Forests under pulpwood concession. (f) Includes 612,000 acres of pulpwood concessions over Crown land and 419,908 acres of exclusive forest permits on Crown land.
 (g) Comprises mainly a fauna and flora reserve on Coburg Peninsula.
 (h) 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 years prior to 1960 were shown as at 30th June. As new areas are being planted in most States at this time of the year, data for 1960 and 1961 have been compiled by the Forestry and Timber Bureau as at 30th September. The following table shows particulars for 30th September, 1961.

SOFTWOOD PLANTATIONS, 30TH SEPTEMBER, 1961.
(Acres.)

State or Territory.	Government.			Private (mainly <i>P. radiata</i>).	Total.
	<i>Pinus radiata</i> .	Other species.	Total.		
New South Wales	68,343	19,198	87,541	12,495	100,036
Victoria	36,609	10,931	(a) 47,540	(b) 61,600	109,140
Queensland	1,957	92,421	94,378	5,970	100,348
South Australia	107,900	9,700	117,600	(c) 33,100	150,700
Western Australia	11,670	22,832	34,502	864	35,366
Tasmania	15,528	410	15,938	5,915	21,853
Australian Capital Territory ..	22,260	2,101	24,361	100	24,461
Australia	264,267	157,593	421,860	120,044	541,904

(a) Forests Commission area only. There are approximately 4,000 acres of plantations owned by other State instrumentalities about which no reliable information is available. (b) Estimated. (c) Excludes plantings during 1961.

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, 1961, was 31,266 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 1960-61. 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, 1960-61.
(‘000 super. feet.)

Particulars.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	Aust.(a)
LOGS TREATED.							
Hardwood	641,585	650,103	399,212	9,824	559,789	408,475	2,668,988
Softwood	148,567	71,973	142,421	246,659	14,438	13,899	637,957
Total	790,152	722,076	541,633	256,483	574,227	422,374	3,306,945
SAWN, PEELLED OR SLICED TIMBER PRODUCED FROM LOGS ABOVE.							
Hardwood	321,024	293,706	193,902	3,483	181,481	159,399	1,152,995
Softwood	69,848	28,419	68,239	88,824	5,276	5,136	265,742
Total	390,872	322,125	262,141	92,307	186,757	164,535	1,418,737

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

The following table shows logs used, and sawn, peeled, and sliced timber produced, in Australia for the years 1956-57 to 1960-61.

OUTPUT OF AUSTRALIAN-GROWN TIMBER : ALL MILLS, AUSTRALIA.(a)
(*000 super. feet.)

Particulars.	1956-57.	1957-58.	1958-59.	1959-60.	1960-61.
LOGS TREATED.					
Hardwood	2,682,236	2,624,436	2,726,768	2,789,406	2,668,988
Softwood	571,998	580,856	677,255	705,405	637,957
Total	3,254,234	3,205,292	3,404,023	3,494,811	3,306,945

SAWN, PEELED OR SLICED TIMBER PRODUCED FROM LOGS ABOVE.

Hardwood	1,151,428	1,127,150	1,158,799	1,208,595	1,152,995
Softwood	267,431	264,027	301,175	312,451	265,742
Total	1,418,859	1,391,177	1,459,974	1,521,046	1,418,737

(a) Excludes the Australian Capital Territory and the Northern Territory, details of 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 1956-57 to 1960-61.

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

State.	1956-57.	1957-58.	1958-59.	1959-60.	1960-61.
New South Wales	365,548	359,737	373,515	398,727	390,872
Victoria	342,288	346,473	344,018	350,458	322,125
Queensland	275,936	268,200	262,033	274,701	262,141
South Australia	94,869	84,541	122,456	128,442	92,307
Western Australia	204,474	201,664	211,943	199,059	186,757
Tasmania	135,744	130,562	146,009	169,659	164,535
Australia(b)	1,418,859	1,391,177	1,459,974	1,521,046	1,418,737

(a) Total production of sawn, peeled and sliced timber. (b) Excludes the Australian Capital Territory and Northern Territory, details of 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 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, 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 1956–57 to 1960–61.

PLYWOOD PRODUCED.
(’000 square feet— $\frac{3}{16}$ -in. basis.)

State.	1956-57.	1957-58.	1958-59.	1959-60.	1960-61.
New South Wales	41,921	45,647	56,378	62,701	64,930
Queensland	118,647	131,205	139,743	134,824	112,414
Other States	33,797	35,784	40,083	44,574	46,045
Australia	194,365	212,636	236,204	242,099	223,389

Of the total plywood produced in 1960–61, 155,737,000 square feet ($\frac{3}{16}$ -in. basis) were classed as “Commercial”, 44,907,000 as “Waterproof”, 2,544,000 as “Case” and 20,201,000 as “Sliced Fancy”.

During 1960–61, 593.7 million square feet ($\frac{1}{8}$ -in. basis) of veneers were produced by the rotary process for the manufacture of plywood, and 230.5 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, 44.7 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 1960–61 (two in New South Wales, and one in each of Victoria, Queensland and Tasmania) and during each of the three years ended 30th June, 1961, the following quantities were produced:—1958–59, 29,067,000 square yards; 1959–60, 31,645,000 square yards; and 1960–61, 31,085,275 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 1960–61 this production accounted for 1,451,653 square yards valued at £548,328.

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 1960–61, six wood pulp mills were operating in three States and production was 148,640 tons of chemical pulp and 64,569 tons of mechanical pulp, a total of 213,209 tons. During the previous year, production was 144,872 tons of chemical pulp and 58,061 tons of mechanical pulp.

(a) *Victoria.* In Victoria, wood pulp is produced 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 1960–61, 343,554 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.

(b) *South Australia.* In South Australia, three wood pulp mills operate in the south-eastern part of the State, using raw material in the form of logs from the State forests. One mill produces paper board, one tissue paper, and the other particle board. During 1960–61, a total of 17 $\frac{1}{4}$ million super. feet of pulpwood was supplied to the three mills.

Investigations are proceeding for the establishment of another large pulp mill near Mount Gambier.

(c) *Tasmania.* In Tasmania, two large mills are making pulp and paper from indigenous hardwoods. At Burnie, on the north-west coast, a mill using the soda process produces 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 by the same company.

In 1960-61, 71,827 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.

The other mill 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 groundwood 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 greater part of the industry is in New South Wales, Victoria and Tasmania. During 1960-61, twenty-two paper mills were operating, ten in Victoria, four in New South Wales, three in Tasmania, two each in Queensland and South Australia and one in Western Australia. A wide variety of paper and paper board is produced in Australian mills. The quantity and value of paper produced in 1960-61 includes the following items. Comparable figures for 1959-60 are shown in parentheses. Newsprint, 88,039 (88,510) tons valued at £6,490,754 (£6,682,005); blotting, 755 (800) tons, £133,373 (£144,685); duplicating, 7,055 (5,804) tons, £1,176,251 (£916,420); printing and writing, 80,166 (67,825) tons, £12,640,988 (£11,507,234); kraft wrapping, 98,607 (66,451) tons, £12,226,040 (£9,000,408); other wrapping, 9,828 (12,600) tons, £1,828,591 (£2,275,045); felt and carpet felt, 3,112 (4,145) tons, £326,760 (£472,668). In addition, 209,532 (221,338) tons of paper boards valued at £17,687,277 (£18,724,122) 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 209,451 lb., £77,083 in 1958-59; 256,888 lb., £94,760 in 1959-60; and 236,921 lb., £80,738 in 1960-61.

(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 1960-61, the recorded production for Australia of gums and resins was 9,659 cwt. Exports of acaroid resin, grass tree and yacca gum from Australia during the same period amounted to 8,949 cwt. valued at £17,173.

(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 astrigens*). Mallet (*E. astrigens*), of Western Australia, is not extensively used in Australian tanneries, but is exported. References to oversea trade in tanning substances are made in § 8, pages 1025 and 1026.

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 1960-61 was only 3,715 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 previous issues of this Year Book. Corresponding information for the census of 30th June, 1961, is not yet available.

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, at 30th June, 1961.

PERSONS EMPLOYED BY FORESTRY DEPARTMENTS, 30TH JUNE, 1961.

Occupational Group.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Professional Staff	208	201	87	80	59	33	3	7	678
Non-professional									
Field Staff	203	250	95	2	139	85	4	1	779
Clerical Staff	334	232	183	103	52	80	1	5	990
Extraction of Timber	1,240	117	117	74	31	4	6		6,095
Milling of Timber		19	..	716	21	..	13	..	
Labour (Forest Workers, etc.)		743	1,748	242	634	226	98	46	
Total	1,985	1,562	2,230	1,217	936	428	(a) 125	59	8,542

(a) Includes 105 full blood aboriginals who were employed in the following occupations: 4 in extraction of logs, 11 in milling of timber, and 90 as forest workers.

3. **Employment in Milling Operations.**—Details of the average number of persons employed, including working proprietors, in sawmills during the year 1960-61 are shown in the next table. Further details regarding the operations of sawmills in 1959-60 are shown in Chapter VI.—Manufacturing Industry.

NUMBER OF SAWMILLS AND NUMBER OF PERSONS EMPLOYED, 1960-61.

Particulars.	N.S.W.	Vic.	Q'ld.	S.A.	W.A.	Tas.	Aust.(a)
Number of Sawmills	907	506	583	84	222	328	2,630
Average number of Persons Employed during Year—							
Males	8,857	6,465	5,941	2,062	3,798	2,721	29,844
Females	411	232	297	186	47	84	1,257
Total	9,268	6,697	6,238	2,248	3,845	2,805	31,101

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

§ 6. Forest Administration and Research.

1. **Forestry Activities of the Commonwealth.**—Although control of forests is a function of the State Governments, the Commonwealth Government has entered the research field with the aim of assisting both public and private enterprise. The two main research authorities administered by the Commonwealth Government are the Commonwealth Forestry and Timber Bureau and the Division of Forest Products of the Commonwealth Scientific and Industrial Research Organization. A brief account of the activities of these two organizations is given below.

(i) *Commonwealth Forestry and Timber Bureau.* In 1925, the Commonwealth Government established the Commonwealth Forestry Bureau which received statutory powers in 1930. 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 functions were extended to embrace investigations, research and advice relating to the supply, production, distribution and use of timber.

The main activities of the Bureau under its statutory functions are as follows.

(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 Dwellin; up 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 co-junction with a private company. 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.

In 1961, the Commonwealth Government decided to expand the research work of the Bureau and to form a Forest Research Institute to carry out silvicultural and forest management investigations.

(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.

(ii) *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.

2. *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 practical nature as opposed to the 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.

The Universities in all States provide facilities for forestry graduates attending the Universities or, in some cases, for forestry graduates working within, or outside, the States to proceed to advanced degrees. The University of Melbourne has established a Department of Forestry to assist both undergraduates and post-graduate students.

3. **Private Forestry.**—A number of private forestry companies are now operating in Australia. They are concerned mainly 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 1018.

§ 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. Of some 52 million acres of dedicated and reserved forest areas throughout Australia, the forest services maintain a high degree of protection over a relatively accessible area of about 20 million acres; about 19 million acres, being more difficult of access, are not so highly protected; about 13 million acres are, at present, not protected.

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 5,000 registered volunteer bush fire brigades with a membership approaching 250,000. 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 1957–61, the annual cost of protecting from fire the 39 million acres of forest land for which State Forest Services provide protection is estimated at £2,100,000 or about 1s. 1d. 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 five 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
		No.	'000 Acres.	Proportion of Total Forest Areas.
1956-57	1,999	344	0.86	
1957-58	2,908	2,073	5.11	
1958-59	1,175	456	1.10	
1959-60	1,504	1,314	2.48	
1960-61	2,667	1,294	2.47	

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.

Since fire prevention is one of the most important aspects of the problem, intensive campaigns are being conducted to reduce the incidence of man-caused fires. A study of fire causes in recent years reveals that human agencies account for 90 per cent. of all fires, and of this figure at least 80 per cent. were preventable. It is estimated that "burning-off" (much of which is started illegally) accounts for 30 per cent. of all fires. Lightning accounts for a little over 10 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 is estimated at about 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 1958-59 to 1960-61 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).		
		1958-59.	1959-60.	1960-61.	1958-59.	1959-60.	1960-61.
Logs not sawn—							
Softwoods (a)	'000 sup. ft.	4,969	3,714	1,872	150,781	117,068	58,210
Hardwoods (b)	"	50,212	60,010	58,460	1,253,733	1,585,362	1,715,251
Undressed timber—							
Sleepers	"	(c)	"	"	26		
Dunnage	"	"	"	"	4,204	4,822	2,514
Softwoods (a), n.e.i.—							
Douglas Fir	'000 sup. ft.	147,647	182,265	183,126	5,533,649	8,365,462	8,498,234
Radiata Pine	"	33,700	43,500	33,462	1,196,846	1,630,525	1,213,071
Other	"	15,370	19,741	35,152	936,697	1,723,063	2,704,577
Hardwoods (b), n.e.i.	"	55,412	67,387	85,262	2,892,734	3,651,162	5,156,597
Box shooks, n.e.i.	"	633	610	567	41,471	38,702	33,212
Dressed timber	"	14,906	11,711	13,178	996,659	729,825	921,836
Veneers	'000 sq. ft.	14,035	13,192	18,755	137,808	146,835	184,581
Plywood	"	24,680	29,523	31,618	885,742	1,074,189	1,089,658
Tanning substances	cwt.	137,847	148,542	164,596	383,020	435,348	402,394
Sandalwood oil	lb.	1,206	1,402	1,540	5,717	8,050	8,712

(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, more than half of Australia's imports of veneer.

Tanning substances are the only other forest products imported in significant quantities. The most important of these is wattle bark produced in the Republic 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 1958–59 to 1960–61 are shown in the following table. The figures given represent total exports and therefore include particulars of re-exported materials, but the amounts involved are, in general, relatively small.

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

Particulars.	Unit of Quantity.	Quantity.			Value (£A.f.o.b. Port of Shipment.)		
		1958–59.	1959–60.	1960–61.	1958–59.	1959–60.	1960–61.
Logs not sawn ..	'000 sup. ft.	4,257	4,099	6,502	258,732	237,416	371,461
Undressed timber (a)—							
Sleepers ..	"	39,842	32,090	17,779	2,287,676	1,775,477	930,566
Fence posts, girders and pole blocks ..	"	1,501	614	387	83,932	42,584	31,030
Softwoods (b), n.e.i. ..	"	387	536	751	32,014	47,621	69,118
Hardwoods (c), n.e.i. ..	"	14,682	13,948	21,145	981,036	954,300	1,464,465
Dressed timber ..	"	863	1,471	1,040	110,982	193,576	144,199
Veneers ..	'000 sq. ft.	7,789	4,037	2,201	219,251	112,888	52,488
Plywood ..	"	701	757	1,103	60,879	86,045	124,461
Tanning substances ..	cwt.	79,983	138,132	63,587	218,649	351,196	183,343
Charcoal ..	"	4,232	7,049	5,712	18,660	31,103	22,385
Eucalyptus oil ..	lb.	209,541	256,888	236,921	77,083	94,760	80,738

(a) Excludes stumps and the like.

(b) Non-pored woods.

(c) Pored woods.

In 1960–61, New Zealand received more than 50 per cent. of Australia's exports of sleepers as well as the greater part of exports of logs and almost 40 per cent. of exports of all undressed timber. The United Kingdom received most of Australia's exports of plywood and veneers.

Exports of tanning substances in 1960–61 were mainly to the United States of America and that country also was the largest importer of eucalyptus oil produced in Australia. More than 60 per cent. of the charcoal exports were shipped to New Zealand.