CHAPTER II - THE VALUE OF EUCALYPTS

(*) See Annex 2

FO/56/E-3-a

THE VALUE OF EUCALYPTS - WORLD-WIDE

PARTICULARLY AUSTRALIA

D.A.N. Cromer*

Contents

I. THE VALUE OF EUCALYPTS TO AUSTRALIA

1. Introduction

Eucalypts are the dominant feature of the Australian landscape. Not only do they constitute almost the whole of the forested land in a narrow belt along the eastern and southern coasts, but they extend inland to the regions of lower rainfall forming a wider belt of

* Officer in charge, Division of Forest Resources, Forestry and Timber Bureau, Canberra, Australia.

savannah woodland, which nearly encircles the arid interior (see map).

The eucalypts have been, and continue to be, of incalculable value to Australia. In this young country fencing material, excellent firewood, mining and constructional timbers are nearly always available close at hand for the settler. The forests produce quality timbers for building construction and other industrial purposes.

Over a range of latitude from 10 deg. to 43 deg. S., an altitude from sea level to nearly 7,000 ft., and an annual rainfall from 10" to 120", nearly 700 species and varieties of the genus grow on a wide range of soils, and under a wide variety of conditions and micro-climates.

Species have adapted themselves to environments which vary from rain forest ecotone through high rainfall regions (wet sclerophyllous formations) to regions of lower rainfall (dry sclerophyll) and finally to semi-arid areas fringing the desert, where they may be reduced to dwarf, multiple-stemmed forms known as "mallees". This variation in environment is accompanied by similar variations in rate of growth, silvicultural requirements and timber characteristics. Many species are in addition extremely sensitive to changes in micro-habitat (Wood 1950) consequently the dominant species frequently change rapidly from point to point, with mixtures of species a common feature and each one dominant over certain small areas.

Within certain limits the characteristics of eucalypt timbers vary according to species over a considerable range. This factor is of great value to Australia for it means that eucalypts can be employed for a wide variety of end-uses. It must be stressed at this point that Australia is deficient in softwoods, both coniferous and other types, consequently hardwoods are used for many purposes for which coniferous timbers would be employed elsewhere. The eucalypts are all comparatively hard timbers, but within the genus* density varies from 71 lbs/c.ft. air day (E. siderophloia) to 38 lbs/c.ft. (E. gigantea), and hardness from 3450 lbs. (E. hemiphloia) to 1500 lbs. (E. diversicolor). Similar variations occur in other properties including bending strength, toughness, colour, ease of working and durability (Boas 1947).

Silviculturally the eucalypts regenerate readily, even under adverse climatic conditions. In view of this it has not been necessary to regenerate forests artificially or establish plantations, except under special circumstances. Most of the eucalypts seed regularly and in quantity. All but a few possess lignotubers and coppice readily. Natural regeneration therefore presents no difficulties, except those associated, in mixed forest, with favouring desirable species.

The value of the eucalypts to Australia may be summarized as follows:-

---

* Throughout this paper the terminology of Blakely (2nd edition) is used. Where there is doubt synonym and alternative names are given.

(1) predominate over almost the whole of the forested land and the savannah woodland areas

(2) cover a wide range of

(a) quality
(b) character
(c) strength
(d) hardness
(e) durability, etc.

(3) occur on a wide range of soils

(4) adapted to a wide range of climates

(5) offer flexibility in usage due to the large number of different species

(6) able to regenerate easily both from seed and coppice

(7) able to withstand fire (some exceptions)

(8) prune themselves

(9) produce clear timber

(10) make excellent firewood

(11) exceptionally high yields in favourable localities

Against these advantages must be set certain disadvantages mainly associated with the conversion of the timber, viz:

(1) slow and sometimes difficult to season

(2) subject to brittle heart or pipe (Central hollow)

(3) growth stresses (Jacobs 1955) cause difficulties in sawing

(4) unless correctly seasoned liable to warp and twist

(5) heavier and harder than coniferous timbers for purposes where light soft woods are required.

It must be stressed that these disadvantages apply to old mature trees, as do previous statistics of timber properties. Young, immature eucalypt timbers especially if rapidly grown, do not possess the properties quoted in most Australian literature. Nevertheless, through the utilisation of small logs for case manufacture, etc. the tendency to radial splitting and other defects, which occur in fast-grown plantation eucalypts in other countries, is well known in Australia. Growth stresses and seasoning difficulties are accentuated under such circumstances, and are inseparable from short rotations, rapid growth, and stems of small diameter.

2. Current Use

(1) Industrial Wood

In spite of the large number of species comprising the genus, comparatively few are utilised commercially on a large scale.

The following list (Turnbull 1956) includes all species with a commercial sawn production exceeding 1,000,000 c.ft. per annum:

TABLE 1

Million c.ft. sawn per annum	Species
over 8	E. marginata E. pilularis E. obliqua
7-8	E. regnans
5-7	E. maculata
3-5	E. gigantea Ironbark group (E. paniculata, E. sideroxylon, E. siderophloia and E. racemosa)
1.7-3	E. diversicolor E. dalrympleana E. camaldulensis E. sieberiana E. microcorys
1-1.7	Brown stringybark group (E. baxteri, E. blaxlandi, E. capitallata) E. viminalis Peppermint group (E. salicifolia,* E. radiata, E. lindleyana, E. piperita, E. dives) E. grandis E. saligna

* amygdaline

A somewhat larger number of species is used industrially to a more limited extent. Table 2 shows all species with an annual production exceeding about 8,000 cu.ft. by industrial usage excluding fuel, fencing, mining timbers, tannin, oil, etc. Under "hewn", employment for sleepers has not been separated from hewn girders, beams, etc., while under "pulp" no distinction has been made between chemical pulp and groundwood (Cohen 1948). Also not shown are those species used (together with other genera) for hardboard.

Tables 1 and 2 may be misleading unless certain facts are taken into account. A large annual production is mainly a reflection of availability, all the leading species occurring abundantly over extensive forest areas, rather than evidence of the superiority of the timbers concerned. For example, E. microcorys, which is one of the best flooring timbers in the world, as well as being of Class 1 durability, would undoubtedly be utilised to a greater extent if supplies were available. Secondly, many species are used locally, when other species would be preferred, solely on account of high transport costs over the long distances involved in such a large country. Thirdly, the tables take no cognisance of the end-uses of the sawn timber, some species being suitable for external use, e.g. weather boards, whereas others are only used for rough scantling or cases.

TABLE 2

INDUSTRIAL USE OF EUCALYPTUS SPECIES

	Sawn	Hewn	Piles	Poles	Ply	Pulp
accedens wandoo (redunca v. elata)	X	X		X		
andrewsi	X					
bicostata	X			X		
baxteri blaxlandi capitellata	X					X
bosistoana	X	X	X	X		
botryoides	X	X				
calophylla	X					
consideniana	X	X				X
camaldulensis (rostrata)	X	X	X	X		
citriodora	X	X				
cloeziana	X	X				
campanulata	X					
diversicolor	X				X	
deglupta (naudiniana)	X					
dalrympleana	X					
decorticans	X	X	X	X		
drepanophylla paniculata	X	X	X	X		
fastigata	X					
gigantea (delegatensis)	X					X
goniocalyx	X	X				X
gummifera (corymbosa) intermedia	X	X	X	X		
grandis	X	X				
globoidea phaeotricha scabra (eugenioides)	X	X		X		X
gomphocephala	X					
guilfoylei	X		X			
hemiphloia	X	X	X	X		
jacksoni	X					
leucoxylon		X	X	X		

	Sawn	Hewn	Piles	Poles	Ply	Pulp
laevopinea	X					
longifolia	X	X		X		
macrorrhyncha	X			X		
muelleriana	X	X	X	X		X
maideni	X					
melliodora	X	X		X		
maculata	X	X			X	
microcorys	X	X	X	X		
micrantha	X					
marginata	X	X		X		
nitens	X					
obliqua	X	X	X	X		X
polyanthemos		X		X		
propinqua punctata	X	X	X	X		
pilularis	X	X		X		
patens	X					
regnans	X				X	X
radiata robertsoni	X					
racemosa (crebra)	X	X	X	X		
resinifera pellita	X	X				
salicifolia (amygdalina)	X			X		X
sieberiana	X					X
saligna	X	X				
siderophloia	X	X	X	X		
sideroxylon	X	X	X	X		
tetrodonta	X			X		
triantha (acmenioides)	X	X		X		
torelliana	X	X				
umbellata (tereticornis)	X	X	X	X		
viminalis	X					X

Table 3 gives the production of wood and wood products in Australia in 1955, together with an estimate of the percentage contributed by the eucalypts.

TABLE 3

AUSTRALIAN PRODUCTION

Approximate Figures for 1955

Product	Unit	Quantity	Value in millions of £A., 1955	Percentage of Eucalypts
Sawn timber	Cubic feet	117,000,000	70	80
Sleepers (sawn and hewn)	Cubic feet	10,500,000	5½	100
Plywood and veneers	Square feet 3/16"	206,000,000	7	Small
Pulpwood	Super feet	330,000,000	4.7	80
Round timber, piles, poles, fencing etc.	Super feet true round (estimate)	368,000,000	4.7	100
Fuel	Super feet true round (estimate)	3,600,000,000	28	100
Tanning bark and extracts	Tons	30,000	.1	N/A
Essential oils	Gallons	250	.4	95

N/A = Not available

In sawn timber the balance is made up of rain forest timbers, cypress pine (Callitris spp.) and plantation grown conifers (mainly Pinus radiata). Plywood and veneers consist principally of rain forest timbers, including hoop pine (Araucaria cunninghamii). Insulating board is produced from sugar cane waste and part of the hardboard is manufactured from a mixture of eucalypts and other genera.

Concurrently with this production 32,000,000 c.ft. of timber was imported, consisting largely of coniferous timbers, with some logs for plywood manufacture and joinery.

A small export of about 2,000,000 c.ft. consisted mainly of eucalypt timber, as sleepers, sawn timber and in the round.

The following list gives the number of industrial plants handling timber (excluding joinery, handles and furniture plants):-

	Number
Sawmills (1953/54)	3,061
Plymills (1953/54)	56
Pulpmills (primary)	4
Hardboard mills	3
Insulating board mills	1
Charcoal Iron and Steel Plants	1
Tannin extract plants	1

Most of the sawmills are comparatively small e.g. only 86 mills employ over 50 persons.

(2) Other products

The estimated quantity of firewood used has been included in Table 3. Almost all species are used for fuel, the denser timbers making the best firewood. The large roots of mallee species, when dug up in the course of land clearing make excellent firewood.

The production of oil is on a comparatively small scale, a little being extracted from Melaleuca spp. and the majority from eucalypts of which the following are the main species used commercially:-

E. citriodora
E. cneorifolia
E. dives
E. dumosa
E. elaephora
E. fruticetorum (syn. E. polybractea)
E. leucoxylon
E. lindleyana (syn. E. numerosa, syn. E. andreana)
E. macarthuri
E. radiata (syn. E. phellandra)
E. radiata var. australiana (syn. E. australiana)
E. sideroxylon
E. viridis

In some cases (e.g. with E. dives) the habitat or particular strain influences markedly the constituents of the oil extracted.

The amount of timber used annually for tannin is small, and is almost wholly contributed by eucalypts, a very limited amount of wattle bark being stripped. Three species are employed for tanning material. The bark of E. astringens is stripped for the purpose, while an extract is made from the wood and bark of E. wandoo and E. accedens. Many other species have a high tannin content in the bark, but are not used commercially.

The only other minor products of any significance are sandalwood (for export) and honey, for which the flowers of many eucalypts are very suitable.

(3) Crop protection, soil stabilization and reclamation

The area planted to eucalypts in Australia for crop protection, soil stabilization and reclamation is insignificant. In the main it has

become the practice to use exotic trees for crop protection, for example poplars planted round hop fields in Tasmania. In the forest zones re-colonisation of cleared land with eucalypts occurs rapidly by natural regeneration.

Limited planting of eucalypts particularly E. cladocalyx, for windbreaks and shelterbelts is carried out, especially in South Australia and Victoria.

3. Volume and Yield of Natural Stands

The eucalypts are the tallest hardwoods in the world. The tallest species Mountain Ash (E. regnans) and Karri (E. diversicolor) also grow to large diameters. Both occur in comparatively pure formations with dense stocking and therefore carry very large volumes per acre.

The greatest authenticated height and volume for a Karri tree are 281 feet and 7,500 c.ft. (true) respectively (Bednall and Hawkins 1945). Helms (1945) records a log volume of 6,770 c.ft. for E. regnans aged approximately 400 years with a total height of 247 feet and a girth underbark of 64 feet at breast height. Recently the height of a tree of this species was measured by surveyors in the Styx Valley, Tasmania, as 322', while similar heights have been recorded for Victoria.

An assessment (Grey 1931) of virgin E. regnans disclosed an average merchantable volume of approximately 10,000 c.ft. per acre on a compartment of 213 acres which carried 21.5 trees per acre. On small selected areas of this species, volumes exceeding 20,000 c.ft. per acre have been reported. A height curve constructed from a stem analysis during the above assessment indicated that a height of 200 feet was attained in about 135 years.

Examples of the development of natural regrowth are given by data from the Forest Experimental Station, Tasmania and the Forest Department, Western Australia, as follows:

	Age in Years	Trees per Acre	Height of dominants in feet	B.A. per acre sw. ft. over 4"	Volume per acre over 4" c.ft.
E. regnans, Tasmania	11	381	64	50	668
	14	-	72	98	1535
E. diversicolor, W.A.	20	102	101	-	1560
" "	75	64 (over 12")	160	-	6307

It must be borne in mind that the above maximum figures apply to restricted small areas in optimum habitats, and that the average height of eucalypts in the forest belt is only about 150 feet, and the average volume per acre in areas of high rainfall would probably be in the region of 1,000 c.ft. In areas where the rainfall is less than 40" per annum volume per acre is much less, with corresponding reductions in height and diameter.

The habitats and rates of growth of the eucalypts vary considerably, consequently it is difficult to generalise under such conditions, but the average annual increment has been estimated at about 17 c.ft. per acre over the whole eucalypt forest area under present conditions.

It should also be mentioned that, in general, with decreasing rainfall and harsher environments, the form of the eucalypts deteriorates, resulting in shorter boles, crookedness and unsoundness.

4. Plantations

In Australia eucalypts have only been established in plantations under special circumstances, such as those quoted hereunder:

(1) The small area of natural forest in South Australia led to the establishment, about 80 years ago, of eucalypt plantations to the north of Adelaide in a 20" rainfall. Their growth did not maintain the early promise shown, the timber was utilised, and the area not replanted (Jolly 1948). Small areas were also planted in the South East of the State, but the project has been long since discarded in favour of coniferous plantations.

(2) In Western Australia plantations of brown mallet (E. astringens) have been established to provide a source of tan bark. This action was necessary because mallet occurred naturally in scattered groups on restricted sites and had become depleted by stripping. In 1955 these plantations amounted to 18,250 acres, and during the year 1954/55 99 tons of bark and 2,528 c.ft. of mining timbers were produced from thinnings.

(3) A few of the eucalypts are not resistant to a fierce fire, for example, E. regnans, and it has been necessary in a few cases to re-stock devastated areas by artificial means. At the same time some planting has been done on water catchment areas to provide full cover. The total area included is approximately 2,000 acres.

(4) Experimental plantings have been made in most States, e.g. to compare the growth of plantations with natural forest, or to determine whether a certain species will flourish outside its natural range. The total area in this category does not exceed 5,000 acres.

II. THE VALUE OF EUCALYPTS TO OTHER COUNTRIES

1. Purposes for which required

The country reports of delegates attending the Eucalyptus Study Tour in 1952 show that the purposes for which eucalypts have been grown vary widely.

By far the most common purpose was for firewood, but also commonly for poles, posts, mining timber and charcoal.

In addition some countries have grown eucalypts for sleepers, sawn timber and pulpwood.

A more limited role has been for windbreaks, reclamation, soil fixation, wood lots and oil production.

2. Reasons for choosing eucalypts

The various reasons for the choice of eucalypts over indigenous species may be listed as follows:

(a) rapid growth
(b) high yields
(c) easily handled
(d) ability to grow under low rainfall conditions
(e) " " " " irrigation
(f) adaptable to poor lands unsuitable for agriculture.

Métro (1955) has emphasised the adaptability of the eucalypts - the "aptitude..... of thriving in environmental conditions different from those of their natural range" and indicated that species become acclimatized and attain not merely equal but often superior growth to that in their native habitats.

Their adaptability to cold has not been fully determined, nor does the pattern of resistance overseas follow closely that exhibited in Australia. The extent of existing knowledge on adaptability to aridity has also been summarised by Métro.

It is clear, however, that species can be found to meet a wide range of climatic conditions, provided the moisture regime is adequate, and the conditions not too cold.

3. Areas planted

Data readily available show the following areas are planted with eucalypts.

Country	Hectares
Brazil	300,000
South Africa	170,000
Madagascar	135,000
Spain	108,000
Portugal	60,000
Chile	50,000
French North Africa	25,000
U.S.A.	10,000
Kenya	9,600
New Zealand	8,000
Ethiopia	4,000
Italy	2,000
Israel	1,800
Cameroons	500
Nigeria	250
	884,150

In addition considerable areas are known to have been planted in Argentina, Peru and Uruguay. Smaller areas exist in Paraguay, Ecuador, Rhodesia, Tanganyika, Belgian Congo, India, Ceylon and Cyprus. Interest has been shown, among others, by France, Greece, Turkey, Iraq, Jordan, Libya, Puerto Rico, Cuba, Malaya and the U.S.S.R.

The total area of planted eucalypts throughout the world must therefore exceed 1,000,000 hectares.

4. Results

Métro (1955) has given details of the results obtained in many countries, and more complete information will undoubtedly be presented in the regional papers which follow.

It is perhaps sufficient to say that (except in a few cases) the countries which have planted eucalypts on a large scale have achieved the objectives for which the genus was introduced.

The outstanding example is Brazil, and its pioneer Navarro de Andrade, who introduced no less than 144 species. It was therefore possible to concentrate, in later years, on selected species which showed superior growth and suitability to particular soils and climates. As a result the Paulista Railway Company, and other organisations which followed suit, have been able to supply from the plantations, sleepers, sawn timber, poles, fencing material, charcoal, firewood and pulp.

Similarly, in South Africa, a large number of species was introduced, and once again the field has been largely narrowed down to a few outstanding species. Here the objective was mining timbers in the shortest possible time. Rotations of 8 to 10 years are the rule for pit prop production, though longer rotations for saw timber are also employed.

III. LOCATIONS SUITABLE FOR GROWING EUCALYPTS AND RECOMMENDED SPECIES

In Australia high forest of eucalypts requires a rainfall of 40" per annum in the temperate and subtropical zones, and a higher rainfall in the tropics. Savannah woodland and mallee formations, however, survive in rainfalls as low as 10".

Although as mentioned previously, there is some degree of tolerance to different climates elsewhere, the above factor is the primary consideration in determining the suitability of a particular region for the growth of eucalypts, and controls the choice of species.

The second limiting factor is minimum temperature. Few commercial eucalypts are capable of withstanding temperatures below 15°F (-10°C) and none of sawmilling quality can withstand lower than 10°F (-12°C) except perhaps E. gigantea. Even these temperatures are too low for satisfactory growth. More detailed information should now be available from recent trials in Japan, Austria and other countries on resistance to low temperatures.

Clearly then, the purpose for which it is proposed to plant eucalypts in a particular locality must be specifically defined before any attempt is made to choose species. For example, if the objective is to produce saw timber then the rainfall and soil must be adequate to maintain high forest and the minimum temperatures preferably above 20°F. The choice of species is already restricted by these conditions, and the final choice is governed by mean annual temperature, temperature range, uniformity and season of rainfall, etc. If, on the other hand, the purpose is soil stabilization in an arid zone, mallees from a more or less comparable climate would be suitable, but again restricted by minimum rainfall of a different order, and by degrees of frost.

In many cases which are referred to Australia, the requirements cannot be met, in others there is a slight possibility of success, but

in a large number of instances no objective is defined, which precludes adequate recommendations.

One point which must be kept constantly in view is that adaptability is such that natural occurrence is not an infalliable guide to reaction in a new environment: some latitude can be expected, with the extent of adaptability depending on the species.

Under these conditions, and in the light of the present state of knowledge, no appropriate universal classification can be given for localities suitable for the growth of eucalypts or for species suitable to those localities, but each situation must be treated on its merits.

IV. REQUIREMENTS FOR SUCCESSFUL EUCALYPT PLANTING PROGRAMMES

The likelihood of the success of eucalypt planting programmes depends in large measure upon the following requirements being met in each case:-

1. An adequate appreciation of
   (1) the range of species available
   (2) Their growth habits
   (3) the properties of their timbers
   (4) the climates of their natural habitats
   (5) their adaptability to altered environments, and the climates of regions where they have been successfully acclimatized.
2. A clearly defined objective or purpose for which planting is proposed, since this will govern the choice of species.
3. A knowledge of successful techniques for establishing plantations.
4. Appropriate arrangements for the supply of certifiable seed of particular provenance.

Once these considerations have been satisfactorily determined the problem becomes one of finance, labour, organisation and supervision which are common to any planting programme.

The proceedings of this Conference will substantially augment the dissemination of information on the eucalypts, and plantation techniques, but nevertheless, there still appears to be a need for a permanent information and research bureau as suggested by the Eucalyptus Study Tour in 1952. Such a body, if located in Australia, could undertake the greater part of the seed collection service so vitally necessary to new and expanded programmes.

In conclusion it can be said that within certain climatic limits there are no insurmountable difficulties to successful plantation establishment with eucalypts. Outside these limits the problems of introduction, acclimatization and techniques, have only been touched upon lightly, and much research remains to be done.

REFERENCES

Anon. 1955 — Australian Timber Supply Review
Vol. 5., Nos 1 and 2
For. and Timber Bur., Canberra

" 1955 — A Survey of the Australian Plywood Industry
For. and Timber Bur., Canberra

Bednall, B.H. and Hawkins, I.M.1956 — Giants of the Forest
Aus. For. Vol. IX, No. 2

Blakely, W.F. 1955 — A Key to the Eucalypts, Second Edition
For. and Timber Bur., Canberra

Boas, I.H. 1947 — The Commercial Timbers of Australia, Their Properties and Uses
C.S.I.R.O., Melbourne

Cohen, W.E. 1948 — Pulp and Paper from Australian Eucalypts
Unasylva, Vol. II, No. 6

Gray, H.R. 1931 — Working Plan for Rubicon State Forest
Australian Forestry School
(unpublished)

Helms, A.D. 1945 — A Giant Eucalypt
Aus. For. Vol. IX, No. 1

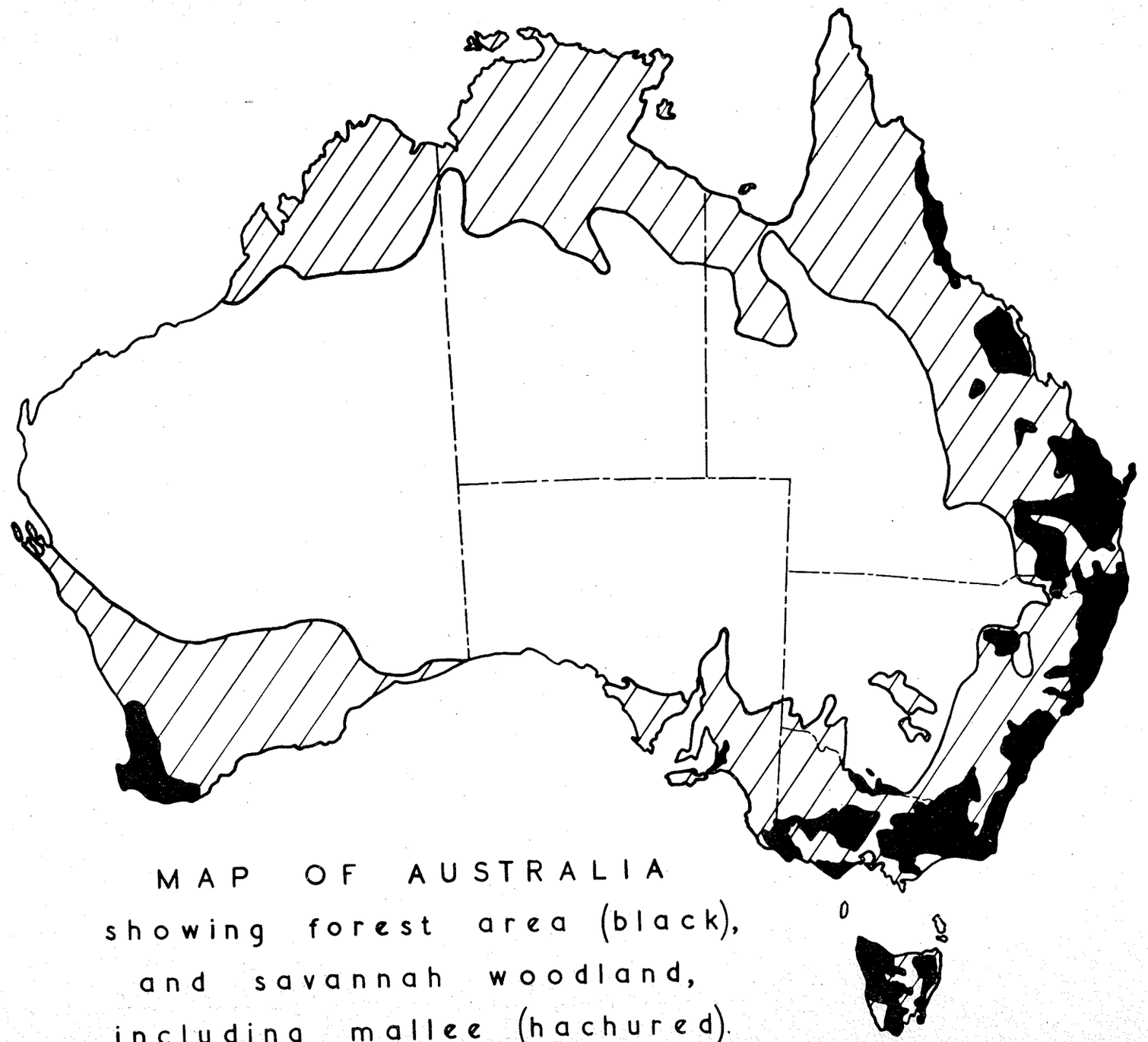
Jacobs, M.R. 1955 — Growth Habits of the Eucalypts
For. and Timber Bur., Canberra

Jolly, N.W. 1948 — The Genus Eucalyptus - Its Past and its Future in Pacific Forests
N.Z. Journ. of For. Vol. V, No. 5

Métro, A. 1955 — Eucalypts for Planting
Study No. 11, F.A.O., Rome

Turnbull, R.F. 1956 — Pattern of Timber Utilization in Australia
Aus. Timber Journal, Vol. 22, No. 2

Wood, J.G. 1950 — The Australian Environment
C.S.I.R.O., Melbourne



MAP OF AUSTRALIA
showing forest area (black),
and savannah woodland,
including mallee (hachured).

DISCUSSION

The Conference took cognizance of the present importance of Eucalypts both in their country of origin, Australia, and in the countries where their cultivation has become widespread since the last century.

It recognized the important but not exclusive role that they could play in a modern forest policy for the production of timber and by-products, crop protection and soil stabilization; and, in a more general way, in land use.

In regard to the production of timber and by-products, Eucalypts allow of building up easily accessible resources near wood-using industries, thus solving the transport problem and making use of available supply of labor and power.

In the case of land use, this species has made it possible to afforest waste land, reclaim land, fix dunes, increase crop yields through the shelter afforded by windbreaks, and to augment farm returns by plantations in various forms.

The Conference noted the fears expressed in certain circles concerning an excessive extension of planting as regards both soil evolution and the possibilities of utilizing the timber produced; but it considered that such fears were generally groundless.

In respect of the first point, the Conference recognized the role played by a stable climax forest. However, it stressed that the undoubted and immediate anticipated physical, economic and social advantages of planting Eucalypts on land unsuited for farming or no longer farmed, or in replacement of degraded forests of no economic value would justify taking the risk, limited moreover by the prospects opened up by the conversion of these plantations into relatively stable formations by means of associated species.

In the case of plantations on farmland, within the framework of intensive land use, and especially as windbreaks, such concern should not arise since it is a question of plantations in farming areas, with all the techniques, care and protection that such crops require. Moreover, as in the preceding case, the permanent establishment of windbreaks as a substructure could, if necessary, be envisaged.

As regards the suitability of the products obtained for a specific present-day use, or even their future possible uses, the grower has to supply the consumer with the products in demand, within the limits, however, of the sites planted or to be planted. The Conference considered that a supply which is abundant, regular, easily accessible and therefore cheap, will always find a market in very many regions.

Important considerations were summarized as follows:

1. It was generally recognized that there were difficulties in obtaining accurate figures of the extent of Eucalypt plantations existing in some countries owing to the lack of statistics on private planting, particularly for windbreak and protection purposes.

2. Every country represented appeared to be satisfied that the Eucalypts have a definite value in any region in which they can be satisfactorily grown.

3. All agreed that much research work needs to be carried out, particularly in the matter of the site requirements of the various species and in connection with utilization.

4. Some concern was expressed with regard to finding an economic market for material which, on account of its very fast early growth, would probably differ considerably in its wood properties from timber of the same species grown in native forests in Australia.

5. It was generally conceded that, despite the lack of accurate information and the research work still to be done to provide answers to many of the problems, it would be reasonable to take some risk with the extension of plantations with species which showed reasonable promise, on the grounds that there is always likely to be a market for large supplies of cheap wood provided it is grown not too far from centers of consumption.

6. It is important that wherever, in any plantations of Eucalypts outside Australia, any insect or disease damaging the Eucalypts is found, it should be reported through FAO to all the likely interested countries.

7. The matter of hybridization amongst Eucalypts on plantations outside Australia is a matter which presents some difficulties, but may also possibly prove beneficial in providing strains possessing characteristics which make them particularly suitable for certain purposes. In this connection it would possibly be desirable to furnish seeds of such hybrids to Australia in order that their behaviour in that country may be studied and compared.