



TROPICAL FORESTRY PAPERS No 15  
2nd edition, revised

# A Guide to Species Selection for Tropical and Sub-Tropical Plantations

by Derek B. Webb  
Peter J. Wood  
Julie P. Smith  
G. Sian Henman

Unit of Tropical Silviculture  
Commonwealth Forestry Institute  
University of Oxford

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# A Guide to Species Selection for Tropical and Sub-Tropical Plantations

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## PREFACE

This publication has been developed from Tropical Forestry Papers No. 15 "A Guide to Species Selection for Tropical and Sub-Tropical Plantations", which was published in 1980 and is now out of print. This revised version includes more species, and incorporates a program in BASIC for the Apple II microcomputer, rather than the previous FORTRAN IV program.

The use of punched cards suggested in the earlier book did not evoke a great deal of interest; nevertheless details of a usable system are suggested here for anyone who wishes to use this method. The BASIC program for a microcomputer is slower to run than that in FORTRAN but provides a portable, flexible system suitable for users with limited computing experience. The more detailed FORTRAN program will be sent on request to anyone requiring it for a larger machine.

To save space and weight the two pages of data for a given species are photoreduced to one. However, blank sheets at the original size are included for users to photocopy and build up their own data base for new species.

Ms G.S. Henman joined the original group of authors to help with the expansion and correction of the earlier book. All the authors express their grateful acknowledgements to the many who helped in this work, and in particular to Mrs E.M. Kariuki, Ms J. Stewart, Drs. R.D. Barnes, B.T. Styles and R.J. Poynton, and Messrs G.L. Gibson, C.E. Hughes, P.J. Robinson and P.D. Hardcastle. The typing, retyping and rearrangement has been done by Ms T.D. Hodgkinson to whom a special debt of gratitude is due.

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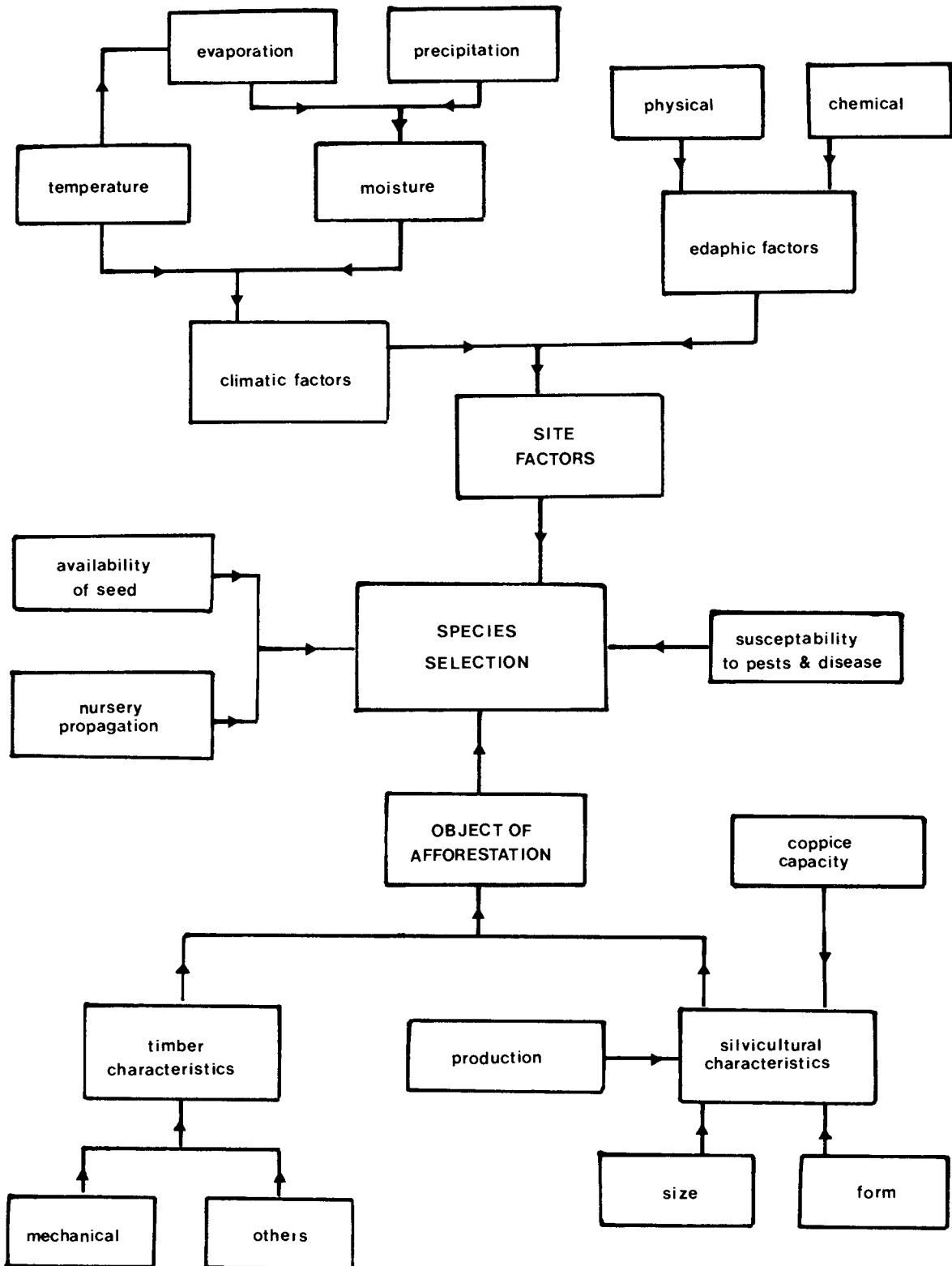
## 1. INTRODUCTION

- 1.1 The aim of this publication is to assist foresters in the selection of species for inclusion in the initial phase of forest species trials programmes. The intention is not to recommend particular species for specific site or climatic conditions, or plantation objectives. Given the varying tolerance and adaptability of different species, and the imprecise methods of quantifying site factors and their interactions, such final selection can only be based on first hand experience of species' performance under any given set of site conditions. Such experience can only be gained by the establishment of species trials. Whilst the degree of sophistication and duration of trials programmes may vary, the need for some form of trials before embarking on large scale planting programmes cannot be overemphasized.
- 1.2 The choice of species for inclusion in the trials is one of the first steps in such a programme. The selection should of course be based on an attempt to equate the conditions of the trial site (which in turn should be representative of the zone of proposed afforestation) with the known and reported characteristics of exotic and indigenous tree species. The site conditions consist of climatic and edaphic factors, each of which in turn depends on such basic elements as temperature and humidity in the case of the climate, and chemical and physical properties in the case of the soil. At the same time the choice of species for trial will be greatly influenced by the objective of the proposed afforestation; whether it be for the production of saw-timber, pulp, fuelwood, etc. or for purely protection purposes. Again the capacity of a given species to meet such objectives depends on a series of basic characteristics, i.e. size, form, growth rate and wood properties. Finally, some consideration must be given to factors such as a species' inherent resistance or susceptibility to pests and diseases, the availability of seed and ease of propagation. A schematic representation of the combination of the major factors involved in species selection is given on page 3.
- 1.3 Although the forester may well appreciate the importance of considering all the factors involved, he has in the past often been handicapped by a lack of available information on the characteristics and requirements of certain species. Thus the first aim of the present publication is to provide such data in a concise and compact form. The authors lay no claim to originality. The guide is simply a compilation of previously reported data on species' characteristics, often amplified by personal experience of their performance in the field.
- 1.4 The guide is designed to cover species warranting consideration for trial in tropical and sub-tropical climates, i.e. approximately between latitudes 30°N and 30°S, including high altitude sites which sometimes may be more suited to species originating from more temperate climates and higher latitudes. However, in this connection it should be noted that a species' capacity to adapt to changes in day length and light intensity often determine its success or failure at lower latitudes. A total of 173 different species, varieties and

provenances have been included. They represent an attempt to ensure the inclusion of all species of major importance and potential as exotics, and at the same time maintain some balance between groups of species suited to various sites and climatic conditions.

- 1.5 Species' characteristics are presented in the form of data sheets for each species. These include brief information on the species' natural occurrence, climatic and edaphic preferences, silvicultural characteristics, production potential, wood properties and uses, seed supply and nursery requirements. The data sheets are in note form, and lengthy descriptions have been intentionally avoided. More detailed information can always be obtained from the principal references quoted for each species. Blank data sheets have been included at the end of the book to enable users to collect information on other species of particular interest.
- 1.6 The second aim of the publication is to assist in the selection of species for inclusion in trial programmes. This may be especially helpful in developing countries where there is little previous experience on which to base the trial programmes. Equally it may help to ensure that even experienced workers do not overlook potentially suitable, but little tried, species. Three systems of arriving at an objective selection are suggested. These are:
  - i) computerised data base and retrieval program;
  - ii) perforated card key;
  - iii) species selection tables.

FACTORS INFLUENCING THE SELECTION OF SPECIES FOR TRIAL





## 2. SELECTION BY SPECIES DATABASE AND RETRIEVAL PROGRAM

### 2.1 The INSPIRE 1/ computer program consists of four parts:

- i) loading to establish the species data base and to add new species;
- ii) editing to allow for up-dating and correction of the base;
- iii) species selection by data retrieval from the base;
- iv) printing of information for an individual species.

Species data are listed and stored under a total of 21 main features. Selection is made by successively applying the user's requirements and site conditions to any of these features until a final choice is achieved. The program also allows the user to revert to a previous selection level in case he has lost all or most of the pool of species by introducing an excessively limiting parameter. A list of all suitable species is displayed at each stage in the program, and full print-outs of the species can be obtained after the final selection.

### 2.2 The flexibility of the selection process is increased by the program's acceptance of ranges of values for all numerical parameters, e.g. rainfall, temperature, etc., together with AND/OR choices of features where alternatives are available, e.g. soils, production requirements, etc. The species selected are listed as either:

MAIN - being species which fully meet all the selections, ranges or requirements applied

or MARGINAL - being species which only partly cover the ranges specified or which only demonstrate a limited tolerance or suitability to certain features.

Marginal species are listed with a star rating indicating the number of features on which they only marginally meet the requirements.

### 2.3 The computer program package is currently in use by the Forestry Department of the Commonwealth Forestry Institute at Oxford. It is written in CP/M BASIC language for an Apple II microcomputer. The program is entirely interactive, which is especially important for species selection, where the response to the user's enquiry can influence his future instructions. The user simply types his requirements into the computer when requested, until he arrives at a suitable selection of species.

### 2.4 The complete INSPIRE package can be stored on one 5 inch floppy disk. It consists of a single program requiring approximately 25 kilobytes of memory, and five data files currently occupying approximately 50 kilobytes of data storage for the 173 species in this guide. The database is designed to be totally flexible, providing a versatile, compact and convenient selection system.

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1/ INSPIRE: INTERACTIVE SPECIES INFORMATION RETRIEVAL

- 2.5 This INSPIRE database in BASIC language supplements an original package in FORTRAN IV for a large computer. The FORTRAN version is still available and is likely to be converted to FORTRAN 77 at a later date. Details and advice are obtainable on request to users wishing to implement these programs on their own computers.

### 3. SELECTION BY PERFORATED CARD KEY

- 3.1 Perforated cards offer a convenient means of selection by the application of a series of site factors and/or species characteristics. A suggested design for a commonly available size of card 1/, together with the relevant key to the location of the characteristics used, is given in examples 3.4 and 3.5. The factors included are all those which would normally be applied in arriving at a species selection. Thus side A of the card deals with altitude and climate (features 6-12 of the species data sheets). The ranges relevant to each factor have been divided into a series of arbitrary bands. Side B of the card covers soil characteristics (features 13-16 on the species data sheets), again offering choices by broad classifications. Side C includes levels of potential production and plantation objectives (features 22-24 and 30-32), whilst side D refers to species' silvicultural characteristics.
- 3.2 As in any standard perforated card key system, the final selection is achieved by successively applying a series of characteristics, at each step eliminating unsuitable species. Thus, in a simple example, by first applying a certain level of mean annual rainfall one might be left with a total of 30 cards, or species, which could be considered for a given rainfall level. If the second selection was then made for mean annual temperatures of 21-23°C, perhaps only 20 of these species would also fit this requirement, the remaining 10 cards from the original selection being rejected. Further application of a particular soil type, a requirement that the species should be capable of coppicing and an objective of growing fuelwood, might reduce the final selection to some half dozen species, all of which fulfilled all five of the selection parameters applied. The number of parameters applied, and the consequent degree of selectivity can of course be varied to suit the user's requirements. Clearly, however, the use of highly detailed selections on difficult sites where the number of species available is in any case limited will inevitably lead to a very reduced final choice.
- 3.3 The punched card, as emphasized above, is necessarily limited to selection on discrete steps in its information base. It cannot therefore list marginal site characteristics for a particular species, and it has to assume that every species can be classified using the same discrete steps. Clearly this is an unsatisfactory situation and the selection of species resulting from the use of a small punched card alone would be very crude.

No worker selecting species for trial would wish to be limited to card information only however; one of the objectives of this guide is to condense information into a small and convenient space and to give guidelines to more detailed sources of information on species of interest. Fortunately the centre and reverse side of the card contains space for much supplementary information, such as:

the actual site requirements of a species, where discrete steps are inaccurate;

pests and diseases, where these occur and their severity;

a description of the tree, including flower colour for ornamentals, nectar production;

seed problems if any;

a list of major references, particularly from places where the species is successfully grown as an exotic.

Thus the practical field forester, who does not have computer facilities nearby, can still have a convenient, quick, and reasonably flexible system in his office. The card becomes the preliminary selection unit, and the source of further detailed information.

3.4 Example of Perforated Card  
Layout for Species Selection

pests and diseases	Seed : sources	No./ kilo	Pretreatment	Storage	Nursery technique	Time required to plantable size

CODE 108 FORM K 558 1 9

C. PRODUCTION AND UTILIZATION										D. SILVICULTURAL CHARACTERISTICS									
B. SOILS Species (family) Synonyms Local names Natural distribution Plantation experience References										A. ALTITUDE AND CLIMATE									

3.5 Key to Card Characteristics

A Altitude and Climate		B Soils		C Production and Utilization		D Silvicultural Characteristics	
1	<u>Altitude</u>	1	<u>Texture</u>	1	<u>Production Potential</u>	1	<u>Size of tree</u>
2	0-500 m	2	light	2	under 5 m <sup>3</sup> /ha/an	2	large tree (over 30 m)
3	500-1000 m	3	medium	3	5-10 m <sup>3</sup> /ha/an	3	medium tree (15-30 m)
4	1000-1500 m	4	heavy	4	10-20 m <sup>3</sup> /ha/an	4	small tree (under 15 m)
5	1500-2000 m	5	Reaction	5	over 20 m <sup>3</sup> /ha/an		<u>Form</u>
6	over 2000 m	6	acid	6	<u>Protection Planting</u>	4	exceptional/good
7	<u>Mean Annual Rainfall</u>	7	neutral	7	shade	5	acceptable
8	250-400 mm	8	alkaline	8	shelterbelts and windbreaks	6	poor
9	400-650 mm	9	<u>Drainage</u>	9	anti-erosion		<u>Light Requirements</u>
10	650-1000 mm	10	good/free draining	10	dune fixation	7	light demanding
11	1000-1600 mm	11	moist	11	agricultural shade	8	semi-tolerant
12	over 1600 mm	12	impeded	12	ornamental	9	shade tolerant
13	<u>Rainfall Regime</u>	13	seasonal waterlogging	13	<u>Density</u>	10	shade tolerant when young
14	winter	14	<u>Other Characteristics</u>	14	Light (S.G. under 0.5)		<u>Other Characteristics</u>
15	summer	15	shallow	15	medium (S.G. 0.5-1.0)	11	coppices/root suckers
16	uniform	16	deep	16	heavy (S.G. over 1.0)	12	fire resistant
17	<u>Dry Season</u>	17	fertile	17	<u>Sawtimber</u>	13	frost resistant
18	0-2 months	18	saline	18	heavy construction	14	resistant to termites
19	2-4 months	19	-	19	light construction	15	requires wide spacing
20	4-6 months	20	-	20	boxes, crates and shuttering	16	fixes nitrogen
21	over 6 months	21		21	furniture	17	windfirm
22	<u>Mean Max. Temp. hottest month</u>	22		22	<u>Roundwood</u>		
23	under 20°C	23		23	transmission poles		
24	20-30°C	24		24	building poles		
25	over 30°C	25		25	fenceposts		
26	<u>Mean Min. Temp. coldest month</u>	26		26	fuel and charcoal		
27	under 10°C	27		27	shortfibre pulp		
28	10-20°C	28		28	longfibre pulp		
29	over 20°C	29		29	veneer/plywood		
	<u>Mean Annual Temperature</u>				<u>Other Products</u>		
	under 16°C				resins		
	16-20°C				tannins		
	20-24°C				fodder		
	over 24°C				oils and gums		
	-				miscellaneous		
	-						

#### 4. SPECIES SELECTION TABLES

- 4.1 A species selection key is presented in the form of six tables. The first five of these are based on mean annual precipitation levels ranging from 250 to over 1,600 mm. The former figure has been accepted as the lowest level of rainfall at which tree growth can be hoped for in the absence of stored ground water or artificial irrigation. Each table is subdivided into columns covering ranges of mean annual temperature from over 24°C to less than 18°C. The tables cover this range in five subdivisions each covering a band of 2°C variation in mean annual temperature. The use of the latter as a parameter is justified in the tropics and sub-tropics where the seasonal extremes of temperate latitudes are generally less marked. If the site under study does exhibit such extremes, these can be checked against the values for mean maximum and mean minimum temperature for the hottest and coldest months which will be found in the relevant data sheets.
- 4.2 The tables name species which would be suitable over the whole range of the classes specified. These are followed by the code numbers of species which could be equally suitable but only over a limited part of the given rainfall or temperature range.

Obviously many species overlap the arbitrary limits applied and consequently occur in more than one temperature or rainfall range. Equally, the extreme ranges of some species have been omitted from the tables, particularly in the case of dry zone species which would thrive in higher rainfalls where, however, more desirable species are usually available.

- 4.3 Where temperature data are not available, the tables can also be entered by applying altitude. However, since mean annual temperatures vary with latitude as well as altitude, some adjustment may be necessary when dealing with higher latitudes. Study of climatic data from a wide range of stations between 30°N and 30°S in all three continents shows:
- i) The temperature lapse rate throughout the zone varies between 0.3 and 0.6 degrees for every rise of 100 metres in altitude 1/.
  - ii) The lapse rate with latitude averages some 0.15 degrees of temperature for every increase of one degree of latitude from the "temperature equator".
  - iii) The "temperature equator" does not coincide with the geographic equator, but in all continents occurs at latitudes of some 7-10 degrees north.

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1/ This does not apply to the arid land masses of Africa north of latitude 15°N, or Australia south of latitude 15°S.

4.4 The tables have been constructed on the basis of a notional MAT of  $27^{\circ}\text{C}$  at sea level on the temperature equator and a mean lapse rate of  $0.5^{\circ}\text{C}$  per 100 metres rise in altitude. Thus at this latitude,  $7^{\circ}\text{N}$ , the MAT is assumed to fall to  $22^{\circ}\text{C}$  at 1,000 metres altitude *etc.* Applying the latitudinal lapse rate of  $0.15^{\circ}\text{C}$  per degree of latitude to the above sea level MAT, it will be seen that this will fall to  $24^{\circ}\text{C}$  (the limit of the next temperature range used in the tables) at latitudes of approximately  $27^{\circ}\text{N}$  and  $13^{\circ}\text{S}$ . It is therefore suggested that entry to the tables via altitude can be made directly for sites between these latitudes. At higher latitudes the following adjustments should be made:

$27-30^{\circ}\text{N}$  drop one column, *i.e.* read the 600-1,000 metre ( $22-24^{\circ}\text{C}$   
 $13-26^{\circ}\text{S}$  column for sites of 0-600 metres.

$26-30^{\circ}\text{S}$  as above but dropping two columns.

4.5 Whilst the above MAT/altitude/latitude relation generally holds good in the tropics and sub-tropics, certain anomalies do occur and the writers recommend that wherever possible mean annual temperature rather than altitude should be used for entry to the tables. Further details of the MAT/altitude/latitude relationship can be found in Appendix II.

4.6 The final selection table (6) deals with soils. It lists species tolerant of heavy soils, impeded drainage, saline and alkaline soils. This table should be consulted in conjunction with the relevant rainfall/MAT table when these soil conditions apply to the site under study.



TABLE I  
Species worth considering for Mean Annual Rainfall 250-400 mm

Mean Annual Temperature (Altitude)		
24°C and above (0-600 metres)	22-24°C (600-1000 metres)	20-22°C (1000-1400 metres)
1. <i>Acacia albida</i> 10. <i>Acacia nilotica</i> 13. <i>Acacia senegal</i> 14. <i>Acacia tortilis</i> subsp. <i>raddiana</i> 46. <i>Conocarpus lancifolius</i>	1. <i>Acacia albida</i> 4. <i>Acacia cyclops</i> 13. <i>Acacia senegal</i> 30. <i>Brachychiton populneum</i> 42. <i>Ceratonia siliqua</i> 45. <i>Colopospermum mopane</i> 54. <i>Dalbergia sissoo</i> 58. <i>Eucalyptus brockwayi</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 72. <i>Eucalyptus intertexta</i> 73. <i>Eucalyptus largiflorens</i> 78. <i>Eucalyptus microtheca</i> 89. <i>Fucalyptus salmonophloia</i> 97. <i>Euphorbia tirucalli</i> 103. <i>Haloxylon aphyllum</i> 118. <i>Parkinsonia aculeata</i> 150. <i>Prosopis chilensis</i> 152. <i>Prosopis juliflora</i> 161. <i>Simmondsia chinensis</i> 164. <i>Tamarix aphylla</i> 173. <i>Zizyphus spina-christi</i>	1. <i>Acacia albida</i> 30. <i>Brachychiton populneum</i> 42. <i>Ceratonia siliqua</i> 54. <i>Dalbergia sissoo</i> 58. <i>Eucalyptus brockwayi</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 72. <i>Eucalyptus intertexta</i> 73. <i>Eucalyptus largiflorens</i> 89. <i>Eucalyptus salmonophloia</i> 103. <i>Haloxylon aphyllum</i> 118. <i>Parkinsonia aculeata</i> 150. <i>Prosopis chilensis</i> 152. <i>Prosopis juliflora</i> 161. <i>Simmondsia chinensis</i> 164. <i>Tamarix aphylla</i> 173. <i>Zizyphus spina-christi</i>
3 4 6 12 30 31 37 42 45 54 58 59 62 72 73 78 81 89 90 97 103 117 118 150 151 152 161 164 173	3 6 10 12 37 46 60 62 81 90 117 151	3 4 6 11 12 13 37 45 60 62 78 81 90 97 123 131 151 158

TABLE I (cont.)  
 Species worth considering for Mean Annual Rainfall 250-400 mm

Mean Annual Temperature (Altitude)	
18-20°C (1400-1800 metres)	18°C and below (1800 metres and above)
1. <i>Acacia albida</i> 11. <i>Acacia pendula</i> 30. <i>Brachychiton populneum</i> 42. <i>Ceratonia siliqua</i> 54. <i>Dalbergia sissoo</i> 72. <i>Eucalyptus intertexta</i> 89. <i>Eucalyptus salmonophloia</i> 103. <i>Haloxylon aphyllum</i> 150. <i>Prosopis chilensis</i> 152. <i>Prosopis juliflora</i> 161. <i>Simmondsia chinensis</i> 164. <i>Tamarix aphylla</i>	50. <i>Cupressus arizonica</i> 56. <i>Elaeagnus angustifolia</i> 103. <i>Haloxylon aphyllum</i>
3 6 12 37 50 58 59 60 62 73 81 90 118 123 131 143 153 158 173	1 3 6 11 12 30 37 42 54 60 62 72 89 90 123 131 143 150 152 153 158 161 164

TABLE 2

Species worth considering for Mean Annual Rainfall 400-650 mm

Mean Annual Temperature (Altitude)		
24°C and above (0-600 metres)	22-24°C (600-1000 metres)	20-22°C (1000-1400 metres)
1. <i>Acacia albida</i> 10. <i>Acacia nilotica</i> 14. <i>Acacia tortilis</i> subsp. <i>raddiana</i> 31. <i>Butyrospermum paradoxum</i> 117. <i>Parkia biglobosa</i>	1. <i>Acacia albida</i> 3. <i>Acacia cyanophylla</i> 4. <i>Acacia cyclops</i> 12. <i>Acacia salicina</i> 30. <i>Brachyhiton populneum</i> 42. <i>Ceratonia siliqua</i> 45. <i>Colophospermum mopane</i> 54. <i>Dalbergia sissoo</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 62. <i>Eucalyptus cladocalyx</i> 78. <i>Eucalyptus microtheca</i> 81. <i>Eucalyptus occidentalis</i> 97. <i>Euphorbia tirucalli</i> 118. <i>Parkinsonia aculeata</i> 151. <i>Prosopis cineraria</i> 152. <i>Prosopis juliflora</i>	1. <i>Acacia albida</i> 3. <i>Acacia cyanophylla</i> 12. <i>Acacia salicina</i> 30. <i>Brachyhiton populneum</i> 42. <i>Ceratonia siliqua</i> 54. <i>Dalbergia sissoo</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 60. <i>Eucalyptus camaldulensis</i> (S. Provs.) 62. <i>Eucalyptus cladocalyx</i> 81. <i>Eucalyptus occidentalis</i> 118. <i>Parkinsonia aculeata</i> 152. <i>Prosopis juliflora</i>
3 4 6 12 13 18 20 22 28 30 36 42 45 46 54 58 59 61 62 64 72 73 78 81 89 90 91 93 97 98 99 103 105 106 108 109 118 129 150 151 152 161 164 173	6 10 13 18 20 28 36 46 53 57 58 60 61 64 70 72 73 89 90 91 93 98 99 103 105 106 108 109 117 129 150 161 164 173	4 6 11 13 18 20 28 36 45 53 57 58 61 64 70 72 73 74 76 78 89 90 91 93 97 98 99 103 105 106 108 109 123 129 131 150 151 158 161 164 173

TABLE 2 (cont.)  
 Species worth considering for Mean Annual Rainfall 400-650 mm

Mean Annual Temperature (Altitude)	
18-20°C (1400-1800 metres)	18°C and below (1800 metres and above)
1. <i>Acacia albida</i> 3. <i>Acacia cyanophylla</i> 11. <i>Acacia pendula</i> 12. <i>Acacia salicina</i> 30. <i>Brachychiton populneum</i> 42. <i>Ceratonia siliqua</i> 54. <i>Dalbergia sissoo</i> 60. <i>Eucalyptus camaldulensis</i> (S. Provs.) 62. <i>Eucalyptus cladocalyx</i> 123. <i>Pinus brutia</i> 131. <i>Pinus halepensis</i> 152. <i>Prosopis juliflora</i>	50. <i>Cupressus arizonica</i> 143. <i>Pinus pinea</i>
6 18 20 50 53 57 58 59 61 64 69 70 72 73 74 76 81 89 90 91 93 98 99 103 105 106 108 109 118 124 129 142 143 146 150 154 158 161 164 173	1 3 6 11 12 20 30 42 53 54 56 57 60 61 62 64 69 70 72 74 76 89 90 93 98 99 103 123 124 129 130 131 142 144 146 150 152 154 158 161 164

TABLE 3

Species worth considering for Mean Annual Rainfall 650-1000 mm

Mean Annual Temperature (Altitude)		
24°C and above (0-600 metres)	22-24°C (600-1000 metres)	20-22°C (1000-1400 metres)
1. <i>Acacia albida</i> 10. <i>Acacia nilotica</i> 22. <i>Anacardium occidentale</i> 28. <i>Azadirachta indica</i> 31. <i>Butyrospermum paradoxum</i> 117. <i>Parkia biglobosa</i>	1. <i>Acacia albida</i> 3. <i>Acacia cyanophylla</i> 18. <i>Albizia lebbek</i> 20. <i>Alnus nepalensis</i> 28. <i>Azadirachta indica</i> 36. <i>Cassia siamea</i> 54. <i>Dalbergia sissoo</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 61. <i>Eucalyptus citriodora</i> 78. <i>Eucalyptus microtheca</i> 93. <i>Eucalyptus tereticornis</i> 97. <i>Euphorbia tirucalli</i> 98. <i>Ficus benghalensis</i> 99. <i>Gleditsia triacanthos</i> 105. <i>Jacaranda copaia</i> 106. <i>Jacaranda mimosifolia</i> 108. <i>Leucaena leucocephala</i> (Hawaiian type) 109. <i>Leucaena leucocephala</i> (Salvador type) 129. <i>Pinus elliottii</i> var. <i>elliottii</i> 152. <i>Prosopis juliflora</i>	1. <i>Acacia albida</i> 3. <i>Acacia cyanophylla</i> 18. <i>Albizia lebbek</i> 20. <i>Alnus nepalensis</i> 53. <i>Cupressus torulosa</i> 54. <i>Dalbergia sissoo</i> 57. <i>Eucalyptus botryoides</i> 59. <i>Eucalyptus camaldulensis</i> (N. Provs.) 60. <i>Eucalyptus camaldulensis</i> (S. Provs.) 61. <i>Eucalyptus citriodora</i> 70. <i>Eucalyptus gomphocephala</i> 93. <i>Eucalyptus tereticornis</i> 98. <i>Ficus benghalensis</i> 99. <i>Gleditsia triacanthos</i> 105. <i>Jacaranda copaia</i> 106. <i>Jacaranda mimosifolia</i> 108. <i>Leucaena leucocephala</i> (Hawaiian type) 109. <i>Leucaena leucocephala</i> (Salvador type) 129. <i>Pinus elliottii</i> var. <i>elliottii</i> 152. <i>Prosopis juliflora</i>
3 4 7 12 14 18 20 25 29 30 32 33 36 38 39 40 42 43 45 47 54 55 59 61 62 63 64 71 78 81 83 87 91 93 94 97 98 99 100 101 105 106 107 108 109 112 118 120 121 125 127 129 133 151 152 155 157 160 171	4 7 10 12 25 29 30 32 33 38 39 40 42 43 45 47 51 53 55 57 60 62 63 64 70 71 75 77 81 82 83 87 88 91 94 100 101 107 112 117 118 120 125 127 128 132 133 139 141 151 155 156 157 159 160 165 171	4 7 8 11 12 19 25 28 29 30 32 33 36 38 39 40 42 43 45 47 51 52 55 62 63 64 71 74 75 76 77 78 81 82 84 86 87 88 91 94 97 100 101 102 107 110 112 118 123 125 127 128 131 132 133 135 138 139 141 147 148 151 156 157 159 160 165 171

TABLE 3 (cont.)

Species worth considering for Mean Annual Rainfall 650-1000 mm

Mean Annual Temperature (Altitude)	
18-20°C (1400-1800 metres)	18°C and below (1800 metres and above)
1. <i>Acacia albida</i>	53. <i>Cupressus torulosa</i>
3. <i>Acacia cyanophylla</i>	69. <i>Eucalyptus globulus</i>
20. <i>Alnus nepalensis</i>	124. <i>Pinus canariensis</i>
53. <i>Cupressus torulosa</i>	142. <i>Pinus pinaster</i> (Portuguese Provs.)
54. <i>Dalbergia sissoo</i>	146. <i>Pinus radiata</i>
57. <i>Eucalyptus botryoides</i>	
60. <i>Eucalyptus camaldulensis</i> (S. Provs.)	
61. <i>Eucalyptus citriodora</i>	
70. <i>Eucalyptus gomphocephala</i>	
74. <i>Eucalyptus maculata</i>	
93. <i>Eucalyptus tereticornis</i>	
98. <i>Ficus benghalensis</i>	
99. <i>Gleditsia triacanthos</i>	
129. <i>Pinus elliottii</i> var. <i>elliottii</i>	
152. <i>Prosopis juliflora</i>	
5 7 8 9 11 12 18 19 25 29	1 3 5 7 8 9 11 12 19 20
30 33 38 39 42 47 50 51 52 55	21 25 30 33 38 39 42 50 51 52
59 62 63 64 68 69 71 75 76 77	54 55 57 60 61 62 63 64 65 67
81 82 84 86 87 88 91 94 102 105	68 70 71 74 75 76 77 79 80 82
106 107 108 109 110 118 123 124 128 131	84 85 86 87 88 92 93 94 96 98
132 135 136 138 139 140 141 142 143 145	99 102 110 123 128 129 130 131 132 135
146 147 148 154 156 159 165	136 138 139 140 141 143 144 145 147 148
	152 154 156 159 165

TABLE 4  
Species worth considering for Mean Annual Rainfall 1000-1600 mm

24° C and above (0-600 metres)		Mean Annual Temperature (Altitude)		20-22° C (1000-1400 metres)	
		22-24° C (600-1000 metres)			
22. Anacardium occidentale		7. Acacia mangium		7. Acacia mangium	
43. Chlorophora excelsa		18. Albizia lebbek		18. Albizia lebbek	
120. Peltophorum pterocarpum		20. Alnus nepalensis		20. Alnus nepalensis	
160. Sesbania grandiflora		25. Araucaria cunninghamii		25. Araucaria cunninghamii	
		29. Bombacopsis quinata		29. Bombacopsis quinata	
		32. Calliandra calothyrsus		38. Casuarina equisetifolia	
		38. Casuarina equisetifolia		47. Cordia alliodora	
		40. Casuarina junghuhniana		51. Cupressus lusitanica	
		43. Chlorophora excelsa		(including C. benthamii)	
		47. Cordia alliodora		53. Cupressus torulosa	
		54. Dalbergia sissoo		54. Dalbergia sissoo	
		55. Delonix regia		55. Delonix regia	
		61. Eucalyptus citriodora		61. Eucalyptus citriodora	
		63. Eucalyptus cloeziana		63. Eucalyptus cloeziana	
		71. Eucalyptus grandis		71. Eucalyptus grandis	
		98. Ficus benghalensis		75. Eucalyptus maidenii	
		99. Gleditsia triacanthos		98. Ficus benghalensis	
		100. Gliricidia sepium		99. Gleditsia triacanthos	
		101. Gmelina arborea		105. Jacaranda copaia	
		105. Jacaranda copaia		106. Jacaranda mimosifolia	
		106. Jacaranda mimosifolia		128. Pinus chiapensis	
		112. Melaleuca leucadendron		129. Pinus eliottii var. eliottii	
		127. Pinus caribaea var. hondurensis		132. Pinus kesiya	
		129. Pinus eliottii var. eliottii		139. Pinus palustris	
		133. Pinus merkusii (Continental Provs.)		141. Pinus patula subsp. tecunumanii	
		157. Samanea saman		159. Schizolobium parahybum	
		160. Sesbania grandiflora		165. Taxodium distichum	
		171. Toona ciliata			
1	2	1	2	1	3
26	27	3	10	8	15
28	29	31	32	33	36
30	31	32	33	36	39
32	33	36	38	39	41
34	35	37	39	41	44
36	37	39	41	44	47
38	39	41	44	47	54
40	41	44	47	54	55
42	43	45	48	51	59
44	45	47	50	53	61
46	47	49	52	55	63
48	49	51	54	57	68
50	51	53	56	59	71
52	53	55	58	61	78
54	55	57	60	63	83
56	57	59	62	65	87
58	59	61	64	67	93
60	61	63	66	69	94
62	63	65	68	71	95
64	65	67	70	73	97
66	67	69	72	75	98
68	69	71	74	77	99
70	71	73	76	79	100
72	73	75	78	81	101
74	75	77	80	83	105
76	77	79	82	85	106
78	79	81	84	87	107
80	81	83	86	89	108
82	83	85	88	91	109
84	85	87	90	93	111
86	87	89	92	95	112
88	89	91	94	97	115
90	91	93	96	99	117
92	93	95	98	101	119
94	95	97	100	102	121
96	97	99	102	104	125
98	99	101	104	106	126
100	101	103	106	108	127
102	103	105	108	110	129
104	105	107	110	112	133
106	107	109	112	114	137
108	109	111	114	116	152
110	111	113	116	118	155
112	113	115	118	120	163
114	115	117	120	122	166
116	117	119	122	124	169
118	119	121	124	126	170
120	121	123	126	128	171
122	123	125	128	130	172
124	125	127	130	132	
126	127	129	132	134	
128	129	131	134	136	
130	131	133	136	138	
132	133	135	138	140	
134	135	137	140	142	
136	137	139	142	144	
138	139	141	144	146	
140	141	143	146	148	
142	143	145	148	150	
144	145	147	150	152	
146	147	149	152	154	
148	149	151	154	156	
150	151	153	156	158	
152	153	155	158	160	
154	155	157	160	162	
156	157	159	162	164	
158	159	161	164	166	
160	161	163	166	168	
162	163	165	168	170	
164	165	167	170	172	
166	167	169	172		
168	169	171			
170	171				
172					

TABLE 4 (cont.)

Species worth considering for Mean Annual Rainfall 1000-1600 mm

Mean Annual Temperature (Altitude)	
18-20°C (1400-1800 metres)	18°C and below (1800 metres and above)
7. <i>Acacia mangium</i>	5. <i>Acacia decurrens</i>
8. <i>Acacia mearnsii</i>	8. <i>Acacia mearnsii</i>
19. <i>Alnus acuminata</i>	9. <i>Acacia melanoxylon</i>
20. <i>Alnus nepalensis</i>	19. <i>Alnus acuminata</i>
25. <i>Araucaria cunninghamii</i>	21. <i>Alnus rubra</i>
38. <i>Casuarina equisetifolia</i>	51. <i>Cupressus lusitanica</i> (including <i>C. benthamii</i> )
51. <i>Cupressus lusitanica</i> (including <i>C. benthamii</i> )	53. <i>Cupressus torulosa</i>
52. <i>Cupressus macrocarpa</i>	67. <i>Eucalyptus delegatensis</i>
53. <i>Cupressus torulosa</i>	85. <i>Eucalyptus regnans</i>
54. <i>Dalbergia sissoo</i>	92. <i>Eucalyptus st.-johnii</i>
55. <i>Delonix regia</i>	96. <i>Eucalyptus viminalis</i>
61. <i>Eucalyptus citriodora</i>	136. <i>Pinus montezumae</i>
63. <i>Eucalyptus cloeziana</i>	140. <i>Pinus patula</i> subsp. <i>patula</i>
71. <i>Eucalyptus grandis</i>	146. <i>Pinus radiata</i>
75. <i>Eucalyptus maidenii</i>	
86. <i>Eucalyptus resinifera</i>	
98. <i>Ficus benghalensis</i>	
99. <i>Gleditsia triacanthos</i>	
128. <i>Pinus chiapensis</i>	
129. <i>Pinus elliotii</i> var. <i>elliottii</i>	
132. <i>Pinus kesiya</i>	
135. <i>Pinus michoacana</i>	
139. <i>Pinus palustris</i>	
141. <i>Pinus patula</i> subsp. <i>tecunumanii</i>	
148. <i>Pinus taeda</i>	
159. <i>Schizolobium parahybum</i>	
165. <i>Taxodium distichum</i>	
1 3 5 9 15 18 23 24 26 29	1 3 7 20 24 25 33 38 39 48
33 39 41 47 48 49 57 59 60 68	49 52 54 55 57 60 61 63 65 68
69 70 74 77 82 84 87 88 93 94	69 70 71 74 75 77 79 80 82 84
95 102 105 106 107 108 109 110 119 124	86 87 88 93 94 95 98 99 102 110
136 137 138 140 142 145 146 147 152 156	122 124 128 129 132 135 137 138 139 141
	142 145 147 148 149 152 156 159 165



TABLE 5  
Species worth considering for Mean Annual Rainfall 1600 mm and above

Mean Annual Temperature (Altitude)		
24 °C and above (0-600 metres)	22-24 °C (600-1000 metres)	20-22 °C (1000-1400 metres)
27. Aucoumea klaineana 35. Carinaria pyriformis 44. Cleistopholis glauca 66. Eucalyptus deglupta 104. Hieronyma chocoensis 113. Musanga cecropioides 114. Nauclea diderrichii 116. Octomeles sumatrana 172. Triplochiton scleroxylon	16. Agathis dammara 17. Albizia falcataria 26. Araucaria hunsteinii 35. Carinaria pyriformis 66. Eucalyptus deglupta  2 7 15 18 20 23 25 29 32 34 38 40 41 43 47 51 53 54 55 61 63 71 75 83 95 98 99 100 101 104 105 106 111 112 114 115 116 119 120 126 127 128 129 132 133 134 139 141 155 157 159 160 162 163 165 166 167 168 169 170 171 172	16. Agathis dammara 26. Araucaria hunsteinii 66. Eucalyptus deglupta 134. Pinus merkusii (Island Provs.)  7 8 15 17 18 19 20 23 25 29 32 35 38 40 41 43 47 49 51 52 53 54 55 61 63 71 75 86 95 98 99 100 101 105 106 111 112 115 119 127 128 129 132 133 135 139 141 148 157 159 160 163 165 166 171
	18-20 °C (1400-1800 metres)	18 °C and below (1800 metres and above)
2 7 15 16 17 18 20 22 23 25 26 29 32 34 38 40 41 43 47 54 55 61 63 71 83 95 98 99 100 101 105 106 111 112 115 119 120 126 127 129 133 155 157 160 162 163 166 167 168 169 170 171	5 7 8 9 15 16 18 19 20 23 24 25 26 29 38 41 47 48 49 51 52 53 54 55 61 63 66 71 75 86 95 98 99 105 106 119 124 128 129 132 134 135 136 139 140 141 146 148 159 165	5 7 8 9 19 20 21 24 25 38 48 49 51 52 53 54 55 61 63 67 71 75 85 86 92 95 96 98 99 122 124 128 129 132 135 136 139 140 141 146 148 149 159 165

TABLE 6  
Species Tolerant of Particular Soil Conditions

Heavy Soils		
2. <i>Acacia auriculiformis</i>	60. <i>Eucalyptus camaldulensis</i> (S. Provs.)	108. <i>Leucaena leucocephala</i> (Hawaiian type)
6. <i>Acacia farnesiana</i>	65. <i>Eucalyptus dalrympleana</i>	109. <i>Leucaena leucocephala</i> (Salvador type)
8. <i>Acacia mearnsii</i>	69. <i>Eucalyptus globulus</i>	110. <i>Liquidambar styraciflua</i>
10. <i>Acacia nilotica</i>	73. <i>Eucalyptus largiflorens</i>	112. <i>Melaleuca leucadendron</i>
11. <i>Acacia pendula</i>	74. <i>Eucalyptus maculata</i>	129. <i>Pinus elliottii</i> var. <i>elliottii</i>
12. <i>Acacia salicina</i>	75. <i>Eucalyptus maidenii</i>	130. <i>Pinus greggii</i>
13. <i>Acacia senegal</i>	76. <i>Eucalyptus melliodora</i>	132. <i>Pinus kesiya</i>
16. <i>Agathis dammara</i>	78. <i>Eucalyptus microtheca</i>	133. <i>Pinus merkusii</i> (Continental Provs.)
17. <i>Albizia falcataria</i>	79. <i>Eucalyptus nitens</i>	135. <i>Pinus michoacana</i>
18. <i>Albizia lebbek</i>	80. <i>Eucalyptus obliqua</i>	137. <i>Pinus occidentalis</i>
19. <i>Alnus acuminata</i>	81. <i>Eucalyptus occidentalis</i>	138. <i>Pinus oocarpa</i>
25. <i>Araucaria cunninghamii</i>	85. <i>Eucalyptus regnans</i>	145. <i>Pinus pseudostrobus</i>
26. <i>Araucaria hunsteinii</i>	87. <i>Eucalyptus robusta</i>	147. <i>Pinus roxburghii</i>
27. <i>Aucoumea klaineana</i>	89. <i>Eucalyptus salmonophloia</i>	148. <i>Pinus taeda</i>
28. <i>Azadirachta indica</i>	91. <i>Eucalyptus sideroxylon</i>	151. <i>Prosopis cineraria</i>
29. <i>Bombacopsis quinata</i>	92. <i>Eucalyptus st.-johnii</i>	152. <i>Prosopis juliflora</i>
32. <i>Calliandra calothyrsus</i>	93. <i>Eucalyptus tereticornis</i>	157. <i>Samanea saman</i>
34. <i>Camposperma brevipetiolata</i>	95. <i>Eucalyptus urophylla</i>	159. <i>Schizolobium parahybum</i>
35. <i>Cariniaria pyriformis</i>	96. <i>Eucalyptus viminalis</i>	160. <i>Sesbania grandiflora</i>
39. <i>Casuarina glauca</i>	99. <i>Gleditsia triacanthos</i>	162. <i>Swietenia macrophylla</i>
41. <i>Cedrela odorata</i>	101. <i>Gmelina arborea</i>	165. <i>Taxodium distichum</i>
45. <i>Colophospermum mopane</i>	103. <i>Haloxylon aphyllum</i>	166. <i>Tectona grandis</i>
47. <i>Cordia alliodora</i>	104. <i>Hieronyma chochoensis</i>	167. <i>Terminalia brassii</i>
48. <i>Cryptomeria japonica</i>	105. <i>Jacaranda copaia</i>	168. <i>Terminalia calamansanai</i>
57. <i>Eucalyptus botryoides</i>	107. <i>Khaya senegalensis</i>	173. <i>Zizyphus spina-christi</i>
59. <i>Eucalyptus camaldulensis</i> (N. Provs.)		

TABLE 6 (cont.)  
Species Tolerant of Particular Soil Conditions

Impeded Drainage/Waterlogging		Saline Soils
1. <i>Acacia albida</i>	81. <i>Eucalyptus occidentalis</i>	4. <i>Acacia cyclops</i>
2. <i>Acacia auriculiformis</i>	87. <i>Eucalyptus robusta</i>	6. <i>Acacia farnesiana</i>
7. <i>Acacia mangium</i>	91. <i>Eucalyptus sideroxylon</i>	12. <i>Acacia salicina</i>
10. <i>Acacia nilotica</i>	104. <i>Hieronyma chocoensis</i>	39. <i>Casuarina glauca</i>
29. <i>Bombacopsis quinata</i>	105. <i>Jacaranda copaia</i>	45. <i>Colophospermum mopane</i>
34. <i>Campnosperma brevipetiolata</i>	112. <i>Melaleuca leucadendron</i>	56. <i>Elaeagnus angustifolia</i>
38. <i>Casuarina equisetifolia</i>	113. <i>Musanga cecropioides</i>	81. <i>Eucalyptus occidentalis</i>
39. <i>Casuarina glauca</i>	148. <i>Pinus taeda</i>	90. <i>Eucalyptus sargentii</i>
45. <i>Colophospermum mopane</i>	151. <i>Prosopis cineraria</i>	99. <i>Gleditsia triacanthos</i>
46. <i>Conocarpus lancifolius</i>	153. <i>Prosopis tamarugo</i>	103. <i>Haloxylon aphyllum</i>
54. <i>Dalbergia sissoo</i>	156. <i>Salix babylonica</i> var. <i>sacramenta</i>	105. <i>Jacaranda copaia</i>
57. <i>Eucalyptus botryoides</i>	157. <i>Samanea saman</i>	112. <i>Melaleuca leucadendron</i>
59. <i>Eucalyptus camaldulensis</i> (N. Provs.)	160. <i>Sesbania grandiflora</i>	153. <i>Prosopis tamarugo</i>
60. <i>Eucalyptus camaldulensis</i> (S. Provs.)	163. <i>Tabebuia rosea</i>	161. <i>Simmondsia chinensis</i>
73. <i>Eucalyptus largiflorens</i>	165. <i>Taxodium distichum</i>	164. <i>Tamarix aphylla</i>
78. <i>Eucalyptus microtheca</i>	167. <i>Terminalia brassii</i>	

TABLE 6 (cont.)

## Species Tolerant of Particular Soil Conditions

Alkaline Soils		
2. <i>Acacia auriculiformis</i>	58. <i>Eucalyptus brockwayi</i>	110. <i>Liquidambar styraciflua</i>
3. <i>Acacia cyanophylla</i>	59. <i>Eucalyptus camaldulensis</i> (N. Provs.)	112. <i>Melaleuca leucadendron</i>
4. <i>Acacia cyclops</i>	60. <i>Eucalyptus camaldulensis</i> (S. Provs.)	115. <i>Ochroma pyramidale</i>
6. <i>Acacia farnesiana</i>	70. <i>Eucalyptus gomphocephala</i>	118. <i>Parkinsonia aculeata</i>
10. <i>Acacia nilotica</i>	72. <i>Eucalyptus intertexta</i>	123. <i>Pinus brutia</i>
11. <i>Acacia pendula</i>	73. <i>Eucalyptus largiflorens</i>	125. <i>Pinus caribaea</i> var. <i>bahamensis</i>
12. <i>Acacia salicina</i>	76. <i>Eucalyptus melliodora</i>	131. <i>Pinus halepensis</i>
14. <i>Acacia tortilis</i> subsp. <i>raddiana</i>	78. <i>Eucalyptus microtheca</i>	144. <i>Pinus ponderosa</i> var. <i>arizonica</i>
18. <i>Albizia lebbek</i>	81. <i>Eucalyptus occidentalis</i>	150. <i>Prosopis chilensis</i>
30. <i>Brachychiton populneum</i>	89. <i>Eucalyptus salmonophloia</i>	151. <i>Prosopis cineraria</i>
38. <i>Casuarina equisetifolia</i>	90. <i>Eucalyptus sargentii</i>	152. <i>Prosopis juliflora</i>
39. <i>Casuarina glauca</i>	91. <i>Eucalyptus sideroxylon</i>	153. <i>Prosopis tamarugo</i>
40. <i>Casuarina junghuhniana</i>	96. <i>Eucalyptus viminalis</i>	154. <i>Robinia pseudoacacia</i>
42. <i>Ceratonia siliqua</i>	98. <i>Ficus benghalensis</i>	158. <i>Schinus molle</i>
45. <i>Colophospermum mopane</i>	99. <i>Gleditsia triacanthos</i>	161. <i>Simmondsia chinensis</i>
46. <i>Conocarpus lancifolius</i>	100. <i>Gliricidia sepium</i>	162. <i>Swietenia macrophylla</i>
47. <i>Cordia alliodora</i>	103. <i>Haloxylon aphyllum</i>	163. <i>Tabebuia rosea</i>
50. <i>Cupressus arizonica</i>	105. <i>Jacaranda copaia</i>	164. <i>Tamarix aphylla</i>
52. <i>Cupressus macrocarpa</i>	106. <i>Jacaranda mimosifolia</i>	165. <i>Taxodium distichum</i>
53. <i>Cupressus torulosa</i>	108. <i>Leucaena leucocephala</i> (Hawaiian type)	170. <i>Terminalia superba</i>
56. <i>Elaeagnus angustifolia</i>	109. <i>Leucaena leucocephala</i> (Salvador type)	173. <i>Zizyphus spina-christi</i>

## INDEX TO SPECIES

1. *Acacia albida*
2. *Acacia auriculiformis*
3. *Acacia cyanophylla*
4. *Acacia cyclops*
5. *Acacia decurrens*
6. *Acacia farnesiana*
7. *Acacia mangium*
8. *Acacia mearnsii*
9. *Acacia melanoxylon*
10. *Acacia nilotica*
11. *Acacia pendula*
12. *Acacia salicina*
13. *Acacia senegal*
14. *Acacia tortilis* subsp. *raddiana*
15. *Acrocarpus fraxinifolius*
16. *Agathis dammara*
17. *Albizia falcataria*
18. *Albizia lebbek*
19. *Alnus acuminata*
20. *Alnus nepalensis*
21. *Alnus rubra*
22. *Anacardium occidentale*
23. *Anthocephalus chinensis*
24. *Araucaria angustifolia*
25. *Araucaria cunninghamii*
26. *Araucaria hunsteinii*
27. *Aucoumea klaineana*
28. *Azadirachta indica*
29. *Bombacopsis quinata*
30. *Brachychiton populneum*
31. *Butyrospermum paradoxum*
32. *Calliandra calothyrsus*
33. *Callitris columellaris*
34. *Camptosperma brevipetiolata*
35. *Cariniaria pyriformis*
36. *Cassia siamea*
37. *Casuarina decaisneana*
38. *Casuarina equisetifolia*
39. *Casuarina glauca*
40. *Casuarina junghuhniana*
41. *Cedrela odorata*
42. *Ceratonia siliqua*
43. *Chlorophora excelsa*
44. *Cleistopholis glauca*
45. *Colophospermum mopane*
46. *Conocarpus lancifolius*
47. *Cordia alliodora*
48. *Cryptomeria japonica*
49. *Cunninghamia lanceolata*
50. *Cupressus arizonica*
51. *Cupressus lusitanica* (including *C. benthamii*)
52. *Cupressus macrocarpa*
53. *Cupressus torulosa*
54. *Dalbergia sissoo*
55. *Delonix regia*
56. *Elaeagnus angustifolia*

57. *Eucalyptus botryoides*
58. *Eucalyptus brockwayi*
59. *Eucalyptus camaldulensis* (Northern Provenances)
60. *Eucalyptus camaldulensis* (Southern Provenances)
61. *Eucalyptus citriodora*
62. *Eucalyptus cladocalyx*
63. *Eucalyptus cloëziana*
64. *Eucalyptus crebra* (Inland Provenances)
65. *Eucalyptus dalrympleana*
66. *Eucalyptus deglupta*
67. *Eucalyptus delegatensis*
68. *Eucalyptus fastigata*
69. *Eucalyptus globulus*
70. *Eucalyptus gomphocephala*
71. *Eucalyptus grandis*
72. *Eucalyptus intertexta*
73. *Eucalyptus largiflorens*
74. *Eucalyptus maculata*
75. *Eucalyptus maidenii*
76. *Eucalyptus melliiodora*
77. *Eucalyptus microcorys*
78. *Eucalyptus microtheca*
79. *Eucalyptus nitens*
80. *Eucalyptus obliqua*
81. *Eucalyptus occidentalis*
82. *Eucalyptus paniculata*
83. *Eucalyptus pellita*
84. *Eucalyptus propinqua*
85. *Eucalyptus regnans*
86. *Eucalyptus resinifera*
87. *Eucalyptus robusta*
88. *Eucalyptus saligna*
89. *Eucalyptus salmonophloia*
90. *Eucalyptus sargentii*
91. *Eucalyptus sideroxylon* (Inland Victoria Provenances)
92. *Eucalyptus st.-johnii*
93. *Eucalyptus tereticornis* (Queensland and New Guinea Provenances)
94. *Eucalyptus torelliana*
95. *Eucalyptus urophylla*
96. *Eucalyptus viminalis*
97. *Euphorbia tirucalli*
98. *Ficus benghalensis*
99. *Gleditsia triacanthos*
100. *Gliricidia sepium*
101. *Gmelina arborea*
102. *Grevillea robusta*
103. *Haloxylon aphyllum*
104. *Hieronyma chocoënsis*
105. *Jacaranda copaia*
106. *Jacaranda mimosifolia*
107. *Khaya senegalensis*
108. *Leucaena leucocephala* (Hawaiian type)
109. *Leucaena leucocephala* (Salvador type)
110. *Liquidambar styraciflua*
111. *Maesopsis eminii*
112. *Melaleuca leucadendron*
113. *Musanga cecropioides*
114. *Nauclea diderrichii*

115. *Ochroma pyramidale*
116. *Octomeles sumatrana*
117. *Parkia biglobosa*
118. *Parkinsonia aculeata*
119. *Paulownia tomentosa*
120. *Peltophorum pterocarpum*
121. *Pericopsis elata*
122. *Pinus ayacahuite*
123. *Pinus brutia*
124. *Pinus canariensis*
125. *Pinus caribaea* var. *bahamensis*
126. *Pinus caribaea* var. *caribaea*
127. *Pinus caribaea* var. *hondurensis*
128. *Pinus chiapensis*
129. *Pinus elliottii* var. *elliottii*
130. *Pinus greggii*
131. *Pinus halepensis*
132. *Pinus kesiya*
133. *Pinus merkusii* (Continental Provenances)
134. *Pinus merkusii* (Island Provenances)
135. *Pinus michoacana*
136. *Pinus montezumae*
137. *Pinus occidentalis*
138. *Pinus oocarpa*
139. *Pinus palustris*
140. *Pinus patula* subsp. *patula*
141. *Pinus patula* subsp. *tecunumanii*
142. *Pinus pinaster* (Portuguese Provenances)
143. *Pinus pinea*
144. *Pinus ponderosa* var. *arizonica*
145. *Pinus pseudostrobus*
146. *Pinus radiata*
147. *Pinus roxburghii*
148. *Pinus taeda*
149. *Populus deltoides* var. *deltoides*
150. *Prosopis chilensis*
151. *Prosopis cineraria*
152. *Prosopis juliflora*
153. *Prosopis tamarugo*
154. *Robinia pseudoacacia*
155. *Roseodendron donnell-smithii*
156. *Salix babylonica* var. *sacramenta*
157. *Samanea saman*
158. *Schinus molle*
159. *Schizolobium parahybum*
160. *Sesbania grandiflora*
161. *Simmondsia chinensis*
162. *Swietenia macrophylla*
163. *Tabebuia rosea*
164. *Tamarix aphylla*
165. *Taxodium distichum*
166. *Tectona grandis*
167. *Terminalia brassii*
168. *Terminalia calamansanai*
169. *Terminalia ivorensis*
170. *Terminalia superba*
171. *Toona ciliata*
172. *Triplochiton scleroxylon*
173. *Zizyphus spina-christi*

SYNONYMS

<u>Synonym</u>	<u>Listed Under:</u>
Acacia arabica .....	Acacia nilotica (10)
Acacia auriculaeformis .....	Acacia auriculiformis (2)
Acacia cavenia .....	Acacia farnesiana (6)
Acacia decurrens var. mollis .....	Acacia mearnsii (8)
Acacia decurrens var. normalis .....	Acacia decurrens (5)
Acacia leucophylla .....	Acacia pendula (11)
Acacia raddiana .....	Acacia tortilis subsp. raddiana (14)
Acacia saligna .....	Acacia cyanophylla (3)
Acacia verec .....	Acacia senegal (13)
Afrormosia elata .....	Pericopsis elata (121)
Agathis alba .....	Agathis dammara (16)
Agati grandiflora .....	Sesbania grandiflora (160)
Albizia falcata .....	Albizia falcataria (17)
Albizia moluccana .....	Albizia falcataria (17)
Alnus jorullensis .....	Alnus acuminata (19)
Alnus oregana .....	Alnus rubra (21)
Anthocephalus cadamba .....	Anthocephalus chinensis (23)
Anthocephalus indicus .....	Anthocephalus chinensis (23)
Araucaria brasiliana .....	Araucaria angustifolia (24)
Araucaria klinkii .....	Araucaria hunsteinii (26)
Bombacopsis sepium .....	Bombacopsis quinata (29)
Butyrospermum niloticum .....	Butyrospermum paradoxum (31)
Butyrospermum parkii .....	Butyrospermum paradoxum (31)
Calliandra confusa .....	Calliandra calothyrsus (32)
Callitris glauca .....	Callitris columellaris (33)
Callitris hugelii .....	Callitris columellaris (33)
Callitris intratropica .....	Callitris columellaris (33)



<i>Cassia florida</i> .....	<i>Cassia siamea</i> (36)
<i>Casuarina lepidophloia</i> .....	<i>Casuarina glauca</i> (39)
<i>Casuarina littoralis</i> .....	<i>Casuarina equisetifolia</i> (38)
<i>Cedrela mexicana</i> .....	<i>Cedrela odorata</i> (41)
<i>Cedrela toona</i> .....	<i>Toona ciliata</i> (171)
<i>Cleistopholis grandiflora</i> .....	<i>Cleistopholis glauca</i> (44)
<i>Copaifera mopane</i> .....	<i>Colophospermum mopane</i> (45)
<i>Cunninghamia sinensis</i> .....	<i>Cunninghamia lanceolata</i> (49)
<i>Cupressus glauca</i> .....	<i>Cupressus lusitanica</i> (51)
<i>Cupressus hartwegii</i> .....	<i>Cupressus macrocarpa</i> (52)
<i>Cupressus lindleyi</i> .....	<i>Cupressus lusitanica</i> (51)
<i>Cybistax donnell-smithii</i> .....	<i>Roseodendron donnell-smithii</i> (155)
<i>Eucalyptus bicolor</i> .....	<i>Eucalyptus largiflorens</i> (73)
<i>Eucalyptus bicostata</i> .....	<i>Eucalyptus st-johnii</i> (92)
<i>Eucalyptus coolabah</i> .....	<i>Eucalyptus microtheca</i> (78)
<i>Eucalyptus gigantea</i> .....	<i>Eucalyptus delegatensis</i> (67)
<i>Eucalyptus hemilampra</i> .....	<i>Eucalyptus resinifera</i> (86)
<i>Eucalyptus multiflora</i> .....	<i>Eucalyptus robusta</i> (87)
<i>Eucalyptus naudiniana</i> .....	<i>Eucalyptus deglupta</i> (66)
<i>Eucalyptus rostrata</i> .....	<i>Eucalyptus camaldulensis</i> (59/60)
<i>Eucalyptus umbellata</i> .....	<i>Eucalyptus tereticornis</i> (93)
<i>Faidherbia albida</i> .....	<i>Acacia albida</i> (1)
<i>Gliricidia maculata</i> .....	<i>Gliricidia sepium</i> (100)
<i>Grevillea umbricata</i> .....	<i>Grevillea robusta</i> (102)
<i>Haloxylon ammondendron</i> .....	<i>Haloxylon aphyllum</i> (103)
<i>Leucaena glauca</i> .....	<i>Leucaena leucocephala</i> (108/109)
<i>Melaleuca leucadendra</i> .....	<i>Melaleuca leucadendron</i> (112)

<i>Melaleuca quinquenervia</i> .....	<i>Melaleuca leucadendron</i> (112)
<i>Melia azadirachta</i> .....	<i>Azadirachta indica</i> (28)
<i>Melia indica</i> .....	<i>Azadirachta indica</i> (28)
<i>Mimosa farnesiana</i> .....	<i>Acacia farnesiana</i> (6)
<i>Mimosa juliflora</i> .....	<i>Prosopis juliflora</i> (152)
<i>Mimosa lebbek</i> .....	<i>Albizia lebbek</i> (18)
<i>Mimosa sirissa</i> .....	<i>Albizia lebbek</i> (18)
<i>Musanga smithii</i> .....	<i>Musanga cecropioides</i> (113)
<i>Ochroma lagopus</i> .....	<i>Ochroma pyramidale</i> (115)
<i>Parkia africana</i> .....	<i>Parkia biglobosa</i> (117)
<i>Peltophorum ferrugineum</i> .....	<i>Peltophorum pterocarpum</i> (120)
<i>Peltophorum inerme</i> .....	<i>Peltophorum pterocarpum</i> (120)
<i>Pinus arizonica</i> .....	<i>Pinus ponderosa</i> var. <i>arizonica</i> (144)
<i>Pinus australis</i> .....	<i>Pinus palustris</i> (139)
<i>Pinus cubensis</i> .....	<i>Pinus occidentalis</i> (137)
<i>Pinus halepensis</i> var. <i>brutia</i> .....	<i>Pinus brutia</i> (123)
<i>Pinus insignis</i> .....	<i>Pinus radiata</i> (146)
<i>Pinus insularis</i> .....	<i>Pinus kesiya</i> (132)
<i>Pinus khasya</i> .....	<i>Pinus kesiya</i> (132)
<i>Pinus longifolia</i> .....	<i>Pinus roxburghii</i> (147)
<i>Pinus maritima</i> .....	<i>Pinus pinaster</i> (142)
<i>Pinus pseudopatula</i> .....	<i>Pinus greggii</i> (130)
<i>Pinus strobus</i> var. <i>chiapensis</i> .....	<i>Pinus chiapensis</i> (128)
<i>Pithecolobium saman</i> .....	<i>Samanea saman</i> (157)
<i>Poinciana regia</i> .....	<i>Delonix regia</i> (55)
<i>Populus deltoides</i> var. <i>missouriensis</i> .....	<i>Populus deltoides</i> var. <i>deltoides</i> (149)
<i>Prosopis spicigera</i> .....	<i>Prosopis cineraria</i> (151)
<i>Rhamnus spina-christi</i> .....	<i>Zizyphus spina-christi</i> (173)
<i>Sarcocephalus trillesii</i> .....	<i>Nauclea diderrichii</i> (114)

*Simmondsia californica* ..... *Simmondsia chinensis* (161)  
*Sterculia diversifolia* ..... *Brachychiton populneum* (30)  
*Tabebuia donnell-smithii* ..... *Roseodendron donnell-smithii* (155)  
*Tamarix articulata* ..... *Tamarix aphylla* (164)  
*Tamarix orientalis* ..... *Tamarix aphylla* (164)

## 6. EXPLANATORY NOTES ON THE SPECIES DATA SHEETS

Note: All characteristics 6-40 include reported experience of the species as an exotic as well as within its natural distribution.

3. Local or Trade Names

In most cases only the accepted English, local or trade names are given.

4. Latitudes

Usually the approximate overall distribution, but in the case of Eucalypts, the latitudes of principal occurrence are quoted.

6. Altitudinal Range

In metres above sea level. The ranges given are those which apply within tropical and subtropical latitudes. Some species, originating from outside this zone, may occur at lower elevations in temperate latitudes.

7. Mean Annual Rainfall

Species may often thrive in rainfalls different from those quoted, but generally more desirable species are available at higher rainfalls.

8. Rainfall Regime

Equatorial, all the year round rainfall has been described as "uniform".

9. Dry Season

Of the many parameters in use, Laurie's (107) definition of a dry month as being one with less than 40 mm precipitation has been applied.

13. Texture

"Heavy" includes clays, clay loams and sandy clays;  
"Medium" includes loams and sandy clay loams;  
"Light" includes sands and sandy loams.

14. Reaction

- "Acid" - pH 6 and below;  
 "Neutral" - pH 6.1 to 7.4;  
 "Alkaline" - pH 7.5 and above.

19. Form

- "Exceptional" - very suitable for transmission poles.  
 "Acceptable" - can be used for transmission poles; suitable for building poles.  
 "Poor" - cannot be used for transmission poles.

21. Other Silvicultural Characteristics

"Aggressive coloniser" - draws attention to the risk of using species which, when introduced to conditions more favourable than those of their natural distribution, may be capable of rapid, uncontrollable colonisation of the surrounding area.

"Provenance variation" - indicates species in which distinct differences in silvicultural characteristics and production rates exist, between provenances. Production figures will be the mean known provenance performances.

"Fixes nitrogen" - a species which is capable (usually due to mycorrhizal associations) of 'fixing' atmospheric nitrogen (N<sub>2</sub>) into organic complexes. Growth of such species often improves soil.

"Fire resistant" - a species which either resists serious damage (e.g. thick bark protects cambium), or regenerates quickly, vegetatively, after fire damage.

"Fuelwood rotation" - where rotation lengths are given, the figures represent the usual ranges experienced. Extremes will depend on soil type, use of fertiliser, etc. and have been omitted.

22. Production

The range of production levels reported on suitable sites in well managed stands, but excluding abnormally high or low figures.

23. Rôle in Land Use

Use of the species in afforestation, where the primary object is not production.

24. Density

"S.G." = specific gravity at 12% moisture content.

25. Natural Durability

Natural durability (resistance to attack by fungi and insects) of heartwood. Chudnoff's (1979) 5-point scale has been used:

<u>Durability in contact with ground</u>	<u>Term of durability (years)</u>
Perishable	Less than 5
Non-durable	5-10
Moderately durable	10-15
Durable	15-25
Very durable	More than 25

N.B. Short rotation trees will have higher proportions of sapwood and durability may therefore be lower than usual.

30-31. Utilization

Uses are described by broad categories. For fuelwood, gross calorific value dry basis (kJ/kg) is quoted, when available, as "C.V.".

"Honeyflora" - High yields of nectar suitable for honey production.

33. Seed Sources

Only the principal seed sources are listed. Seed of a large number of species is also available from major commercial seed houses.

34. Seeds per Kilogramme

Average figures or the range of reported values.

35. Seed Storage

Storage in airtight conditions is understood, in addition to the recommendations described. Generally a temperature of 4°C is preferred.

36. Pre-treatment

The most common treatments are:-

- i) Bring water to boil, immerse seed, allow to cool for 24 hours,
- ii) Soak in cold water for the stated period,
- iii) Cold stratify in damp sand for the stated period.

### 37. Planting Stock

"Potted plants" includes all containerised stock, whether in tubes, plastic pots, or other types of container.

### 38. Special Requirements

"Grass stage in seedling" - Important. In early years, tree consists of 'leader' only. Careful weeding is necessary until tree is well established and a 'normal' crown with side branches develops.

"Requires mycorrhizae" - When young trees are introduced to sites new to the species, the soil may need to be 'inoculated' with cultures of the appropriate mycorrhizal organism.

### 39. Germination and Growth

Growth "to plantable size" is only a very approximate indication. It will depend greatly on ambient temperatures and nursery techniques. However, periods are quoted to give some idea of the time required in the nursery, for the planning of species trials timetables.

### 40. Principal Pests and Diseases

Limited to those reported to be of major importance and capable of limiting the use of the species as an exotic. Even in such cases, the attacks may be of regional importance and the pests or diseases may not necessarily present a problem in other parts of the world.

7. COUNTRIES WITH EXPERIENCE OF AFFORESTATION WITH EXOTIC OR LOCAL SPECIES

Local species in parentheses. Some promising trials are included; however, many countries other than those listed, are carrying out trials.

Species	Countries
1. <i>Acacia albida</i>	I KEN NIG (SA) SFN (SUD) UGA (ZIM) ZAM
2. <i>Acacia auriculiformis</i>	(AUS) I IND MAL NIG (PNG) SAB UGA ZAN
3. <i>Acacia cyanophylla</i>	CHL CYP I MEX MOR
4. <i>Acacia cyclops</i>	(AUS) CYP PAL (SA)
5. <i>Acacia decurrens</i>	ARG BRA I KFN NZ (SA) SLK TAN URG
6. <i>Acacia farnesiana</i>	(ARG) AUS (CHL) CYP (HAW) IND JAM (MEX) UGA (USA)
7. <i>Acacia mangium</i>	(AUS) MAL PHI SAB
8. <i>Acacia mearnsii</i>	I KFN SA SLK TAN ZIM
9. <i>Acacia melanoxylon</i>	KEN SLK TAN
10. <i>Acacia nilotica</i>	AUS CYP EPT (I) IND (KFN) (NIG) (PAK) SA (SUD) TAN ZIM
11. <i>Acacia pendula</i>	(AUS)
12. <i>Acacia salicina</i>	CYP IRA JOR KUW
13. <i>Acacia senegal</i>	(NGR) (SEN) (SUD) (TCH)
14. <i>Acacia tortilis</i> subsp. <i>raddiana</i>	(ETH) I (SR) (JOR) KEN (SA) (SOM) (SUD) (TAN) (YEM)



Species	Countries
15. <i>Acrocarpus fraxinifolius</i>	(I) MAL NIG TAN UGA ZAM ZIM
16. <i>Agathis dammara</i>	(IND)
17. <i>Albizia falcataria</i>	AUS BAN FIJ HAW I (IND) IVC MAL PHI SAB SLK SOL ZAI
18. <i>Albizia lebbek</i>	FIJ (I) KUV MAU
19. <i>Alnus acuminata</i>	(ARG) (COL) CR (ECU) (PER)
20. <i>Alnus nepalensis</i>	(CHN) HAW (I) IND
21. <i>Alnus rubra</i>	(USA)
22. <i>Anacardium occidentale</i>	AUS (BRA) I JAM (MEX) MOZ (PER) SA SLK ZIM
23. <i>Anthocephalus chinensis</i>	AUS (BAN) CHI CR FIJ I (IND) IVC (PHI) (PNG) PR (SAB)
24. <i>Araucaria angustifolia</i>	(ARG) AUS (BRA) KFN SA TAN UGA ZIM
25. <i>Araucaria cunninghamii</i>	(AUS) I KFN MAL MAU NIG (PNG) TAN TRI UGA ZIM
26. <i>Araucaria hunsteinii</i>	KFN MAL (PNG) SOL TAN
27. <i>Aucoumea klaineana</i>	(GAB) GHA IVC NIG SUD UGA
28. <i>Azadirachta indica</i>	GHA (I) NGR NIG SUD TCH
29. <i>Bombacopsis quinata</i>	(CR) (VEN)

Species	Countries
30. <i>Brachychiton populneum</i>	(AUS) CYP
31. <i>Butyrospermum paradoxum</i>	-
32. <i>Calliandra calothyrsus</i>	IND (MEX)
33. <i>Callitris columellaris</i>	(AUS) BRA KEN MAL MLW SA UGA
34. <i>Camposperma brevipetiolata</i>	(PNG) (SOL)
35. <i>Cariniaria pyriformis</i>	(COL)
36. <i>Cassia siamea</i>	GHA (I) NIG SUD TAN UGA
37. <i>Casuarina decaisneana</i>	(AUS)
38. <i>Casuarina equisetifolia</i>	ARG BRA CHL CHN EGY I KEN MAU MEX PR SLK TAN
39. <i>Casuarina glauca</i>	(AUS) CYP I ISR KEN PAL USA
40. <i>Casuarina junghuhniana</i>	TAI
41. <i>Cedrela odorata</i>	ARG BRA (COL) CUB ECU FIJ GHA IND MAD MEX NIG PHI SL SOL TAN TRI UGA
42. <i>Ceratonia siliqua</i>	(ALG) AUS (CYP) GHA (GRE) I KEN LEB MEX MOR PAL POR SP (TUN) USA ZIM
43. <i>Chlorophora excelsa</i>	COB NIG
44. <i>Cleistopholis glauca</i>	COB NIG

Species	Countries										
45. <i>Colophospermum mopane</i>	I	NIG	(SA)	(ZAM)	(ZIM)						
46. <i>Conocarpus lancifolius</i>	(SOM)	SUD				IVC	MAU	NH			NIG
47. <i>Cordia alliodora</i>	(BRA)	COB	(COL)	(CR)	(ECU)	FIJ	MAU	NH			NIG
48. <i>Cryptomeria japonica</i>	I	IRA	(JAP)	NZ	SA	TAN					
49. <i>Cunninghamia lanceolata</i>	BRA	(CHN)	I	JPA	MAL	(TWN)	ZIM				
50. <i>Cupressus arizonica</i>	ARG	AUS	IRA	(MEX)	(USA)						
51. <i>Cupressus lusitanica</i>	ARG	AUS	BRA	CHL	COL	CR	ECU	I	KEN	ZIM	(MEX)
52. <i>Cupressus macrocarpa</i>	COL	KEN	NZ	SA	TAN	UGA					
53. <i>Cupressus torulosa</i>	SA	ZIM									
54. <i>Dalbergia sissoo</i>	ECU	(I)	MEX	(PAK)	SUD	ZIM					
55. <i>Delonix regia</i>	ECU	FIJ	I	JAM	KEN	(MAD)	MAU	NIG	PAK	SA	
56. <i>Elaeagnus angustifolia</i>	SL	TAN	VEN	ZAM	ZIM						
57. <i>Eucalyptus botryoides</i>	CYP	(IRA)	(TUR)	USA							
58. <i>Eucalyptus brockwayi</i>	ALG	ARG	BRA	HAW	ITA	KEN	MAL	MOR	NZ	SA	

Species	Countries
59. <i>Eucalyptus camaldulensis</i> & 60.	ALG ANG ARG BRA CHL COB CYP GRE I ISR ITA KEN LBY MAD URG CHL MOR NIG PAK POR SA SP TUN TUR USA ZAM ZIM
61. <i>Eucalyptus citriodora</i>	ARG BRA BUR CHL COB FIJ GUA HAW I MLW POR SA SP TAN ZAM ZIM
62. <i>Eucalyptus cladocalyx</i>	(AUS) MOR SA USA
63. <i>Eucalyptus cloeziana</i>	BRA COB KEN MAD MAD NIG SA SL TAN UGA ZAM
64. <i>Eucalyptus crebra</i>	BRA I HAW SA
65. <i>Eucalyptus dalrympleana</i>	BRA BOL PER SA USA
66. <i>Eucalyptus deglupta</i>	BRA COB COL CR CUB FIJ HAW I (IND) IVC MAL NIG (PHI) (PNG) SAB SA SL SOL SUR ZAI
67. <i>Eucalyptus delegatensis</i>	NZ SA
68. <i>Eucalyptus fastigata</i>	BRA NZ SA
69. <i>Eucalyptus globulus</i>	ALG ARG (AUS) BRA CHI COL ECU ETH I ITA KEN NZ PER POR POR SA SP SP TAN UGA ZIM
70. <i>Eucalyptus gomphocephala</i>	ALG CYP ETH ISR ITA LBY MOR TUR URG
71. <i>Eucalyptus grandis</i>	ANG ARG BRA COB COL TAN MLW MOZ NIG RWA SA SP UGA URG ZAI ZAM ZIM
72. <i>Eucalyptus intertexta</i>	-

Species	Countries
73. <i>Eucalyptus largiflorens</i>	I SA
74. <i>Eucalyptus maculata</i>	(AUS) BRA GHA I ISR KEN MAD SA SL TAN TUR UGA ZAI ZAM ZIM
75. <i>Eucalyptus maidenii</i>	BRA BUR CAM HAW HAW ITA KEN MAD MLW PER NIG SA SP TAN ZIM ZIM
76. <i>Eucalyptus melliodora</i>	SA
77. <i>Eucalyptus microcorys</i>	BRA HAW KEN MAD MAL SA SLK TAN UGA ZAI ZIM
78. <i>Eucalyptus microtheca</i>	IRA IRQ PAK NIG SUD
79. <i>Eucalyptus nitens</i>	ARG BOL BRA NZ PER SA USA ZIM
80. <i>Eucalyptus obliqua</i>	I NZ
81. <i>Eucalyptus occidentalis</i>	ALG HAW ISR MOR SLK TUN
82. <i>Eucalyptus paniculata</i>	ARG BRA BRA HAW HAW KEN MAD SA SL UGA ZAM ZIM
83. <i>Eucalyptus pellita</i>	BRA ZIM
84. <i>Eucalyptus propinqua</i>	BRA SA
85. <i>Eucalyptus regnans</i>	KEN NZ SA TAN UGA
86. <i>Eucalyptus resinifera</i>	ARG BRA BRA HAW HAW KEN KEN SA SLK TAN UGA ZAM ZIM
87. <i>Eucalyptus robusta</i>	ANG ARG ARG (AUS) BRA CHL CHN CAM COR CR FIJ GRE HAW HAW I IND IND KEN MAD MAL MAV NIG NZ PER PHI PNG PR SA SLK SLK UGA UGA ZAI

Species	Countries													
88. <i>Eucalyptus saligna</i>	ANG	ARG	BRA	BUR	CAM	GRE	HAW	I	IND	KEN	URG			
	MLW	MOR	MOZ	NIG	NZ	RWA	SA	TAN	UGA					
89. <i>Eucalyptus salmonophloia</i>	ZAI	ZAM	ZIM											
90. <i>Eucalyptus sargentii</i>	MOR	SA												
91. <i>Eucalyptus sideroxylon</i>	(AUS)	BRA	BUR	COB	MOR	SA	ZIM							
92. <i>Eucalyptus st.-johnii</i>	BOL	ECU	KEN	PER										
93. <i>Eucalyptus tereticornis</i>	ARG	BOT	BRA	COB	COL	CHL	CHN	ETH	FIJ	GHA	PHI			
	I	ISR	IVC	MAD	MAL	MAU	MOZ	PAK	PAR					
	PNG	PR	SOT,	SUD	URG	ZAI	ZAM	ZIM						
94. <i>Eucalyptus torelliana</i>	ARG	AUS	FIJ	GHA	I	MAL	NIG	SOL	ZAM	ZIM				
95. <i>Eucalyptus urophylla</i>	ARG	AUS	BRA	CAM	COB	FIJ	(IND)	IVC	MAD	MAL				
	NIG	PNG	SOL											
96. <i>Eucalyptus viminalis</i>	ARG	BOL	CHL	FRA	GRE	HAW	I	NZ	PER	SA				
	SP													
97. <i>Euphorbia tirucalli</i>	I	MEX												
98. <i>Ficus benghalensis</i>	(I)	PAK	UGA											
99. <i>Gleditsia triacanthos</i>	ARG	AUS	I	ISR	ITA	KEN	SA	SP	TAN	TUR				
	URG	(USA)												
100. <i>Gliricidia sepium</i>	(BRA)	NIC	NIG	PHI	(PR)	(VEN)								

Species	Countries															
101. <i>Gmelina arborea</i>	BRA SL	CR UGA	FIJ VEN	GHA	I	IVC	MAL	MLW	NIG	PHI						
102. <i>Grevillea robusta</i>	ANG PER	ARG RWA	(AUS) SA	CR SLK	ETH TAN	HAW	I	JAM	KEN	MAD						
103. <i>Haloxylon aphyllum</i>	(CHN)	(USR)														
104. <i>Hieronyma choocoensis</i>	COL	CR	(FCU)													
105. <i>Jacaranda copaia</i>	(BRA)	(HON)	KEN	(NIC)	PAK	TAN	(URG)	(VEN)								
106. <i>Jacaranda mimosifolia</i>	ARG	(BOL)	BRA	MLW	TAN	ZIM										
107. <i>Khaya senegalensis</i>	CAR	(COB)	(GHA)	IND	(IVC)	(NIG)	(SEN)	(SL)	SUD							
108. <i>Leucaena leucocephala</i>	AUS	GUA	(HAW)	IND	MAU	(MEX)	NIG	PR	PHI	ZAM						
& 109.	ZAN															
110. <i>Liquidambar styraciflua</i>	ARG	BRA	(USA)	ZIM												
111. <i>Maesopsis eminii</i>	CR	FIJ	GHA	(KEN)	MAL	SAB	SOL	TAN	(UGA)	(ZAI)						
112. <i>Melaleuca leucadendron</i>	(AUS) (TAI)	CAM	(IND)	LIB	MAD	MAL	MOZ	PNG	(SAB)	SL						
113. <i>Musanga cecropioides</i>	CAM	IVC														
114. <i>Nauclea diderichii</i>	FIJ	(NIG)	UGA													
115. <i>Ochroma pyramidale</i>	(BFL) SLK	(COL)	CR	(ECU)	I	IND	MAL	(PER)	PNG	SAB						
116. <i>Octomeles sumatrana</i>	BRA	(PHI)	(PNG)	SAB	(SOL)											

Species	Countries
117. <i>Parkia biglobosa</i>	-
118. <i>Parkinsonia aculeata</i>	CYP I ISR KUW PAK SUD
119. <i>Paulownia tomentosa</i>	ARG BRA (JAP) PAR
120. <i>Peltophorum pterocarpum</i>	AUS CAM HAW (I) IND KAM (MAL) (SLK) USA
121. <i>Pericopsis elata</i>	(GHA) (IVC) NIG (ZAI)
122. <i>Pinus ayacahuite</i>	KEN MLW SA TAN UGA ZIM
123. <i>Pinus brutia</i>	AUS (CYP) IRA (ISR) SA (TUR)
124. <i>Pinus canariensis</i>	AUS ISR NZ SA SP USA
125. <i>Pinus caribaea</i> var. <i>bahamensis</i>	AUS (BAH) BEL COB I KEN MAD SA ZAI
126. <i>Pinus caribaea</i> var. <i>caribaea</i>	ARG AUS BRA (CUB) MAD SA SUR UGA ZAI ZAM
127. <i>Pinus caribaea</i> var. <i>hondurensis</i>	AUS (BEL) BRA COB I IND FIJ KEN LIB MAD MAL MLW MOZ NH SA SLK SUR SWZ TAI TAN TRI UGA VEN VN ZAI ZIM
128. <i>Pinus chiapensis</i>	AUS KEN MAL PNG SA TAN UGA ZAM
129. <i>Pinus elliottii</i> var. <i>elliottii</i>	ARG AUS FIJ KEN MAD MLW NZ SA TAN UGA
130. <i>Pinus greggii</i>	ARG SA



Species	Countries
131. <i>Pinus halepensis</i>	ARG AUS CHL (GRE) SA URG
132. <i>Pinus kesiya</i>	AUS COL (I) IND KEN MAD (PHI) SA (TAI) TAN ZAI ZAM
133. <i>Pinus merkusii</i>	(IND) JAM MAD MAL PNG SA ZAM
134. & 135. <i>Pinus michoacana</i>	KEN MAD SA TAN UGA ZAM ZIM
136. <i>Pinus montezumae</i>	COB (MEX) SA ZIM
137. <i>Pinus occidentalis</i>	(CUB) JAM KEN TAN
138. <i>Pinus oocarpa</i>	BRA COB COL FIJ IND LIB MAL PR SA SLK SOL TAI ZAM
139. <i>Pinus palustris</i>	AUS NZ SA UGA (USA) ZIM
140. <i>Pinus patula</i> subsp. <i>patula</i>	ANG ARG I KEN MAD MLW MOZ NG PER SA SWZ TAN UGA ZAI ZIM
141. <i>Pinus patula</i> subsp. <i>tecumananii</i>	-
142. <i>Pinus pinaster</i> (Portuguese Provenances)	ARG AUS BRA CHL (FR) (IT) NZ (POR) SA (SP) (TUN) URG
143. <i>Pinus pinea</i>	(ALG) AUS (CYP) (ISR) (LEB) (LBY) (TUN)
144. <i>Pinus ponderosa</i> var. <i>arizonica</i>	ARG AUS NZ
145. <i>Pinus pseudostrabus</i>	AUS BRA COL I KEN MOZ PNG SA TAI TAN UGA

Species	Countries															
146. <i>Pinus radiata</i>	ARG POR	AUS SA	BOL SP	BRA TAN	CHL UGA	COL URG	ECU ZIM	KEN	MLW	NZ						
147. <i>Pinus roxburghii</i>	AUS	(I)	MAU	SA	ZIM											
148. <i>Pinus taeda</i>	ARG	IRA	MAD	MLW	NZ	SA	URG	(USA)	ZIM							
149. <i>Populus deltoides</i> var. <i>deltoides</i>	ARG	MAD	NG	NIC	SA	(USA)	ZIM									
150. <i>Prosopis chilensis</i>	I	SUD	USA													
151. <i>Prosopis cineraria</i>	(I)	PAK														
152. <i>Prosopis juliflora</i>	(ECU) (USA)	I	ISR	KEN	KUW	(MEX)	PAK	(PER)	SUD	UAE						
153. <i>Prosopis tamarugo</i>	(CHL)															
154. <i>Robinia pseudoacacia</i>	ARG	CHL	CYP	IRA	ISR	JAP	URG									
155. <i>Roseodendron donnell-smithii</i>	(CR)	(GUA)	(HON)	(MEX)												
156. <i>Salix babylonica</i> var. <i>sacramento</i>	BRA															
157. <i>Samanea saman</i>	AUS	FIJ	HAW	PHI	SLK											
158. <i>Schinus molle</i>	ARG	CHL	I	KEN	(MEX)	NIG	(PER)	TAN	UGA	USA						
159. <i>Schizolobium parahybum</i>	(BRA)	HON	MEX													
160. <i>Sesbania grandiflora</i>	AUS	FIJ	(I)	(IND)	(MAL)	(PHI)	PR									
161. <i>Simmondsia chinensis</i>	I	(MEX)	(USA)													

Species	Countries
162. <i>Swietenia macrophylla</i>	(BEL) (PHI) PR (MEX) NIG
163. <i>Tabebuia rosea</i>	(BFL) (COL) PR (SLK) SOL (TRI)
164. <i>Tamarix aphylla</i>	ALG ISR KUV MOR PAK
165. <i>Taxodium distichum</i>	ARG
166. <i>Tectona grandis</i>	BAN BEN (KAM) COL CUB (I) IND IVC MAL MAU PR SL SLK (TAI) TAN TOG TRI VEN
167. <i>Terminalia brassii</i>	FIJ NH (PNG) (SOL)
168. <i>Terminalia calamansanai</i>	MAL (PHI) (PNG) (SOL)
169. <i>Terminalia ivorensis</i>	FIJ (GHA) (IVC) (NIG) (SL) SOL TAN TRI UGA
170. <i>Terminalia superba</i>	ANG (CAR) (COB) FIJ (GHA) (IVC) (LIB) NH (NIG) SOL TAN (TOG) TRI UGA (ZAI)
171. <i>Toona ciliata</i>	ARG AUS (BAN) CR HAW (I) KEN MLW PNG PR TAN UGA
172. <i>Triplochiton scleroxylon</i>	(GHA) (IVC) NIG
172. <i>Zizyphus spina-christi</i>	(EPT) (SUD)

## KEY TO COUNTRY ABBREVIATIONS

ALG Algeria	I India	RWA Rwanda
ANG Angola	IND Indonesia	SA South Africa
ARG Argentina	IRA Iran	SAB Sabah
AUS Australia	IRQ Iraq	SEN Senegal
BAH Bahamas	ISR Israel	SL Sierra Leone
BAN Bangladesh	ITA Italy	SLK Sri Lanka
BEL Belize	IVC Ivory Coast	SOL Solomon Islands
BEN Benin	JAM Jamaica	SOM Somalia
BOL Bolivia	JAP Japan	SP Spain
BOT Botswana	JOR Jordan	SUD Sudan
BRA Brazil	KEN Kenya	SUR Surinam
BUR Burundi	KUW Kuwait	SWZ Swaziland
CAM Camerouns	LBY Libya	TAI Thailand
CAR Central African Republic	LEB Lebanon	TAN Tanzania
CBD Cambodia	LIB Liberia	TCH Tchad
CHL Chile	MAD Madagascar	TOG Togo
CHN China	MAL Malaya	TRI Trinidad
COB Congo	MAR Martinique	TUN Tunisia
COL Colombia	MAU Mauritius	TUR Turkey
CR Costa Rica	MEX Mexico	TWN Taiwan
CUB Cuba	MLW Malawi	UAE United Arab Emirates
CVI Cape Verde Islands	MOR Morocco	UGA Uganda
CYP Cyprus	MOZ Mozambique	URG Uruguay
ECU Ecuador	NEP Nepal	USA U.S.A.
EPT Egypt	NGR Niger	USR U.S.S.R.
ETH Ethiopia	NH New Hebrides	VEN Venezuela
FIJ Fiji	NIG Nigeria	VN Viet Nam
FRA France	NL Netherlands	ZAI Zaire
GAB Gabon	NZ New Zealand	ZAM Zambia
GAM Gambia	PAK Pakistan	ZAN Zanzibar
GHA Ghana	PAR Paraguay	ZIM Zimbabwe
GRE Greece	PER Peru	
GUA Guatemala	PHI Philippines	
HAW Hawaii	PNG Papua New Guinea	
HON Honduras	POR Portugal	
	PR Puerto Rico	

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## SPECIES:

## TAXONOMY:

- 1 FAMILY .....
- 2 SYNONYMS .....
- 3 LOCAL OR TRADE NAMES .

## NATURAL OCCURRENCE:

- 4 LATITUDES .....
- 5 AREAS .....

## CLIMATE:

- 6 ALTITUDINAL RANGE ....
- 7 MEAN ANNUAL RAINFALL .
- 8 RAINFALL REGIME .....
- 9 DRY SEASON .....
- 10 MEAN MAX. TEMP.  
HOTTEST MONTH .....
- 11 MEAN MIN. TEMP.  
COLDEST MONTH .....
- 12 MEAN ANNUAL TEMP. ....

## SOILS:

- 13 TEXTURE .....
- 14 REACTION .....
- 15 DRAINAGE .....
- 16 OTHER CHARACTERISTICS

## SILVICULTURE:

- 17 SIZE .....
- 18 DESCRIPTION .....
- 19 FORM .....
- 20 LIGHT REQUIREMENTS ...
- 21 OTHER CHARACTERISTICS



## PRODUCTION:

22 VOLUME (M<sup>3</sup>/HA/AN) .....

## ROLE IN LAND USE:

23 .....

## TIMBER:

24 DENSITY .....

25 NATURAL DURABILITY ...

26 PRESERVATION .....

27 SAWING .....

28 SEASONING .....

29 OTHER FEATURES .....

## UTILIZATION:

30 SAW TIMBER .....

31 ROUNDWOOD .....

32 OTHER PRODUCTS .....

## NURSERY:

33 SEED SOURCES .....

34 SEEDS PER KILOGRAMME .

35 STORAGE .....

36 PRE-TREATMENT .....

37 PLANTING STOCK .....

38 SPECIAL REQUIREMENTS .

39 GERMINATION AND GROWTH

PRINCIPAL PESTS AND  
DISEASES:

40 .....

## PRINCIPAL REFERENCES:

Appendix IUse of INSPIRE Computer Program

This version of INSPIRE is written for use with an Apple II microcomputer equipped with the following accessories:

1. 5 inch floppy disk drive
2. printer (preferable but not essential)
3. CP/M BASIC language software
4. 80-column screen display with upper and lower case characters

The BASIC interpreter should be loaded into memory to enable simultaneous access to 5 files (i.e. by MBASIC /F:5). The program runs entirely interactively and requires very little external instruction to the user. It is divided into four main sections performing the following functions:

1. to load information about a new species
2. to edit existing information
3. to select species from the database which satisfy given conditions
4. to print the names of all species in the database, or information about an individual species, either to the screen, to the printer or to both.

The program will ask for all information it requires and has many built-in diagnostics. Instructions may be given in upper or lower case characters. Details and advice, and also copies of the complete database on floppy disk, are available on request.

Subsequent pages show a typical program printout of recorded data for an individual species, followed by an example of a typical selection run and the results obtained.

- INSPIRE PROGRAM EXAMPLES -

Species 1      *Acacia albida* Del.

---

altitude (metres)	0      to 2000
mean annual rainfall (mm)	250 to 1000
rainfall regime	winter, summer
dry season (months)	6      to 9
mean max. temp. hottest month (C)	30    to 42
mean min. temp. coldest month (C)	6      to 18
mean annual temperature (C)	18    to 30
soil texture	light, medium
soil reaction	neutral, acid
soil drainage	free draining, seasonally waterlogged
other soil characteristics	*saline
size of tree (metres)	15    to 25
form of tree	poor
light requirements	strongly demanding
other silvic. characteristics	coppices/root suckers, *frost resistant, termite resistant, drought hardy, fixes nitrogen
production potential (m <sup>3</sup> /ha/an)	-
role in land use	shade and shelter, agroforestry, soil improvement
timber density (S.G.)	.58 to .71
sawtimber utilization	boxes crates etc., furniture, boat building
roundwood utilization	posts, fuel/charcoal, shortfibre pulp, miscellaneous
other timber products	tannins, fodder, gums

HELLO!...and welcome to INSPIRE

Do you want to L)oad E)dit S)elect P)rint or F)inish? s

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? ?

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 altitude (metres)                 | 12 size of tree (metres)           |
| 2 mean annual rainfall (mm)         | 13 form of tree                    |
| 3 rainfall regime                   | 14 light requirements              |
| 4 dry season (months)               | 15 other silvic. characteristics   |
| 5 mean max. temp. hottest month (C) | 16 production potential (m3/ha/an) |
| 6 mean min. temp. coldest month (C) | 17 role in land use                |
| 7 mean annual temperature (C)       | 18 timber density (S.G.)           |
| 8 soil texture                      | 19 sawtimber utilization           |
| 9 soil reaction                     | 20 roundwood utilization           |
| 10 soil drainage                    | 21 other timber products           |
| 11 other soil characteristics       |                                    |

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? 2

mean annual rainfall (mm)

-----

your value(s) for mean annual rainfall (mm)?

lower value? 450

upper value? (press RETURN if none) 500

Selection 1

-----

39 main species:-	1	3	4	6	10	11	12	13	14	28
	30	31	42	45	46	50	54	56	59	60
	62	73	78	81	89	91	97	117	118	123
	131	143	150	151	152	158	161	164	173	
10 marginal species:-	18	20	22	64	70	90	93	98	99	154

Do you want to C)ontinue the elimination,

R)ever to a previous selection,

or F)inish

? c

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? temp

\*\* ERROR \*\* wording not unique - which characteristic do you mean please?

5 mean max. temp. hottest month (C)

6 mean min. temp. coldest month (C)

or 7 mean annual temperature (C)

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? 7

mean annual temperature (C)

-----

your value(s) for mean annual temperature (C)?

lower value? 21

upper value? (press RETURN if none) 23

Selection 2

-----

23 main species:-	1	3	6	12	28	30	42	54	59	62
	73	78	81	89	91	97	118	150	151	152
	161	164	173							
12 marginal species:-	4	13	18	20	45	60	64	70	90	93
	98	99								

Do you want to C)ontinue the elimination,  
R)ever to a previous selection,  
or F)inish

? c

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? 4

dry season (months)

-----

your value(s) for dry season (months)?

lower value? 5

upper value? (press RETURN if none)

Selection 3

-----

12 main species:-	3	6	12	28	54	59	73	78	81	89
	91	161								
10 marginal species:-	4	18	20	45	60	64	70	93	98	99

Do you want to C)ontinue the elimination,  
R)ever to a previous selection,  
or F)inish

? c

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? soil reaction

soil reaction

-----

please put 'Y' for choices of interest, otherwise press RETURN

? y alkaline

? neutral

? acid

## Selection 4

-----  
 10 main species:-

- 3 Acacia cyanophylla Lindl.
- 6 Acacia farnesiana (L.) Willd.
- 12 Acacia salicina Lindl.
- 59 Eucalyptus camaldulensis Dehnh. (Northern Provenances)
- 73 Eucalyptus largiflorens F. Muell.
- 78 Eucalyptus microtheca F. Muell.
- 81 Eucalyptus occidentalis Engl.
- 89 Eucalyptus salmonophloia F. Muell.
- 91 Eucalyptus sideroxylon A. Cunn. ex Woolls.
- 161 Simmondsia chinensis (Link) Schneid.

7 marginal species:- 4 18 45 60 70 98 99

Do you want to C)ontinue the elimination,  
 R)evert to a previous selection,  
 or F)inish

? c

characteristic of interest?

(give characteristic number or describe in words, put ? for list)  
 ? land use

role in land use

-----  
 please put 'Y' for choices of interest, otherwise press RETURN

- ? shade and shelter
- ? agricultural shade
- ? y windbreaks
- ? y erosion control
- ? y dune/soil stabilisation
- ? agroforestry
- ? land reclamation
- ? soil improvement
- ? ornamental
- ? miscellaneous

Must ALL these conditions be met? (Y/N)? n

## Selection 5

-----  
 7 main species:-

- 3 Acacia cyanophylla Lindl.
- 6 Acacia farnesiana (L.) Willd.
- 12 Acacia salicina Lindl.
- 73 Eucalyptus largiflorens F. Muell.
- 78 Eucalyptus microtheca F. Muell.
- 81 Eucalyptus occidentalis Engl.
- 89 Eucalyptus salmonophloia F. Muell.

5 marginal species:-

- 4 Acacia cyclops A. Cunn. ex G. Don.
- 18 Albizia lebbek (L.) Benth.
- 45 Colophospermum mopane (Kirk ex Benth.) Kirk ex J. Leonard
- 70 Eucalyptus gomphocephala DC.
- 99 Gleditsia triacanthos L.

Do you want to C)ontinue the elimination,  
 R)ever to a previous selection,  
 or F)inish

? c

characteristic of interest?

(give characteristic number or describe in words, put ? for list)

? roundwood

roundwood utilization

-----

please put 'Y' for choices of interest, otherwise press RETURN

? transmission poles  
 ? building poles/piling  
 ? y posts  
 ? y fuel/charcoal  
 ? shortfibre pulp  
 ? longfibre pulp  
 ? veneer/plywood  
 ? turnery  
 ? miscellaneous

Must ALL these conditions be met? (Y/N)? y

Selection 6

-----

6 main species:-

6 Acacia farnesiana (L.) Willd.  
 12 Acacia salicina Lindl.  
 73 Eucalyptus largiflorens F. Muell.  
 78 Eucalyptus microtheca F.Muell.  
 81 Eucalyptus occidentalis Engl.  
 89 Eucalyptus salmonophloia F. Muell.

4 marginal species:-

18 Albizia lebbek (L.) Benth.  
 45 Colophospermum mopane (Kirk ex Benth.) Kirk ex J. Leonard  
 70 Eucalyptus gomphocephala DC.  
 99 Gleditsia triacanthos L.

Do you want to C)ontinue the elimination,  
 R)ever to a previous selection,  
 or F)inish

? f

Do you want N)o output at all,  
 a S)imple list of selected species only,  
 or F)ull output for each selected species

? s

Do you want to L)oad E)dit S)elect P)rint or F)inish? f

end of INSPIRE

Thank you....and goodbye



INSPIRE Species Selections  
 \*\*\*\*\*

mean annual rainfall (mm)	450 to 500
mean annual temperature (C)	21 to 23
dry season (months)	5
soil reaction	alkaline
role in land use	windbreaks or erosion control or dune/soil stabilisation
roundwood utilization	posts and fuel/charcoal

Selected Species  
 -----

6 main species:-

- 6 *Acacia farnesiana* (L.) Willd.
- 12 *Acacia salicina* Lindl.
- 73 *Eucalyptus largiflorens* F. Muell.
- 78 *Eucalyptus microtheca* F. Muell.
- 81 *Eucalyptus occidentalis* Engl.
- 89 *Eucalyptus salmonophloia* F. Muell.

4 marginal species:-

- \* 18 *Albizia lebbek* (L.) Benth.
- \* 45 *Colophospermum mopane* (Kirk ex Benth.) Kirk ex J. Leonard
- \* 99 *Gleditsia triacanthos* L.
- \*\* 70 *Eucalyptus gomphocephala* DC.

```

10 RESET
20 REM *** PROGRAM INSPIRE (Autumn 1983) ***
30 REM MAXSTEP = max no. of sel. stages
40 REM MAXCH = no. of characteristics (see DATA statements)
50 REM MAXSEL = max. no. of catagories/sel. char.
60 REM LENS P = max. no. of digits for species code no.
70 REM LENRAN = max. no. of digits for a range value
80 REM LENS PNAM = max. no. of characters for species name
90 MAXSTEP=15: MAXCH=21: MAXSEL=10: LENS P=4: LENRAN=4: LENS PNAM=65
100 DIM NC(MAXCH), N$(MAXCH), LN(MAXCH), LC$(MAXCH), LC(MAXCH), CH(MAXSEL)
110 DIM OLDSEL(MAXSTEP, MAXSEL+2)
120 KK$(0)="n": KK$(1)="m": KK$(2)="y"
130 BB$(0)="s": BB$(1)="p": BB$(2)="b"
140 NRANC=0: NSEL C=0: FOR I=0 TO MAXCH: READ NC(I)
150 IF NC(I)>0 THEN GOTO 180
160 IF NC(I)<0 THEN GOTO 190
170 NRANC=NRANC+1: LN(I)=NRANC: GOTO 190
180 NSEL C=NSEL C+1: LN(I)=NSEL C
190 NEXT I
200 DIM SN$(NSEL C, MAXSEL)
210 FOR I=0 TO MAXCH: READ N$(I): NEXT I
220 S=0
230 FOR I=1 TO MAXCH
240 IF NC(I)=0 THEN GOTO 260
250 S=S+1: FOR J=1 TO NC(I): READ SN$(S, J): NEXT J
260 NEXT I
270 NR=NRANC*LENRAN*2: NS=NSEL C*MAXSEL
280 OPEN "R", #1, "RANDATA.RAF", NR
290 OPEN "R", #2, "SELDATA.RAF", NS
300 OPEN "R", #3, "SPNAMES.RAF", LENS PNAM
310 OPEN "R", #4, "SPNUMS.RAF", LENS P
320 FIELD #1, NR AS R$
330 FIELD #2, NS AS S$
340 FIELD #3, LENS PNAM AS SPN$
350 FIELD #4, LENS P AS SNU$
360 GET #4, 1
370 NSP=VAL(SNU$)
380 MAXSFOP=20
390 DIM IND(NSP), ORD(MAXSFOP)
400 CAT$(1)="1": CAT$(2)="e": CAT$(3)="s": CAT$(4)="p": CAT$(5)="f"
410 HOME: PRINT SPC(20); "HELLO!...and welcome to INSPIRE"
420 PRINT: PRINT: PRINT
430 PRINT SPC(10);: PRINT "Do you want to L)oad E)dit S)elect ";
440 INPUT "P)rint or F)inish"; ANS$
450 GOSUB 5090
460 A$=LEFT$(ANS$, 1): FOR ICAT=1 TO 5: IF A$=CAT$(ICAT) THEN GOTO 490
470 NEXT ICAT
480 GOSUB 6090: GOTO 420
490 ON ICAT GOTO 500, 1240, 2290, 4630, 5010
500 REM *****
510 REM *      LOAD SECTION      *
520 REM *****
530 PRINT: PRINT

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540 INPUT "code number for new species? (press RETURN to finish) ",SNO$
550 IF LEN(SNO$)=0 THEN GOTO 5010
560 IF VAL(SNO$)<>0 THEN GOTO 600
570 BEEP 12,20: BEEP 15,20
580 PRINT: PRINT "*** ERROR ** species number must start with a digit - ";
590 PRINT "please try again": GOTO 540
600 IF NSP=0 THEN GOTO 670
610 A$=LEFT$(SNO$+SPACE$(LENSP),LENSP)
620 FOR S=1 TO NSP: GET #4,S+1
630 IF A$=SNU$ THEN GOTO 650
640 NEXT S: GOTO 670
650 BEEP 12,20: BEEP 15,20: PRINT: PRINT "*** ERROR ** species ";SNO$;
660 PRINT " is already recorded - please try again": GOTO 500
670 PRINT: INPUT "name of new species";SNAM$
680 IF LEN(SNAM$)>0 THEN GOTO 700
690 GOSUB 6090: GOTO 670
700 NEWREC=1: IF NSP=0 THEN GOTO 810
710 FOR NEWREC=1 TO NSP: GET #3,NEWREC
720 IF SNAM$<SPN$ THEN GOTO 750
730 NEXT NEWREC: NEWREC=NSP+1: GOTO 810
740 REM if new species not alphabetically on end of list, shift along one
750 FOR I=NSP TO NEWREC STEP -1
760 GET #1,I: RR$=R$: LSET R$=RR$: PUT #1,I+1
770 GET #2,I: SS$=S$: LSET S$=SS$: PUT #2,I+1
780 GET #3,I: SPP$=SPN$: LSET SPN$=SPP$: PUT #3,I+1
790 GET #4,I+1: SNUM$=SNU$: LSET SNU$=SNUM$: PUT #4,I+2
800 NEXT I
810 RR$=SPACE$(NR)
820 SS$=SPACE$(NS)
830 FOR I=1 TO MAXCH
840 PRINT
850 PRINT N$(I): PRINT STRING$(LEN(N$(I)),45)
860 IF NC(I)>0 THEN GOTO 970
870 N1=LN(I)
880 PRINT "lower value";: INPUT A$
890 PRINT "upper value";: INPUT B$
900 IF VAL(A$)<=VAL(B$) THEN GOTO 940
910 BEEP 12,20:BEEP 15,20: PRINT
920 PRINT "*** ERROR ** upper value < lower value - please repeat"
930 PRINT: GOTO 880
940 IC=(N1-1)*LENRAN*2+1: MID$(RR$,IC,LENRAN)=A$+SPACE$(LENRAN)
950 IC=IC+LENRAN: MID$(RR$,IC,LENRAN)=B$+SPACE$(LENRAN)
960 GOTO 1140
970 N2=LN(I)
980 PRINT "define each required category using Y)es or M)arginal"
990 PRINT "(or press RETURN or 'N' if not required)": PRINT
1000 FOR K=1 TO NC(I)
1010 PRINT SPC(4);SN$(N2,K)
1020 NEXT K: VTAB VPOS(0)-NC(I)
1030 FOR K=1 TO NC(I)
1040 INPUT ANS$
1050 J=0
1060 IF LEN(ANS$)=0 THEN GOTO 1120
1070 GOSUB 5090
1080 FOR J=0 TO 2: IF LEFT$(ANS$,1)=KK$(J) THEN GOTO 1120

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1090 NEXT J
1100 BEEP 12,20: BEEP 15,20: BEEP 12,20: BEEP 15,20: VTAB VPOS(0)-1
1110 GOTO 1040
1120 IC=(N2-1)*MAXSEL+K: K$=MID$(STR$(J),2): MID$(SS$,IC,1)=K$
1130 NEXT K
1140 NEXT I
1150 NSP=NSP+1
1160 LSET R$=RR$: PUT #1,NEWREC
1170 LSET S$=SS$: PUT #2,NEWREC
1180 LSET SNU$=SNO$: PUT #4,NEWREC+1
1190 LSET SPN$=SNAM$: PUT #3,NEWREC
1200 SNUM$=MID$(STR$(NSP),2): LSET SNU$=SNUM$: PUT #4,1
1210 GOSUB 6570: IF LP=-1 THEN GOTO 540
1220 SREC=NEWREC: GOSUB 5450
1230 GOTO 500
1240 REM *****
1250 REM *      EDIT SECTION      *
1260 REM *****
1270 PRINT: PRINT: PRINT "species to edit? ";
1280 INPUT "(give number or name, press RETURN to finish) ",ANS$
1290 IF LEN(ANS$)=0 THEN GOTO 420
1300 GOSUB 6280: IF IFAIL=1 THEN GOTO 1270
1310 GET #1,SREC: GET #2,SREC: RR$=R$: SS$=S$
1320 EDR=0: EDS=0: EDSNUM=0: EDSNAM=0
1330 PRINT: PRINT "editing species ";SNO$;" ";SPP$
1340 LU=16+LENSP+2+LEN(SPP$): PRINT STRING$(LU,45)
1350 PRINT: PRINT "characteristic to edit?"
1360 PRINT "either describe in words, or give characteristic number,"
1370 PRINT "      or put ? for a list of characteristics,"
1380 PRINT "      or press RETURN to finish"
1390 PRINT "(n.b. 'species number'/'species name' (or char. no. 0) ";
1400 PRINT "can be specified)"
1410 INPUT ANS$
1420 IF LEN(ANS$)>0 THEN GOTO 1730
1430 IF EDSNAM=0 THEN GOTO 1620
1440 A$=" ": IF SREC=1 THEN GOTO 1460
1450 GET #3,SREC-1: A$=SPN$
1460 B$=STRING$(LENSPNAM,122): IF SREC=NSP THEN GOTO 1480
1470 GET #3,SREC+1: B$=SPN$
1480 IF SSN$>A$ AND SSN$<B$ THEN GOTO 1620
1490 A$=SPACE$(LENSPNAM): LSET SPN$=A$: PUT #3,SREC
1500 FOR NEWREC=1 TO NSP: GET #3,NEWREC: A$=SPN$
1510 IF SSN$<A$ THEN GOTO 1530
1520 NEXT NEWREC: NEWREC=NSP+1
1530 IF NEWREC>SREC THEN WAY=1 ELSE WAY=-1
1540 STA=SREC+WAY: IF WAY=1 THEN STO=NEWREC-1 ELSE STO=NEWREC
1550 FOR I=STA TO STO STEP WAY
1560 GET #1,I: A$=R$: LSET R$=A$: PUT #1,I-WAY
1570 GET #2,I: A$=S$: LSET S$=A$: PUT #2,I-WAY
1580 GET #3,I: A$=SPN$: LSET SPN$=A$: PUT #3,I-WAY
1590 J=I+1: GET #4,J: A$=SNU$: LSET SNU$=A$: PUT #4,J-WAY
1600 NEXT I
1610 SREC=STO: EDR=1: EDS=1: EDSNUM=1
1620 IF EDR=0 THEN GOTO 1640
1630 LSET R$=RR$: PUT #1,SREC

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1640 IF EDS=0 THEN GOTO 1660
1650 LSET S$=SS$: PUT #2,SREC
1660 IF EDSNAM=0 THEN GOTO 1680
1670 LSET SPN$=SSN$: PUT #3,SREC
1680 IF EDSNUM=0 THEN GOTO 1700
1690 LSET SNU$=SP$: PUT #4,SREC+1
1700 GOSUB 6570
1710 IF LP>=0 THEN GOSUB 5450
1720 GOTO 1270
1730 IF LEFT$(ANS$,1)<>"?" THEN GOTO 1750
1740 GOSUB 6140: GOTO 1350
1750 GOSUB 5190
1760 IF IFAIL=1 THEN GOTO 1350
1770 IF NC(JJ)>0 THEN GOTO 2100
1780 IF NC(JJ)=0 THEN GOTO 1940
1790 PRINT: PRINT "new species number for ";SNO$;
1800 INPUT "? (press RETURN if OK) ",SP$
1810 IF LEN(SP$)>0 THEN GOTO 1830
1820 SP$=SNO$: GOTO 1880
1830 IF VAL(SP$)<>0 THEN GOTO 1870
1840 BEEP 12,20: BEEP 15,20
1850 PRINT: PRINT "** ERROR ** species number does not start with a ";
1860 PRINT "digit - please try again": GOTO 1790
1870 EDSNUM=1: SNO$=SP$
1880 PRINT: PRINT "new species name for ";SPP$;"?"
1890 INPUT "(press RETURN if OK) ",SSN$
1900 IF LEN(SSN$)>0 THEN GOTO 1920
1910 SSN$=SPP$: GOTO 1350
1920 EDSNAM=1
1930 GOTO 1350
1940 EDR=1: N1=LN(JJ)
1950 PRINT: PRINT N$(JJ): PRINT STRING$(LEN(N$(JJ)),45):PRINT
1960 PRINT "please give new values or press RETURN if OK:-"
1970 IC1=(N1-1)*LENRAN*2+1
1980 PRINT "lower value: old was ";MID$(RR$,IC1,LENRAN);" new";: INPUT A$
1990 IF LEN(A$)=0 THEN A$=MID$(RR$,IC1,LENRAN)
2000 IC2=IC1+LENRAN
2010 PRINT "upper value: old was ";MID$(RR$,IC2,LENRAN);" new";: INPUT B$
2020 IF LEN(B$)=0 THEN B$=MID$(RR$,IC2,LENRAN)
2030 IF VAL(A$)<=VAL(B$) THEN GOTO 2070
2040 BEEP 12,20: BEEP 15,20: PRINT
2050 PRINT "** ERROR ** upper value < lower value - please repeat"
2060 PRINT: GOTO 1980
2070 MID$(RR$,IC1,LENRAN)=A$+SPACE$(LENRAN)
2080 MID$(RR$,IC2,LENRAN)=B$+SPACE$(LENRAN)
2090 GOTO 1350
2100 PRINT: PRINT N$(JJ): PRINT STRING$(LEN(N$(JJ)),45): PRINT
2110 PRINT "please confirm category settings (old ones shown in brackets):-"
2120 PRINT "press RETURN if OK, otherwise redefine setting by ";
2130 PRINT "Y)es N)o or M)arginal": PRINT
2140 N2=LN(JJ): IC=(N2-1)*MAXSEL: FOR J=1 TO NC(JJ)
2150 K=VAL(MID$(SS$,IC+J,1))
2160 PRINT " (";KK$(K);") ";SN$(N2,J)
2170 NEXT J: VTAB VPOS(0)-NC(JJ)
2180 FOR J=1 TO NC(JJ)

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2190 INPUT ANS$
2200 IF LEN(ANS$)=0 THEN GOTO 2270
2210 EDS=1: GOSUB 5090
2220 FOR L=0 TO 2: IF LEFT$(ANS$,1)=KK$(L) THEN GOTO 2260
2230 NEXT L
2240 BEEP 12,20: BEEP 15,20: BEEP 12,20: BEEP 15,20
2250 VTAB VPOS(0)-1: GOTO 2190
2260 K$=MID$(STR$(L),2): MID$(SS$,IC+J,1)=K$
2270 NEXT J
2280 GOTO 1350
2290 REM *****
2300 REM *   SELECT SECTION   *
2310 REM *****
2320 REM state of each species is 1=main, 0=out, -n=marginal by n factors
2330 LSEL=LEN(STR$(MAXSTEP)): N1=128\LSEL: N2=CINT((NSP/N1)+.499)
2340 STO=N1*LSEL
2350 OPEN "R",#5,"SELTRACE.RAF",STO
2360 FIELD #5,STO AS SV$
2370 PPMAIN=10: PPTOT=15
2380 NSTEP=0
2390 FOR J=1 TO NSP: IND(J)=1: NEXT J: GOTO 2500
2400 PRINT "Do you want to C)ontinue the elimination,"
2410 PRINT SPC(16);"R)ever to a previous selection,"
2420 PRINT SPC(13);"or F)inish"
2430 INPUT ANS$: IF LEN(ANS$)>0 THEN GOTO 2450
2440 GOSUB 6090: GOTO 2400
2450 GOSUB 5090: IF LEFT$(ANS$,1)="c" THEN GOTO 2500
2460 IF LEFT$(ANS$,1)="f" THEN GOTO 3990
2470 IF LEFT$(ANS$,1)<>"r" THEN GOTO 2440
2480 PRINT: PRINT "reverting to which selection number? ";
2490 INPUT "(put 0 to restart) ",NSTEP: GOTO 3670
2500 IF NSTEP+1<MAXSTEP THEN GOTO 2550
2510 IF NSTEP=MAXSTEP THEN GOTO 2530
2520 BEEP 15,25: PRINT: PRINT "last selection please!": GOTO 2550
2530 BEEP 15,25: PRINT: PRINT "limit on selection steps reached - ";
2540 PRINT "please F)inish or R)ever ";: GOTO 2430
2550 PRINT: PRINT: PRINT "characteristic of interest?"
2560 PRINT "(give characteristic number or describe in words, ";
2570 PRINT "put ? for list)": INPUT ANS$
2580 IF LEN(ANS$)>0 THEN GOTO 2600
2590 GOSUB 6090: GOTO 2550
2600 IF LEFT$(ANS$,1)<>"?" THEN GOTO 2620
2610 GOSUB 6140: GOTO 2550
2620 GOSUB 5190
2630 IF IFAIL=1 THEN GOTO 2550
2640 PRINT: PRINT N$(JJ): PRINT STRING$(LEN(N$(JJ)),45)
2650 NSTEP=NSTEP+1
2660 OLDSEL(NSTEP,1)=JJ
2670 NN=LN(JJ): IF NC(JJ)>0 THEN GOTO 2990
2680 PRINT: PRINT "your value(s) for ";N$(JJ);"?"
2690 INPUT "  lower value";RLV
2700 INPUT "  upper value? (press RETURN if none) ",ANS$
2710 RUV=VAL(ANS$)
2720 IF LEN(ANS$)=0 THEN RUV=RLV
2730 IF RLV<=RUV THEN GOTO 2770

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2740 BEEP 12,20: BEEP 15,20: PRINT
2750 PRINT "*** ERROR ** upper value < lower value - please repeat"
2760 PRINT: GOTO 2690
2770 OLDSEL(NSTEP,2)=RLV: OLDSEL(NSTEP,3)=RUV
2780 FOR SNO=1 TO NSP
2790 IF IND(SNO)=0 THEN GOTO 2970
2800 GET #1,SNO
2810 IC1=(NN-1)*LENRAN*2+1: LV=VAL(MID$(R$,IC1,LENRAN))
2820 IC2=IC1+LENRAN: UV=VAL(MID$(R$,IC2,LENRAN))
2830 IF LV=0 AND UV=0 THEN GOTO 2960
2840 NIN=0
2850 IF RLV>=LV AND RLV<=UV THEN NIN=NIN+1
2860 IF RUV>=LV AND RUV<=UV THEN NIN=NIN+1
2870 IF NIN=2 THEN GOTO 2890
2880 IF NIN=0 THEN GOTO 2920
2890 IF IND(SNO)<0 THEN GOTO 2940
2900 IF NIN=1 THEN IND(SNO)=-1
2910 GOTO 2970
2920 IF RLV>UV OR RUV<LV THEN GOTO 2960
2930 NIN=1: GOTO 2890
2940 IF NIN=1 THEN IND(SNO)=IND(SNO)-1
2950 GOTO 2970
2960 IND(SNO)=0
2970 NEXT SNO
2980 GOTO 3490
2990 PRINT: PRINT "please put 'Y' for choices of interest, ";
3000 PRINT "otherwise press RETURN": PRINT
3010 FOR J=1 TO NC(JJ): PRINT SPC(4);SN$(NN,J): NEXT J
3020 VTAB VPOS(0)-NC(JJ)
3030 NNOS=0
3040 FOR J=1 TO NC(JJ)
3050 INPUT ANS$
3060 IF LEN(ANS$)=0 THEN GOTO 3120
3070 GOSUB 5090: IF LEFT$(ANS$,1)="y" THEN GOTO 3110
3080 BEEP 12,20: BEEP 15,20: BEEP 12,20: BEEP 15,20
3090 VTAB VPOS(0)-1
3100 GOTO 3050
3110 NNOS=NNOS+1: CH(NNOS)=J
3120 NEXT J
3130 IF NNOS>0 THEN GOTO 3170
3140 BEEP 12,20: BEEP 15,20: PRINT
3150 PRINT "*** ERROR ** no choices specified - please try again"
3160 PRINT: GOTO 2990
3170 IOR=1: IF NNOS=1 THEN GOTO 3250
3180 PRINT: PRINT "Must ALL these conditions be met? (Y/N)";
3190 INPUT ANS$
3200 IF LEN(ANS$)>0 THEN GOTO 3220
3210 GOSUB 6090: GOTO 3180
3220 GOSUB 5090: IOR=0: IF LEFT$(ANS$,1)="y" THEN IOR=2
3230 IF LEFT$(ANS$,1)="n" THEN IOR=1
3240 IF IOR=0 THEN GOTO 3210
3250 OLDSEL(NSTEP,2)=IOR
3260 FOR K=1 TO NNOS: OLDSEL(NSTEP,K+2)=CH(K): NEXT K
3270 FOR SNO=1 TO NSP
3280 IF IND(SNO)=0 THEN GOTO 3480

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3290 GET #2,SNO
3300 IC=(NN-1)*MAXSEL
3310 MAIN=0: NZER=0
3320 FOR K=1 TO NNOS
3330 ISET=VAL(MID$(S$,IC+CH(K),1))
3340 IF ISET=0 THEN NZER=NZER+1
3350 IF ISET=2 THEN MAIN=MAIN+1
3360 NEXT K
3370 IF NZER=NNOS THEN GOTO 3470
3380 IF IOR=2 THEN GOTO 3410
3390 MM=1: IF MAIN=0 THEN MM=-1
3400 GOTO 3430
3410 IF NZER>0 THEN GOTO 3470
3420 MM=1: IF MAIN<>NNOS THEN MM=-1
3430 IF IND(SNO)<0 THEN GOTO 3450
3440 IND(SNO)=MM: GOTO 3480
3450 IF MM=-1 THEN IND(SNO)=IND(SNO)-1
3460 GOTO 3480
3470 IND(SNO)=0
3480 NEXT SNO
3490 A$=SPACE$(STO): J=0: K=(NSTEP-1)*N2: FOR I=1 TO NSP
3500 J=J+1: IC=(J-1)*LSEL+1
3510 MID$(A$,IC,LSEL)=STR$(IND(I))
3520 IF J<N1 THEN GOTO 3560
3530 J=0: K=K+1
3540 LSET SV$=A$: PUT #5,K
3550 A$=SPACE$(STO)
3560 NEXT I
3570 IF J=0 THEN GOTO 3590
3580 LSET SV$=A$: K=K+1: PUT #5,K
3590 PRINT: PRINT: PRINT "Selection ";NSTEP: PRINT STRING$(13,45)
3600 MAIN=0: MARG=0
3610 FOR I=1 TO NSP: II=IND(I)
3620 IF II=1 THEN MAIN=MAIN+1
3630 IF II<0 THEN MARG=MARG+1
3640 NEXT I: NSEL=MAIN+MARG: IF NSEL>0 THEN GOTO 3760
3650 BEEP 15,15: PRINT: PRINT "No suitable species found";
3660 PRINT "- reverting to previous selection": NSTEP=NSTEP-1
3670 IF NSTEP=0 THEN GOTO 3750
3680 J=0: K=(NSTEP-1)*N2+1: GET #5,K
3690 FOR I=1 TO NSP
3700 J=J+1: IC=(J-1)*LSEL+1: IND(I)=VAL(MID$(SV$,IC,LSEL))
3710 IF I=NSP THEN GOTO 3590
3720 IF J<N1 THEN GOTO 3740
3730 J=0: K=K+1: GET #5,K
3740 NEXT I: GOTO 3590
3750 PRINT: PRINT: PRINT "Starting from scratch": GOTO 2380
3760 IF MAIN=0 THEN GOTO 3870
3770 PRINT: PRINT USING "###";MAIN;: PRINT " main species:- ";
3780 IF MAIN<=PPMAIN OR NSEL<=PPTOT THEN PRINT
3790 FOR I=1 TO NSP: IF IND(I)<>1 THEN GOTO 3860
3800 GET #3,I: GET #4,I+1
3810 IF MAIN<=PPMAIN OR NSEL<=PPTOT THEN GOTO 3850
3820 IF POS(X)+LENSP+2>80 THEN PRINT TAB(25)
3830 PRINT SPC(1);SNU$;

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3840 GOTO 3860
3850 PRINT SPC(3);SNU$;" ";SPN$
3860 NEXT I
3870 IF MARG=0 THEN GOTO 3980
3880 PRINT: PRINT USING "###";MARG;: PRINT " marginal species:- ";
3890 IF NSEL<=PPTOT THEN PRINT
3900 FOR I=1 TO NSP: IF IND(I)>=0 THEN GOTO 3970
3910 GET #3,I: GET #4,I+1
3920 IF NSEL<=PPTOT THEN GOTO 3960
3930 IF POS(X)+LENSP+2>80 THEN PRINT TAB(25)
3940 PRINT SPC(1);SNU$;
3950 GOTO 3970
3960 PRINT SPC(3);SNU$;" ";SPN$
3970 NEXT I
3980 PRINT: PRINT: GOTO 2400
3990 CLOSE #5: KILL "SELTRACE.RAF"
4000 PRINT: PRINT: PRINT "Do you want  N)o output at all,"
4010 PRINT SPC(11);" a S)imple list of selected species only,"
4020 PRINT SPC(11);"or F)ull output for each selected species"
4030 INPUT ANS$
4040 IF LEN(ANS$)>0 THEN GOTO 4060
4050 GOSUB 6090: GOTO 3990
4060 GOSUB 5090: AN$=LEFT$(ANS$,1): IF AN$="n" THEN GOTO 420
4070 IF AN$="s" OR AN$="f" THEN GOTO 4090
4080 GOSUB 6090: GOTO 3990
4090 LPRINT SPC(10);"INSPIRE Species Selections"
4100 LPRINT SPC(10);STRING$(26,42): LPRINT
4110 FOR I=1 TO NSTEP: LPRINT: NCH=OLDSEL(I,1)
4120 LPRINT N$(NCH);TAB(41): IF NC(NCH)>0 THEN GOTO 4160
4130 RLV=OLDSEL(I,2): RUV=OLDSEL(I,3): LPRINT RLV;
4140 IF RUV>RLV THEN LPRINT " to ";RUV ELSE LPRINT
4150 GOTO 4220
4160 IOR=OLDSEL(I,2): FOR J=1 TO MAXSEL: CH(J)=OLDSEL(I,J+2): NEXT J
4170 N2=LN(NCH): LPRINT SN$(N2,CH(1))
4180 FOR J=2 TO MAXSEL: IF CH(J)=0 THEN GOTO 4210
4190 LPRINT SPC(36);: IF IOR=1 THEN LPRINT " or "; ELSE LPRINT "and ";
4200 LPRINT SN$(N2,CH(J))
4210 NEXT J
4220 NEXT I
4230 LPRINT: LPRINT: LPRINT SPC(10);"Selected Species"
4240 LPRINT SPC(10);STRING$(16,45)
4250 LSP=-1: IF AN$="f" AND NSEL<=MAXSFOP THEN LSP=0
4260 IF MAIN=0 THEN GOTO 4350
4270 LPRINT: LPRINT USING "###";MAIN;
4280 LPRINT " main species:-": FOR J=1 TO NSP
4290 IF IND(J)<>1 THEN GOTO 4340
4300 GET #3,J: GET #4,J+1
4310 LPRINT: LPRINT SPC(8);SNU$;" ";SPN$
4320 IF LSP<0 THEN GOTO 4340
4330 LSP=LSP+1: ORD(LSP)=J
4340 NEXT J
4350 IF MARG=0 THEN GOTO 4500
4360 L=0: I=-1
4370 LPRINT: LPRINT USING "###";MARG;: LPRINT " marginal species:-"
4380 FOR J=1 TO NSP: IF IND(J)<>I THEN GOTO 4480

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4390 GET #3,J: GET #4,J+1: L=L+1
4400 IF LSP<0 THEN GOTO 4420
4410 LSP=LSP+1: ORD(LSP)=J
4420 IF I<-5 THEN GOTO 4460
4430 K=ABS(IND(J))
4440 LL=5-K+1: A$=SPACE$(LL)+STRING$(K,42): LPRINT
4450 LPRINT A$;" ";SNU$;" ";SPN$: GOTO 4470
4460 LPRINT: LPRINT ">***** ";SNU$;" ";SPN$
4470 IF L=MARG THEN GOTO 4500
4480 NEXT J
4490 I=I-1: GOTO 4380
4500 LPRINT STRING$(1,12)
4510 IF AN$<>"f" THEN GOTO 420
4520 IF LSP>0 THEN GOTO 4570
4530 BEEP 12,20: BEEP 15,20: PRINT: PRINT
4540 PRINT "Only";MAXSFOP;"species may be printed in full";
4550 PRINT " - therefore output will not be attempted": PRINT
4560 GOTO 420
4570 LP=1
4580 FOR LS=1 TO LSP
4590 SREC=ORD(LS)
4600 GOSUB 5450
4610 NEXT LS
4620 GOTO 420
4630 REM *****
4640 REM * PRINT SECTION *
4650 REM *****
4660 PRINT: PRINT: PRINT "Do you want to print to the S)creen ";
4670 INPUT "P)rinter or B)oth ";ANS$
4680 IF LEN(ANS$)>0 THEN GOTO 4700
4690 GOSUB 6090: GOTO 4660
4700 GOSUB 5090
4710 REM LP =0 for screen only, =1 for printer only, =2 for both
4720 FOR LP=0 TO 2: IF LEFT$(ANS$,1)=BB$(LP) THEN GOTO 4740
4730 NEXT LP
4740 PRINT: INPUT "Do you want to print A)ll or S)elected species";ANS$
4750 IF LEN(ANS$)>0 THEN GOTO 4770
4760 GOSUB 6090: GOTO 4740
4770 GOSUB 5090
4780 IF LEFT$(ANS$,1)="s" THEN GOTO 4960
4790 IF LEFT$(ANS$,1)<>"a" THEN GOTO 4760
4800 PRINT: INPUT "Do you want F)ull information or N)ames only";ANS$
4810 IF LEN(ANS$)>0 THEN GOTO 4830
4820 GOSUB 6090: GOTO 4800
4830 GOSUB 5090
4840 IF LEFT$(ANS$,1)="f" THEN GOTO 4950
4850 IF LEFT$(ANS$,1)<>"n" THEN GOTO 4820
4860 IF LP<>1 THEN PRINT
4870 FOR SREC=1 TO NSP: GET #3,SREC: GET #4,SREC+1
4880 IF LP=1 THEN GOTO 4920
4890 PRINT SPC(3);SNU$;" ";SPN$: A%=SREC\20
4900 IF SREC-A%*20<>0 OR SREC=NSP THEN GOTO 4920
4910 PRINT: INPUT "Press RETURN to continue",ANS$: PRINT
4920 IF LP<>0 THEN LPRINT SNU$;" ";SPN$
4930 NEXT SREC: IF LP<>0 THEN LPRINT STRING$(1,12)

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4940 GOTO 420
4950 FOR SREC=1 TO NSP: GOSUB 5450: NEXT SREC: GOTO 420
4960 PRINT: PRINT: PRINT "Species to print? (give number or name, ";
4970 PRINT "press RETURN to finish)": INPUT ANS$
4980 L=LEN(ANS$): IF L=0 THEN GOTO 420
4990 GOSUB 6280: IF IFAIL=1 THEN GOTO 4960
5000 GOSUB 5450: GOTO 4960
5010 REM *****
5020 REM *   FINISH SECTION   *
5030 REM *****
5040 PRINT:PRINT:PRINT: PRINT SPC(30);"end of INSPIRE"
5050 PRINT: PRINT SPC(25);"Thank you....and goodbye"
5060 PRINT: PRINT: PRINT
5070 END
5080 REM -----
5090 REM ROUTINE TO CONVERT TEXT STRINGS TO LOWER CASE
5100 FOR II=1 TO LEN(ANS$)
5110 IA=ASC(MID$(ANS$,II,1))
5120 IF IA >= 65 AND IA <= 90 THEN GOTO 5140
5130 GOTO 5160
5140 IA=IA+32
5150 MID$(ANS$,II,1)=CHR$(IA)
5160 NEXT II
5170 RETURN
5180 REM -----
5190 REM ROUTINE TO IDENTIFY CHARACTERISTIC SELECTION
5200 IFAIL=0
5210 JJ=VAL(ANS$): IF JJ=0 AND ANS$<>"0" THEN GOTO 5240
5220 IF JJ>=ICAT-2 AND JJ<=MAXCH THEN RETURN
5230 GOTO 5300
5240 GOSUB 5090: NM=0
5250 FOR KK=ICAT-2 TO MAXCH
5260 IF INSTR(N$(KK),ANS$)=0 THEN GOTO 5280
5270 NM=NM+1: JJ=KK: LC(NM)=KK
5280 NEXT KK
5290 IF NM>0 THEN GOTO 5360
5300 IFAIL=1
5310 BEEP 12,20: BEEP 15,20: PRINT
5320 PRINT "** ERROR ** characteristic not identified - ";
5330 PRINT "please check the list"
5340 GOSUB 6140
5350 RETURN
5360 IF NM=1 THEN RETURN
5370 IFAIL=1: BEEP 12,20: BEEP 15,20: PRINT
5380 PRINT "** ERROR ** wording not unique - ";
5390 PRINT "which characteristic do you mean please?"
5400 PRINT: FOR J=1 TO NM
5410 IF J<NM THEN PRINT SPC(3); ELSE PRINT "or ";
5420 PRINT USING "  ## ";LC(J);: PRINT " ";N$(LC(J)): NEXT J
5430 RETURN
5440 REM -----
5450 REM ROUTINE TO PRINT ALL INFORMATION ON SPECIES AT RECORD SREC
5460 NL=3: P1=1-LENRAN
5470 GET #1,SREC: GET #2,SREC
5480 GET #3,SREC: GET #4,SREC+1

```

```

5490 IF LP=1 THEN GOTO 5530
5500 PRINT: PRINT: PRINT "Species ";
5510 PRINT SNU$;" ";SPN$: PRINT STRING$(80,45): PRINT
5520 IF LP=0 THEN GOTO 5550
5530 LPRINT "Species ";
5540 LPRINT SNU$;" ";SPN$: LPRINT STRING$(80,45): LPRINT
5550 FOR I=1 TO MAXCH
5560 N2=LN(I): NP=0
5570 IF LP<>1 THEN PRINT N$(I);
5580 IF LP=0 THEN GOTO 5600
5590 LPRINT N$(I);
5600 IF NC(I)>0 THEN GOTO 5790
5610 P1=P1+LENRAN: A$=MID$(R$,P1,LENRAN)
5620 P1=P1+LENRAN: B$=MID$(R$,P1,LENRAN)
5630 IF VAL(A$)<>0 OR VAL(B$)<>0 THEN GOTO 5670
5640 IF LP<>1 THEN PRINT TAB(41);"- "
5650 IF LP<>0 THEN LPRINT TAB(41);"- "
5660 GOTO 5760
5670 IF LP=1 THEN GOTO 5720
5680 PRINT TAB(41);A$;
5690 IF VAL(A$)=VAL(B$) THEN GOTO 5710
5700 PRINT " to ";B$;
5710 PRINT
5720 IF LP=0 THEN GOTO 5760
5730 LPRINT TAB(41);A$;; IF VAL(A$)=VAL(B$) THEN GOTO 5750
5740 LPRINT " to ";B$;
5750 LPRINT: IF LP=1 THEN GOTO 6030
5760 NL=NL+1: IF NL<16 THEN GOTO 6030
5770 PRINT: INPUT "press RETURN to continue",A$: PRINT: NL=0
5780 GOTO 6030
5790 IF LP<>1 THEN PRINT TAB(39)
5800 IF LP<>0 THEN LPRINT TAB(39)
5810 P2=(N2-1)*MAXSEL: FOR J=1 TO NC(I): K=VAL(MID$(S$,P2+J,1))
5820 IF K=0 THEN GOTO 5970
5830 NP=NP+1: IF NP=1 THEN GOTO 5860
5840 IF LP<>1 THEN PRINT ",";
5850 IF LP<>0 THEN LPRINT ",";
5860 IF LP<>1 THEN PX=POS(X) ELSE PX=LPOS(X)
5870 L=LEN(SN$(N2,J))+3: LL=PX+L: IF LP=1 THEN GOTO 5930
5880 IF LL<=80 THEN GOTO 5900
5890 NL=NL+1: PRINT: PRINT TAB(39)
5900 IF K=1 THEN PRINT " *"; ELSE PRINT " ";
5910 PRINT SN$(N2,J);
5920 IF LP=0 THEN GOTO 5970
5930 IF LL<=80 THEN GOTO 5950
5940 LPRINT: LPRINT TAB(39)
5950 IF K=1 THEN LPRINT " *"; ELSE LPRINT " ";
5960 LPRINT SN$(N2,J);
5970 NEXT J: IF LP=1 THEN GOTO 6010
5980 IF NP=0 THEN PRINT " -";
5990 PRINT
6000 IF LP=0 THEN GOTO 5760
6010 IF NP=0 THEN LPRINT " -";
6020 LPRINT: IF LP<>1 THEN GOTO 5760
6030 NEXT I

```

```

6040 IF LP<>0 THEN LPRINT STRING$(1,12)
6050 IF LP=1 OR NL=0 THEN RETURN
6060 PRINT: INPUT "press RETURN to continue",A$
6070 RETURN
6080 REM -----
6090 REM ROUTINE TO PRINT DIAGNOSTIC MESSAGE
6100 BEEP 12,20: BEEP 15,20: PRINT
6110 PRINT "*** ERROR **  invalid reply - please repeat": PRINT
6120 RETURN
6130 REM -----
6140 REM ROUTINE TO PRINT CHARACTERISTICS LIST IN TWO COLUMNS
6150 PRINT: LM=MAXCH+(3-ICAT): LE=(LM+1)/2: NPP=11
6160 IF LE>NPP THEN LE=NPP
6170 NN=1: L=ICAT-2
6180 HT=1
6190 HTAB HT: PRINT USING "  ## ";L;: PRINT " ";N$(L)
6200 NN=NN+1: L=L+1: IF L<=MAXCH THEN GOTO 6220
6210 VTAB LV: RETURN
6220 IF NN<=LE THEN GOTO 6190
6230 NN=1: IF LM<=NPP*2 OR HT=1 THEN GOTO 6260
6240 PRINT: INPUT "press return to continue",A$: PRINT
6250 GOTO 6180
6260 LV=VPOS(0): VTAB LV-LE: HT=41: GOTO 6190
6270 REM -----
6280 REM ROUTINE TO FIND SPECIES LOCATION BY NUMBER OR NAME
6290 REM * warning * this routine is v. slow when searching by name
6300 IFAIL=0: IF VAL(ANS$)=0 THEN GOTO 6350
6310 A$=ANS$: B$=LEFT$(ANS$+SPACE$(LENSP),LENSP)
6320 FOR SREC=1 TO NSP: GET #4,SREC+1
6330 IF B$=SNU$ THEN GOTO 6420
6340 NEXT SREC: GOTO 6540
6350 GOSUB 5090: A$=ANS$: NM=0: FOR J=1 TO NSP: GET #3,J
6360 ANS$=SPN$: GOSUB 5090
6370 IF INSTR(ANS$,A$)=0 THEN GOTO 6390
6380 NM=NM+1: IND(NM)=J
6390 NEXT J
6400 IF NM<>1 THEN GOTO 6470
6410 SREC=IND(1): GET #4,SREC+1
6420 SNO$=SNU$: GET #3,SREC
6430 FOR J=LEN(SPN$) TO 1 STEP -1
6440 IF ASC(MID$(SPN$,J,1))<>32 THEN GOTO 6460
6450 NEXT J
6460 SPP$=LEFT$(SPN$,J): RETURN
6470 IF NM=0 THEN GOTO 6540
6480 BEEP 12,20: BEEP 15,20: PRINT: PRINT "*** ERROR **  wording ";
6490 PRINT "not unique - which species do you mean please?": PRINT
6500 FOR J=1 TO NM: JJ=IND(J): GET #3,JJ: GET #4,JJ+1
6510 IF J-(J\15)*15<>1 OR J=1 THEN GOTO 6530
6520 PRINT: INPUT "press RETURN to continue",A$: PRINT
6530 PRINT SPC(3);SNU$;" ";SPN$: NEXT J: IFAIL=1: RETURN
6540 BEEP 12,20: BEEP 15,20: PRINT: PRINT "*** ERROR **  species ";A$;
6550 PRINT " is not recorded - please try again": IFAIL=1: RETURN
6560 REM -----
6570 REM ROUTINE FOR OPTIONAL SPECIES PRINT
6580 LP=-1

```

```

6590 PRINT: PRINT "Do you want to print species ";SNO$;
6600 INPUT "? (Y/N) ",ANS$
6610 IF LEN(ANS$)>0 THEN GOTO 6630
6620 GOSUB 6090: GOTO 6590
6630 GOSUB 5090: IF LEFT$(ANS$,1)="n" THEN RETURN
6640 IF LEFT$(ANS$,1)<>"y" THEN GOTO 6620
6650 PRINT: INPUT "Do you want a copy on the printer? (Y/N) ",ANS$
6660 GOSUB 5090: IF LEFT$(ANS$,1)="n" THEN LP=0
6670 IF LEFT$(ANS$,1)="y" THEN LP=2
6680 IF LP=-1 THEN GOTO 6620
6690 RETURN
6700 REM -----
6710 REM The data here may be varied when setting up the database.
6720 REM The first line contains char. settings - no. of catagories,
6730 REM or 0 if a range, or -1 if species no./name
6740 DATA -1,0,0,3,0,0,0,0,3,3,4,6,0,5,4,10,0,10,0,9,9,9
6750 REM Char. names, & catagory names for selection-type chars.
6760 DATA "species number/species name","altitude (metres)"
6770 DATA "mean annual rainfall (mm)"
6780 DATA "rainfall regime","dry season (months)"
6790 DATA "mean max. temp. hottest month (C)"
6800 DATA "mean min. temp. coldest month (C)"
6810 DATA "mean annual temperature (C)","soil texture","soil reaction"
6820 DATA "soil drainage","other soil characteristics"
6830 DATA "size of tree (metres)","form of tree","light requirements"
6840 DATA "other silvic. characteristics"
6850 DATA "production potential (m3/ha/an)","role in land use"
6860 DATA "timber density (S.G.)"
6870 DATA "sawtimber utilization","roundwood utilization"
6880 DATA "other timber products"
6890 DATA "winter","summer","uniform"
6900 DATA "light","medium","heavy"
6910 DATA "alkaline","neutral","acid"
6920 DATA "free draining","moist","impeded","seasonally waterlogged"
6930 DATA "shallow","deep","fertile","saline"
6940 DATA "adaptable","poor/infertile"
6950 DATA "exceptional","good","acceptable","poor","variable"
6960 DATA "strongly demanding","moderately demanding"
6970 DATA "shade tolerant","shade tolerant in youth"
6980 DATA "coppices/root suckers","fire resistant","frost resistant"
6990 DATA "termite resistant","drought hardy","requires wide spacing"
7000 DATA "fixes nitrogen","windfirm","tolerates salt winds"
7010 DATA "regenerates rapidly"
7020 DATA "shade and shelter","agricultural shade","windbreaks"
7030 DATA "erosion control","dune/soil stabilisation","agroforestry"
7040 DATA "land reclamation","soil improvement","ornamental"
7050 DATA "miscellaneous"
7060 DATA "heavy construction","light construction","boxes crates etc."
7070 DATA "furniture","boat building","carpentry/joinery"
7080 DATA "flooring/panelling","railway sleepers","miscellaneous"
7090 DATA "transmission poles","building poles/piling","posts"
7100 DATA "fuel/charcoal","shortfibre pulp","longfibre pulp"
7110 DATA "veneer/plywood","turnery","miscellaneous"
7120 DATA "resins","tannins","fodder","oils","gums","medicinal products"
7130 DATA "honeyflora","edible fruits/seeds","miscellaneous"

```

Appendix III

Analysis of Mean Annual Temperature Variation

in Tropical and Sub-Tropical Latitudes 1/.

Data from 1045 meteorological stations 2/. was analysed to investigate the effect of various factors on mean annual temperature between latitudes 30°N and 30°S. The variables studied were; altitude, latitude, mean annual precipitation and distance from the sea. It was not possible to include other possible influences, such as cloud cover, ocean currents, etc., due to lack of data.

The distribution of the stations studied was as follows:

continent	number of stations						
	altitude (m)						
	<u>0</u> 100	<u>101</u> 500	<u>501</u> 1000	<u>1001</u> 1500	<u>1501</u> 2000	<u>2001</u> 3000	over 3000
Americas	120	58	46	25	23	31	16
Africa	81	94	54	62	27	11	0
Asia	236	95	32	20	7	5	2
	latitude (°)						
	20-30N	10-20N	0-10N	0-10S	10-20S	20-30S	
Americas	57	66	52	41	51	52	
Africa	27	48	77	59	61	57	
Asia	97	110	60	43	38	49	

1/. The authors gratefully acknowledge the advice and assistance in the analysis given by Mr. H. L. Wright of C.F.I., Oxford.

2/. The data was derived from Walter, H. and Leith, H. (1967) Klimadiagramm-Weltatlas, Gustav Fischer Verlag, Jena.

The distribution was largely governed by the existence land area, and consequently meteorological data, in the various categories. As a result of the scanty data available at higher altitudes in Asia and Africa, the analysis in these continents was restricted to altitudes of 0-1500 metres and 0-2000 metres respectively. Preliminary analysis of the data also showed that in the arid land masses of northern Africa and Australia no regular trends could be discovered and consequently Africa north of latitude 15°N and Australia south of 15°S were excluded from further analysis.

Within these limitations, multiple regression equations for MAT on the previously mentioned variables were calculated separately for each of the continents. All three regressions were highly significant. In no case did mean annual precipitation or distance from the sea make any significant contribution. The equations were as below, where

MAT = mean annual temperature (°C)  
A = altitude in metres  
L = latitude in degrees

Americas ( $r^2 = 0.942$ )

$$\text{MAT} = 26.75 + 0.06785L - 0.003585A - 0.006844L^2 \\ - 0.0000004714A^2 - 0.00000001086A^2L + 0.000001666AL^2$$

Africa ( $r^2 = 0.869$ )

$$\text{MAT} = 27.00 + 0.07041L - 0.002044A - 0.003546L^2 \\ - 0.000001459A^2 - 0.00000001510A^2L + 0.0000000007832A^2L^2$$

Asia and Pacific ( $r^2 = 0.777$ )

$$\text{MAT} = 27.82 - 0.006527A - 0.005921L^2 + 0.0003830AL \\ - 0.0000002047A^2L - 0.000009918AL^2 + 0.000000006839A^2L^2$$

Use of the above regressions resulted in the estimates of MAT listed below for each continent. As previously explained the calculated values only cover the altitudinal ranges for which sufficient data was analysed and latitudes where the regressions are significant.



Values of Mean Annual Temperature Derived  
from Multiple Regression Formulae

AMERICAS

ALTITUDE	(north)					LATITUDE					(south)		
	30.0	25.0	20.0	15.0	10.0	5.0	0.0	-5.0	-10.0	-15.0	-20.0	-25.0	-30.0
0	23.1	24.6	25.8	26.7	27.2	27.4	27.2	26.7	25.8	24.6	23.1	21.2	19.0
200	22.6	24.1	25.2	26.0	26.5	26.6	26.5	26.0	25.1	24.0	22.5	20.7	18.6
400	22.1	23.5	24.5	25.3	25.7	25.9	25.7	25.2	24.4	23.3	21.9	20.2	18.1
600	21.5	22.8	23.8	24.5	24.9	25.1	24.9	24.4	23.7	22.6	21.3	19.6	17.7
800	22.1	23.0	23.7	24.1	24.2	24.0	23.6	22.9	22.9	21.9	20.6	19.1	17.2
1000	20.2	21.3	22.2	22.8	23.2	23.3	23.1	22.7	22.1	21.1	19.9	18.5	16.8
1200	19.4	20.5	21.3	21.9	22.3	22.4	22.2	21.8	21.2	20.3	19.2	17.9	16.3
1400	18.6	19.6	20.4	20.9	21.3	21.4	21.3	20.9	20.3	19.5	18.5	17.3	15.8
1600	17.7	18.6	19.4	19.9	20.2	20.4	20.3	20.0	19.4	18.7	17.8	16.6	15.3
1800	16.7	17.6	18.3	18.8	19.2	19.3	19.2	19.0	18.5	17.9	17.0	16.0	14.8
2000	15.7	16.6	17.2	17.7	18.0	18.2	18.1	17.9	17.5	17.0	16.3	15.3	14.3
2200	14.6	15.4	16.1	16.5	16.9	17.0	17.0	16.9	16.6	16.1	15.5	14.7	13.7
2400	13.5	14.2	14.8	15.3	15.6	15.8	15.9	15.8	15.5	15.2	14.6	14.0	13.2
2600	12.3	13.0	13.6	14.0	14.4	14.6	14.7	14.7	14.5	14.2	13.8	13.3	12.6
2800	11.0	11.7	12.2	12.7	13.1	13.3	13.5	13.5	13.4	13.2	12.9	12.5	12.0
3000	9.6	10.3	10.9	11.3	11.7	12.0	12.2	12.3	12.3	12.2	12.1	11.8	11.4

AFRICA

ALTITUDE	(north)		LATITUDE					(south)		
	15.0	10.0	5.0	0.0	-5.0	-10.0	-15.0	-20.0	-25.0	-30.0
0	27.7	27.8	27.7	27.5	27.0	26.4	25.6	24.6	23.5	22.1
200	27.3	27.3	27.3	27.0	26.5	25.9	25.1	24.2	23.0	22.1
400	26.7	26.8	26.7	26.4	25.9	25.3	24.5	23.6	22.4	21.1
600	26.1	26.1	26.0	25.7	25.2	24.6	23.8	22.9	21.8	20.5
800	25.4	25.4	25.2	24.9	24.4	23.8	23.0	22.1	21.0	19.7
1000	24.6	24.5	24.3	23.9	23.5	22.8	22.0	21.1	20.1	18.9
1200	23.7	23.6	23.3	22.9	22.4	21.7	21.0	20.1	19.1	18.0
1400	22.8	22.5	22.2	21.7	21.2	20.5	19.8	18.9	18.0	16.9
1600	21.7	21.4	21.0	20.4	19.9	19.2	18.5	17.6	16.8	15.8
1800	20.6	20.1	19.6	19.0	18.4	17.7	17.0	16.3	15.4	14.6
2000	19.4	18.8	18.2	17.5	16.9	16.2	15.5	14.7	14.0	13.2

ASIA AND PACIFIC

ALTITUDE	(north)					LATITUDE					(south)
	30.0	25.0	20.0	15.0	10.0	5.0	0.0	-5.0	-10.0	-15.0	
0	22.9	24.6	25.9	26.9	27.7	28.1	28.3	28.1	27.7	26.9	
200	22.1	23.9	25.3	26.3	26.9	27.1	27.0	26.4	25.5	24.2	
400	21.4	23.2	24.6	25.5	26.0	26.0	25.7	24.8	23.6	21.9	
600	20.6	22.4	23.7	24.6	25.0	24.9	24.4	23.3	21.9	19.9	
800	19.8	21.5	22.8	23.5	23.9	23.7	23.0	21.9	20.3	18.3	
1000	19.0	20.6	21.7	22.4	22.6	22.4	21.7	20.6	19.1	17.0	
1200	18.2	19.6	20.5	21.1	21.3	21.1	20.4	19.4	18.0	16.2	
1400	17.4	18.5	19.3	19.7	19.8	19.6	19.1	18.3	17.1	15.7	

- SPECIES DATA SHEETS -

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; soil improvement; agroforestry
TIMBER:	
24 DENSITY .....	S.G. 0.58-0.71
25 NATURAL DURABILITY .....	Perishable
26 PRESERVATION .....	Easy
27 SAWING .....	Fair
28 SEASONING .....	Good
29 OTHER FEATURES .....	Weak; tends to 'spring' after sawing.
UTILIZATION:	
30 SAW TIMBER .....	Furniture; boxes; boat building.
31 ROUNDWOOD .....	Household utensils; fence posts; cartwheels; fuel c.v. = 19.74 kJ/kg; short fibre pulp.
32 OTHER PRODUCTS .....	Fodder (leaves and pods; 400-600 kg pods/ha/ann; N.B. store pods dry to avoid toxicity); tannin; gum.
NURSERY:	
33 SEED SOURCES .....	Notably Senegal, but also from most dry zone African countries.
34 SEEDS PER KILOGRAMME .....	11,500-20,000 seeds or 3,500 plants/kg of seed.
35 STORAGE .....	Several years at ambient temperatures
36 PRE-TREATMENT .....	Soak in cold water for 24 hours
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .....	None
39 GERMINATION AND GROWTH .....	40-60% germination in 6-30 days. Plantable size in 4-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance. Bruchid beetles may infest seed.
PRINCIPAL REFERENCES: 28 47 69 85 107 118 120 134	

SPECIES: *Acacia albida* Del.

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>Faidherbia albida</i> (Del.) A. Chev.
3 LOCAL OR TRADE NAMES .....	Kad; Kababu; Ana tree; Winter thorn.
NATURAL OCCURRENCE:	
4 LATITUDES .....	35°N-25°S
5 AREAS .....	Africa from lower Egypt to South Africa (but excluding rain forest zones) and Asia Minor.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,000 m
7 MEAN ANNUAL RAINFALL .....	250-1,000 mm
8 RAINFALL REGIME .....	Winter/Summer
9 DRY SEASON .....	6-9 months
10 MEAN MAX. TEMP. ....	
HOTTEST MONTH .....	30-42°C
11 MEAN MIN. TEMP. ....	
COLDEST MONTH .....	6-18°C
12 MEAN ANNUAL TEMP. ....	18-30°C
SOILS:	
13 TEXTURE .....	Medium/light
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; tolerates seasonal waterlogging.
16 OTHER CHARACTERISTICS .....	Requires high water table in lowest rainfall areas; tolerates slight salinity.
SILVICULTURE:	
17 SIZE .....	h = 15-25 m
18 DESCRIPTION .....	Deciduous; spiny.
19 FORM .....	Poor; sometimes buttressed.
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; termite resistant; fixes nitrogen; tolerates moderate frosts; drought hardy; substantial provenance variation; leafy during dry season.

SPECIES: <u>Acacia auriculiiformis</u> A. Cunn. ex Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. auriculiiformis</u> A. Cunn.
3 LOCAL OR TRADE NAMES .....	Tan Wattle
NATURAL OCCURRENCE:	
4 LATITUDES .....	20-7°S
5 AREAS .....	Coastal Queensland, Papua New Guinea and islands of Torres Strait
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	1,300-1,700 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-34°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	20-24°C
12 MEAN ANNUAL TEMP. ....	24-29°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates shallow soils and is adaptable to most soil conditions
SILVICULTURE:	
17 SIZE .....	h = 15-25 m; d = 35-60 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices poorly but regenerates rapidly; fixes nitrogen.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-20
ROLE IN LAND USE:	
23 .....	Shade and shelter; dune fixation; anti-erosion; soil improvement; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.60-0.75
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Small size and form limit use as sawtimber.
UTILIZATION:	
30 SAW TIMBER .....	Limited use for furniture
31 ROUNDWOOD .....	Building poles; fence posts; fuel (c.v.=20,110-20,450 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Tannins
NURSERY:	
33 SEED SOURCES .....	Malaysia, Indonesia and Papua New Guinea.
34 SEEDS PER KILOGRAMME .....	39,000-42,000
35 STORAGE .....	Dry and airtight for one-two years.
36 PRE-TREATMENT .....	Boiling water till cool
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH .....	50% germination in 5-15 days (No information on growth in nursery)
PRINCIPAL PESTS AND DISEASES:	
40 .....	Roots attacked by <u>Canoderma lucidum</u> , but generally none of importance reported.
PRINCIPAL REFERENCES:	
59	120 121 128 149 152 172

SPECIES: <u>Acacia auriculiiformis</u> A. Cunn. ex Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. auriculiiformis</u> A. Cunn.
3 LOCAL OR TRADE NAMES .....	Tan Wattle
NATURAL OCCURRENCE:	
4 LATITUDES .....	20-7°S
5 AREAS .....	Coastal Queensland, Papua New Guinea and islands of Torres Strait
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	1,300-1,700 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-34°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	20-24°C
12 MEAN ANNUAL TEMP. ....	24-29°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates shallow soils and is adaptable to most soil conditions
SILVICULTURE:	
17 SIZE .....	h = 15-25 m; d = 35-60 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices poorly but regenerates rapidly; fixes nitrogen.

SPECIES: <u>Acacia cyanophylla</u> Lindl.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Acacia saligna</u> (Labill.) Wendl.
3 LOCAL OR TRADE NAMES	Orange Wattle; Golden Wreath Wattle; Blue-leafed Wattle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-29°S
5 AREAS .....	S.W. coastal strip of W. Australia, early introduction to S. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,500 m
7 MEAN ANNUAL RAINFALL .....	300-1,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	16-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow or moderately saline soils, and highly alkaline soils.
SILVICULTURE:	
17 SIZE .....	h = 4-8 m
18 DESCRIPTION .....	Evergreen shrub or tree
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Moderately tolerant of shade
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; fire resistant; tolerates salt winds; fixes nitrogen; drought hardy; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	2-5
ROLE IN LAND USE:	
23 .....	Windbreaks; dune fixation; anti-erosion.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal.
32 OTHER PRODUCTS .....	Fodder; gum.
NURSERY:	
33 SEED SOURCES .....	Australia
34 SEEDS PER KILOGRAMME .	50,000-60,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 2-7 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	8 52 71 84 95 121 152

SPECIES: <u>Acacia cyanophylla</u> Lindl.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Acacia saligna</u> (Labill.) Wendl.
3 LOCAL OR TRADE NAMES	Orange Wattle; Golden Wreath Wattle; Blue-leafed Wattle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-29°S
5 AREAS .....	S.W. coastal strip of W. Australia, early introduction to S. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,500 m
7 MEAN ANNUAL RAINFALL .....	300-1,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	16-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow or moderately saline soils, and highly alkaline soils.
SILVICULTURE:	
17 SIZE .....	h = 4-8 m
18 DESCRIPTION .....	Evergreen shrub or tree
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Moderately tolerant of shade
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; fire resistant; tolerates salt winds; fixes nitrogen; drought hardy; frost tender.

SPECIES: <i>Acacia cyclops</i> A. Cunn. ex G. Don.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Rooikrans; Red-eye.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-33°S
5 AREAS .....	S.W. Australia; naturalised in coastal Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-300 m
7 MEAN ANNUAL RAINFALL	250-750 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	28-32°C
11 MEAN MIN. TEMP.	8-10°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Well drained
16 OTHER CHARACTERISTICS	Tolerates saline soils
SILVICULTURE:	
17 SIZE .....	h = 3-8 m
18 DESCRIPTION .....	Multistemmed, evergreen shrub; phyllodes present
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Light demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; tolerates salt winds; fixes nitrogen; slightly frost resistant; drought hardy; fuelwood rotation of 7-10 years.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Dune stabilisation; shelterbelts; windbreaks.
TIMBER:	
24 DENSITY .....	
25 NATURAL DURABILITY ...	
26 PRESERVATION .....	
27 SAWING .....	
28 SEASONING .....	
29 OTHER FEATURES .....	
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Building poles; high quality firewood.
32 OTHER PRODUCTS .....	Fodder (12-60 kg dry wt/tree/year)
NURSERY:	
33 SEED SOURCES .....	N. Australia, Spain, France, Tunisia, Cyprus.
34 SEEDS PER KILOGRAMME	23,000-30,000
35 STORAGE .....	
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	
38 SPECIAL REQUIREMENTS	
39 GERMINATION AND GROWTH	50-70% germination.
PRINCIPAL PESTS AND DISEASES:	
40 .....	
PRINCIPAL REFERENCES:	
	28 71 121 134

SPECIES: <i>Acacia cyclops</i> A. Cunn. ex G. Don.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Rooikrans; Red-eye.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-33°S
5 AREAS .....	S.W. Australia; naturalised in coastal Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-300 m
7 MEAN ANNUAL RAINFALL	250-750 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	28-32°C
11 MEAN MIN. TEMP.	8-10°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Well drained
16 OTHER CHARACTERISTICS	Tolerates saline soils
SILVICULTURE:	
17 SIZE .....	h = 3-8 m
18 DESCRIPTION .....	Multistemmed, evergreen shrub; phyllodes present
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Light demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; tolerates salt winds; fixes nitrogen; slightly frost resistant; drought hardy; fuelwood rotation of 7-10 years.

SPECIES: Acacia decurrens Willd.

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Acacia decurrens</u> var. <u>normalis</u> Benth.
3 LOCAL OR TRADE NAMES .	Green wattle
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-25°C
5 AREAS .....	Australia: Victoria, N.S.W., Queensland. Well established in S. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,000-2,500 m
7 MEAN ANNUAL RAINFALL .	900-2,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	16-24°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	2-10°C
12 MEAN ANNUAL TEMP, ....	12-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 10-20 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Frost resistant; root suckers vigorously; 15 year firewood rotation.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	6-16 (-20)
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.50-0.70
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Fissile
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Building poles; fence posts; fuel (c.v. = 19,430-19,470 kJ/kg) and charcoal.
32 OTHER PRODUCTS .....	Tannins; green manure.
NURSERY:	
33 SEED SOURCES .....	South Africa; Australia.
34 SEEDS PER KILOGRAMME .	70,000-80,000
35 STORAGE .....	Dry, cold and airtight for 1-2 years.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Direct sown; bare-rooted plants.
38 SPECIAL REQUIREMENTS .	Direct sow pre-treated at 2 kg/ha.
39 GERMINATION AND GROWTH	Germinates in 7-14 days Plantable size in 5-7 months
PRINCIPAL PESTS AND DISEASES:	
40 .....	Defoliator <u>Acanthopsycha junode</u> (less than <u>A. mearnsii</u> )
PRINCIPAL REFERENCES: 49 152	

SPECIES: <u>Acacia farnesiana</u> (L.) Willd.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. cavenia</u> Bert.; <u>Mimosa farnesiana</u> L.
3 LOCAL OR TRADE NAMES	Cassia flower; Opopanax (Southern U.S.A.); Espino blanco; lluisache (Mex.).
NATURAL OCCURRENCE:	
4 LATITUDES .....	30°N-40°S
5 AREAS .....	Tropical Americas from Texas to Chile. Naturalised in parts of E. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,300 m
7 MEAN ANNUAL RAINFALL	400-600 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	25-32°C
11 MEAN MIN. TEMP.	2-10°C
12 MEAN ANNUAL TEMP. ....	15-28°C
SOILS:	
13 TEXTURE .....	Light/(medium/heavy)
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Well drained
16 OTHER CHARACTERISTICS	Tolerates poor and saline soils
SILVICULTURE:	
17 SIZE .....	h = 3-4 m
18 DESCRIPTION .....	Small, thorny tree; much branched.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Fire resistant; drought hardy; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; hedges.
TIMBER:	
24 DENSITY .....	S.G. = 0.83
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	
27 SAWING .....	
28 SEASONING .....	
29 OTHER FEATURES .....	Hard; close grained.
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Posts; turnery; fuelwood (c.v. = 19,218 kJ/kg)
32 OTHER PRODUCTS .....	Fodder (leaves); tannin; gum; toothbrushes; dyes; host for lac insect; perfume.
NURSERY:	
33 SEED SOURCES .....	Australia, France, Kenya, Sudan, Uruguay, Cyprus.
34 SEEDS PER KILOGRAMME	10,000-13,000
35 STORAGE .....	Ambient temperature for several years.
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Bare rooted plants; cuttings.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	70% germination.
PRINCIPAL PESTS AND DISEASES:	
40 .....	
PRINCIPAL REFERENCES: 10 42 49 71 150	

SPECIES: <u>Acacia farnesiana</u> (L.) Willd.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. cavenia</u> Bert.; <u>Mimosa farnesiana</u> L.
3 LOCAL OR TRADE NAMES	Cassia flower; Opopanax (Southern U.S.A.); Espino blanco; lluisache (Mex.).
NATURAL OCCURRENCE:	
4 LATITUDES .....	30°N-40°S
5 AREAS .....	Tropical Americas from Texas to Chile. Naturalised in parts of E. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,300 m
7 MEAN ANNUAL RAINFALL	400-600 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	25-32°C
11 MEAN MIN. TEMP.	2-10°C
12 MEAN ANNUAL TEMP. ....	15-28°C
SOILS:	
13 TEXTURE .....	Light/(medium/heavy)
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Well drained
16 OTHER CHARACTERISTICS	Tolerates poor and saline soils
SILVICULTURE:	
17 SIZE .....	h = 3-4 m
18 DESCRIPTION .....	Small, thorny tree; much branched.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Fire resistant; drought hardy; frost tender.



SPECIES: Acacia mangium Willd.

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	-
NATURAL OCCURRENCE:	
4 LATITUDES .....	18-1°S
5 AREAS .....	Australia: N. Queensland, Papua New Guinea and Moluccas Islands.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-100 (-720) m
7 MEAN ANNUAL RAINFALL .	1,000-2,100 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	3-4 months
10 MEAN MAX. TEMP.	30-32°C
11 MEAN MIN. TEMP.	13-22°C
12 MEAN ANNUAL TEMP. ....	18-28°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Acid/neutral
15 DRAINAGE .....	Moist; tolerates seasonal waterlogging.
16 OTHER CHARACTERISTICS	Tolerates very poor sites and slight salinity; often grows on creek and swamp margins.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Fluted bole.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Fairly light demanding.
21 OTHER CHARACTERISTICS	Coppices; fixes nitrogen; competes well with Imperata grass; regenerates freely on disturbed sites.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	20-46
ROLE IN LAND USE:	
23 .....	Plantation of water catchments; firebreaks; reforestation after shifting cultivation.
TIMBER:	
24 DENSITY .....	S.G. = 0.63-0.69
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	General construction; furniture, boxes.
31 ROUNDWOOD .....	Veneer/plywood; shortfibre pulp; particle board.
32 OTHER PRODUCTS .....	Fodder; medicines.
NURSERY:	
33 SEED SOURCES .....	Papua New Guinea; Queensland, Australia.
34 SEEDS PER KILOGRAMME .	40,000-70,000
35 STORAGE .....	Cold, sealed.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Bare-rooted plants.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH -	-
PRINCIPAL PESTS AND DISEASES:	
40 .....	Seedlings attacked by insects in nursery.
PRINCIPAL REFERENCES: 1 156 157	

SPECIES: <u>Acacia mearnsii</u> De Wild.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. decurrens</u> var. <u>mollis</u> Lindl.
3 LOCAL OR TRADE NAMES	Black wattle; Tan wattle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-25°S
5 AREAS .....	Australia; Tasmania, Victoria, N.S.W., S. Australia and non-tropical Queensland. Well established in S. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	100-2,500 m
7 MEAN ANNUAL RAINFALL .....	700-2,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	18-24°C
11 MEAN MIN. TEMP.	2-8°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 7-10 (up to 20) m; d = 10-60 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices poorly; tolerates salt winds; fixes nitrogen; moderately drought hardy; moderately frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-25
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; anti-erosion; soil improvement.
TIMBER:	
24 DENSITY .....	S.G. 0.65-0.85
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Fair
27 SAWING .....	-
28 SEASONING .....	Fair; tendency to warp.
29 OTHER FEATURES .....	Fissile
UTILIZATION:	
30 SAW TIMBER .....	Flooring
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal; shortfibre pulp; mining timber.
32 OTHER PRODUCTS .....	Tannins
NURSERY:	
33 SEED SOURCES .....	South Africa; East Africa; Australia.
34 SEEDS PER KILOGRAMME	66,000-80,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	75% germination in 7-14 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Serious attack by defoliator <u>Acanthopsycha junode</u> . Susceptible to fungal and insect attack in high rainfall conditions.
PRINCIPAL REFERENCES:	
	16 42 49 52 121 128 148 152

SPECIES: <u>Acacia mearnsii</u> De Wild.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>A. decurrens</u> var. <u>mollis</u> Lindl.
3 LOCAL OR TRADE NAMES	Black wattle; Tan wattle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-25°S
5 AREAS .....	Australia; Tasmania, Victoria, N.S.W., S. Australia and non-tropical Queensland. Well established in S. Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	100-2,500 m
7 MEAN ANNUAL RAINFALL .....	700-2,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	18-24°C
11 MEAN MIN. TEMP.	2-8°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 7-10 (up to 20) m; d = 10-60 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices poorly; tolerates salt winds; fixes nitrogen; moderately drought hardy; moderately frost tender.

SPECIES: *Acacia melanoxylon* R. Br.

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Australian Blackwood
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-34°S
5 AREAS .....	S.E. Australia and Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,500-2,500 m
7 MEAN ANNUAL RAINFALL .....	900-2,700 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	16-22°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	0-12°C
12 MEAN ANNUAL TEMP., .....	12-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils; tolerates some salinity.
SILVICULTURE:	
17 SIZE .....	h = 18-30 m; d = 80-90 cm
18 DESCRIPTION .....	Evergreen; often buttressed.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Shade tolerant in youth.
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; fixes nitrogen; root suckers vigorously.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	5-12
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.60-0.70
25 NATURAL DURABILITY .....	Non-durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Fissile; decorative; good bending properties.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; fine furniture; boat building; casks.
31 ROUNDWOOD .....	Fence posts; fuel and charcoal; veneer/plywood; shortfibre pulp.
32 OTHER PRODUCTS .....	Fodder (leaves); gums.
NURSERY:	
33 SEED SOURCES .....	Australia and East Africa.
34 SEEDS PER KILOGRAMME .....	65,000-70,000
35 STORAGE .....	Dry, cold and airtight for 5 months to 1 year.
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Potted; stumps.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH .....	-
PRINCIPAL PESTS AND DISEASES:	
40 .....	Seriously attacked by <i>Armillaria</i> root disease and <i>Loranthus</i> in E. Africa.
PRINCIPAL REFERENCES:	
16	52
57	71
82	128
152	

SPECIES: <i>Acacia nilotica</i> (L.) Willd. ex Del.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. arabica</i> (L.) Willd.
3 LOCAL OR TRADE NAMES	Egyptian thorn; babul; kikar (India); sunt (Arabic).
NATURAL OCCURRENCE:	
4 LATITUDES .....	30°N-20°S
5 AREAS .....	Western India and Pakistan (sub species <i>indica</i> ); Africa from Sudan to Senegal and Botswana (sub species <i>nilotica</i> ).
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	200-1,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-9 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	32-42°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	15-23°C
12 MEAN ANNUAL TEMP. ....	24-28°C
SOILS:	
13 TEXTURE .....	Heavy/medium/light
14 REACTION .....	Acid/neutral/alkaline
15 DRAINAGE .....	Thrives on seasonal waterlogging.
16 OTHER CHARACTERISTICS	Adaptable; tolerates poor and alkaline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-15 m
18 DESCRIPTION .....	Spiny; open crowned; deciduous.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; very weak coppice; fixes nitrogen; drought hardy; retains leaves during dry season; short-lived; 20 year rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; agroforestry; erosion control.
TIMBER:	
24 DENSITY .....	S.G. 0.67-0.85
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	Fair
27 SAWING .....	Difficult
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Resistant to termites; frequent knots; siliceous.
UTILIZATION:	
30 SAW TIMBER .....	Buildings; carts; boats; furniture; floors.
31 ROUNDWOOD .....	Fuel (c.v. = 16,896-20,790 kJ/kg) and charcoal; sleepers; mine timbers; shortfibre pulp.
32 OTHER PRODUCTS .....	Fodder (pods); tannins; gums; toothbrushes.
NURSERY:	
33 SEED SOURCES .....	Sudan; Nigeria; India; Pakistan; Kenya; France.
34 SEEDS PER KILOGRAMME .....	5,000-10,000
35 STORAGE .....	Ambient conditions for 1-2 years.
36 PRE-TREATMENT .....	Boiling water till cool or 1 hr in conc. H <sub>2</sub> SO <sub>4</sub> .
37 PLANTING STOCK .....	Direct sown; rarely potted; cuttings.
38 SPECIAL REQUIREMENTS .....	Care of long taproot.
39 GERMINATION AND GROWTH	75-95% germination in one week.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Most serious pests are Bruchidius beetles attacking seeds; tree liable to attack by various wood borers. Root boring beetle <i>Coelosterna scabrata</i> .
PRINCIPAL REFERENCES:	
	12 28 46 70 71 76 95 101 121 128 141 150 152

SPECIES: <i>Acacia nilotica</i> (L.) Willd. ex Del.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. arabica</i> (L.) Willd.
3 LOCAL OR TRADE NAMES	Egyptian thorn; babul; kikar (India); sunt (Arabic).
NATURAL OCCURRENCE:	
4 LATITUDES .....	30°N-20°S
5 AREAS .....	Western India and Pakistan (sub species <i>indica</i> ); Africa from Sudan to Senegal and Botswana (sub species <i>nilotica</i> ).
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	200-1,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-9 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	32-42°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	15-23°C
12 MEAN ANNUAL TEMP. ....	24-28°C
SOILS:	
13 TEXTURE .....	Heavy/medium/light
14 REACTION .....	Acid/neutral/alkaline
15 DRAINAGE .....	Thrives on seasonal waterlogging.
16 OTHER CHARACTERISTICS	Adaptable; tolerates poor and alkaline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-15 m
18 DESCRIPTION .....	Spiny; open crowned; deciduous.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; very weak coppice; fixes nitrogen; drought hardy; retains leaves during dry season; short-lived; 20 year rotation.

SPECIES: <i>Acacia pendula</i> A. Cunn. ex G. Don	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. leucophylla</i> Lindl.
3 LOCAL OR TRADE NAMES	Myall; Weeping myall; Boree.
NATURAL OCCURRENCE:	
4 LATITUDES .....	35-20°S
5 AREAS .....	Australia (Queensland and New South Wales).
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	250-700 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	2-10°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Moist
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 6-13 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Light demanding
21 OTHER CHARACTERISTICS	Frost resistant; fixes nitrogen; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Windbreaks
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Dark; hard.
UTILIZATION:	
30 SAW TIMBER .....	Furniture.
31 ROUNDWOOD .....	Turnery; wheel spokes; fuelwood; posts.
32 OTHER PRODUCTS .....	Fodder (leaves).
NURSERY:	
33 SEED SOURCES .....	Australia; France.
34 SEEDS PER KILOGRAMME .....	43,000-48,000
35 STORAGE .....	Dry, cold and airtight for one to two years.
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	70-90% germination; rapid seedling growth.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Protect from grazing animals until 45 cm high. 'Bag caterpillars' (Liparidae) defoliate tree.
PRINCIPAL REFERENCES: 4 134 150 152	

SPECIES: <i>Acacia pendula</i> A. Cunn. ex G. Don	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. leucophylla</i> Lindl.
3 LOCAL OR TRADE NAMES	Myall; Weeping myall; Boree.
NATURAL OCCURRENCE:	
4 LATITUDES .....	35-20°S
5 AREAS .....	Australia (Queensland and New South Wales).
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	250-700 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	2-10°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Moist
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 6-13 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Light demanding
21 OTHER CHARACTERISTICS	Frost resistant; fixes nitrogen; drought hardy.

PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 3-5	
ROLE IN LAND USE: 23 ..... Shade and shelter; windbreaks; ornamental.	
TIMBER: 24 DENSITY ..... S.G. 0.75-0.80 25 NATURAL DURABILITY ... Moderately durable. 26 PRESERVATION ..... - 27 SAWING ..... - 28 SEASONING ..... - 29 OTHER FEATURES ..... Tough; decorative.	
UTILIZATION: 30 SAW TIMBER ..... - 31 ROUNDWOOD ..... Fence posts; fuel and charcoal. 32 OTHER PRODUCTS ..... Hodder	
NURSERY: 33 SEED SOURCES ..... Australia 34 SEEDS PER KILOGRAMME : 22,000-26,000 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... Boiling water till cool. 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS : - 39 GERMINATION AND GROWTH : Germinates in 12-14 days. Plantable size in 4-6 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported.	
PRINCIPAL REFERENCES: 84 95 152	

SPECIES: <u>Acacia salicina</u> Lindl.	
TAXONOMY: 1 FAMILY ..... Mimosaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES : Cooba	
NATURAL OCCURRENCE: 4 LATITUDES ..... 28-20°C 5 AREAS ..... Semi-arid zones of N.S.W.	
CLIMATE: 6 ALTITUDINAL RANGE ..... 0-2,000 m 7 MEAN ANNUAL RAINFALL : 300-700 mm 8 RAINFALL REGIME ..... Winter/summer/uniform 9 DRY SEASON ..... 4-8 months 10 MEAN MAX. TEMP. : 28-36°C HOTTEST MONTH ..... 11 MEAN MIN. TEMP. : 4-14°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP. .... 16-26°C	
SOILS: 13 TEXTURE ..... Medium/heavy 14 REACTION ..... Alkaline/neutral 15 DRAINAGE ..... Moderately free drainage 16 OTHER CHARACTERISTICS : Tolerates saline soils	
SILVICULTURE: 17 SIZE ..... h = 10-16 m 18 DESCRIPTION ..... Evergreen; open-crowned. 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Moderately demanding 21 OTHER CHARACTERISTICS : Moderately frost resistant	

SPECIES: <u>Acacia senegal</u> (L.) Willd.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Acacia verek</u> Guill. and Perr.
3 LOCAL OR TRADE NAMES	Commier; Goma; Gum arabic.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-18°N
5 AREAS .....	Sahel zone of Africa from Mauretania to Sudan and Somalia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	200-500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	30-40°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	16-28°C
12 MEAN ANNUAL TEMP. ....	22-32°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 2-5 (up to 13) m
18 DESCRIPTION .....	Spiny; open-crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; substantial provenance variation; requires wide spacing; short-lived.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	4-7
ROLE IN LAND USE:	
23 .....	Dune fixation; anti-erosion; agroforestry.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal.
32 OTHER PRODUCTS .....	Gum arabic; fodder; honeyflora.
NURSERY:	
33 SEED SOURCES .....	Sudan; Nigeria; Senegal.
34 SEEDS PER KILOGRAMME .....	7,000-12,000
35 STORAGE .....	Shortlived viability
36 PRE-TREATMENT .....	Boiling water till cool; soak cold water 24 hours.
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	No information available on germination. Plantable size in 4-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported, but roots susceptible to attack by termites and young plants liable to browsing damage.
PRINCIPAL REFERENCES: 69 70 71 95 121 128 152	

SPECIES: <u>Acacia senegal</u> (L.) Willd.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Acacia verek</u> Guill. and Perr.
3 LOCAL OR TRADE NAMES	Commier; Goma; Gum arabic.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-18°N
5 AREAS .....	Sahel zone of Africa from Mauretania to Sudan and Somalia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	200-500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	30-40°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	16-28°C
12 MEAN ANNUAL TEMP. ....	22-32°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 2-5 (up to 13) m
18 DESCRIPTION .....	Spiny; open-crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; substantial provenance variation; requires wide spacing; short-lived.

SPECIES: <i>Acacia tortillis</i> (Forsk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. raddiana</i> Savi
3 LOCAL OR TRADE NAMES	Karanoja; umbrella thorn (Africa); seyal (Arabic)
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-30°N
5 AREAS .....	N.E. African deserts; New East; Saudi Arabia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	100-800 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	32-45°C
11 MEAN MIN. TEMP.	2-10°C
12 MEAN ANNUAL TEMP. ....	26-28°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Thrives on poor shallow soils, often bordering deserts.
SILVICULTURE:	
17 SIZE .....	h = 4-13 m
18 DESCRIPTION .....	Deciduous; thorny, savanna tree.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; drought hardy; one of four distinct sub-species from different ecological zones. Frost tender when young; 10 year fuelwood rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Dune stabilisation.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Posts; tools; firewood (c.v. = 18,390 kJ/kg) and charcoal (4-5 tonnes/ha/ann).
32 OTHER PRODUCTS .....	Fodder; branches for fencing; honey flora.
NURSERY:	
33 SEED SOURCES .....	France; Kenya; Netherlands.
34 SEEDS PER KILOGRAMME	12,000-15,000
35 STORAGE .....	Dry, cold, airtight.
36 PRE-TREATMENT .....	Soak in water 24 hrs; or conc. H <sub>2</sub> SO <sub>4</sub> for 40 mins.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Pit planting on calcareous pan soils; initial weeding.
39 GERMINATION AND GROWTH	40% germination in 4 days. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Bruchid beetles attack seed.
PRINCIPAL REFERENCES:	
	67 71 94 120 121

SPECIES: <i>Acacia tortillis</i> (Forsk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<i>A. raddiana</i> Savi
3 LOCAL OR TRADE NAMES	Karanoja; umbrella thorn (Africa); seyal (Arabic)
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-30°N
5 AREAS .....	N.E. African deserts; New East; Saudi Arabia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	100-800 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	32-45°C
11 MEAN MIN. TEMP.	2-10°C
12 MEAN ANNUAL TEMP. ....	26-28°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Thrives on poor shallow soils, often bordering deserts.
SILVICULTURE:	
17 SIZE .....	h = 4-13 m
18 DESCRIPTION .....	Deciduous; thorny, savanna tree.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; drought hardy; one of four distinct sub-species from different ecological zones. Frost tender when young; 10 year fuelwood rotation.



SPECIES: <u>Acrocarpus fraxinifolius</u> Wight	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Shingle tree; Indian Ash.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-27°N
5 AREAS .....	Western India, Assam and Burma.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL .....	1,100-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP.	28-35°C
11 MEAN MIN. TEMP.	12-18°C
12 MEAN ANNUAL TEMP. ....	19-28°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-50 m; d = 100-250 cm
18 DESCRIPTION .....	Deciduous/evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost tender; requires wide spacing; susceptible to drought.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	Up to 10
ROLE IN LAND USE:	
23 .....	Shade and shelter; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.63
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes.
31 ROUNDWOOD .....	Fuel and charcoal; fence posts.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	India and Kenya.
34 SEEDS PER KILOGRAMME	26,000-30,000
35 STORAGE .....	Cold
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Use large planting stock.
39 GERMINATION AND GROWTH	Sporadic; 10 days-3 months. Plantable size in 3-4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Termites attack young plants.
PRINCIPAL REFERENCES: 4 5 107 120 137 152 170	

SPECIES: <u>Acrocarpus fraxinifolius</u> Wight	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Shingle tree; Indian Ash.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-27°N
5 AREAS .....	Western India, Assam and Burma.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL .....	1,100-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP.	28-35°C
11 MEAN MIN. TEMP.	12-18°C
12 MEAN ANNUAL TEMP. ....	19-28°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-50 m; d = 100-250 cm
18 DESCRIPTION .....	Deciduous/evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost tender; requires wide spacing; susceptible to drought.

SPECIES: Agathis dammara (A.B. Lamb.) L.C. Richard

TAXONOMY:

- 1 FAMILY ..... Araucariaceae
- 2 SYNONYMS ..... A. loranthifolia K.A. Salisbury
- 3 LOCAL OR TRADE NAMES : Damar; Malayan Kauri.

NATURAL OCCURRENCE:

- 4 LATITUDES ..... 11°S-20°N
- 5 AREAS ..... Malaya, Indonesia, Philippines, New Guinea and New Britain (3 sub-species).

CLIMATE:

- 6 ALTITUDINAL RANGE .... 100-1,600 m
- 7 MEAN ANNUAL RAINFALL : 2,000-4,000 mm
- 8 RAINFALL REGIME ..... Uniform
- 9 DRY SEASON ..... 0-2 months
- 10 MEAN MAX. TEMP. .... 28-34 °C
- HOTTEST MONTH ..... 12-22 °C
- 11 MEAN MIN. TEMP. .... 19-28 °C
- COLDEST MONTH ..... 19-28 °C
- 12 MEAN ANNUAL TEMP. ....

SOILS:

- 13 TEXTURE ..... Light/medium/heavy
- 14 REACTION ..... Neutral/acid
- 15 DRAINAGE ..... Free draining; moist.
- 16 OTHER CHARACTERISTICS : Better growth on deep soils.

SILVICULTURE:

- 17 SIZE ..... h = 45-60 m; d = 100-200 cm
- 18 DESCRIPTION ..... Evergreen
- 19 FORM ..... Exceptional
- 20 LIGHT REQUIREMENTS ... Shade tolerant in youth.
- 21 OTHER CHARACTERISTICS : Windfirm; suitable for line planting.

PRODUCTION:

- 22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-20

ROLE IN LAND USE:

- 23 .....

TIMBER:

- 24 DENSITY ..... S.G. 0.45-0.50
- 25 NATURAL DURABILITY ... Non-durable
- 26 PRESERVATION ..... Easy
- 27 SAWING ..... Easy
- 28 SEASONING ..... Easy
- 29 OTHER FEATURES ..... Spiral grain; blue stains easily.

UTILIZATION:

- 30 SAW TIMBER ..... Light construction; boxes; boat building; furniture.
- 31 ROUNDWOOD ..... Longfibre pulp; veneer/plywood.
- 32 OTHER PRODUCTS ..... Gums ("copal")

NURSERY:

- 33 SEED SOURCES ..... Indonesia
- 34 SEEDS PER KILOGRAMME : 16,000-21,000
- 35 STORAGE ..... Short viability
- 36 PRE-TREATMENT ..... Soak in cold water for 1-2 days.
- 37 PLANTING STOCK ..... Potted
- 38 SPECIAL REQUIREMENTS : Seedlings require shade.
- 39 GERMINATION AND GROWTH : Germinates in 7-14 days. Plantable size in 12-18 months.

PRINCIPAL PESTS AND

DISEASES:

- 40 ..... Dieback due to Corticium salmonicolor infection through wounds. Termite attack reported from Java.

PRINCIPAL REFERENCES:

- 12 34 171

SPECIES: Albizia falcataria (L.) Fosberg

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Mimosaceae</p> <p>2 SYNONYMS ..... <u>A. moliuccana</u> Miq.; and <u>A. falcata</u> (L.) Backer</p> <p>3 LOCAL OR TRADE NAMES ..... Batai, Kara.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 10°S-3°N</p> <p>5 AREAS ..... North Moluccas, Indonesia; naturalized in much of Far East.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-2,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 2,000-4,000 mm</p> <p>8 RAINFALL REGIME ..... Uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP, HOTTEST MONTH ..... 30-34°C</p> <p>11 MEAN MIN. TEMP, COLDEST MONTH ..... 20-24°C</p> <p>12 MEAN ANNUAL TEMP. .... 22-29°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining; moist.</p> <p>16 OTHER CHARACTERISTICS ..... Adaptable</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 25-45 m; d = 50-90 cm</p> <p>18 DESCRIPTION ..... Deciduous; open-crowned.</p> <p>19 FORM ..... Acceptable; variable.</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding.</p> <p>21 OTHER CHARACTERISTICS ..... Coppices; fixes nitrogen; very fire tender; easily wind damaged; 8 year rotation for pulpwood.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-40</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Soil improvement; agricultural shade; agroforestry.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.30-0.46</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Soft and non-fissile; vulnerable to termite attack.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; boxes; furniture.</p> <p>31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood; fuelwood (c.v. = 19525 - 20585 kJ/kg)</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Malaya; Fiji; Sabah; Hawaii; Indonesia; Philippines.</p> <p>34 SEEDS PER KILOGRAMME . 38,000-44,000</p> <p>35 STORAGE ..... Airtight for 1-2 years</p> <p>36 PRE-TREATMENT ..... Boiling water till cool.</p> <p>37 PLANTING STOCK ..... Potted; stumps.</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH ..... Germination begins in 2-5 days; 65% germination of fresh seed. Plantable size in 4-6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Defoliation in plantation, by <u>Eurema</u> and <u>Semiothisa</u>, is a problem in Malaysia.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 43 59 100 120 142 152</p>	

SPECIES: <u>Albizia lebbek</u> (L.) Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Mimosa lebeck</u> L.; <u>M. sirissa</u> Roxb.
3 LOCAL OR TRADE NAMES :	Siris; Kokko; E. Indian Walnut.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-27°N
5 AREAS .....	Burma, India and Andaman Islands.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL .....	500-2,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	26-36°C
11 MEAN MIN. TEMP.	10-26°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adaptable
SILVICULTURE:	
17 SIZE .....	h = 15-30 m; d = 60-90 cm
18 DESCRIPTION .....	Deciduous; open-crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; fixes nitrogen; moderately frost resistant when established; root suckers vigorously; drought hardy; not wind firm; rotation of 10-15 years.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	5
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; ornamental; anti-erosion; green manure; dune stabilisation.
TIMBER:	
24 DENSITY .....	S.G. 0.55-0.90
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Fair
27 SAWING .....	Fair
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Interlocked grain; decorative.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; flooring.
31 ROUNDWOOD .....	Fuel (c.v. = 21,340-21,350 kJ/kg) and charcoal; veneer/plywood; posts.
32 OTHER PRODUCTS .....	Fodder (leaves); gums; tannin; medicinal products.
NURSERY:	
33 SEED SOURCES .....	India
34 SEEDS PER KILOGRAMME .....	8,000-11,000
35 STORAGE .....	Ambient temperature for several years.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Stumps; direct sown.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	60-90% germination in 1-2 months. Plantable size in 4-7 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported but liable to browsing damage.
PRINCIPAL REFERENCES:	
	16 57 61 69 71 95 100 109 120 121 128 152

SPECIES: <u>Albizia lebbek</u> (L.) Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Mimosa lebeck</u> L.; <u>M. sirissa</u> Roxb.
3 LOCAL OR TRADE NAMES :	Siris; Kokko; E. Indian Walnut.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-27°N
5 AREAS .....	Burma, India and Andaman Islands.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL .....	500-2,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	26-36°C
11 MEAN MIN. TEMP.	10-26°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adaptable
SILVICULTURE:	
17 SIZE .....	h = 15-30 m; d = 60-90 cm
18 DESCRIPTION .....	Deciduous; open-crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; fixes nitrogen; moderately frost resistant when established; root suckers vigorously; drought hardy; not wind firm; rotation of 10-15 years.

SPECIES: <i>Alnus acuminata</i> O. Kuntze	
TAXONOMY:	
1 FAMILY .....	Betulaceae
2 SYNONYMS .....	<i>Alnus jorullensis</i> H.B.K.
3 LOCAL OR TRADE NAMES .....	Aliso; Jaul.
NATURAL OCCURRENCE:	
4 LATITUDES .....	18°N-28°S
5 AREAS .....	Medium altitudes of mountain ranges in Central and South America from Mexico to Argentina.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-3,000 m
7 MEAN ANNUAL RAINFALL .....	1,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP. ....	22-30°C
11 MEAN MIN. TEMP. ....	4-14°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS .....	On steep slopes; develops best on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 15-30 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Aggressive coloniser of bare soils; coppices; fixes nitrogen; tolerates occasional frost; surface rooting; rotation of 18-22 years.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	10-15
ROLE IN LAND USE:	
23 .....	Sylvopastoral systems; anti-erosion; soil improvement; agroforestry.
TIMBER:	
24 DENSITY .....	S.G. 0.50-0.60
25 NATURAL DURABILITY .....	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Semi-decorative
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes.
31 ROUNDWOOD .....	Fuel and charcoal; shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Costa Rica, Colombia, Ecuador and Peru.
34 SEEDS PER KILOGRAMME .....	650,000-4,400,000
35 STORAGE .....	Seed quickly loses viability after 1 month.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Bare rooted plants; root cuttings.
38 SPECIAL REQUIREMENTS .....	Inoculate soil of new sites with nitrogen-fixing actinomycetes.
39 GERMINATION AND GROWTH .....	50-70% germination. Plantable size in 1-2 years.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES: 52 56 121	

SPECIES: <i>Alnus acuminata</i> O. Kuntze	
TAXONOMY:	
1 FAMILY .....	Betulaceae
2 SYNONYMS .....	<i>Alnus jorullensis</i> H.B.K.
3 LOCAL OR TRADE NAMES .....	Aliso; Jaul.
NATURAL OCCURRENCE:	
4 LATITUDES .....	18°N-28°S
5 AREAS .....	Medium altitudes of mountain ranges in Central and South America from Mexico to Argentina.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-3,000 m
7 MEAN ANNUAL RAINFALL .....	1,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP. ....	22-30°C
11 MEAN MIN. TEMP. ....	4-14°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS .....	On steep slopes; develops best on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 15-30 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Aggressive coloniser of bare soils; coppices; fixes nitrogen; tolerates occasional frost; surface rooting; rotation of 18-22 years.

SPECIES: <i>Alnus nepalensis</i> D. Don	
TAXONOMY:	
1 FAMILY .....	Betulaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Utis (Bengal); Maibau (Burma); Indian alder.
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-28°N
5 AREAS .....	Burma; N. India; W. China.
CLIMATE:	
6 ALTITUDINAL RANGE ....	100-3,000 m
7 MEAN ANNUAL RAINFALL .	500-2,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	19-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	2-8°C
12 MEAN ANNUAL TEMP. ....	13-26°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free-draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 15-33 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Poor/acceptable
20 LIGHT REQUIREMENTS ...	Shade bearing
21 OTHER CHARACTERISTICS	Coppices; fixes nitrogen; frost tender; best growth in humid climates.
PRODUCTION:	
22 VOLUME (m <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Water-catchment plantations; erosion control.
TIMBER:	
24 DENSITY .....	S.G. = 0.32-0.37
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	Good
29 OTHER FEATURES .....	Frequent knots.
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuelwood (c.v. = 20,479 kJ/kg).
32 OTHER PRODUCTS .....	Fodder
NURSERY:	
33 SEED SOURCES .....	Burma; India.
34 SEEDS PER KILOGRAMME .	1,600,000-2,300,000 pure or 400,000 with chaff.
35 STORAGE .....	3-4 months sealed at 1-3°C
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Direct sown; bare rooted plants.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	70% germination in 4-6 weeks. Plantable size 4-5 months. Good weed competitor.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Batocera spp. stem borers are a bad pest. Easily damaged by wind.
PRINCIPAL REFERENCES:	
	16 67 121 168

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 10-11	
<b>ROLE IN LAND USE:</b> 23 ..... Soil improver; reclamation of eroded or derelict land.	
<b>TIMBER:</b> 24 DENSITY ..... 0.33-0.48 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... - 27 SAWING ..... Easy 28 SEASONING ..... - 29 OTHER FEATURES ..... Blue stains easily; wears poorly.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Furniture; panelling. 31 ROUNDWOOD ..... Turnery; plywood; firewood (c.v. = 19,020 kJ/kg). 32 OTHER PRODUCTS ..... -	
<b>NURSERY:</b> 33 SEED SOURCES ..... N.W. America; avoid Haney II provenance (poor viability). 34 SEEDS PER KILOGRAMME , 1,200,000-430,000 35 STORAGE ..... Cold, sealed up to one year. 36 PRE-TREATMENT ..... Soak 24 hrs in cold water; or cold stratify 8 days 37 PLANTING STOCK ..... Potted; bare-rooted plants. 38 SPECIAL REQUIREMENTS , Cool temperatures during seedling establishment. 39 GERMINATION AND GROWTH 70-90% germination; competes well with weeds.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Few serious pests in native habitat. <i>Fomes ignarius</i> ; <i>Malacosoma pluvialis</i> (forest tent caterpillars).	
<b>PRINCIPAL REFERENCES:</b> 13 62 121 132	

SPECIES: Alnus rubra Bong.

<b>TAXONOMY:</b> 1 FAMILY ..... Betulaceae 2 SYNONYMS ..... <u>A. oregana</u> Nutt. 3 LOCAL OR TRADE NAMES , Western red alder; Oregon alder; Erle; Aune.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 30-60°N 5 AREAS ..... N. America: up to 2,000 km inland from Pacific Coast.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE ..... 0-1,000 m 7 MEAN ANNUAL RAINFALL , 800-2,600 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 2-4 months 10 MEAN MAX. TEMP. , 25-28°C HOTTEST MONTH ..... 11 MEAN MIN. TEMP. , -1-+2°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP. .... 10-17°C	
<b>SOILS:</b> 13 TEXTURE ..... Medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Moist but free draining. 16 OTHER CHARACTERISTICS -	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 13-35 m 18 DESCRIPTION ..... Deciduous 19 FORM ..... Good 20 LIGHT REQUIREMENTS ... Light demanding 21 OTHER CHARACTERISTICS Aggressive coloniser; young trees coppice; fixes nitrogen; substantial provenance variation; adapts to a wide variety of environments; withstands occasional extremes of temperature.	

<b>PRODUCTION:</b>	
22	VOLUME (M <sup>3</sup> /HA/AN) . . . . -
<b>ROLE IN LAND USE:</b>	
23	erosion control; dune stabilisation; windbreaks.
<b>TIMBER:</b>	
24	DENSITY . . . . . -
25	NATURAL DURABILITY . . . . . Durable
26	PRESERVATION . . . . . -
27	SAWING . . . . . -
28	SEASONING . . . . . -
29	OTHER FEATURES . . . . . Termite resistant.
<b>UTILIZATION:</b>	
30	SAM TIMBER . . . . . -
31	ROUNDWOOD . . . . . Fence posts; fuel.
32	OTHER PRODUCTS . . . . . Nut (shell poisonous until roasted) 800-3000 kg nuts/ha/yr; edible fruit stalk; oil ("cardol") with many industrial uses; gum; medicine; ink; fodder.
<b>NURSERY:</b>	
33	SEED SOURCES . . . . . Thailand; Tropical America; Burma; France, India, Sri Lanka.
34	SEEDS PER KILOGRAMME . . . . . 139-300
35	STORAGE . . . . . Up to one year, dried and sealed.
36	PRE-TREATMENT . . . . . Soak 24 hours in water.
37	PLANTING STOCK . . . . . Potted; stumps; direct sown; air layering.
38	SPECIAL REQUIREMENTS . . . . . Care of long tap root; water daily for 1 month.
39	GERMINATION AND GROWTH . . . . . 60-70% germination in 4-7 weeks; transplant at one year old.
<b>PRINCIPAL PESTS AND DISEASES:</b>	
40	Helopeltis spp. main pest. Plocaderus ferrugineus - a cerambycid root/shoot-boring beetle; Crimissa cruralis Brazil, chrysomeiid bug.
<b>PRINCIPAL REFERENCES:</b>	
	67 107 117 124 134 135 152

<b>SPECIES:</b> <u>Anacardium occidentale</u> L.	
<b>TAXONOMY:</b>	
1	FAMILY . . . . . Anacardiaceae
2	SYNONYMS . . . . . -
3	LOCAL OR TRADE NAMES . . . . . Cashew; Mkorosho; Mkanju; Acajú.
<b>NATURAL OCCURRENCE:</b>	
4	LATITUDES . . . . . 30°N-25°S
5	AREAS . . . . . Tropical Americas, Mexico to Peru and Brazil, West Indies; naturalised in Africa and Mozambique.
<b>CLIMATE:</b>	
6	ALTITUDINAL RANGE . . . . . 0-1,000 m
7	MEAN ANNUAL RAINFALL . . . . . 500-1,600 (-3,000) mm
8	RAINFALL REGIME . . . . . Summer/uniform
9	DRY SEASON . . . . . 4-6 months
10	MEAN MAX. TEMP. . . . . 28-35°C
11	MEAN MIN. TEMP. . . . . 9-23°C
12	MEAN ANNUAL TEMP. . . . . 27-33°C
<b>SOILS:</b>	
13	TEXTURE . . . . . light
14	REACTION . . . . . Neutral/acid
15	DRAINAGE . . . . . Good
16	OTHER CHARACTERISTICS . . . . . Tolerates poor soils; thrives on coastal soils if fresh ground water available.
<b>SILVICULTURE:</b>	
17	SIZE . . . . . h = 5-15 m
18	DESCRIPTION . . . . . Evergreen
19	FORM . . . . . Poor
20	LIGHT REQUIREMENTS . . . . . Light demanding
21	OTHER CHARACTERISTICS . . . . . Termite resistant; drought hardy; substantial provenance variation; requires wide spacing; frost sensitive; benefits from intercropping with legumes.



<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... 10-40</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 .....</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.35-0.40</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... <u>Lycetus</u> susceptible.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Puerto Rico; Bangladesh; Sabah.</p> <p>34 SEEDS PER KILOGRAMME : Over 6,000,000</p> <p>35 STORAGE ..... Dry, cold and airtight for up to 4 months.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS : 30% shade in the nursery.</p> <p>39 GERMINATION AND GROWTH : 90% germination of fresh seed in 7-14 days. Plantable size in 3-4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Defoliators including <u>Arthroschista hilaralis</u>. Susceptible to damping off in the nursery.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 16 23 59 152</p>	

**SPECIES:** Anthocephalus chinensis (Lamk.) Rich. ex Walp.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Rubiaceae</p> <p>2 SYNONYMS ..... <u>A. indicus</u> Rich; <u>A. cadamba</u> (Roxb.) Miq.</p> <p>3 LOCAL OR TRADE NAMES : Kadam; Laran.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 9°S-27°N</p> <p>5 AREAS ..... Assam; Benegal; Burma; Sri Lanka; Philippines; Indonesia and New Guinea.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE ..... 0-1,300 m</p> <p>7 MEAN ANNUAL RAINFALL : 1,300-4,000 mm</p> <p>8 RAINFALL REGIME ..... Uniform</p> <p>9 DRY SEASON ..... 0-3 months</p> <p>10 MEAN MAX. TEMP. : 24-34 °C</p> <p>11 MEAN MIN. TEMP. : 16-26 °C</p> <p>12 MEAN ANNUAL TEMP, .... 20-32 °C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining; moist.</p> <p>16 OTHER CHARACTERISTICS : Adaptable</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-30 m; d = 50-100 cm</p> <p>18 DESCRIPTION ..... Deciduous; open-crowned.</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS : Frost tender; 6-8 year pulp rotation.</p>	

PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 10-23	
ROLE IN LAND USE: 23 ..... -	
TIMBER: 24 DENSITY ..... S.G. 0.45-0.57 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Easy 27 SAWING ..... Easy 28 SEASONING ..... Easy/Fair 29 OTHER FEATURES ..... Thick barked	
UTILIZATION: 30 SAW TIMBER ..... Heavy construction; light construction; furniture; boxes. 31 ROUNDWOOD ..... Transmission poles; fence posts; longfibre pulp; plywood/veneer. 32 OTHER PRODUCTS ..... -	
NURSERY: 33 SEED SOURCES ..... Brazil and Kenya. 34 SEEDS PER KILOGRAMME , 100-120 35 STORAGE ..... Short viability 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS , Requires fifty per cent shade. 39 GERMINATION AND GROWTH Germinates in 60-100 days. Plantable size in 21-27 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... Liable to butt rot.	
PRINCIPAL REFERENCES: 25 34 52 100 124 134 152	

SPECIES: <u>Araucaria angustifolia</u> (Bert.) O. Kuntze	
TAXONOMY: 1 FAMILY ..... Araucariaceae 2 SYNONYMS ..... <u>A. brasiliiana</u> A. Rich. 3 LOCAL OR TRADE NAMES , Parana pine	
NATURAL OCCURRENCE: 4 LATITUDES ..... 30-20°S 5 AREAS ..... Southern Brazil, principally Parana.	
CLIMATE: 6 ALTITUDINAL RANGE ..... 1,500-2,000 m 7 MEAN ANNUAL RAINFALL , 1,250-2,200 mm 8 RAINFALL REGIME ..... Summer/uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 18-23°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 9-16°C 12 MEAN ANNUAL TEMP. .... 12-18°C	
SOILS: 13 TEXTURE ..... Medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Free draining but moist 16 OTHER CHARACTERISTICS Better growth on fertile and deep soils.	
SILVICULTURE: 17 SIZE ..... h = 25-40 m; d = 100-150 cm 18 DESCRIPTION ..... Evergreen 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Frost resistant; fairly drought hardy.	

SPECIES: <i>Araucaria cunninghamii</i> D. Don								
TAXONOMY:								
1 FAMILY .....	Araucariaceae							
2 SYNONYMS .....	-							
3 LOCAL OR TRADE NAMES .....	Hoop pine							
NATURAL OCCURRENCE:								
4 LATITUDES .....	32-0°S							
5 AREAS .....	Papua New Guinea and tropical N.E. Australia.							
CLIMATE:								
6 ALTITUDINAL RANGE .....	0-2,000 m							
7 MEAN ANNUAL RAINFALL .....	1,000-1,800 mm							
8 RAINFALL REGIME .....	Summer							
9 DRY SEASON .....	2-4 months							
10 MEAN MAX. TEMP. HOTTEST MONTH .....	15-30°C							
11 MEAN MIN. TEMP. COLDEST MONTH .....	16-23°C							
12 MEAN ANNUAL TEMP. ....	16-26°C							
SOILS:								
13 TEXTURE .....	Medium/heavy							
14 REACTION .....	Neutral/acid							
15 DRAINAGE .....	Free draining							
16 OTHER CHARACTERISTICS .....	Better growth on fertile and deep soils.							
SILVICULTURE:								
17 SIZE .....	h = 40-70 m; d = 100-200 cm							
18 DESCRIPTION .....	Evergreen							
19 FORM .....	Exceptional							
20 LIGHT REQUIREMENTS .....	Strongly demanding; shade tolerant in youth.							
21 OTHER CHARACTERISTICS .....	Windfirm; tolerates salt winds; moderately frost resistant.							
PRODUCTION:								
22 VOLUME (M <sup>3</sup> /HA/AN) .....	10-18							
ROLE IN LAND USE:								
23 .....	-							
TIMBER:								
24 DENSITY .....	S.G. 0.50-0.55							
25 NATURAL DURABILITY .....	Non-durable							
26 PRESERVATION .....	Easy							
27 SAWING .....	Easy							
28 SEASONING .....	Easy							
29 OTHER FEATURES .....	Thick barked							
UTILIZATION:								
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes.							
31 ROUNDWOOD .....	Transmission poles; fence posts; longfibre pulp; veneer/plywood.							
32 OTHER PRODUCTS .....	-							
NURSERY:								
33 SEED SOURCES .....	Papua New Guinea and Australia (Queensland).							
34 SEEDS PER KILOGRAMME .....	2,400-2,800							
35 STORAGE .....	Short viability							
36 PRE-TREATMENT .....	None							
37 PLANTING STOCK .....	Potted							
38 SPECIAL REQUIREMENTS .....	Requires 50% shade.							
39 GERMINATION AND GROWTH .....	No information available on germination. Plantable size in 18-24 months.							
PRINCIPAL PESTS AND DISEASES:								
40 .....	Termites cause stem collapse; Hoop pine weevil <i>Vanapa oberthuri</i> attacks stem. Bumping off in nursery.							
PRINCIPAL REFERENCES:								
4	34	56	82	107	124	128	152	169

SPECIES: <i>Araucaria cunninghamii</i> D. Don	
TAXONOMY:	
1 FAMILY .....	Araucariaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Hoop pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	32-0°S
5 AREAS .....	Papua New Guinea and tropical N.E. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,000 m
7 MEAN ANNUAL RAINFALL .....	1,000-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	15-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	16-23°C
12 MEAN ANNUAL TEMP. ....	16-26°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 40-70 m; d = 100-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding; shade tolerant in youth.
21 OTHER CHARACTERISTICS .....	Windfirm; tolerates salt winds; moderately frost resistant.

SPECIES: <u>Araucaria hunsteinii</u> K. Schum.	
TAXONOMY:	
1 FAMILY .....	Araucariaceae
2 SYNONYMS .....	<u>A. klinkii</u> Lauterbach
3 LOCAL OR TRADE NAMES	Klinki pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-5°S
5 AREAS .....	New Guinea in same area as <u>A. cunninghamii</u> .
CLIMATE:	
6 ALTITUDINAL RANGE .....	200-1,800 m
7 MEAN ANNUAL RAINFALL .....	1,500-4,600 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	24-32°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.	12-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	20-27°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 40-80 m; d = 200-400 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Frost tender
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	20-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.40-0.48
25 NATURAL DURABILITY .....	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes; joinery; flooring; aircraft frames.
31 ROUNDWOOD .....	Transmission poles; fence posts; longfibre pulp; veneer/plywood; matches.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	New Guinea
34 SEEDS PER KILOGRAMME .....	1,700-1,800 (2,000-2,500 de-winged)
35 STORAGE .....	Short viability (5-6 weeks), cold, moist, sealed.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	Requires 75% shade in early months.
39 GERMINATION AND GROWTH	No information available on germination. Plantable size in 18-21 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Similar to <u>A. cunninghamii</u> ; <u>Armillaria mellea</u> attacks roots.
PRINCIPAL REFERENCES:	
	34 56 87 124 169

SPECIES: <u>Araucaria hunsteinii</u> K. Schum.	
TAXONOMY:	
1 FAMILY .....	Araucariaceae
2 SYNONYMS .....	<u>A. klinkii</u> Lauterbach
3 LOCAL OR TRADE NAMES	Klinki pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-5°S
5 AREAS .....	New Guinea in same area as <u>A. cunninghamii</u> .
CLIMATE:	
6 ALTITUDINAL RANGE .....	200-1,800 m
7 MEAN ANNUAL RAINFALL .....	1,500-4,600 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	24-32°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.	12-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	20-27°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 40-80 m; d = 200-400 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Frost tender

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) , , , , 15-30</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 , , , , , , , , , , , , , , -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY , , , , , , , , S.G. 0.40-0.46</p> <p>25 NATURAL DURABILITY , , , Perishable</p> <p>26 PRESERVATION , , , , , , , , Difficult</p> <p>27 SAWING , , , , , , , , , , , , Easy</p> <p>28 SEASONING , , , , , , , , , , , , Easy</p> <p>29 OTHER FEATURES , , , , , , , , Wood contains silica.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER , , , , , , , , , , Light construction; boxes; joinery.</p> <p>31 ROUNDWOOD , , , , , , , , , , Shortfibre pulp; veneer/plywood.</p> <p>32 OTHER PRODUCTS , , , , , , , , -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES , , , , , , , , Gabon and Congo.</p> <p>34 SEEDS PER KILOGRAMME , 9,000-12,000</p> <p>35 STORAGE , , , , , , , , Short viability</p> <p>36 PRE-TREATMENT , , , , , , , , None</p> <p>37 PLANTING STOCK , , , , , , , , Striplings; direct sown.</p> <p>38 SPECIAL REQUIREMENTS , Requires 50% shade for some weeks.</p> <p>39 GERMINATION AND GROWTH No information available on germination. Plantable size in 3-4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 , , , , , , , , , , , , Very susceptible to borer attack both as a tree and as timber.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 38 49 57 100 128 143</p>	

<p><b>SPECIES:</b> <i>Aucoumea klaineana</i> Pierre</p>	
<p><b>TAXONOMY:</b></p> <p>1 FAMILY , , , , , , , , Burseraceae</p> <p>2 SYNONYMS , , , , , , , , -</p> <p>3 LOCAL OR TRADE NAMES , Gaboon mahogany; Okoumé.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES , , , , , , , , 2°S-2°N</p> <p>5 AREAS , , , , , , , , Rain forests of Gabon and Congo.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE , , , , 0-500 m</p> <p>7 MEAN ANNUAL RAINFALL , 1,600-3,000 mm</p> <p>8 RAINFALL REGIME , , , , Uniform</p> <p>9 DRY SEASON , , , , , , , , 0-2 months</p> <p>10 MEAN MAX. TEMP. , , , , 28-36°C</p> <p>11 MEAN MIN. TEMP. , , , , 20-26°C</p> <p>12 MEAN ANNUAL TEMP. , , , , 25-33°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE , , , , , , , , Light/medium/heavy</p> <p>14 REACTION , , , , , , , , Acid</p> <p>15 DRAINAGE , , , , , , , , Free draining</p> <p>16 OTHER CHARACTERISTICS , , , , , , , , Adaptable</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE , , , , , , , , h = 30-40 m; d = 90-250 cm</p> <p>18 DESCRIPTION , , , , , , , , Buttressed</p> <p>19 FORM , , , , , , , , , , Acceptable</p> <p>20 LIGHT REQUIREMENTS , , , , , , , , Strongly demanding</p> <p>21 OTHER CHARACTERISTICS , , , , , , , , Coppices</p>	

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 5-18	
<b>ROLE IN LAND USE:</b> 23 ..... Shade and shelter; windbreaks; soil improvement; waste-land reclamation.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.60-0.70 25 NATURAL DURABILITY ... Moderately durable 26 PRESERVATION ..... Difficult 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Resistant to termite and insect attack; interlocked grain.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Light construction; furniture; boxes. 31 ROUNDWOOD ..... Building poles; fence posts; fuel (c.v. = 20,895 kJ/kg) and charcoal; transmission poles. 32 OTHER PRODUCTS ..... Fodder; leaves and seeds contain 'azadirachtin', a promising new insect repellent; medicine; green manure; oil from seeds; tannin.	
<b>NURSERY:</b> 33 SEED SOURCES ..... India; Nigeria; Sudan. 34 SEEDS PER KILOGRAMME , 4,000-4,500 35 STORAGE ..... Short viability (2-3 weeks). 36 PRE-TREATMENT ..... Soak in cold water for one-two days. 37 PLANTING STOCK ..... Potted; stumps; direct sown. 38 SPECIAL REQUIREMENTS , Light shade recommended; careful weeding. 39 GERMINATION AND GROWTH , 55% germination of fresh seed in 10-12 days. Plantable size in 11-14 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Termites attack trees of all ages.	
<b>PRINCIPAL REFERENCES:</b> 16 69 71 93 95 107 109 121 128 152	

<b>SPECIES: <u>Azadirachta indica</u> A. Juss.</b>	
<b>TAXONOMY:</b> 1 FAMILY ..... Meliaceae 2 SYNONYMS ..... <u>Melia azadirachta</u> L.; <u>Melia indica</u> Brand. 3 LOCAL OR TRADE NAMES , Neem; Nim; Margosa; Marrango.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 10-25°N 5 AREAS ..... Drier parts of India, Burma, Thailand and Cambodia.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE ..... 0-1,000 m 7 MEAN ANNUAL RAINFALL , 450-1,200 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 5-7 months 10 MEAN MAX. TEMP. , 26-38°C 11 MEAN MIN. TEMP. , 14-24°C 12 MEAN ANNUAL TEMP. .... 21-32°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium/heavy 14 REACTION ..... Neutral 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS , Better growth on deep soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 20-25 m; d = 100-150 cm 18 DESCRIPTION ..... Evergreen 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Moderately demanding; shade tolerant in youth. 21 OTHER CHARACTERISTICS , Aggressive coloniser; vigorous coppice; drought hardy; long tap root; frost and fire tender; fuelwood rotation of 8 years.	

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... -</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... -</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.38-0.42</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Difficult</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Slow, but little degrade.</p> <p>29 OTHER FEATURES ..... Resembles cedar.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light construction; furniture.</p> <p>31 ROUNDWOOD ..... Plywood/veneer; pulp; firewood.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Venezuela and Costa Rica.</p> <p>34 SEEDS PER KILOGRAMME , 2,300-2,700</p> <p>35 STORAGE ..... -</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Stumps</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH -</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Very susceptible to beetle and weevil attack.</p>	
<p>PRINCIPAL REFERENCES: 25</p>	

SPECIES: Bombacopsis quinata (Jacq.) Dugand

<p>TAXONOMY:</p> <p>1 FAMILY ..... Bombacaceae</p> <p>2 SYNONYMS ..... <u>B. sepium</u> Pittier</p> <p>3 LOCAL OR TRADE NAMES , Pochote</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 6-14° N</p> <p>5 AREAS ..... Central and South America, from Honduras to Venezuela.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE ..... 0-800 m</p> <p>7 MEAN ANNUAL RAINFALL , 800-1,600 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 3-5 months</p> <p>10 MEAN MAX. TEMP. 26-32°C</p> <p>11 MEAN MIN. TEMP. 16-24°C</p> <p>12 MEAN ANNUAL TEMP. .... 20-27°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining; seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 30-40 m</p> <p>18 DESCRIPTION ..... Deciduous; spiny; buttressed.</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding; shade tolerant in youth.</p> <p>21 OTHER CHARACTERISTICS Coppices</p>	

SPECIES: <u>Brachychiton populneum</u> (Schott) R.Br.	
TAXONOMY:	
1 FAMILY .....	Sterculiaceae
2 SYNONYMS .....	<u>Sterculia diversifolia</u> D. Don
3 LOCAL OR TRADE NAMES .	Kurrajong; bottle tree.
NATURAL OCCURRENCE:	
4 LATITUDES .....	20-40° S
5 AREAS .....	South-eastern Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,000 m
7 MEAN ANNUAL RAINFALL .	250-760 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8 months
10 MEAN MAX. TEMP.	38°C
11 MEAN MIN. TEMP.	13-17°C
12 MEAN ANNUAL TEMP. ....	16-25°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS	Intolerant of poor soils; tolerates slight salinity.
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Evergreen; bole swollen at base.
19 FORM .....	Good above basal swelling.
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Drought resistant; frost tender; withstands lopping.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade
TIMBER:	
24 DENSITY .....	S.G. 0.36-0.40
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Boxes
31 ROUNDWOOD .....	Fuelwood; woodwool.
32 OTHER PRODUCTS .....	Fodder (leaves and branches); fibres; edible fruit, (N.B. large amounts of seed can poison cattle); honey flora.
NURSERY:	
33 SEED SOURCES .....	Australia; Cyprus.
34 SEEDS PER KILOGRAMME .	6,700-10,000
35 STORAGE .....	At ambient temperature.
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Potted seedlings; direct sown; cuttings.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	50-70% germination.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES: 14 71 134 152	

SPECIES: <u>Brachychiton populneum</u> (Schott) R.Br.	
TAXONOMY:	
1 FAMILY .....	Sterculiaceae
2 SYNONYMS .....	<u>Sterculia diversifolia</u> D. Don
3 LOCAL OR TRADE NAMES .	Kurrajong; bottle tree.
NATURAL OCCURRENCE:	
4 LATITUDES .....	20-40° S
5 AREAS .....	South-eastern Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,000 m
7 MEAN ANNUAL RAINFALL .	250-760 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8 months
10 MEAN MAX. TEMP.	38°C
11 MEAN MIN. TEMP.	13-17°C
12 MEAN ANNUAL TEMP. ....	16-25°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS	Intolerant of poor soils; tolerates slight salinity.
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Evergreen; bole swollen at base.
19 FORM .....	Good above basal swelling.
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Drought resistant; frost tender; withstands lopping.



SPECIES: Butyrospermum paradoxum (Gaertn. f.) Hepper

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Sapotaceae</p> <p>2 SYNONYMS ..... <u>B. niloticum</u> kotschy; <u>B. parkii</u> (G.Don.) kotschy</p> <p>3 LOCAL OR TRADE NAMES : Shea butter tree; imuru; lulu (Arabic).</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 10-20°N</p> <p>5 AREAS ..... Central and West African savannas.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-300 m</p> <p>7 MEAN ANNUAL RAINFALL , 300-1,000 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 4-6 months</p> <p>10 MEAN MAX. TEMP. ....</p> <p>HOTTEST MONTH ..... 35-40°C</p> <p>11 MEAN MIN. TEMP. ....</p> <p>COLDEST MONTH ..... 26-29°C</p> <p>12 MEAN ANNUAL TEMP. ....</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium</p> <p>14 REACTION ..... -</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 7-15 m</p> <p>18 DESCRIPTION ..... Deciduous; spreading crown.</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Light demanding</p> <p>21 OTHER CHARACTERISTICS Fire resistant; long taproot.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... -</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Agroforestry</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. = 1.28</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Difficult</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... Hard; resistant to termite attack.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... -</p> <p>31 ROUNDWOOD ..... -</p> <p>32 OTHER PRODUCTS ..... Edible fats and 'shea' oil in seed kernels; (25-40 kg fruit/tree/year); medicine.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... West Africa.</p> <p>34 SEEDS PER KILOGRAMME -</p> <p>35 STORAGE ..... None: fresh seed essential.</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Direct sown.</p> <p>38 SPECIAL REQUIREMENTS : Care of taproot if transplanting.</p> <p>39 GERMINATION AND GROWTH Fruit borne at 12-15 years after planting.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... -</p>	
<p><b>PRINCIPAL REFERENCES:</b> 44</p>	

SPECIES: <u>Calliandra calothyrsus</u> Meisn.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Calliandra confusa</u> Sprague & Riley
3 LOCAL OR TRADE NAMES .	Calliandra
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-18°N
5 AREAS .....	Central America but well established in Indonesia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	150-1,500 m
7 MEAN ANNUAL RAINFALL .	1,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.,	24-30°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.,	18-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP., ....	22-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist, moderately free draining.
16 OTHER CHARACTERISTICS	Tolerates infertile and compacted soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Small shrub
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; vigorous coppice; fixes nitrogen; withstands long drought; annual coppicing can be carried out for 15-20 years; requires very close spacing in plantation; suppresses weeds including <u>Imperata cylindrica</u> .
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	5-20 in first year after planting; 35-65 thereafter.
ROLE IN LAND USE:	
23 .....	Anti-erosion; soil improvement; firebreaks; ornamental; green manure.
TIMBER:	
24 DENSITY .....	S.G. 0.51-0.78
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Strong
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuelwood (c.v. = 18,900 - 19,950 kJ/kg); tool handles.
32 OTHER PRODUCTS .....	Fodder (7-10 tonnes dry leaves/ha/ann); honey flora.
NURSERY:	
33 SEED SOURCES .....	Indonesia
34 SEEDS PER KILOGRAMME .	-
35 STORAGE .....	-
36 PRE-TREATMENT .....	Hot water then soak in cold for 24 hours.
37 PLANTING STOCK .....	Direct sown; bare rooted plants; large cuttings.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None reported.
PRINCIPAL REFERENCES:	
	47 120 121

SPECIES: <u>Calliandra calothyrsus</u> Meisn.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Calliandra confusa</u> Sprague & Riley
3 LOCAL OR TRADE NAMES .	Calliandra
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-18°N
5 AREAS .....	Central America but well established in Indonesia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	150-1,500 m
7 MEAN ANNUAL RAINFALL .	1,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.,	24-30°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.,	18-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP., ....	22-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist, moderately free draining.
16 OTHER CHARACTERISTICS	Tolerates infertile and compacted soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Small shrub
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; vigorous coppice; fixes nitrogen; withstands long drought; annual coppicing can be carried out for 15-20 years; requires very close spacing in plantation; suppresses weeds including <u>Imperata cylindrica</u> .

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 2-5 (-10)	
<b>ROLE IN LAND USE:</b> 23 ..... Windbreaks	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.46-0.80 25 NATURAL DURABILITY ... Very durable 26 PRESERVATION ..... - 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Frequent live knots; termite resistant; fissile; aromatic; decorative; irritant dust.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Light construction; flooring; boat-building; boxes; furniture. 31 ROUNDWOOD ..... Transmission poles; fence posts; fuelwood; veneer/plywood; turnery. 32 OTHER PRODUCTS ..... Christmas trees; tannins.	
<b>NURSERY:</b> 33 SEED SOURCES ..... Queensland, Australia; South Africa. 34 SEEDS PER KILOGRAMME . 60,000-120,000 35 STORAGE ..... Dry, cold, airtight for several years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS . Careful weeding 39 GERMINATION AND GROWTH 30-40% germination (5-20% of Northern provenance); growth slow.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Fomes robustus may occur in trees over 20 years old.	
<b>PRINCIPAL REFERENCES:</b> 4 9 34 63 71 82 84 95 101 107 128 133 152 160	

SPECIES: *Callitris columellaris* F. Muell.

<b>TAXONOMY:</b> 1 FAMILY ..... Cupressaceae 2 SYNONYMS ..... <i>C. glauca</i> R. Br. ex R.T. Bak. & H.G. Sm.; <i>C. intratropica</i> F. Muell. ex R.T. Bak. & H.G. Sm.; <i>C. hugelii</i> (Carr.) Franco. 3 LOCAL OR TRADE NAMES . White Cypress Pine; (Northern Cypress pine)	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 35°-15°S (-12°S for Northern provenances). 5 AREAS ..... Australia: Northern Cypress pine being the provenance from the Northern Territories.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 0-1800 m 7 MEAN ANNUAL RAINFALL . 750-1,500 mm 8 RAINFALL REGIME ..... Summer/uniform 9 DRY SEASON ..... 4-6 months 10 MEAN MAX. TEMP, ..... 27-34°C HOTTEST MONTH ..... 11 MEAN MIN. TEMP, ..... 8-15°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP, .... 17-24°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Acid/neutral 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS Better growth on deep fertile soils; tolerates slight salinity.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 18-28 m; d = 45-60 cm 18 DESCRIPTION ..... Evergreen; light crowned. 19 FORM ..... Acceptable; exceptional in Africa as an exotic. 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; termite resistant; fairly frost resistant; very drought hardy; substantial provenance variation; (Northern provenances have higher rainfall tolerance and greater termite resistance).	



SPECIES: <i>Carinaria pyriformis</i> Miers TAXONOMY: 1 FAMILY ..... Lecythidaceae 2 SYNONYMS ..... 3 LOCAL OR TRADE NAMES , Albarco; Colombian mahogany; Jequitibá.		PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) .... 10-20
NATURAL OCCURRENCE: 4 LATITUDES ..... 1-9°N 5 AREAS ..... Northern Colombia and Venezuela.		ROLE IN LAND USE: 23 ..... -
CLIMATE: 6 ALTITUDINAL RANGE .... 0-600 m 7 MEAN ANNUAL RAINFALL , 2,000-4,000 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. .... HOTTEST MONTH ..... 25-28°C 11 MEAN MIN. TEMP. .... COLDEST MONTH ..... 20-25°C 12 MEAN ANNUAL TEMP. .... 22-30°C		TIMBER: 24 DENSITY ..... S.G. 0.50-0.75 25 NATURAL DURABILITY ... Durable 26 PRESERVATION ..... Heartwood difficult; sapwood easy. 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Silica in wood; termite resistant.
SOILS: 13 TEXTURE ..... Medium/heavy 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS -		UTILIZATION: 30 SAW TIMBER ..... Heavy construction; light construction; furniture; flooring. 31 ROUNDWOOD ..... Veneer/plywood; turnery. 32 OTHER PRODUCTS ..... -
SILVICULTURE: 17 SIZE ..... h = 40-50 m; d = 100-300 cm 18 DESCRIPTION ..... Evergreen; buttressed. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Moderately shade tolerant. 21 OTHER CHARACTERISTICS -		NURSERY: 33 SEED SOURCES ..... Colombia 34 SEEDS PER KILOGRAMME , 1,000 35 STORAGE ..... Dry, cold and airtight for up to one year 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted; striplings; bare-rooted plants. 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH Germinates in 8-20 days. No information on growth in nursery.
PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported.		PRINCIPAL REFERENCES: 19 25 100

SPECIES: <i>Carinaria pyriformis</i> Miers TAXONOMY: 1 FAMILY ..... Lecythidaceae 2 SYNONYMS ..... 3 LOCAL OR TRADE NAMES , Albarco; Colombian mahogany; Jequitibá.		PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) .... 10-20
NATURAL OCCURRENCE: 4 LATITUDES ..... 1-9°N 5 AREAS ..... Northern Colombia and Venezuela.		ROLE IN LAND USE: 23 ..... -
CLIMATE: 6 ALTITUDINAL RANGE .... 0-600 m 7 MEAN ANNUAL RAINFALL , 2,000-4,000 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. .... HOTTEST MONTH ..... 25-28°C 11 MEAN MIN. TEMP. .... COLDEST MONTH ..... 20-25°C 12 MEAN ANNUAL TEMP. .... 22-30°C		TIMBER: 24 DENSITY ..... S.G. 0.50-0.75 25 NATURAL DURABILITY ... Durable 26 PRESERVATION ..... Heartwood difficult; sapwood easy. 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Silica in wood; termite resistant.
SOILS: 13 TEXTURE ..... Medium/heavy 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS -		UTILIZATION: 30 SAW TIMBER ..... Heavy construction; light construction; furniture; flooring. 31 ROUNDWOOD ..... Veneer/plywood; turnery. 32 OTHER PRODUCTS ..... -
SILVICULTURE: 17 SIZE ..... h = 40-50 m; d = 100-300 cm 18 DESCRIPTION ..... Evergreen; buttressed. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Moderately shade tolerant. 21 OTHER CHARACTERISTICS -		NURSERY: 33 SEED SOURCES ..... Colombia 34 SEEDS PER KILOGRAMME , 1,000 35 STORAGE ..... Dry, cold and airtight for up to one year 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted; striplings; bare-rooted plants. 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH Germinates in 8-20 days. No information on growth in nursery.
PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported.		PRINCIPAL REFERENCES: 19 25 100

SPECIES: <u>Cassia siamea</u> Lam.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	<u>C. florida</u> Vahl
3 LOCAL OR TRADE NAMES	Cassia; Waa.
NATURAL OCCURRENCE:	
4 LATITUDES .....	1-5°N
5 AREAS .....	S.E. Asia, including India, Sri Lanka and Malaya; but widely established as an exotic.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	650-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	23-35°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	13-24°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 (up to 20) m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor/acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; root suckers vigorously; drought hardy; moderately frost resistant; rotation of 10 years for firewood.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	8-12
ROLE IN LAND USE:	
23 .....	Windbreaks; ornamental; agroforestry.
TIMBER:	
24 DENSITY .....	S.G. 0.60-0.80
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	Moderate
28 SEASONING .....	Moderate
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Fine furniture in larger sizes.
31 ROUNDWOOD .....	Building poles; fuel (c.v. = 19,380 kJ/kg) and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	Fodder (not for pigs).
NURSERY:	
33 SEED SOURCES .....	Most tropical countries.
34 SEEDS PER KILOGRAMME	34,000-40,000
35 STORAGE .....	Dry, ambient temperature for several years.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Potted; stumps; direct sown.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Good (90%) and uniform after 7 days. Plantable size in 12-24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	A serious disease is <i>Phaeolus manihotis</i> which kills roots causing dieback. Also susceptible to attack by scale insects and liable to browsing damage.
PRINCIPAL REFERENCES:	
	69 71 95 107 109 120 121 128 134 152

SPECIES: <u>Cassia siamea</u> Lam.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	<u>C. florida</u> Vahl
3 LOCAL OR TRADE NAMES	Cassia; Waa.
NATURAL OCCURRENCE:	
4 LATITUDES .....	1-5°N
5 AREAS .....	S.E. Asia, including India, Sri Lanka and Malaya; but widely established as an exotic.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	650-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	23-35°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	13-24°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 (up to 20) m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor/acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; root suckers vigorously; drought hardy; moderately frost resistant; rotation of 10 years for firewood.

SPECIES: *Casuarina decaisneana* F. Muell.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Casuarinaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES : Desert she-oak.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 27-21.5°S</p> <p>5 AREAS ..... Central Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 250-700 m</p> <p>7 MEAN ANNUAL RAINFALL : 200-250 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 4-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 20-35°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 10-20°C</p> <p>12 MEAN ANNUAL TEMP. .... 18-26°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Acid/neutral</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS : Deep soils</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 9-15 m; d = 25-30 cm</p> <p>18 DESCRIPTION ..... Evergreen; needle-like branchlets with reduced leaves.</p> <p>19 FORM ..... Acceptable/exceptional</p> <p>20 LIGHT REQUIREMENTS ... Light demanding</p> <p>21 OTHER CHARACTERISTICS : Fire resistant; frost resistant; fixes nitrogen; drought hardy.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-12</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Shade and shelter</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 1.05-1.12</p> <p>25 NATURAL DURABILITY ... Moderately durable.</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Difficult</p> <p>28 SEASONING ..... Difficult</p> <p>29 OTHER FEATURES ..... Termite resistant</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction.</p> <p>31 ROUNDWOOD ..... Fuel; fence posts; turnery.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia</p> <p>34 SEEDS PER KILOGRAMME : 70,000-85,000</p> <p>35 STORAGE ..... Ambient temperature for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted; bare-rooted seedlings; cuttings.</p> <p>38 SPECIAL REQUIREMENTS : -</p> <p>39 GERMINATION AND GROWTH : Germination of 60-90%.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of major importance.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 26 41 55 121</p>	

SPECIES: <u>Casuarina equisetifolia L.</u>	
TAXONOMY:	
1 FAMILY .....	Casuarinaceae
2 SYNONYMS .....	<u>C. littoralis</u> Salisb.
3 LOCAL OR TRADE NAMES :	Coast or Beach She-oak.
NATURAL OCCURRENCE:	
4 LATITUDES .....	31.5-12°S and 18-22°N
5 AREAS .....	Coastal dunes of S.E. Asia and Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL :	750-2,500 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	3-4 months
10 MEAN MAX. TEMP.	20-35°C
HOTTEST MONTH .....	10-20°C
11 MEAN MIN. TEMP.	18-28°C
12 MEAN ANNUAL TEMP. ....	
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils and poor, dry soils.
SILVICULTURE:	
17 SIZE .....	h = 10-40 m; d = 40-45 cm
18 DESCRIPTION .....	Evergreen; light crowned; dioecious.
19 FORM .....	Exceptional/acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Weak coppice; termite resistant; tolerates salt winds; fixes nitrogen; requires wide spacing; frost tender; fire sensitive; short-lived (20-40 years); rotations of 8-15 years for fuelwood.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	5-18
ROLE IN LAND USE:	
23 .....	Windbreaks; soil improvement; ornamental; anti-erosion; dune stabilisation.
TIMBER:	
24 DENSITY .....	S.G. 0.80-1.20
25 NATURAL DURABILITY ...	Moderately durable.
26 PRESERVATION .....	Fair
27 SAWING .....	Difficult
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Very hard; attractive figure when quartersawn.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; boat building.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. 19,580 - 20,560 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Tannins; dyes; medicine; 'Cones' (1.8 t/ha/an) for fuel.
NURSERY:	
33 SEED SOURCES .....	Nearly all tropical and sub-tropical coastal areas.
34 SEEDS PER KILOGRAMME .	700,000-800,000
35 STORAGE .....	Sealed at 4°C for up to 8 months.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; bare-rooted plants; cuttings.
38 SPECIAL REQUIREMENTS .	Shade in nursery. Inoculate soil of new plantation sites with crushed root nodules.
39 GERMINATION AND GROWTH	Germinates in 20-40 days (60-70% of fresh seed). 5-25% germination after 12 months storage. Plantable size in 4-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Usually free from pests and diseases.
PRINCIPAL REFERENCES:	
	40 52 60 71 95 109 121 128 152

SPECIES: <u>Casuarina equisetifolia L.</u>	
TAXONOMY:	
1 FAMILY .....	Casuarinaceae
2 SYNONYMS .....	<u>C. littoralis</u> Salisb.
3 LOCAL OR TRADE NAMES :	Coast or Beach She-oak.
NATURAL OCCURRENCE:	
4 LATITUDES .....	31.5-12°S and 18-22°N
5 AREAS .....	Coastal dunes of S.E. Asia and Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL :	750-2,500 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	3-4 months
10 MEAN MAX. TEMP.	20-35°C
HOTTEST MONTH .....	10-20°C
11 MEAN MIN. TEMP.	18-28°C
12 MEAN ANNUAL TEMP. ....	
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils and poor, dry soils.
SILVICULTURE:	
17 SIZE .....	h = 10-40 m; d = 40-45 cm
18 DESCRIPTION .....	Evergreen; light crowned; dioecious.
19 FORM .....	Exceptional/acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Weak coppice; termite resistant; tolerates salt winds; fixes nitrogen; requires wide spacing; frost tender; fire sensitive; short-lived (20-40 years); rotations of 8-15 years for fuelwood.



<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) . . . . . 10-12	
<b>ROLE IN LAND USE:</b> 23 . . . . . Swamp reclamation; stabilisation of canal banks; windbreaks.	
<b>TIMBER:</b> 24 DENSITY . . . . . 0.90-0.98 25 NATURAL DURABILITY . . . . . Durable 26 PRESERVATION . . . . . - 27 SAWING . . . . . - 28 SEASONING . . . . . Fiar/difficult 29 OTHER FEATURES . . . . . Fissile; tough; decorative; strong.	
<b>UTILIZATION:</b> 30 SAW TIMBER . . . . . Wharf timbers 31 ROUNDWOOD . . . . . Fuelwood; posts; turnery. 32 OTHER PRODUCTS . . . . . Tannin.	
<b>NURSERY:</b> 33 SEED SOURCES . . . . . Australia, Cyprus; France; Kenya; Netherlands. 34 SEEDS PER KILOGRAMME . . . . . 8000,000-1,050,000 35 STORAGE . . . . . Ambient temperature. 36 PRE-TREATMENT . . . . . None 37 PLANTING STOCK . . . . . Potted; root cuttings. 38 SPECIAL REQUIREMENTS . . . . . - 39 GERMINATION AND GROWTH . . . . . Germination of 50-65%; fast growth in nursery.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 . . . . . None	
<b>PRINCIPAL REFERENCES:</b> 10 27 54 71 121 152	

**SPECIES:** *Casuarina glauca* Sieb. ex Spreng.

<b>TAXONOMY:</b> 1 FAMILY . . . . . Casuarinaceae 2 SYNONYMS . . . . . <i>C. lepidophloia</i> F. Muell. 3 LOCAL OR TRADE NAMES . . . . . Swamp she-oak; Muinji; Longleaf ironwood.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES . . . . . 36.5-23°S 5 AREAS . . . . . Coastal Eastern Australia.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE . . . . . 0-30 m 7 MEAN ANNUAL RAINFALL . . . . . 900-1,150 mm 8 RAINFALL REGIME . . . . . Summer 9 DRY SEASON . . . . . 3-4 months 10 MEAN MAX. TEMP. . . . . 20-30°C 11 MEAN MIN. TEMP. . . . . 10-20°C 12 MEAN ANNUAL TEMP. . . . . 18-24°C	
<b>SOILS:</b> 13 TEXTURE . . . . . Heavy/medium 14 REACTION . . . . . Neutral/alkaline 15 DRAINAGE . . . . . Seasonally waterlogged. 16 OTHER CHARACTERISTICS . . . . . Saline and swampy; also tolerates shallow, dry soils.	
<b>SILVICULTURE:</b> 17 SIZE . . . . . h = 10-20 m; d = 50-75 cm 18 DESCRIPTION . . . . . Swamp tree; evergreen; buttressed. 19 FORM . . . . . Acceptable 20 LIGHT REQUIREMENTS . . . . . - 21 OTHER CHARACTERISTICS . . . . . Aggressive coloniser; coppices; tolerates salt winds; slightly frost resistant; root suckers vigorously; fixes nitrogen; drought resistant.	

SPECIES: <u>Casuarina junghuhniana</u> Miq.	
TAXONOMY:	
1 FAMILY .....	Casuarinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES , -	
NATURAL OCCURRENCE:	
4 LATITUDES .....	5°N-2°S
5 AREAS .....	Central and East Java.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,100 m
7 MEAN ANNUAL RAINFALL ,	750-2,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	19-22°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid/neutral/(alkaline)
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adapts to various sites.
SILVICULTURE:	
17 SIZE .....	h = 15-20 m; d = 15 cm
18 DESCRIPTION .....	Dioecious
19 FORM .....	Acceptable/exceptional
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Root suckers vigorously; fixes nitrogen; drought resistant; 5-8 year rotation for roundwood.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	7-11
ROLE IN LAND USE:	
23 .....	Shade and shelter; ornamental.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY ...	Very durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Pissile
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Underground piling for construction; fuel and charcoal.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	-
34 SEEDS PER KILOGRAMME ,	-
35 STORAGE .....	-
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Cuttings; air-layering.
38 SPECIAL REQUIREMENTS ,	50% shade in nursery.
39 GERMINATION AND GROWTH	Plantable size in 2-3 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of major importance.
PRINCIPAL REFERENCES:	
	24

SPECIES: <u>Casuarina junghuhniana</u> Miq.	
TAXONOMY:	
1 FAMILY .....	Casuarinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES , -	
NATURAL OCCURRENCE:	
4 LATITUDES .....	5°N-2°S
5 AREAS .....	Central and East Java.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,100 m
7 MEAN ANNUAL RAINFALL ,	750-2,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	19-22°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid/neutral/(alkaline)
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adapts to various sites.
SILVICULTURE:	
17 SIZE .....	h = 15-20 m; d = 15 cm
18 DESCRIPTION .....	Dioecious
19 FORM .....	Acceptable/exceptional
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Root suckers vigorously; fixes nitrogen; drought resistant; 5-8 year rotation for roundwood.

SPECIES: <u>Cedrela odorata</u> L.	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	<u>Cedrela mexicana</u> M.J. Roem.
3 LOCAL OR TRADE NAMES .	West Indian Cedar; Cedro.
NATURAL OCCURRENCE:	
4 LATITUDES .....	28°S-26°N
5 AREAS .....	Central and South America from Mexico to Bolivia and Argentina.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	1,200-2,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	11-22°C
12 MEAN ANNUAL TEMP. ....	20-32°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 100-300 cm
18 DESCRIPTION .....	Deciduous; buttressed.
19 FORM .....	Acceptable/exceptional.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	11-22
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.37-0.60
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Decorative; scented; termite resistant.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes; boat-building; musical instruments.
31 ROUNDWOOD .....	Veneer/plywood; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	South and Central America; Trinidad.
34 SEEDS PER KILOGRAMME .	45,000-60,000
35 STORAGE .....	Dry, cold and airtight for one-two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; striplings.
38 SPECIAL REQUIREMENTS .	Benefits from some shade in nursery.
39 GERMINATION AND GROWTH	Germinates in 14-28 days. Plantable size in 12-15 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	The shoot borer <u>Hypsipyla grandella</u> is a major pest. Attack in the Americas can only be avoided by maintaining optimum vigour and mixing with other species.
PRINCIPAL REFERENCES:	
1	25 52 57 59 100 103 128 152

SPECIES: <u>Cedrela odorata</u> L.	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	<u>Cedrela mexicana</u> M.J. Roem.
3 LOCAL OR TRADE NAMES .	West Indian Cedar; Cedro.
NATURAL OCCURRENCE:	
4 LATITUDES .....	28°S-26°N
5 AREAS .....	Central and South America from Mexico to Bolivia and Argentina.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	1,200-2,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	11-22°C
12 MEAN ANNUAL TEMP. ....	20-32°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 100-300 cm
18 DESCRIPTION .....	Deciduous; buttressed.
19 FORM .....	Acceptable/exceptional.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-

SPECIES: <i>Ceratonia siliqua</i> L.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Carob; St. John's Bread; Locust bean.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27°-42°N
5 AREAS .....	Mediterranean Basin; naturalised in N. India. Coasts, up to 25 km inland, best.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	200-800 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-10°C
12 MEAN ANNUAL TEMP. ....	13-27°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Good
16 OTHER CHARACTERISTICS	Calcareous soils and dunes; tolerates thin soils and up to 3% salinity.
SILVICULTURE:	
17 SIZE .....	b = 8-17 m
18 DESCRIPTION .....	Small, evergreen tree; dioecious (some hermaphrodite).
19 FORM .....	Poor; heavy branching.
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; heat and fire resistant; windfirm; termite resistant; tolerates salt winds; moderately frost resistant; drought hardy; four varieties; requires wide spacing; penetrating root system; long lived; slow growing
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Erosion control; agroforestry; windbreak.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuelwood
32 OTHER PRODUCTS .....	Pods (2.5 tonnes/ha/an) yield gum, syrup and industrial extractives; pods are valuable fodder (not for poultry).
NURSERY:	
33 SEED SOURCES .....	Cyprus (var. Tylliria); USA (vars. Bolser, Horne, Santa Fe); France; S. Africa; Lebanon.
34 SEEDS PER KILOGRAMME	4,000-6,000
35 STORAGE .....	Up to 5 years fumigated, cold and sealed.
36 PRE-TREATMENT .....	Boiling water till cool; or cold stratification 10 weeks.
37 PLANTING STOCK .....	Potted; direct sown; cuttings.
38 SPECIAL REQUIREMENTS	Care of long tap-root.
39 GERMINATION AND GROWTH	80% germination.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Rodents - eat roots; carob-fly <i>Asphodylia gemmadii</i> in Mediterranean; withstands browsing.
PRINCIPAL REFERENCES:	
	31 42 71 72 89 174

SPECIES: <i>Ceratonia siliqua</i> L.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Carob; St. John's Bread; Locust bean.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27°-42°N
5 AREAS .....	Mediterranean Basin; naturalised in N. India. Coasts, up to 25 km inland, best.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	200-800 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-10°C
12 MEAN ANNUAL TEMP. ....	13-27°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Good
16 OTHER CHARACTERISTICS	Calcareous soils and dunes; tolerates thin soils and up to 3% salinity.
SILVICULTURE:	
17 SIZE .....	b = 8-17 m
18 DESCRIPTION .....	Small, evergreen tree; dioecious (some hermaphrodite).
19 FORM .....	Poor; heavy branching.
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; heat and fire resistant; windfirm; termite resistant; tolerates salt winds; moderately frost resistant; drought hardy; four varieties; requires wide spacing; penetrating root system; long lived; slow growing

SPECIES: <u>Chlorophora excelsa</u> (Welw.) Benth.	
PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 5-8	
ROLE IN LAND USE: 23 .....	
TIMBER: 24 DENSITY ..... S.G. 0.55-0.66 25 NATURAL DURABILITY ... Very durable. 26 PRESERVATION ..... Difficult 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... High quality; interlocked grain; calcite crystals in wood.	
UTILIZATION: 30 SAW TIMBER ..... Heavy construction; light construction; furniture; boat building; joinery. 31 ROUNDWOOD ..... Veneer/plywood. 32 OTHER PRODUCTS ..... -	
NURSERY: 33 SEED SOURCES ..... Most tropical African countries. 34 SEEDS PER KILOGRAMME , 300,000-480,000 35 STORAGE ..... Dry, cold, airtight - shortlived viability. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Stripplings; stumps. 38 SPECIAL REQUIREMENTS , Plant large stumps. 39 GERMINATION AND GROWTH Germinates in 14-18 days. Plantable size in 12-18 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... <u>Phytoloma</u> sp. is important: causing galls on and devastating shoots. The Giant Snail <u>Achatina</u> has proved a pest in E. Africa.	
PRINCIPAL REFERENCES: 4 5 49 57 100 107 128 152 155	

TAXONOMY: 1 FAMILY ..... Moraceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES , Iroko; Mvule.	
NATURAL OCCURRENCE: 4 LATITUDES ..... 5°S-10°N 5 AREAS ..... Tropical Africa from Ghana to East Coast.	
CLIMATE: 6 ALTITUDINAL RANGE .... 0-1,200 m 7 MEAN ANNUAL RAINFALL , 1,000-1,800 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 0-3 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 23-33°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 20-26°C 12 MEAN ANNUAL TEMP. .... 22-33°C	
SOILS: 13 TEXTURE ..... Medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Moderately free draining. 16 OTHER CHARACTERISTICS -	
SILVICULTURE: 17 SIZE ..... h = 35-40 m 18 DESCRIPTION ..... Deciduous; similar to <u>C. regia</u> , West of Ghana. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; root suckers vigorously; requires wide spacing.	

SPECIES: <u>Cleistopholis glauca</u> Pierre ex Engl. & Diels.	
TAXONOMY:	
1 FAMILY .....	Annonaceae
2 SYNONYMS .....	<u>C. grandiflora</u> de Wild
3 LOCAL OR TRADE NAMES .	Ovok; Montole.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-5°N
5 AREAS .....	Tropical Central Africa from Zaire to Cabinda and Angola.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-200 m
7 MEAN ANNUAL RAINFALL .	1,600-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	25-30°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist; free draining.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	25-40
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	0.25-0.40
25 NATURAL DURABILITY ...	Non-durable.
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Whitewood; straight grained.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; joinery; boxes.
31 ROUNDWOOD .....	Shortfibre pulp; core veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Zaire; Solomon Islands; Congo.
34 SEEDS PER KILOGRAMME .	1,200-1,500
35 STORAGE .....	Cold, sealed for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	None
39 GERMINATION AND GROWTH	Germinates in 28-40 days. Plantable size within 6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES: 58 111 112 159	

SPECIES: <u>Cleistopholis glauca</u> Pierre ex Engl. & Diels.	
TAXONOMY:	
1 FAMILY .....	Annonaceae
2 SYNONYMS .....	<u>C. grandiflora</u> de Wild
3 LOCAL OR TRADE NAMES .	Ovok; Montole.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-5°N
5 AREAS .....	Tropical Central Africa from Zaire to Cabinda and Angola.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-200 m
7 MEAN ANNUAL RAINFALL .	1,600-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	25-30°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist; free draining.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... -	
<b>ROLE IN LAND USE:</b> 23 ..... Soil stabilisation.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. over 1.0 25 NATURAL DURABILITY ... Very durable. 26 PRESERVATION ..... - 27 SAWING ..... Difficult 28 SEASONING ..... Difficult 29 OTHER FEATURES ..... Felling difficult. Heavy, dark wood, black gum. Termite and <u>Lycetus</u> resistant.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Furniture; railway sleepers; flooring; heavy construction; boat building. 31 ROUNDWOOD ..... Mine props; turnery; fence posts; bridge piles; firewood. 32 OTHER PRODUCTS ..... Fodder (fruit and leaves).	
<b>NURSERY:</b> 33 SEED SOURCES ..... - 34 SEEDS PER KILOGRAMME . - 35 STORAGE ..... - 36 PRE-TREATMENT ..... None required. 37 PLANTING STOCK ..... Seedlings. 38 SPECIAL REQUIREMENTS . Seeds must be planted in pod. 39 GERMINATION AND GROWTH Slow early growth; weed carefully.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... <u>Gonombrasia belina</u> (mopane worm) feeds on leaves; caterpillars eaten in many African countries. Elephants destroy the woodlands.	
<b>PRINCIPAL REFERENCES:</b> 9 28 85 121	

SPECIES: Colophospermum mopane (Kirk ex Benth.) Kirk ex J. Léonard

<b>TAXONOMY:</b> 1 FAMILY ..... Caesalpinaceae 2 SYNONYMS ..... <u>Copaifera mopane</u> Kirk ex Benth.	
3 LOCAL OR TRADE NAMES . Mopane; musaru; lipani; turpentine tree; Rhodesian ironwood.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 10°N-25°S 5 AREAS ..... Central and Southern Africa; naturalised in arid zones of India.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 0-1,200 m 7 MEAN ANNUAL RAINFALL . 200-750 mm 8 RAINFALL REGIME ..... Summer 9 DRY SEASON ..... 5-8 months 10 MEAN MAX. TEMP. .... 34-36°C HOTTTEST MONTH ..... 11 MEAN MIN. TEMP. .... 12-16°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP. .... 22-28°C	
<b>SOILS:</b> 13 TEXTURE ..... Heavy/medium 14 REACTION ..... Neutral/alkaline 15 DRAINAGE ..... Moist/waterlogging tolerated. 16 OTHER CHARACTERISTICS Tolerates dry saline sites. Grey, calcareous "mopane" soils are specific to pure natural stands.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 10-20 m 18 DESCRIPTION ..... Deciduous, savanna tree. 19 FORM ..... Good 20 LIGHT REQUIREMENTS ... Light demander 21 OTHER CHARACTERISTICS Coppices vigorously after fire, frost or felling; fixes nitrogen; very drought hardy; casts little shade; slow growing.	

SPECIES: <u>Conocarpus lancifolius</u> Engl.	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Damas
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-11°N
5 AREAS .....	Somalia
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-800 m
7 MEAN ANNUAL RAINFALL ..	250-600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	25-39°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	22-25°C
12 MEAN ANNUAL TEMP. ....	24-30°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged.
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-18 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Frequently used in irrigated plantations.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	5-10
ROLE IN LAND USE:	
23 .....	Shade and shelter.
TIMBER:	
24 DENSITY .....	S.G. 0.81
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boat building.
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Fodder.
NURSERY:	
33 SEED SOURCES .....	Somalia and Sudan.
34 SEEDS PER KILOGRAMME ..	1,000,000-2,000,000
35 STORAGE .....	-
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; striplings; stumps.
38 SPECIAL REQUIREMENTS ..	Low germination capacity. Sow uncovered. Difficult to raise.
39 GERMINATION AND GROWTH	Germinates in 18-25 days. Plantable size in 12-18 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to damping off.
PRINCIPAL REFERENCES:	
	7 60 107 166

SPECIES: <u>Conocarpus lancifolius</u> Engl.	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Damas
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-11°N
5 AREAS .....	Somalia
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-800 m
7 MEAN ANNUAL RAINFALL ..	250-600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	25-39°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	22-25°C
12 MEAN ANNUAL TEMP. ....	24-30°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged.
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-18 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Frequently used in irrigated plantations.



SPECIES: *Cordia alliodora* (Ruiz and Pav.) Cham.

TAXONOMY:	
1 FAMILY .....	Boraginaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Laurel; Salmwood.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25°S-20°N
5 AREAS .....	Central America, West Indies, South America to Peru and Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL .....	1,000-4,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP.	26-32°C
11 MEAN MIN. TEMP.	16-25°C
12 MEAN ANNUAL TEMP. ....	20-27°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 25-30 m; d = 60-70 cm
18 DESCRIPTION .....	Deciduous; buttressed when adult.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; requires wide spacing.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-20
ROLE IN LAND USE:	
23 .....	Agricultural shade.
TIMBER:	
24 DENSITY .....	S.G. 0.45-0.55
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Some resistance to termites and marine borers.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; flooring; boats.
31 ROUNDWOOD .....	Veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Tropical, South and Central America and West Indies.
34 SEEDS PER KILOGRAMME .	20,000-30,000
35 STORAGE .....	Dry, cold, airtight - short viability.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Stumps; direct sown.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 15-30 days. Plantable size in 9-12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Very susceptible to various defoliators and canker-forming <i>Puccinia cordiae</i> in South America. Unidentified canker reported from Pacific.
PRINCIPAL REFERENCES:	
	4 5 52 59 92 100 152

SPECIES: <i>Cryptomeria japonica</i> (L.f.) Don	
TAXONOMY:	
1 FAMILY .....	Taxodiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Sugi; Japanese Cedar.
NATURAL OCCURRENCE:	
4 LATITUDES .....	30-40°N
5 AREAS .....	China and Japan.
CLIMATE:	
6 ALTITUDINAL RANGE .....	650-2,400 m
7 MEAN ANNUAL RAINFALL .....	1,500-2,500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	18-25°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	2-13°C
12 MEAN ANNUAL TEMP. ....	10-18°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 35-50 m; d = 100-300 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost resistant; substantial provenance variation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-33
ROLE IN LAND USE:	
23 .....	Windbreaks; agricultural shade.
TIMBER:	
24 DENSITY .....	S.G. 0.25-0.35
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Soft
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boxes.
31 ROUNDWOOD .....	Veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Japan and New Zealand.
34 SEEDS PER KILOGRAMME .	330,000-400,000
35 STORAGE .....	-
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; cuttings.
38 SPECIAL REQUIREMENTS .	Use large plants.
39 GERMINATION AND GROWTH	Germinates in 14-28 days; low germination capacity. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Resistant to Cypress canker.
PRINCIPAL REFERENCES:	
	4 34 128 133 152 154

SPECIES: <i>Cryptomeria japonica</i> (L.f.) Don	
TAXONOMY:	
1 FAMILY .....	Taxodiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Sugi; Japanese Cedar.
NATURAL OCCURRENCE:	
4 LATITUDES .....	30-40°N
5 AREAS .....	China and Japan.
CLIMATE:	
6 ALTITUDINAL RANGE .....	650-2,400 m
7 MEAN ANNUAL RAINFALL .....	1,500-2,500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	18-25°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	2-13°C
12 MEAN ANNUAL TEMP. ....	10-18°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 35-50 m; d = 100-300 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost resistant; substantial provenance variation.

SPECIES: <i>Cunninghamia lanceolata</i> (Lamb.) Hook.	
TAXONOMY:	
1 FAMILY .....	Taxodiaceae
2 SYNONYMS .....	<i>C. sinensis</i> Rich.
3 LOCAL OR TRADE NAMES .....	Chinese fir.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-27°N
5 AREAS .....	S. China and Taiwan. Wide latitudinal range as an exotic.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-1,800 m
7 MEAN ANNUAL RAINFALL .....	1,100-1,900 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-5 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	22-27°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-9°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Acid/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	-
SILVICULTURE:	
17 SIZE .....	h = 20-50 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional/acceptable
20 LIGHT REQUIREMENTS .....	Light demanding
21 OTHER CHARACTERISTICS .....	Coppices; frost tolerant; self pruning; fire sensitive when young; pulp rotation of 15 years; timber rotation of 50 years.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	Up to 36
ROLE IN LAND USE:	
23 .....	Windbreaks
TIMBER:	
24 DENSITY .....	S.G. = 0.4
25 NATURAL DURABILITY .....	Very durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Scented timber.
UTILIZATION:	
30 SAW TIMBER .....	Construction; carpentry; boat building; boxes.
31 ROUNDWOOD .....	Longfibre pulp.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	France; Netherlands; Brazil; China; India.
34 SEEDS PER KILOGRAMME .....	202,700
35 STORAGE .....	Dry for up to one year.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Bare rooted plants; stumps; cuttings.
38 SPECIAL REQUIREMENTS .....	Careful weeding. Shade young trees lightly.
39 GERMINATION AND GROWTH .....	50% germination in three weeks. Plantable size in 1 year.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Fusarium and Rhizoctonia wilts infect nursery stock. <i>Agrobacterium tumefaciens</i> root disease.
PRINCIPAL REFERENCES: 2 4 56 152	

SPECIES: <i>Cunninghamia lanceolata</i> (Lamb.) Hook.	
TAXONOMY:	
1 FAMILY .....	Taxodiaceae
2 SYNONYMS .....	<i>C. sinensis</i> Rich.
3 LOCAL OR TRADE NAMES .....	Chinese fir.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-27°N
5 AREAS .....	S. China and Taiwan. Wide latitudinal range as an exotic.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-1,800 m
7 MEAN ANNUAL RAINFALL .....	1,100-1,900 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-5 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	22-27°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-9°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Acid/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	-
SILVICULTURE:	
17 SIZE .....	h = 20-50 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional/acceptable
20 LIGHT REQUIREMENTS .....	Light demanding
21 OTHER CHARACTERISTICS .....	Coppices; frost tolerant; self pruning; fire sensitive when young; pulp rotation of 15 years; timber rotation of 50 years.

SPECIES: <u>Cupressus arizonica</u> Greene	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Arizona cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-35°N
5 AREAS .....	Southern Arizona and New Mexico, and Northern Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,800 m
7 MEAN ANNUAL RAINFALL .....	250-750 mm
8 RAINFALL REGIME .....	Winter/uniform/summer
9 DRY SEASON .....	4-7 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-35°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-5°C
12 MEAN ANNUAL TEMP. ....	15-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-20 m
18 DESCRIPTION .....	Evergreen; open-crowned.
19 FORM .....	Moderate
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Frost resistant; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	3-5
ROLE IN LAND USE:	
23 .....	Windbreaks; anti-erosion.
TIMBER:	
24 DENSITY .....	S.G. 0.45-0.55
25 NATURAL DURABILITY ...	Moderately durable.
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Termite susceptible.
UTILIZATION:	
30 SAW TIMBER .....	Furniture; boxes.
31 ROUNDWOOD .....	Fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	USA and Mexico.
34 SEEDS PER KILOGRAMME .	88,000-200,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Stratify in damp sand for thirty days.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Low germination capacity (25%). Germinates in 18-30 days. Plantable size in 15-18 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	16 34 52 71 84 95 134 166

SPECIES: <u>Cupressus arizonica</u> Greene	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Arizona cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-35°N
5 AREAS .....	Southern Arizona and New Mexico, and Northern Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,800 m
7 MEAN ANNUAL RAINFALL .....	250-750 mm
8 RAINFALL REGIME .....	Winter/uniform/summer
9 DRY SEASON .....	4-7 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-35°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-5°C
12 MEAN ANNUAL TEMP. ....	15-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-20 m
18 DESCRIPTION .....	Evergreen; open-crowned.
19 FORM .....	Moderate
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Frost resistant; drought hardy.

SPECIES: Cupressus lusitanica Mill. (including C. benthamii Endl.)

TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	<u>C. lindleyi</u> Klotzsch; <u>C. glauca</u> Lam.
3 LOCAL OR TRADE NAMES	Mexican cypress; Portuguese cedar; Kenya cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-27°N
5 AREAS .....	Mountains of Mexico and Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,300-3,300 m
7 MEAN ANNUAL RAINFALL .....	1,060-2,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-14°C
12 MEAN ANNUAL TEMP. ....	12-22°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m; d = 60-100 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost resistant; substantial provenance variation; responds well to fertilisers.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	15-40
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; hedging.
TIMBER:	
24 DENSITY .....	S.G. 0.43-0.48
25 NATURAL DURABILITY ...	Moderately durable.
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Fissile; fine softwood.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; joinery; furniture; boxes.
31 ROUNDWOOD .....	Building poles; longfibre pulp; plywood; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Kenya; Tanzania; Mexico and Guatemala.
34 SEEDS PER KILOGRAMME	170,000-320,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Stratify in damp sand for thirty days.
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS	Frost tender in nursery; careful weeding.
39 GERMINATION AND GROWTH	Germinates in 35 days. Plantable size in 12-24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Canker <u>Monochaetia unicornis</u> attacks some provenances. Timber borer <u>Oemida gahani</u> enters via pruning wounds, degrading timber.
PRINCIPAL REFERENCES:	
	25 34 52 53 71 85 128 152

SPECIES: <u>Cupressus macrocarpa</u> Hartweg	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	<u>C. hartwegii</u> Carrière
3 LOCAL OR TRADE NAMES	Monterey cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	36.5°N
5 AREAS .....	Limited area at Monterey on Californian coast.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-3,500 m
7 MEAN ANNUAL RAINFALL .....	700-1,600 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-32°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	0-11°C
12 MEAN ANNUAL TEMP. ....	14-20°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	11-25
ROLE IN LAND USE:	
23 .....	Windbreaks; dune fixation.
TIMBER:	
24 DENSITY .....	S.G. 0.47-0.50
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Branching leads to knotty timber if not pruned.
UTILIZATION:	
30 SAW TIMBER .....	Light construction.
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	USA and New Zealand.
34 SEEDS PER KILOGRAMME ..	140,000-150,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Stratify in damp sand for thirty days.
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH	Germinates in 20-26 days; low germination capacity. Plantable size in 24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Very susceptible to various cankers wherever grown. Timber borer <u>Oemida gahani</u> enters via pruning wounds, degrading timber.
PRINCIPAL REFERENCES:	
	34 71 109 128 152

SPECIES: <u>Cupressus macrocarpa</u> Hartweg	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	<u>C. hartwegii</u> Carrière
3 LOCAL OR TRADE NAMES	Monterey cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	36.5°N
5 AREAS .....	Limited area at Monterey on Californian coast.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-3,500 m
7 MEAN ANNUAL RAINFALL .....	700-1,600 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-32°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	0-11°C
12 MEAN ANNUAL TEMP. ....	14-20°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Shade tolerant
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost resistant.

SPECIES: <u>Cupressus torulosa</u> Don	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Bhutan cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-32°N
5 AREAS .....	Western Himalayas to Bhutan.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,800 m
7 MEAN ANNUAL RAINFALL	650-1,600 mm
*8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	3-4 months
10 MEAN MAX. TEMP.	20-32°C
11 MEAN MIN. TEMP.	2-12°C
12 MEAN ANNUAL TEMP. ....	12-22°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adaptable to most soil conditions but better growth on fertile, moist sites.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost resistant
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	12-17 (on best sites).
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.48-0.52
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Knotty unless pruned.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction.
31 ROUNDWOOD .....	Building poles; fence posts; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Kenya; Pakistan and India.
34 SEEDS PER KILOGRAMME	160,000-280,000
35 STORAGE .....	Dry, cold and airtight for 1-2 years.
36 PRE-TREATMENT .....	Stratify in damp sand.
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	40-60% germination in 14-28 days. Plantable size in 12-24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Reported to be less susceptible to <u>Monochaetia unicornis</u> than other Cupresses.
PRINCIPAL REFERENCES:	
	16 34 49 133 152 154 162

SPECIES: <u>Cupressus torulosa</u> Don	
TAXONOMY:	
1 FAMILY .....	Cupressaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Bhutan cypress.
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-32°N
5 AREAS .....	Western Himalayas to Bhutan.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,800 m
7 MEAN ANNUAL RAINFALL	650-1,600 mm
*8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	3-4 months
10 MEAN MAX. TEMP.	20-32°C
11 MEAN MIN. TEMP.	2-12°C
12 MEAN ANNUAL TEMP. ....	12-22°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Adaptable to most soil conditions but better growth on fertile, moist sites.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost resistant

SPECIES: <i>Dalbergia sissoo</i> Roxb.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Shisham; sissoo.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-30°N
5 AREAS .....	Indus to Assam; Himalayas.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	500-4,000 mm (200 mm if irrigated).
8 RAINFALL REGIME .....	Summer monsoon.
9 DRY SEASON .....	Up to 6 months.
10 MEAN MAX. TEMP.	35-45°C
11 MEAN MIN. TEMP.	-2-+5°C
12 MEAN ANNUAL TEMP. ....	18-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acidic
15 DRAINAGE .....	Good; seasonally inundated.
16 OTHER CHARACTERISTICS	River beds and river flats.
SILVICULTURE:	
17 SIZE .....	h = 30 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost resistant; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	5-8
ROLE IN LAND USE:	
23 .....	Agroforestry (gives minimal root and shade competition); erosion control in gullies and dunes.
TIMBER:	
24 DENSITY .....	S.G. 0.78-0.83
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Sapwood easily treated.
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Black heartwood figured; good bending properties.
UTILIZATION:	
30 SAW TIMBER .....	Carpentry; furniture; carriages.
31 ROUNDWOOD .....	Veneer; wheels; fuelwood (c.v. = 20,450 kJ/kg); transmission poles; fence posts.
32 OTHER PRODUCTS .....	Fodder (leaves for silage); honey flora.
NURSERY:	
33 SEED SOURCES .....	India; Pakistan; Sudan; Kenya; Cyprus.
34 SEEDS PER KILOGRAMME .	45,000-55,000
35 STORAGE .....	Dry, cold, sealed for 1-2 years. Protect from rodents.
36 PRE-TREATMENT .....	Soak in water, 48 hours.
37 PLANTING STOCK .....	Potted; stumps; root suckers; branch cuttings.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	85-95% germination in 7-15 days. Plantable size in 12-15 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Mixed species plantations recommended to combat weeds and pests. Browsing damage by porcupines. Termites attack young plants. <i>Tapinanthus dodoneifolius</i> , mistletoe.
PRINCIPAL REFERENCES:	
	16 61 65 71 82 84 134 141 152

SPECIES: <i>Dalbergia sissoo</i> Roxb.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Shisham; sissoo.
NATURAL OCCURRENCE:	
4 LATITUDES .....	23-30°N
5 AREAS .....	Indus to Assam; Himalayas.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	500-4,000 mm (200 mm if irrigated).
8 RAINFALL REGIME .....	Summer monsoon.
9 DRY SEASON .....	Up to 6 months.
10 MEAN MAX. TEMP.	35-45°C
11 MEAN MIN. TEMP.	-2-+5°C
12 MEAN ANNUAL TEMP. ....	18-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acidic
15 DRAINAGE .....	Good; seasonally inundated.
16 OTHER CHARACTERISTICS	River beds and river flats.
SILVICULTURE:	
17 SIZE .....	h = 30 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost resistant; drought hardy.



<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... -	
<b>ROLE IN LAND USE:</b> 23 ..... Shade and shelter; ornamental.	
<b>TIMBER:</b> 24 DENSITY ..... - 25 NATURAL DURABILITY ..... - 26 PRESERVATION ..... - 27 SAWING ..... - 28 SEASONING ..... - 29 OTHER FEATURES ..... Weak; soft.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... - 31 ROUNDWOOD ..... Fuelwood. 32 OTHER PRODUCTS ..... Edible seed pod.	
<b>NURSERY:</b> 33 SEED SOURCES ..... Kenya; Venezuela; Zambia; Nigeria; France; Pakistan. 34 SEEDS PER KILOGRAMME ..... 1,600-3,700 (-9,300) 35 STORAGE ..... For up to 4 years. 36 PRE-TREATMENT ..... Conc. H <sub>2</sub> SO <sub>4</sub> for 3 hours; or soak in hot water 24 hours. 37 PLANTING STOCK ..... Potted seedlings; stumps; branch cuttings. 38 SPECIAL REQUIREMENTS ..... - 39 GERMINATION AND GROWTH ..... 50-80% germination in 6-9 weeks. Plantable size in 4 months (10 for stumps).	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Susceptible to termites and shoot borers.	
<b>PRINCIPAL REFERENCES:</b> 16 55 71 152 173	

SPECIES: *Delonix regia* (Boj. ex Hook.) Raf.

<b>TAXONOMY:</b> 1 FAMILY ..... Caesalpiniaceae 2 SYNONYMS ..... <i>Poinciana regia</i> Boj. ex Hook. 3 LOCAL OR TRADE NAMES ..... Flamboyant; Poinciana; Krishna chura (Bengal).	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 12-25°S 5 AREAS ..... Madagascar. Naturalised in Jamaica and widely cultivated throughout the tropics.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE ..... 0-2,000 m 7 MEAN ANNUAL RAINFALL ..... 700-1,800 mm 8 RAINFALL REGIME ..... Summer 9 DRY SEASON ..... 6 months 10 MEAN MAX. TEMP. .... Hottest month ..... 22-35°C 11 MEAN MIN. TEMP. .... Coldest month ..... 6-18°C 12 MEAN ANNUAL TEMP. .... 14-26°C	
<b>SOILS:</b> 13 TEXTURE ..... Light 14 REACTION ..... - 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS ..... Tolerates slight salinity; tolerates a wide variety of soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 8-17 m 18 DESCRIPTION ..... Briefly deciduous; buttressed. 19 FORM ..... Acceptable above buttresses; spreading crown. 20 LIGHT REQUIREMENTS ..... - 21 OTHER CHARACTERISTICS ..... Tolerates salt winds; frost tender; spreading root system; good natural regeneration; fast growing.	

SPECIES: <u>Elaeagnus angustifolia</u> L.		
TAXONOMY:		
1	FAMILY .....	Elaeagnaceae
2	SYNONYMS .....	-
3	LOCAL OR TRADE NAMES	Russian olive.
NATURAL OCCURRENCE:		
4	LATITUDES .....	30-44°N
5	AREAS .....	Southern Europe; Middle East; Central Asia to Himalayas.
CLIMATE:		
6	ALTITUDINAL RANGE .....	1,600-2,500 m
7	MEAN ANNUAL RAINFALL .....	250-600 mm
8	RAINFALL REGIME .....	Winter
9	DRY SEASON .....	6-8 months
10	MEAN MAX. TEMP., HOTTEST MONTH .....	20-32°C
11	MEAN MIN. TEMP., COLDEST MONTH .....	0-10°C
12	MEAN ANNUAL TEMP. ....	8-14°C
SOILS:		
13	TEXTURE .....	Light/medium
14	REACTION .....	Alkaline/neutral
15	DRAINAGE .....	Free draining
16	OTHER CHARACTERISTICS	Tolerates saline soils.
SILVICULTURE:		
17	SIZE .....	h = 4-8 m
18	DESCRIPTION .....	Deciduous; spiny.
19	FORM .....	Poor
20	LIGHT REQUIREMENTS .....	Strongly demanding
21	OTHER CHARACTERISTICS	Coppices; frost resistant.
PRODUCTION:		
22	VOLUME (M <sup>3</sup> /HA/AN) .....	3-5
ROLE IN LAND USE:		
23	.....	Windbreaks; dune fixation; anti-erosion.
TIMBER:		
24	DENSITY .....	-
25	NATURAL DURABILITY .....	Non-durable
26	PRESERVATION .....	-
27	SAWING .....	-
28	SEASONING .....	-
29	OTHER FEATURES .....	Only useful as fuel.
UTILIZATION:		
30	SAW TIMBER .....	-
31	ROUNDWOOD .....	Fuel and charcoal.
32	OTHER PRODUCTS .....	-
NURSERY:		
33	SEED SOURCES .....	USA; Turkey; Israel; Iran.
34	SEEDS PER KILOGRAMME .....	10,000-12,000
35	STORAGE .....	Ambient temperature for several years.
36	PRE-TREATMENT .....	Stratify in damp sand for sixty days.
37	PLANTING STOCK .....	Potted; cuttings.
38	SPECIAL REQUIREMENTS .....	-
39	GERMINATION AND GROWTH	Germinates in 30-40 days. Plantable size in 6-8 months.
PRINCIPAL PESTS AND DISEASES:		
40	.....	None of importance reported.
PRINCIPAL REFERENCES:		95 154

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 15-35	
<b>ROLE IN LAND USE:</b> 23 ..... Shade and shelter; windbreaks.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.61-0.70 25 NATURAL DURABILITY ... Moderately durable 26 PRESERVATION ..... Fair 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Heavy construction; light construction; boxes. 31 ROUNDWOOD ..... Transmission poles; fence posts; fuel and charcoal; shortfibre pulp. 32 OTHER PRODUCTS ..... Honeyflora.	
<b>NURSERY:</b> 33 SEED SOURCES ..... Australia; Argentina; Italy. 34 SEEDS PER KILOGRAMME , 300,000-400,000 (viable). 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted; bare-rooted plants. 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH Germinates in 10 days. Plantable size in 6 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... None of importance reported. Resists <u>Gonipterus</u> beetle attack.	
<b>PRINCIPAL REFERENCES:</b> 82 83 91 130 152	

SPECIES: Eucalyptus botryoides Sm.

<b>TAXONOMY:</b> 1 FAMILY ..... Myrtaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES , Southern mahogany; Bangalay.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 39-32°S 5 AREAS ..... Australia: Coastal Victoria and New South Wales.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE ..... 800-1,800 m 7 MEAN ANNUAL RAINFALL , 650-1,000 mm 8 RAINFALL REGIME ..... Summer/uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 23-29°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 2-9°C 12 MEAN ANNUAL TEMP. .... 16-22°C	
<b>SOILS:</b> 13 TEXTURE ..... Medium/heavy 14 REACTION ..... Acid 15 DRAINAGE ..... Seasonally waterlogged. 16 OTHER CHARACTERISTICS Tolerates moderately saline soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 20-40 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; termite resistant; tolerates salt winds; moderately frost resistant; 8-12 year fuelwood rotation.	

SPECIES: <u>Eucalyptus brockwayi</u> C.A. Gardn.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Dundas mahogany.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-31°S
5 AREAS .....	Restricted area in Western Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	250-400 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	19-25°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-22 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	4-5
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.75-0.85
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Tough
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Tannins
NURSERY:	
33 SEED SOURCES .....	Australia; Morocco.
34 SEEDS PER KILOGRAMME .	350,000-400,000 (viable).
35 STORAGE .....	Dry and airtight in ambient temperature.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 12-16 days. Plantable size in 6-9 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	83 84 95 91 120 152

SPECIES: <u>Eucalyptus brockwayi</u> C.A. Gardn.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Dundas mahogany.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-31°S
5 AREAS .....	Restricted area in Western Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	250-400 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	19-25°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 15-22 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices

SPECIES: Eucaalyptus camaldulensis Dehnh. (Northern Provenances)

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... <u>E. rostrata</u> Schlecht.</p> <p>3 LOCAL OR TRADE NAMES . River Red gum.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 32-15°S</p> <p>5 AREAS ..... Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,500 m</p> <p>7 MEAN ANNUAL RAINFALL . 250-1,250 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 4-8 months</p> <p>10 MEAN MAX. TEMP. .... 28-36°C</p> <p>11 HOTTTEST MONTH ..... 10-22°C</p> <p>12 MEAN MIN. TEMP. .... 19-26°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral</p> <p>15 DRAINAGE ..... Seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS Tolerates moderately saline soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-40 m; d = 80-200 cm</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; drought hardy; substantial provenance variation (Petford-QL, and Katherine-NT are generally outstanding provenances for tropical climates, Wiluna-WA for alkaline soils); frost tender; 6-10 year coppice rotation.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 15-25</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Swamp reclamation; shade and shelter.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.75-1.0</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... Fair</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Difficult</p> <p>29 OTHER FEATURES ..... Tough; interlocked grain; termite resistant.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; railway sleepers.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel (c.v. = 19,737 kJ/kg) and charcoal; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... Honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia specifying provenance.</p> <p>34 SEEDS PER KILOGRAMME . 700,000-800,000 (plus chaff); or 190,000 plants/kg of seed.</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 4-15 days. Plantable size in 4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Young plants liable to termite attack. Susceptible to attack by <u>Conipiterus</u> beetle.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 16 46 71 82 83 84 91 95 96 107</p> <p>109 121 128 130 152</p>	

SPECIES: <u>Eucalyptus camaldulensis</u> Dehnh. (Southern Provenances)	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. rostrata</u> Schlecht.
3 LOCAL OR TRADE NAMES .	River Red gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	38-32°S
5 AREAS .....	Australia, excluding Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-2,000 m
7 MEAN ANNUAL RAINFALL .	400-1,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	22-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	8-14°C
12 MEAN ANNUAL TEMP. ....	16-22°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS	Tolerates shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 80-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately frost resistant; drought hardy; substantial provenance variation (Lake Albacutya-VIC is generally outstanding provenance for Mediterranean climates); 6-10 year coppice rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-22
ROLE IN LAND USE:	
23 .....	Shade and shelter.
TIMBER:	
24 DENSITY .....	S.G. 0.70-0.90
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Tough; interlocked grain; resists termites.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; railway sleepers.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. 19,737 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Honeyflora.
NURSERY:	
33 SEED SOURCES .....	Australia specifying provenance.
34 SEEDS PER KILOGRAMME .	700,000-800,000 (plus chaff); or 190,000 plants/kg of seed.
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	Early shade beneficial.
39 GERMINATION AND GROWTH	Germinates in 4-15 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Young plants liable to termite attack. Susceptible to attack by <u>Gonipterus</u> beetle.
PRINCIPAL REFERENCES:	
	4 46 71 82 83 84 91 95 96 107 109 121 128 130 152

SPECIES: <u>Eucalyptus camaldulensis</u> Dehnh. (Southern Provenances)	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. rostrata</u> Schlecht.
3 LOCAL OR TRADE NAMES .	River Red gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	38-32°S
5 AREAS .....	Australia, excluding Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-2,000 m
7 MEAN ANNUAL RAINFALL .	400-1,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	22-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	8-14°C
12 MEAN ANNUAL TEMP. ....	16-22°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS	Tolerates shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 80-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately frost resistant; drought hardy; substantial provenance variation (Lake Albacutya-VIC is generally outstanding provenance for Mediterranean climates); 6-10 year coppice rotation.

SPECIES: Eucalyptus citriodora Hook.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Spotted gum; Lemon-scented gum.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 25-15°S</p> <p>5 AREAS ..... Australia: Central and Northern coastal Queensland.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,800 m</p> <p>7 MEAN ANNUAL RAINFALL , 650-1,600 mm</p> <p>8 RAINFALL REGIME ..... Winter/summer</p> <p>9 DRY SEASON ..... 2-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 28-34°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 8-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 17-24°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Better growth on deep soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 30-40 m; d = 60-120 cm</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Weak coppice; moderately frost resistant; drought hardy; tolerates salt winds.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-21</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Ornamental</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.80-1.03</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... Fair</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Strong; tough; <u>Lyctus</u> susceptible.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; light construction.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel and charcoal; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... Oils; honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia and many tropical countries.</p> <p>34 SEEDS PER KILOGRAMME , 140,000-220,000; or 55,000 plants/kg of seed.</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 4-19 days. Plantable size in 5-6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Liable to attack by termites when young, but less attacked by <u>Atta</u> ants than most eucalypts. Resists attack by <u>Gonipterus</u> beetle.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 82 83 91 95 107 109 128 130 148</p>	

SPECIES: Eucalyptus cladocalyx F. Muell.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES . Sugar gum</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 36-32°S</p> <p>5 AREAS ..... Discontinuous occurrence in S. Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-2,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 400-650 mm</p> <p>8 RAINFALL REGIME ..... Winter/summer</p> <p>9 DRY SEASON ..... 3-4 months</p> <p>10 MEAN MAX. TEMP. .... 22-32°C</p> <p>11 MEAN MIN. TEMP. .... 4-10°C</p> <p>12 MEAN ANNUAL TEMP. .... 15-25°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Moderately free draining</p> <p>16 OTHER CHARACTERISTICS Tolerates shallow soils and is adaptable to most soil conditions; tolerates slight salinity.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 25-30 m; d = 200 cm</p> <p>18 DESCRIPTION ..... Evergreen; light crowned.</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; tolerates salt winds; drought hardy; frost tender.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 13-22</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Shade and shelter; windbreaks; ornamental.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 1.00-1.10</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... <u>Lyctus</u> susceptible.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel and charcoal.</p> <p>32 OTHER PRODUCTS ..... Fodder (leaves); honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; A. Africa.</p> <p>34 SEEDS PER KILOGRAMME . 100,000-200,000</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH Germinates in 13-21 days. Plantable size in 6-12 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Immune to attack by <u>Gonipterus</u> beetle and generally resistant to pests and diseases.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 49 82 83 84 91 130 133 152 166</p>	



PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) . . . . . 15-34	
ROLE IN LAND USE: 23 . . . . . -	
TIMBER: 24 DENSITY . . . . . S.G. 0.80-0.90 25 NATURAL DURABILITY . . . . . Very durable 26 PRESERVATION . . . . . Easy 27 SAWING . . . . . Easy 28 SEASONING . . . . . Easy 29 OTHER FEATURES . . . . . Termite resistant.	
UTILIZATION: 30 SAW TIMBER . . . . . Heavy construction. 31 ROUNDWOOD . . . . . Building poles; transmission poles; fuelwood. 32 OTHER PRODUCTS . . . . . Honeyflora.	
NURSERY: 33 SEED SOURCES . . . . . Australia; S. Africa; Zambia. 34 SEEDS PER KILOGRAMME . . . . . 140,000-160,000 (viable); or 33,000 plants/kg of seed. 35 STORAGE . . . . . Dry, cold and airtight for several years. 36 PRE-TREATMENT . . . . . None 37 PLANTING STOCK . . . . . Potted 38 SPECIAL REQUIREMENTS . . . . . Often susceptible to damping off. 39 GERMINATION AND GROWTH . . . . . Germinative capacity often poor. Plantable size in 4-5 months.	
PRINCIPAL PESTS AND DISEASES: 40 . . . . . Seedlings attacked by termites; resists attack by <i>Conitorus</i> beetle.	
PRINCIPAL REFERENCES: . . . . . 4 82 83 91 107 130 133 152	

SPECIES: *Eucalyptus cloëziana* F.Muell.

TAXONOMY: 1 FAMILY . . . . . Myrtaceae 2 SYNONYMS . . . . . - 3 LOCAL OR TRADE NAMES . . . . . <i>Gympie messmate</i> .	
NATURAL OCCURRENCE: 4 LATITUDES . . . . . 26-16°S 5 AREAS . . . . . Australia: discontinuous occurrence in Queensland.	
CLIMATE: 6 ALTITUDINAL RANGE . . . . . 0-1,500 m 7 MEAN ANNUAL RAINFALL . . . . . 900-1,650 mm 8 RAINFALL REGIME . . . . . Summer 9 DRY SEASON . . . . . 0-2 months 10 MEAN MAX. TEMP., HOTTEST MONTH . . . . . 28-32°C 11 MEAN MIN. TEMP., COLDEST MONTH . . . . . 6-14°C 12 MEAN ANNUAL TEMP. . . . . 18-26°C	
SOILS: 13 TEXTURE . . . . . Medium 14 REACTION . . . . . Neutral/acid 15 DRAINAGE . . . . . Free draining; moist. 16 OTHER CHARACTERISTICS . . . . . -	
SILVICULTURE: 17 SIZE . . . . . h = 35-45 m; d = 100-300 cm 18 DESCRIPTION . . . . . Evergreen 19 FORM . . . . . Exceptional 20 LIGHT REQUIREMENTS . . . . . Shade tolerant 21 OTHER CHARACTERISTICS . . . . . Coppices; substantial provenance variation; 6-12 year rotation for poles.	

SPECIES: <u>Eucalyptus crebra</u> F. Muell. (Inland Provenances)	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Narrow-leaved ironbark.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-23°C
5 AREAS .....	Inland tropical N.W.S. and Queensland.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL	500-900 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	5-6 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	26-36°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	6-18°C
12 MEAN ANNUAL TEMP, .....	18-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moderately free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS	Strongly demanding
21 OTHER CHARACTERISTICS	Resists termites; moderately frost resistant; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	3-8
ROLE IN LAND USE:	
23 .....	Windbreaks
TIMBER:	
24 DENSITY .....	S.G. 1.05-1.12
25 NATURAL DURABILITY	Very durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Difficult
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Timber rarely sawn.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction.
31 ROUNDWOOD .....	Building poles; fence posts; fuel (c.v. = 20,093 kJ/kg) and charcoal.
32 OTHER PRODUCTS .....	Honeyflora; tannin.
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME	640,000-680,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 6-21 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported. Resists attack by <u>Conipteris</u> beetle.
PRINCIPAL REFERENCES:	
	4 82 83 81 91 130 152

SPECIES: <u>Eucalyptus crebra</u> F. Muell. (Inland Provenances)	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Narrow-leaved ironbark.
NATURAL OCCURRENCE:	
4 LATITUDES .....	33-23°C
5 AREAS .....	Inland tropical N.W.S. and Queensland.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL	500-900 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	5-6 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	26-36°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	6-18°C
12 MEAN ANNUAL TEMP, .....	18-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moderately free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS	Strongly demanding
21 OTHER CHARACTERISTICS	Resists termites; moderately frost resistant; drought hardy.

SPECIES: Eucalyptus dalrympleana Maiden

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES . Mountain gum.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 42-32°C</p> <p>5 AREAS ..... S.E. New South Wales, Victoria and Tasmania.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 1,000-2,500 m</p> <p>7 MEAN ANNUAL RAINFALL . 750-1,500 mm</p> <p>8 RAINFALL REGIME ..... Winter/summer/uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP, HOTTEST MONTH ..... 18-24°C</p> <p>11 MEAN MIN. TEMP, COLDEST MONTH ..... 0-1°C</p> <p>12 MEAN ANNUAL TEMP, .... 10-14°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Moderately free draining</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 30-40 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; frost resistant.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 8-10</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 .....</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.53-0.60</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Fissile</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Shortfibre pulp; posts.</p> <p>32 OTHER PRODUCTS ..... Honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia.</p> <p>34 SEEDS PER KILOGRAMME . 180,000-280,000 (viable).</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH Germinates in 6-25 days. Plantable size in 6-8 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 .....</p>	
<p><b>PRINCIPAL REFERENCES:</b> 82 83 91 130 152</p>	

SPECIES: <i>Eucalyptus deglupta</i> Blume	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<i>E. naudiniana</i> F. Muell.
3 LOCAL OR TRADE NAMES .....	Mindanao gum; Kamarere (Papua New Guinea).
NATURAL OCCURRENCE:	
4 LATITUDES .....	11°S-9°N
5 AREAS .....	Philippines; Sulawesi; Papua New Guinea; New Britain.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,500 m
7 MEAN ANNUAL RAINFALL .....	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-1 month
10 MEAN MAX. TEMP. ....	24-32°C
11 MEAN MIN. TEMP. ....	21-26°C
12 MEAN ANNUAL TEMP. ....	20-32°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Better growth on fertile deep soils.
SILVICULTURE:	
17 SIZE .....	h = 35-70 m; d = 100-250 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Weak coppice; moderately termite resistant; sensitive to fire; frost tender; 20 year rotation for sawlogs; 6-7 year pulpwood rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	14-50
ROLE IN LAND USE:	
23 .....	Ornamental
TIMBER:	
24 DENSITY .....	S.G. 0.40 (plantation) 0.70 (natural).
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Easy/fair
29 OTHER FEATURES .....	Lighter than most eucalypts.
UTILIZATION:	
30 SAW TIMBER .....	heavy construction; light construction; furniture; boat building.
31 ROUNDWOOD .....	Fuel (c.v. = 21,107 kJ/kg) and charcoal; shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Papua New Guinea; Fiji and many tropical countries.
34 SEEDS PER KILOGRAMME .....	2,000,000-4,000,000 (viable).
35 STORAGE .....	Dry, cold and airtight for one-two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; root cuttings.
38 SPECIAL REQUIREMENTS .....	Requires shade.
39 GERMINATION AND GROWTH .....	Germinates in 4-20 days. Plantable size in 3-4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	<i>Amblypelta cotophaga</i> shoot borer can cause widespread death and dieback in young plantations. Shoot borer <i>Zeuzera coffea</i> is a serious pest in Malaya. Susceptible to damping off in nursery.
PRINCIPAL REFERENCES:	
4 59 73 77 82 83 130 152	

SPECIES: <i>Eucalyptus deglupta</i> Blume	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<i>E. naudiniana</i> F. Muell.
3 LOCAL OR TRADE NAMES .....	Mindanao gum; Kamarere (Papua New Guinea).
NATURAL OCCURRENCE:	
4 LATITUDES .....	11°S-9°N
5 AREAS .....	Philippines; Sulawesi; Papua New Guinea; New Britain.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,500 m
7 MEAN ANNUAL RAINFALL .....	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-1 month
10 MEAN MAX. TEMP. ....	24-32°C
11 MEAN MIN. TEMP. ....	21-26°C
12 MEAN ANNUAL TEMP. ....	20-32°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Better growth on fertile deep soils.
SILVICULTURE:	
17 SIZE .....	h = 35-70 m; d = 100-250 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Weak coppice; moderately termite resistant; sensitive to fire; frost tender; 20 year rotation for sawlogs; 6-7 year pulpwood rotation.

SPECIES: Eucalyptus delegatensis R.T. Baker

TAXONOMY:

- 1 FAMILY ..... Myrtaceae
- 2 SYNONYMS ..... E. gigantea Hook
- 3 LOCAL OR TRADE NAMES : Alpine ash.

NATURAL OCCURRENCE:

- 4 LATITUDES ..... 42-35° S
- 5 AREAS ..... Australia: S.E. New South Wales, Victoria and Tasmania.

CLIMATE:

- 6 ALTITUDINAL RANGE .... 0-2,500 m
- 7 MEAN ANNUAL RAINFALL . 1,000-3,500 mm
- 8 RAINFALL REGIME ..... Winter
- 9 DRY SEASON ..... 0-2 months
- 10 MEAN MAX. TEMP, HOTTEST MONTH ..... 19-22°C
- 11 MEAN MIN. TEMP, COLDEST MONTH ..... 0-6°C
- 12 MEAN ANNUAL TEMP, .... 12-15°C

SOILS:

- 13 TEXTURE ..... Medium
- 14 REACTION ..... Acid
- 15 DRAINAGE ..... Free draining
- 16 OTHER CHARACTERISTICS Better growth on deep, fertile soils.

SILVICULTURE:

- 17 SIZE ..... h = 50-60 m
- 18 DESCRIPTION ..... Evergreen
- 19 FORM ..... Acceptable
- 20 LIGHT REQUIREMENTS ... Strongly demanding
- 21 OTHER CHARACTERISTICS Frost resistant; 15-20 year rotation for saw timber.

PRODUCTION:

- 22 VOLUME (M<sup>3</sup>/HA/AN) ..... 10-25

ROLE IN LAND USE:

- 23 ..... Windbreaks

TIMBER:

- 24 DENSITY ..... S.G. 0.58-0.68
- 25 NATURAL DURABILITY ... Moderately durable
- 26 PRESERVATION ..... Difficult
- 27 SAWING ..... Easy
- 28 SEASONING ..... Fair
- 29 OTHER FEATURES ..... -

UTILIZATION:

- 30 SAW TIMBER ..... Light construction; furniture; boxes.
- 31 ROUNDWOOD ..... Transmission poles; shortfibre pulp; veneer/plywood.
- 32 OTHER PRODUCTS ..... Honeyflora.

NURSERY:

- 33 SEED SOURCES ..... Australia; New Zealand.
- 34 SEEDS PER KILOGRAMME . 90,000-100,000 (viable).
- 35 STORAGE ..... Dry, cold and airtight for several years.
- 36 PRE-TREATMENT ..... Stratify in damp sand for thirty days.
- 37 PLANTING STOCK ..... Potted
- 38 SPECIAL REQUIREMENTS . Soil may require inoculation with mycorrhizae.
- 39 GERMINATION AND GROWTH Germinates in 10-14 days. Plantable size in 9-12 months.

PRINCIPAL PESTS AND

DISEASES:

- 40 ..... None of importance reported. Resists Conioperus beetle.

PRINCIPAL REFERENCES:

57 82 83 91 130 152

SPECIES: <u>Eucalyptus fastigata</u> Deane & Maiden	
TAXONOMY: 1 FAMILY ..... Myrtaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES , Brown barrel.	
NATURAL OCCURRENCE: 4 LATITUDES ..... 37-30°S 5 AREAS ..... Australia: Highlands of Eastern New South Wales.	
CLIMATE: 6 ALTITUDINAL RANGE .... 200-2,000 m 7 MEAN ANNUAL RAINFALL . 750-1,100 mm 8 RAINFALL REGIME ..... Winter/summer/uniform 9 DRY SEASON ..... 1-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 22-26°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 0-4°C 12 MEAN ANNUAL TEMP. .... 13-18°C	
SOILS: 13 TEXTURE ..... Medium 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining; moist. 16 OTHER CHARACTERISTICS -	
SILVICULTURE: 17 SIZE ..... h = 30-40 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Exceptional/acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Weak coppice; moderately resistant to frost.	
PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) .... 21-28	
ROLE IN LAND USE: 23 ..... -	
TIMBER: 24 DENSITY ..... S.G. 0.67-0.86 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Easy 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Wood contains resin pockets.	
UTILIZATION: 30 SAW TIMBER ..... Light construction; boxes. 31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood. 32 OTHER PRODUCTS ..... -	
NURSERY: 33 SEED SOURCES ..... Australia; S. Africa; New Zealand. 34 SEEDS PER KILOGRAMME , 100,000-200,000 (viable). 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... Stratify in damp sand for thirty days. 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS , Very susceptible to damping off. 39 GERMINATION AND GROWTH Plantable size in 7-9 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported. Resists attack by <u>Conioperus</u> beetle.	
PRINCIPAL REFERENCES: 4 82 83 91 130 133 152 166	

SPECIES: <u>Eucalyptus fastigata</u> Deane & Maiden	
TAXONOMY: 1 FAMILY ..... Myrtaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES , Brown barrel.	
NATURAL OCCURRENCE: 4 LATITUDES ..... 37-30°S 5 AREAS ..... Australia: Highlands of Eastern New South Wales.	
CLIMATE: 6 ALTITUDINAL RANGE .... 200-2,000 m 7 MEAN ANNUAL RAINFALL . 750-1,100 mm 8 RAINFALL REGIME ..... Winter/summer/uniform 9 DRY SEASON ..... 1-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 22-26°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 0-4°C 12 MEAN ANNUAL TEMP. .... 13-18°C	
SOILS: 13 TEXTURE ..... Medium 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining; moist. 16 OTHER CHARACTERISTICS -	
SILVICULTURE: 17 SIZE ..... h = 30-40 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Exceptional/acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Weak coppice; moderately resistant to frost.	

SPECIES: <u>Eucalyptus globulus</u> Labill.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES :	Tasmanian blue-gum; Blue gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-38°S
5 AREAS .....	Southern Victoria and Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,500-3,000 m
7 MEAN ANNUAL RAINFALL .	550-1,500 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	4-12°C
12 MEAN ANNUAL TEMP. ....	12-18°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils; tolerates poor soils.
SILVICULTURE:	
17 SIZE .....	h = 40-60 m; d = 90-150 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost tender.
PRODUCTION:	
22 VOLUME (m <sup>3</sup> /HA/AN) .....	10-40
ROLE IN LAND USE:	
23 .....	Anti-erosion.
TIMBER:	
24 DENSITY .....	S.G. 0.55-0.78 (plantation), 0.80-1.00 (natural).
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. = 20,719 kJ/kg) and charcoal; short-fibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	Oils; honeyflora.
NURSERY:	
33 SEED SOURCES .....	Australia; Spain; Portugal; F. and S. Africa.
34 SEEDS PER KILOGRAMME .	70,000-100,000(viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; direct sown; bare-rooted plants.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	80% germination in 8-14 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Particularly susceptible to defoliating beetle <u>Coniapterus scutellus</u> .
PRINCIPAL REFERENCES:	
	16 51 91 93 109 121 128 130 133 152

SPECIES: <u>Eucalyptus globulus</u> Labill.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES :	Tasmanian blue-gum; Blue gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-38°S
5 AREAS .....	Southern Victoria and Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,500-3,000 m
7 MEAN ANNUAL RAINFALL .	550-1,500 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	4-12°C
12 MEAN ANNUAL TEMP. ....	12-18°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils; tolerates poor soils.
SILVICULTURE:	
17 SIZE .....	h = 40-60 m; d = 90-150 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost tender.

SPECIES: Eucalyptus gomphocephala DC.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES , Tuart</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 33-31°S</p> <p>5 AREAS ..... Very restricted, in S.W. coast of W. Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 500-2,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 500-1,000 mm</p> <p>8 RAINFALL REGIME ..... Winter</p> <p>9 DRY SEASON ..... 4-6 months</p> <p>10 MEAN MAX. TEMP.</p> <p>HOTTEST MONTH ..... 27-32°C</p> <p>11 MEAN MIN. TEMP.</p> <p>COLDEST MONTH ..... 6-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 16-22°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Alkaline/neutral</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Tolerates slightly saline soils, and low fertility, but not waterlogging.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-30 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; resists termites; tolerates salt winds; frost tender; fire tender when young.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 8-15</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Dune fixation.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.76-1.05</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Tough; interlocked grain.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... -</p> <p>31 ROUNDWOOD ..... Fence posts; fuel and charcoal.</p> <p>32 OTHER PRODUCTS ..... Tannins</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; Morocco; Cyprus.</p> <p>34 SEEDS PER KILOGRAMME . 70,000-200,000 (viable).</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH Germinates in 4-10 days. Plantable size in 6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Susceptible to attack by borer, <i>Phoracantha semipunctata</i> when grown under moisture stress. Resists attack by <i>Coniophorus</i> beetle.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 4 71 82 83 91 95 121 130 152</p>	



SPECIES: <i>Eucalyptus grandis</i> Hill ex Maiden	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Flooded gum; Rose gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	32-17°S
5 AREAS .....	Australia: Coastal Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-2,100 m
7 MEAN ANNUAL RAINFALL ..	1,000-4,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-35°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	10-18°C
12 MEAN ANNUAL TEMP. ....	17-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Richer soils of lowlands best.
SILVICULTURE:	
17 SIZE .....	h = 40-55 m; d = 100-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; tolerates salt winds; moderately frost resistant; substantial provenance variation; fire sensitive; 6-15 year coppice rotations; 20 year timber rotation; coppice rotations generally out-yield seedling rotations.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	24-70
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.48-0.64
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Difficult
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Tendency to split on felling.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel and charcoal; shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia; South and East Africa; Brazil.
34 SEEDS PER KILOGRAMME ..	600,000-650,000 (viable); or 150,000 plants/kg of seed.
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH	Germinates in 7-10 days. Plantable size in 2-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Very susceptible to attack by termites when young. Attacked by the fungus <i>Diaporthe cubensis</i> in Brazil.
PRINCIPAL REFERENCES:	
	4 82 83 85 91 101 121 130 133 152

SPECIES: <i>Eucalyptus grandis</i> Hill ex Maiden	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Flooded gum; Rose gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	32-17°S
5 AREAS .....	Australia: Coastal Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-2,100 m
7 MEAN ANNUAL RAINFALL ..	1,000-4,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-35°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	10-18°C
12 MEAN ANNUAL TEMP. ....	17-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Richer soils of lowlands best.
SILVICULTURE:	
17 SIZE .....	h = 40-55 m; d = 100-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; tolerates salt winds; moderately frost resistant; substantial provenance variation; fire sensitive; 6-15 year coppice rotations; 20 year timber rotation; coppice rotations generally out-yield seedling rotations.

SPECIES: Eucalyptus intertexta R.T. Bak.

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... 4-5</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... Shade and shelter; windbreaks.</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.75-0.85</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... -</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... Tough, interlocked grain. Only used in round.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... -</p> <p>31 ROUNDWOOD ..... Fence posts; fuel and charcoal.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Australia.</p> <p>34 SEEDS PER KILOGRAMME , 120,000-150,000 (viable).</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 7-14 days. Plantable size in 6-8 months.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... None of importance reported.</p>	
<p>PRINCIPAL REFERENCES: 81 84 95 130</p>	

<p>TAXONOMY:</p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Gum-barked Coolibah.</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 34-21°S</p> <p>5 AREAS ..... Central and S.E. Australia.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 0-1,250 m</p> <p>7 MEAN ANNUAL RAINFALL , 250-400 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 6-8 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 32-38°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 8-13°C</p> <p>12 MEAN ANNUAL TEMP, .... 18-25°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Tolerates moderately saline soils.</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 15-20 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices</p>	

SPECIES: <u>Eucalyptus largiflorens</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. bicolor</u> A. Cunn. ex Hook.
3 LOCAL OR TRADE NAMES	Black box
NATURAL OCCURRENCE:	
4 LATITUDES .....	35-28°S
5 AREAS .....	Semi-arid areas of Central Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,200 m
7 MEAN ANNUAL RAINFALL .....	250-500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	30-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-12°C
12 MEAN ANNUAL TEMP. ....	19-25°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 10-18 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	7-9
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.90-1.00
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME	400,000-700,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 12-21 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	4 83 84 95

SPECIES: <u>Eucalyptus largiflorens</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. bicolor</u> A. Cunn. ex Hook.
3 LOCAL OR TRADE NAMES	Black box
NATURAL OCCURRENCE:	
4 LATITUDES .....	35-28°S
5 AREAS .....	Semi-arid areas of Central Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,200 m
7 MEAN ANNUAL RAINFALL .....	250-500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	30-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-12°C
12 MEAN ANNUAL TEMP. ....	19-25°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 10-18 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost resistant.

SPECIES: <u>Eucalyptus maculata</u> Hook.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Spotted gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-23°S
5 AREAS .....	Australia: non-tropical Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL ..	620-1,250 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-32°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	2-6°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 30-45 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; windfirm; tolerates salt winds; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	21-35
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 1.00-1.10
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Fair
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Interlocked grain
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; fence posts; fuel (c.v. = 19,036 kJ/kg) and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia; S. Africa; Kenya.
34 SEEDS PER KILOGRAMME ..	120,000-180,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH	Germinates in 6-7 days.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to termite attack when young.
PRINCIPAL REFERENCES:	
	4 57 82 83 91 128 130 133 152

SPECIES: <u>Eucalyptus maculata</u> Hook.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Spotted gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-23°S
5 AREAS .....	Australia: non-tropical Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL ..	620-1,250 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-32°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	2-6°C
12 MEAN ANNUAL TEMP. ....	15-20°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 30-45 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; windfirm; tolerates salt winds; drought hardy.

SPECIES: *Eucalyptus maidenii* F. Muell.

<p>TAXONOMY:</p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES : Maiden's gum.</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 38-35°S</p> <p>5 AREAS ..... Australia: S.E. New South Wales and Victoria.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 600-2,100 m</p> <p>7 MEAN ANNUAL RAINFALL . 760-2,000 mm</p> <p>8 RAINFALL REGIME ..... Winter/uniform</p> <p>9 DRY SEASON ..... 2-3 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 22-30°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 8-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 18-22°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining; moist.</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 50-70 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; moderately frost resistant; 6-9 year coppice rotation.</p>	

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20-35</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... -</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.60-0.80</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... Difficult</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Difficult</p> <p>29 OTHER FEATURES ..... Normally used in round.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Heavy construction.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel and charcoal; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Australia; E. Africa.</p> <p>34 SEEDS PER KILOGRAMME . 150,000-300,000</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH Germinates in 7-8 days. Plantable size in 4-6 months.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Very susceptible to termite attack when young. One of the <i>Eucalyptus</i> species most liable to <i>Gonipterus</i> attack.</p>	
<p>PRINCIPAL REFERENCES: 4 82 83 85 91 128 130 152</p>	

SPECIES: <u>Eucalyptus melliodora</u> A. Cunn. ex Schau.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Yellow box; Honey-scented gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-26°S
5 AREAS .....	Inland New South Wales and Victoria.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL	625-900 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	0-7°C
12 MEAN ANNUAL TEMP. ....	16-21°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppies; termite resistant; frost resistant; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	2-6
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.75-0.85
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Rarely sawn; interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Honeyflora.
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME	300,000-330,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 5-7 days. Plantable size in 9 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported. Resists attack by <u>Conioperus</u> beetle.
PRINCIPAL REFERENCES:	
	4 71 82 88 84 91 95 130 152

SPECIES: <u>Eucalyptus melliodora</u> A. Cunn. ex Schau.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Yellow box; Honey-scented gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-26°S
5 AREAS .....	Inland New South Wales and Victoria.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL	625-900 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	0-7°C
12 MEAN ANNUAL TEMP. ....	16-21°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppies; termite resistant; frost resistant; drought hardy.

SPECIES: Eucalyptus microcorys F.Muell.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Tallow wood</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 32-25°S</p> <p>5 AREAS ..... Australia: N.E. New South Wales and S.E. Queensland.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 500-2,000 m</p> <p>7 MEAN ANNUAL RAINFALL , 900-1,500 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 25-35°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 5-14°C</p> <p>12 MEAN ANNUAL TEMP. .... 17-23°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Growth better on fertile soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 25-50 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Moderately tolerant of shade.</p> <p>21 OTHER CHARACTERISTICS Coppices; frost tender; 7-10 year pole rotation; 15-20 year timber rotation.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 8-30</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Windbreaks; shade and shelter.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.90-0.99</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Tough</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; light construction; furniture; flooring.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel (c.v. = 19,538 kJ/kg).</p> <p>32 OTHER PRODUCTS ..... Honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; S. Africa.</p> <p>34 SEEDS PER KILOGRAMME , 250,000-280,000 (viable)</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 12-15 days. Plantable size in 4-6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported. Resists attack by <u>Coniapterus</u> beetle.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 4 82 83 85 91 109 130 133 134 152</p>	

SPECIES: <u>Eucalyptus microtheca</u> F.Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. coolabah</u> Blakely & Jacobs
3 LOCAL OR TRADE NAMES ..	Coolibah
NATURAL OCCURRENCE:	
4 LATITUDES .....	30-14°S
5 AREAS .....	Arid and semi-arid zones of N. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,000 m
7 MEAN ANNUAL RAINFALL ..	250-1,000 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	5-7 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-40°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-14°C
12 MEAN ANNUAL TEMP. ....	21-27°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS ..	-
SILVICULTURE:	
17 SIZE .....	h = 10-15 m; d = 120-250 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ....	Strongly demanding
21 OTHER CHARACTERISTICS ..	Coppices; fire tender; substantial provenance variation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	3-5
ROLE IN LAND USE:	
23 .....	Shade and shelter; anti-erosion.
TIMBER:	
24 DENSITY .....	S.G. 0.75-1.10
25 NATURAL DURABILITY ....	Very durable
26 PRESERVATION .....	-
27 SAWING .....	Difficult
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Resistant to termites; interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fence posts; fuel and charcoal; wharf piles.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia; Sudan.
34 SEEDS PER KILOGRAMME ..	400,000-450,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH	Germinates in 5-14 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Less liable to termite attack than <u>E. camaldulensis</u> .
PRINCIPAL REFERENCES:	
	4 84 91 95 107 121 130 152

SPECIES: <u>Eucalyptus microtheca</u> F.Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. coolabah</u> Blakely & Jacobs
3 LOCAL OR TRADE NAMES ..	Coolibah
NATURAL OCCURRENCE:	
4 LATITUDES .....	30-14°S
5 AREAS .....	Arid and semi-arid zones of N. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,000 m
7 MEAN ANNUAL RAINFALL ..	250-1,000 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	5-7 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-40°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-14°C
12 MEAN ANNUAL TEMP. ....	21-27°C
SOILS:	
13 TEXTURE .....	Heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS ..	-
SILVICULTURE:	
17 SIZE .....	h = 10-15 m; d = 120-250 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ....	Strongly demanding
21 OTHER CHARACTERISTICS ..	Coppices; fire tender; substantial provenance variation.



SPECIES: *Eucalyptus nitens* (Deane & Maid.) Maid.

<p>TAXONOMY:</p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES , Shining gum.</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 38-35°C</p> <p>5 AREAS ..... S.E. New South Wales and Victoria.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 2,000-3,500 m</p> <p>7 MEAN ANNUAL RAINFALL , 750-1,500 mm</p> <p>8 RAINFALL REGIME ..... Winter/uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP., HOTTEST MONTH ..... 20-22°C</p> <p>11 MEAN MIN. TEMP., COLDEST MONTH ..... -1-+4°C</p> <p>12 MEAN ANNUAL TEMP. .... 9-15°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Medium/heavy</p> <p>14 REACTION ..... Acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 40-50 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; frost resistant.</p>	

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 12-28</p>	
<p>ROLE IN LAND USE:</p> <p>23 .....</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.60-0.65</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Fissile</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Australia.</p> <p>34 SEEDS PER KILOGRAMME , 200,000-250,000 (viable).</p> <p>35 STORAGE ..... Dry and airtight for several years.</p> <p>36 PRE-TREATMENT ..... Stratify in damp sand for thirty days.</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 10 days. Plantable size in 4-6 months.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... None of importance reported. Resists attack by <i>Gonipterus</i> beetle.</p>	
<p>PRINCIPAL REFERENCES: 4 82 130 152</p>	

SPECIES: *Eucalyptus obliqua* L'Herit.

TAXONOMY:

- 1 FAMILY ..... Myrtaceae
- 2 SYNONYMS .....
- 3 LOCAL OR TRADE NAMES . Messmate stringybark.

NATURAL OCCURRENCE:

- 4 LATITUDES ..... 43-37°C
- 5 AREAS ..... Australia: New South Wales, Victoria and Tasmania.

CLIMATE:

- 6 ALTITUDINAL RANGE .... 2,000-3,000 m
- 7 MEAN ANNUAL RAINFALL . 700-1,500 mm
- 8 RAINFALL REGIME ..... Winter/summer
- 9 DRY SEASON ..... 0-2 months
- 10 MEAN MAX. TEMP. .... 27-32°C
- 11 MEAN MIN. TEMP. .... 2-5°C
- 12 MEAN ANNUAL TEMP. .... 9-16°C

SOILS:

- 13 TEXTURE ..... Medium/heavy
- 14 REACTION ..... Neutral/acid
- 15 DRAINAGE ..... Moderately free draining; moist.
- 16 OTHER CHARACTERISTICS . Adaptable

SILVICULTURE:

- 17 SIZE ..... h = 50-70 m
- 18 DESCRIPTION ..... Evergreen
- 19 FORM ..... Exceptional
- 20 LIGHT REQUIREMENTS ... Strongly demanding
- 21 OTHER CHARACTERISTICS . Coppices; moderately fire resistant; frost resistant.

PRODUCTION:

- 22 VOLUME (M<sup>3</sup>/HA/AN) .... 18-30

ROLE IN LAND USE:

- 23 ..... Shade and shelter.

TIMBER:

- 24 DENSITY ..... S.G. 0.64-0.90
- 25 NATURAL DURABILITY ... Moderately durable
- 26 PRESERVATION ..... Difficult
- 27 SAWING ..... Easy
- 28 SEASONING ..... Fair
- 29 OTHER FEATURES ..... Fissile

UTILIZATION:

- 30 SAW TIMBER ..... Light construction; furniture; boxes.
- 31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel and charcoal; shortfibre pulp; veneer/plywood.
- 32 OTHER PRODUCTS .....

NURSERY:

- 33 SEED SOURCES ..... Australia; New Zealand; S. Africa.
- 34 SEEDS PER KILOGRAMME . 100,000-130,000 (viable).
- 35 STORAGE ..... Dry, cold and airtight for several years.
- 36 PRE-TREATMENT ..... Stratify in damp sand for thirty days.
- 37 PLANTING STOCK ..... Potted
- 38 SPECIAL REQUIREMENTS . Soil may require inoculation with mycorrhizae.
- 39 GERMINATION AND GROWTH . Germinates in 10-12 days. Plantable size in 6 months.

PRINCIPAL PESTS AND

DISEASES:

- 40 ..... None of importance reported. Resists attack by Coniapterus beetle.

PRINCIPAL REFERENCES:

4 57 82 83 91 120 152

SPECIES: *Eucalyptus occidentalis* Engl.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES , Flat-topped yate.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 33-30°S</p> <p>5 AREAS ..... Semi-arid zone of S.W. Western Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,400 m</p> <p>7 MEAN ANNUAL RAINFALL , 350-750 mm</p> <p>8 RAINFALL REGIME ..... Winter</p> <p>9 DRY SEASON ..... 5-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 36-38°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 0-2°C</p> <p>12 MEAN ANNUAL TEMP. .... 20-25°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral</p> <p>15 DRAINAGE ..... Seasonally waterlogged</p> <p>16 OTHER CHARACTERISTICS Tolerates saline soils</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-25 m</p> <p>18 DESCRIPTION ..... Evergreen; open-crowned.</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; moderately frost resistant; drought hardy.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 3-5</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Shade and shelter; anti-erosion.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.85-0.90</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION .....</p> <p>27 SAWING .....</p> <p>28 SEASONING .....</p> <p>29 OTHER FEATURES ..... Very strong; not sawn.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction.</p> <p>31 ROUNDWOOD ..... Building poles; fence posts; fuel and charcoal.</p> <p>32 OTHER PRODUCTS ..... Tannins</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; Morocco.</p> <p>34 SEEDS PER KILOGRAMME , 330,000-400,000 (viable).</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Germinates in 11-23 days. Plantable size in 5 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 4 59 84 91 95 121 130 152</p>	

SPECIES: <u>Eucalyptus paniculata</u> Sm.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Grey ironbark.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-28°S
5 AREAS .....	Australia: Central and Southern New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	500-1,500 m
7 MEAN ANNUAL RAINFALL .	750-1,300 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-31°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	2-5°C
12 MEAN ANNUAL TEMP, ....	18-23°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow soils and lateritic soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately frost resistant; drought hardy; 8-15 year pole rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	9-18
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 1.10-1.20
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	Difficult
28 SEASONING .....	-
29 OTHER FEATURES .....	Tough, interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; sleepers; ship building.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia; S. Africa; Kenya.
34 SEEDS PER KILOGRAMME .	440,000-460,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 5-10 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Young plants liable to attack by termites. Resists <u>Gonipterus</u> .
PRINCIPAL REFERENCES:	
	4 82 83 91 130 133 152

SPECIES: <u>Eucalyptus paniculata</u> Sm.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Grey ironbark.
NATURAL OCCURRENCE:	
4 LATITUDES .....	37-28°S
5 AREAS .....	Australia: Central and Southern New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	500-1,500 m
7 MEAN ANNUAL RAINFALL .	750-1,300 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-31°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	2-5°C
12 MEAN ANNUAL TEMP, ....	18-23°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow soils and lateritic soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately frost resistant; drought hardy; 8-15 year pole rotation.

SPECIES: <u>Eucalyptus pellita</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Large-fruited red mahogany.
NATURAL OCCURRENCE:	
4 LATITUDES .....	12-18°S and 27-36°S
5 AREAS .....	Cape York Peninsula, Queensland and Fraser Island, Queensland to New South Wales, Australia. Discontinuous distribution.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	900-2,400 mm
8 RAINFALL REGIME .....	Uniform/summer
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	24-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	12-16°C
12 MEAN ANNUAL TEMP. ....	23-26°C
SOILS:	
13 TEXTURE .....	Medium/Light
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 47 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately shade tolerant.
21 OTHER CHARACTERISTICS	Coppices; 4-8 year coppice rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.90-1.00
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Red colour; resin pockets.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; flooring; boat building; furniture; railway sleepers.
31 ROUNDWOOD .....	Fuelwood; veneer/plywood; fence posts; building poles.
32 OTHER PRODUCTS .....	Oils from leaves.
NURSERY:	
33 SEED SOURCES .....	Australia (tropical northern provenances).
34 SEEDS PER KILOGRAMME	25,000-160,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germination in 3 weeks.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Prone to <u>Gonipterus</u> attack.
PRINCIPAL REFERENCES:	
	4 85 91

SPECIES: <u>Eucalyptus pellita</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Large-fruited red mahogany.
NATURAL OCCURRENCE:	
4 LATITUDES .....	12-18°S and 27-36°S
5 AREAS .....	Cape York Peninsula, Queensland and Fraser Island, Queensland to New South Wales, Australia. Discontinuous distribution.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL	900-2,400 mm
8 RAINFALL REGIME .....	Uniform/summer
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	24-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	12-16°C
12 MEAN ANNUAL TEMP. ....	23-26°C
SOILS:	
13 TEXTURE .....	Medium/Light
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 47 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately shade tolerant.
21 OTHER CHARACTERISTICS	Coppices; 4-8 year coppice rotation.

SPECIES: <u>Eucalyptus propinqua</u> Deane & Maid.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Grey gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	24-33°S
5 AREAS .....	Australia: New South Wales, N. Queensland.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	875-1,400 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	16-21°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates dry, shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 35-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Moderately light demanding.
21 OTHER CHARACTERISTICS	Coppices; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 1.06
25 NATURAL DURABILITY ...	Very durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Red; hard.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction.
31 ROUNDWOOD .....	Poles; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Queensland, Australia.
34 SEEDS PER KILOGRAMME	203,000-683,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germination in 3 weeks.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	
	91

SPECIES: <u>Eucalyptus propinqua</u> Deane & Maid.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Grey gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	24-33°S
5 AREAS .....	Australia: New South Wales, N. Queensland.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	875-1,400 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	27-33°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-10°C
12 MEAN ANNUAL TEMP. ....	16-21°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates dry, shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 35-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Moderately light demanding.
21 OTHER CHARACTERISTICS	Coppices; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 1.06
25 NATURAL DURABILITY ...	Very durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Red; hard.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction.
31 ROUNDWOOD .....	Poles; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Queensland, Australia.
34 SEEDS PER KILOGRAMME	203,000-683,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germination in 3 weeks.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	
	91

SPECIES: <u>Eucalyptus regnans</u> F.Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Mountain ash
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-37°S
5 AREAS .....	Australia: discontinuous distribution through Victoria and Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE .....	2,000-3,200 m
7 MEAN ANNUAL RAINFALL .....	1,000-2,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. ....	HOTTEST MONTH .....
11 MEAN MIN. TEMP. ....	18-25°C
12 MEAN ANNUAL TEMP. ....	COLDEST MONTH .....
0-10°C	10-16°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS .....	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 60-100 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Frost resistant; 15-20 year timber rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	11-15
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.56-0.80
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	White; odour-free.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes.
31 ROUNDWOOD .....	Transmission poles; shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME .....	80,000-100,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Stratify in damp sand for thirty days.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	Soil may require inoculation with mycorrhizae.
39 GERMINATION AND GROWTH .....	Germinates in 10-14 days. Plantable size in 8-9 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Very susceptible to <u>Conioperus</u> attack.
PRINCIPAL REFERENCES:	
4	57 82 83 85 88 91 130 152

SPECIES: <u>Eucalyptus regnans</u> F.Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Mountain ash
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-37°S
5 AREAS .....	Australia: discontinuous distribution through Victoria and Tasmania.
CLIMATE:	
6 ALTITUDINAL RANGE .....	2,000-3,200 m
7 MEAN ANNUAL RAINFALL .....	1,000-2,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. ....	HOTTEST MONTH .....
11 MEAN MIN. TEMP. ....	18-25°C
12 MEAN ANNUAL TEMP. ....	COLDEST MONTH .....
0-10°C	10-16°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS .....	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 60-100 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Frost resistant; 15-20 year timber rotation.

PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 5-11	
ROLE IN LAND USE: 23 ..... -	
TIMBER: 24 DENSITY ..... S.G. 0.85-1.00 25 NATURAL DURABILITY ... Moderately durable 26 PRESERVATION ..... Difficult 27 SAWING ..... Easy 28 SEASONING ..... Fair 29 OTHER FEATURES ..... Tough, interlocked grain.	
UTILIZATION: 30 SAW TIMBER ..... Heavy construction; boat-building. 31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; fuel and charcoal. 32 OTHER PRODUCTS ..... -	
NURSERY: 33 SEED SOURCES ..... Australia. 34 SEEDS PER KILOGRAMME , 120,000-160,000 (viable). 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH Germinates in 7 days. Plantable size in 4-5 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... Severely attacked by termites when young. Resists <u>Gonipterus</u> beetle attack.	
PRINCIPAL REFERENCES: 4 82 83 91 130 134 152	

SPECIES: Eucalyptus resinifera F. Muell.

TAXONOMY: 1 FAMILY ..... Myrtaceae 2 SYNONYMS ..... <u>E. hemilampra</u> F. Muell. 3 LOCAL OR TRADE NAMES , Red mahogany	
NATURAL OCCURRENCE: 4 LATITUDES ..... 34-17°S 5 AREAS ..... Australia: Coastal Queensland and New South Wales.	
CLIMATE: 6 ALTITUDINAL RANGE .... 900-2,000 m 7 MEAN ANNUAL RAINFALL , 1,000-3,000 mm 8 RAINFALL REGIME ..... Summer/uniform 9 DRY SEASON ..... 2-4 months 10 MEAN MAX. TEMP., HOTTEST MONTH ..... 25-32°C 11 MEAN MIN. TEMP., COLDEST MONTH ..... 4-5°C 12 MEAN ANNUAL TEMP. .... 15-21°C	
SOILS: 13 TEXTURE ..... Light/medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS -	
SILVICULTURE: 17 SIZE ..... h = 30-40 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Shade tolerant in youth. 21 OTHER CHARACTERISTICS Coppices; frost tender.	



SPECIES: <u>Eucalyptus robusta</u> Sm.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. multiflora</u> Poir.
3 LOCAL OR TRADE NAMES .....	Swamp mahogany
NATURAL OCCURRENCE:	
4 LATITUDES .....	36-23°C
5 AREAS .....	Australia: coasts of S. Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,600 m
7 MEAN ANNUAL RAINFALL .....	1,000-1,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	1-4 months
10 MEAN MAX. TEMP. ....	30-32°C
11 MEAN MIN. TEMP. ....	3-5°C
12 MEAN ANNUAL TEMP. ....	18-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Better growth on deep soils; tolerates slight salinity.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m; d = 60-100 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable to poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; regenerates fast after fire; tolerates salt winds; frost tender; sawn-wood rotation of 35-50 years.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	14-28
ROLE IN LAND USE:	
23 .....	Shade and shelter.
TIMBER:	
24 DENSITY .....	S.G. 0.70-0.80
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Red; coarse grained; <u>Lyctus</u> susceptible; moderately termite resistant.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Building poles; fence posts; fuel (c.v. = 20,448 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Honeyflora.
NURSERY:	
33 SEED SOURCES .....	Australia; S. Africa; Hawaii; Madagascar.
34 SEEDS PER KILOGRAMME .....	500,000-600,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH .....	80-85% germination in 7-10 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to attack by <u>Gonipterus</u> beetle and by termites when young.
PRINCIPAL REFERENCES:	
4	82 83 88 91 96 109 128 130 134 152

SPECIES: <u>Eucalyptus robusta</u> Sm.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. multiflora</u> Poir.
3 LOCAL OR TRADE NAMES .....	Swamp mahogany
NATURAL OCCURRENCE:	
4 LATITUDES .....	36-23°C
5 AREAS .....	Australia: coasts of S. Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,600 m
7 MEAN ANNUAL RAINFALL .....	1,000-1,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	1-4 months
10 MEAN MAX. TEMP. ....	30-32°C
11 MEAN MIN. TEMP. ....	3-5°C
12 MEAN ANNUAL TEMP. ....	18-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Better growth on deep soils; tolerates slight salinity.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m; d = 60-100 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable to poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; regenerates fast after fire; tolerates salt winds; frost tender; sawn-wood rotation of 35-50 years.

SPECIES: <u>Eucalyptus saligna</u> Sm.										
TAXONOMY:										
1 FAMILY .....	Myrtaceae									
2 SYNONYMS .....	-									
3 LOCAL OR TRADE NAMES .....	Sydney blue gum.									
NATURAL OCCURRENCE:										
4 LATITUDES .....	35-28°S									
5 AREAS .....	Australia: New South Wales and extreme S.E. Queensland.									
CLIMATE:										
6 ALTITUDINAL RANGE .....	500-2,100 m									
7 MEAN ANNUAL RAINFALL .....	800-1,500 mm									
8 RAINFALL REGIME .....	Summer/uniform									
9 DRY SEASON .....	0-4 months									
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-30°C									
11 MEAN MIN. TEMP. COLDEST MONTH .....	3-4°C									
12 MEAN ANNUAL TEMP. ....	15-23°C									
SOILS:										
13 TEXTURE .....	Light/medium									
14 REACTION .....	Neutral/acid									
15 DRAINAGE .....	Free draining; moist.									
16 OTHER CHARACTERISTICS .....	-									
SILVICULTURE:										
17 SIZE .....	h = 35-45 m; d = 120-200 cm									
18 DESCRIPTION .....	Evergreen. Often confused with <u>E. grandis</u> in Africa.									
19 FORM .....	Exceptional									
20 LIGHT REQUIREMENTS .....	Strongly demanding									
21 OTHER CHARACTERISTICS .....	Coppices; moderately frost resistant; 12 year rotation for fuel.									
PRODUCTION:										
22 VOLUME (M <sup>3</sup> /HA/AN) ....	15-25(-35)									
ROLE IN LAND USE:										
23 .....	-									
TIMBER:										
24 DENSITY .....	S.G. 0.48-0.77									
25 NATURAL DURABILITY .....	Moderately durable									
26 PRESERVATION .....	Easy									
27 SAWING .....	Difficult									
28 SEASONING .....	Difficult									
29 OTHER FEATURES .....	Tendency to split after sawing.									
UTILIZATION:										
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes.									
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel and charcoal; shortfibre pulp; veneer/plywood.									
32 OTHER PRODUCTS .....	Oil from leaves.									
NURSERY:										
33 SEED SOURCES .....	Australia; S. Africa; Brazil (avoid confusion with <u>E. grandis</u> ).									
34 SEEDS PER KILOGRAMME .....	600,000-650,000 (viable).									
35 STORAGE .....	Dry, cold and airtight for several years.									
36 PRE-TREATMENT .....	None									
37 PLANTING STOCK .....	Potted; bare-rooted plants.									
38 SPECIAL REQUIREMENTS .....	-									
39 GERMINATION AND GROWTH .....	Germinates in 10-20 days. Plantable size in 4-6 months.									
PRINCIPAL PESTS AND DISEASES:										
40 .....	Similar to <u>E. grandis</u> .									
PRINCIPAL REFERENCES:										
4	57	82	83	85	88	91	107	109	128	130
	133	134	152							

SPECIES: <u>Eucalyptus saligna</u> Sm.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Sydney blue gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	35-28°S
5 AREAS .....	Australia: New South Wales and extreme S.E. Queensland.
CLIMATE:	
6 ALTITUDINAL RANGE .....	500-2,100 m
7 MEAN ANNUAL RAINFALL .....	800-1,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	28-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	3-4°C
12 MEAN ANNUAL TEMP. ....	15-23°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS .....	-
SILVICULTURE:	
17 SIZE .....	h = 35-45 m; d = 120-200 cm
18 DESCRIPTION .....	Evergreen. Often confused with <u>E. grandis</u> in Africa.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; moderately frost resistant; 12 year rotation for fuel.

SPECIES: Eucalyptus salmonophloia F. Muell.

TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Salmon gum
NATURAL OCCURRENCE:	
4 LATITUDES .....	33.5-29.5°S
5 AREAS .....	Inland, South West of W. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,800 m
7 MEAN ANNUAL RAINFALL .....	250-500 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	32-35°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	4-12°C
12 MEAN ANNUAL TEMP. ....	17-25°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 18-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost tender.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 1.00-1.10
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Strong
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction.
31 ROUNDWOOD .....	Building poles; fence posts; fuel (c.v. = 20,230 kJ/kg) and charcoal.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME .....	230,000-900,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	Germinates in 15-19 days. Plantable size in 6-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	4 49 82 83 84 91 95 130 152 166

SPECIES: <u>Eucalyptus sargentii</u> Maiden	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Salt River mallett.
NATURAL OCCURRENCE:	
4 LATITUDES .....	34-32.50° C
5 AREAS .....	South West W. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	330-450 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	34-36° C
11 MEAN MIN. TEMP.	4-10° C
12 MEAN ANNUAL TEMP. ....	18-25° C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates saline soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Never sawn.
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal.
32 OTHER PRODUCTS .....	Tannins
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME	250,000-500,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 5-10 days. Plantable size in 8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	84 95 130 166

SPECIES: <u>Eucalyptus sargentii</u> Maiden	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Salt River mallett.
NATURAL OCCURRENCE:	
4 LATITUDES .....	34-32.50° C
5 AREAS .....	South West W. Australia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	330-450 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	34-36° C
11 MEAN MIN. TEMP.	4-10° C
12 MEAN ANNUAL TEMP. ....	18-25° C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates saline soils.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices

SPECIES: Eucalyptus sideroxylon A. Cunn. ex Woolls

TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Red ironbark.
NATURAL OCCURRENCE:	
4 LATITUDES .....	39-25°S
5 AREAS .....	Australia: Inland Victoria.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,000 m
7 MEAN ANNUAL RAINFALL	420-750 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-7 months
10 MEAN MAX. TEMP.	HOTTEST MONTH .....
11 MEAN MIN. TEMP.	27-34°C
12 MEAN ANNUAL TEMP. ....	COLDEST MONTH .....
	3-8°C
	19-24°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	Tolerates shallow and moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 20-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; frost resistant; drought hardy.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	4-9
ROLE IN LAND USE:	
23 .....	Ornamental; shade and shelter.
TIMBER:	
24 DENSITY .....	S.G. 0.90-1.06
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Rarely sawn; interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction.
31 ROUNDWOOD .....	Fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Tannins; honeyflora.
NURSERY:	
33 SEED SOURCES .....	Australia; S. Africa.
34 SEEDS PER KILOGRAMME	100,000-20,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 14-18 days; low germination percentage. Plantable size in 7-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to <u>Conioperus</u> and termites.
PRINCIPAL REFERENCES:	
	4 82 83 84 88 95 115 130 134 152

SPECIES: <u>Eucalyptus st.-johnii</u> (R.T. Bak.) R.T. Bak.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. bicostata</u> Blakely & Simmonds
3 LOCAL OR TRADE NAMES ..	Eurabbie
NATURAL OCCURRENCE:	
4 LATITUDES .....	40-31°S
5 AREAS .....	Australia; Victoria and S.E. New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	2,000-3,500 m
7 MEAN ANNUAL RAINFALL ..	750-2,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	3 months
10 MEAN MAX. TEMP. ....	21-27°C
11 MEAN MIN. TEMP. ....	2-7°C
12 MEAN ANNUAL TEMP. ....	9-16°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS ..	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable to exceptional.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS ..	Coppices; windfirm; moderately frost resistant; 6-10 year fuelwood rotation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	8-14
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.73-0.82
25 NATURAL DURABILITY ...	Moderate
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction.
31 ROUNDWOOD .....	Building poles; fence posts; fuel and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME ..	100,000-140,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH ..	Germinates in 12-14 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Probably similar to <u>E. globulus</u> .
PRINCIPAL REFERENCES:	
	82 83 85 91 130 152

SPECIES: <u>Eucalyptus st.-johnii</u> (R.T. Bak.) R.T. Bak.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. bicostata</u> Blakely & Simmonds
3 LOCAL OR TRADE NAMES ..	Eurabbie
NATURAL OCCURRENCE:	
4 LATITUDES .....	40-31°S
5 AREAS .....	Australia; Victoria and S.E. New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE ....	2,000-3,500 m
7 MEAN ANNUAL RAINFALL ..	750-2,000 mm
8 RAINFALL REGIME .....	Winter
9 DRY SEASON .....	3 months
10 MEAN MAX. TEMP. ....	21-27°C
11 MEAN MIN. TEMP. ....	2-7°C
12 MEAN ANNUAL TEMP. ....	9-16°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining but moist.
16 OTHER CHARACTERISTICS ..	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable to exceptional.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS ..	Coppices; windfirm; moderately frost resistant; 6-10 year fuelwood rotation.

SPECIES: Eucalyptus tereticornis Sm.

TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	<u>E. umbellata</u> (Gaertn.) Domin
3 LOCAL OR TRADE NAMES .	Forest red gum; Mysore "hybrid" (India); "JABAL" (Madagascar); <u>Eucalyptus "C"</u> (Zanzibar).
NATURAL OCCURRENCE:	
4 LATITUDES .....	38-5°S
5 AREAS .....	Queensland, Australia; Papua New Guinea.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,800 m
7 MEAN ANNUAL RAINFALL .	500-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-7 months
10 MEAN MAX. TEMP.	22-32°C
11 MEAN MIN. TEMP.	2-12°C
12 MEAN ANNUAL TEMP. ....	17-27°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 35-45 m; d = 100-200 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable to exceptional.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; windfirm; frost resistant; substantial provenance variation; drought hardy; 6-10 year coppice rotation.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	12-25
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.70-0.85
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Interlocked grain; <u>Lyctus</u> susceptible.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes; boat building.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. = 22,120 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Honeyflora; oils.
NURSERY:	
33 SEED SOURCES .....	Australia; Brazil; Sudan; India; Madagascar and many other tropical countries.
34 SEEDS PER KILOGRAMME .	300,000-800,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 5-15 days. Plantable size in 4-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to termite attack when young. Liable to attack by <u>Gonipterus</u> beetle.
PRINCIPAL REFERENCES:	
	4 71 82 83 85 88 91 95 101 130 152

SPECIES: <u>Eucalyptus torelliana</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Cadaga; Cadaghi.
NATURAL OCCURRENCE:	
4 LATITUDES .....	19-16°S
5 AREAS .....	Australia: Coast and coastal ranges of N. Queensland (tropical rain forest margin).
CLIMATE:	
6 ALTITUDINAL RANGE .....	100-1,800 m
7 MEAN ANNUAL RAINFALL .....	900-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	29-40°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	6-16°C
12 MEAN ANNUAL TEMP. ....	14-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates some salinity.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Tall, dense-crowned tree.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Adapts well to arid conditions; windfirm; moderately frost resistant; fire tender; very fast growing.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Windbreak. Soil improvement and land reclamation: may be useful for afforestation of degraded sites not suitable for rain-forest pioneers.
TIMBER:	
24 DENSITY .....	S.G. 0.45 (small wood)-0.91
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	-
27 SAWING .....	Fair
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Straight grain; gum veins present.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; wagon work.
31 ROUNDWOOD .....	Shortfibre pulp; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Queensland, Australia; India; USA.
34 SEEDS PER KILOGRAMME .....	260,000-800,000
35 STORAGE .....	6-12 months
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	Careful weeding.
39 GERMINATION AND GROWTH	Easy to raise; plantation performance erratic. Germination of 30-70%. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Defoliation by coleoptera. Resists <u>Diaporthe cubensis</u> canker in latitudes below 20°S.
PRINCIPAL REFERENCES:	
	4 59 91 152

SPECIES: <u>Eucalyptus torelliana</u> F. Muell.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Cadaga; Cadaghi.
NATURAL OCCURRENCE:	
4 LATITUDES .....	19-16°S
5 AREAS .....	Australia: Coast and coastal ranges of N. Queensland (tropical rain forest margin).
CLIMATE:	
6 ALTITUDINAL RANGE .....	100-1,800 m
7 MEAN ANNUAL RAINFALL .....	900-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	29-40°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	6-16°C
12 MEAN ANNUAL TEMP. ....	14-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates some salinity.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Tall, dense-crowned tree.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Adapts well to arid conditions; windfirm; moderately frost resistant; fire tender; very fast growing.



SPECIES: Eucalyptus utrophylla S.T. Blake

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... Previously included in <u>E. alba</u> and <u>E. decaisniana</u> in Indonesia and Brazil.</p> <p>3 LOCAL OR TRADE NAMES ..... Timor white gum.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 10-7°S</p> <p>5 AREAS ..... Western Sunda Islands of Indonesia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE ..... 200-3,000 m</p> <p>7 MEAN ANNUAL RAINFALL ..... 1,100-1,950 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 20-26°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 8-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 18-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS -</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 35-45 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ..... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS ..... Coppices; frost tender; substantial provenance variation.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20-30</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... -</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... -</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction.</p> <p>31 ROUNDWOOD ..... Building poles; fence posts; fuel and charcoal; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; Indonesia; CTFT, France have made widespread collections.</p> <p>34 SEEDS PER KILOGRAMME . . 210,000-400,000 (viable).</p> <p>35 STORAGE ..... Dry, cold and airtight.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted; cuttings.</p> <p>38 SPECIAL REQUIREMENTS . . -</p> <p>39 GERMINATION AND GROWTH . . Germinates in 7-12 days. Plantable size in 4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Susceptible to termite attack. Very resistant to canker <u>Diaporthe cubensis</u>.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 59 113</p>	

SPECIES: <i>Eucalyptus viminalis</i> Labill.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Manna gum; Ribbon gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-28°C
5 AREAS .....	Australia: Upland areas of Victoria, Tasmania and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	2,000-3,000 m
7 MEAN ANNUAL RAINFALL .....	750-2,500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-26°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-6°C
12 MEAN ANNUAL TEMP. ....	10-16°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils; tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; fire resistant; frost resistant; substantial provenance variation; 6-8 year coppice rotation for pulp.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	10-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.60-0.90
25 NATURAL DURABILITY .....	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Fair
28 SEASONING .....	Fair (plantation-grown reputedly difficult).
29 OTHER FEATURES .....	Second-quality timber.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Australia.
34 SEEDS PER KILOGRAMME .....	300,000-400,000 (viable).
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	Germinates in 5-6 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to <i>Gonipterus</i> beetle attack. Defoliation by chrysomelids severe in Australia and New Zealand.
PRINCIPAL REFERENCES:	
4	82 83 88 91 128 130 134 152

SPECIES: <i>Eucalyptus viminalis</i> Labill.	
TAXONOMY:	
1 FAMILY .....	Myrtaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Manna gum; Ribbon gum.
NATURAL OCCURRENCE:	
4 LATITUDES .....	43-28°C
5 AREAS .....	Australia: Upland areas of Victoria, Tasmania and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	2,000-3,000 m
7 MEAN ANNUAL RAINFALL .....	750-2,500 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	20-26°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	0-6°C
12 MEAN ANNUAL TEMP. ....	10-16°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid/alkaline
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils; tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; fire resistant; frost resistant; substantial provenance variation; 6-8 year coppice rotation for pulp.

SPECIES: <u>Euphorbia tirucalli</u> L.	
TAXONOMY:	
1	FAMILY ..... Euphorbiaceae
2	SYNONYMS .....
3	LOCAL OR TRADE NAMES , Rubberhedge euphorbia; milk-bush; mgovu; manyara (E. Africa).
NATURAL OCCURRENCE:	
4	LATITUDES ..... 20°S-18°N
5	AREAS ..... Origins in S. Western Africa (probably Angola). Widely cultivated and naturalised in Americas and India.
CLIMATE:	
6	ALTITUDINAL RANGE .... 0-2,000 m
7	MEAN ANNUAL RAINFALL . 250-1,000 mm
8	RAINFALL REGIME ..... Summer
9	DRY SEASON ..... 6-8 months
10	MEAN MAX. TEMP.
	HOTTEST MONTH ..... 25-37°C
11	MEAN MIN. TEMP.
	COLDEST MONTH ..... 9-18°C
12	MEAN ANNUAL TEMP. .... 21-26°C
SOILS:	
13	TEXTURE ..... Light
14	REACTION ..... Neutral/acid
15	DRAINAGE ..... Good; but ground water must be available.
16	OTHER CHARACTERISTICS -
SILVICULTURE:	
17	SIZE ..... h = 3-10 m; d = 15 cm
18	DESCRIPTION ..... Succulent, many branched shrub.
19	FORM ..... Poor
20	LIGHT REQUIREMENTS ... Light demanding
21	OTHER CHARACTERISTICS drought hardy; frost tender.
PRODUCTION:	
22	VOLUME (M <sup>3</sup> /HA/AN) .... -
ROLE IN LAND USE:	
23	..... Windbreak (does not compete with crops); living hedge for habitations.
TIMBER:	
24	DENSITY .....
25	NATURAL DURABILITY ... Poor
26	PRESERVATION .....
27	SAWING .....
28	SEASONING .....
29	OTHER FEATURES ..... Contains toxic latex; soft.
UTILIZATION:	
30	SAW TIMBER .....
31	ROUNDWOOD ..... Fuel from large trees; charcoal.
32	OTHER PRODUCTS ..... Toxic latex for insecticide and fish poison.
NURSERY:	
33	SEED SOURCES .....
34	SEEDS PER KILOGRAMME , -
35	STORAGE .....
36	PRE-TREATMENT .....
37	PLANTING STOCK ..... Branch cuttings.
38	SPECIAL REQUIREMENTS , -
39	GERMINATION AND GROWTH Large (1 m long) branches planted at end of dry season, form 'instant' hedge.
PRINCIPAL PESTS AND DISEASES:	
40	..... -
PRINCIPAL REFERENCES: 28 36 71 85 107	

SPECIES: Ficus benghalensis L.

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... -</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... Shade</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... -</p> <p>25 NATURAL DURABILITY ..... -</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Fasy</p> <p>28 SEASONING ..... Kiln dry at once after felling.</p> <p>29 OTHER FEATURES ..... -</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Boxes.</p> <p>31 ROUNDWOOD ..... Posts; fuel (c.v. = 18,598 kJ/kg).</p> <p>32 OTHER PRODUCTS ..... Fodder (leaves); host to <u>Laccifer</u> spp. for shellac production.</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... India; Pakistan.</p> <p>34 SEEDS PER KILOGRAMME . 2,500,000 (cleaned, viable).</p> <p>35 STORAGE ..... For up to 2 years, dry, cool and sealed.</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Cuttings; bare-rooted or potted plants.</p> <p>38 SPECIAL REQUIREMENTS . Shade young plants.</p> <p>39 GERMINATION AND GROWTH . Low germination percentage; germinates in 7-14 days; plantable size in 16 months.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Various defoliating insects: especially <u>Ocynara varians</u> and <u>Euploea</u> core.</p>	
<p>PRINCIPAL REFERENCES: 16</p>	

<p>TAXONOMY:</p> <p>1 FAMILY ..... Moraceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES . Banyan</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 10°-30°N</p> <p>5 AREAS ..... India: sub-Himalayan tract and western peninsula.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 500-1,200 m</p> <p>7 MEAN ANNUAL RAINFALL . 500-4,000 mm</p> <p>8 RAINFALL REGIME ..... Winter</p> <p>9 DRY SEASON ..... 4-6 months</p> <p>10 MEAN MAX. TEMP. ....</p> <p>11 HOTTEST MONTH ..... 28-36°C</p> <p>12 MEAN MIN. TEMP. .... 6-13°C</p> <p>13 COLDEST MONTH ..... 17-25°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid/alkaline</p> <p>15 DRAINAGE ..... Moist</p> <p>16 OTHER CHARACTERISTICS . Better growth on fertile, deep soils.</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 20-30 m</p> <p>18 DESCRIPTION ..... Evergreen (or semi deciduous) tree sacred to Hindus.</p> <p>19 FORM ..... FOOT</p> <p>20 LIGHT REQUIREMENTS ... Strongly light demanding</p> <p>21 OTHER CHARACTERISTICS . Brought hardy; moderately frost resistant; fire sensitive; epiphytic in natural forest; adventitious prop roots; F. religiosa has similar characteristics and uses.</p>	

SPECIES: Gleditsia triacanthos L.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Caesalpinaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES . Honey-locust; driedoring (S. Africa).</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 28-40°N</p> <p>5 AREAS ..... East, Central and Southern USA.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-2,200 m</p> <p>7 MEAN ANNUAL RAINFALL . 500-1,800 mm</p> <p>8 RAINFALL REGIME ..... Winter/uniform/summer</p> <p>9 DRY SEASON ..... 2-6 months</p> <p>10 MEAN MAX. TEMP, HOTTEST MONTH ..... 32-40°C</p> <p>11 MEAN MIN. TEMP, COLDEST MONTH ..... -5-+15°C</p> <p>12 MEAN ANNUAL TEMP, .... 15-24°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Moist; free draining.</p> <p>16 OTHER CHARACTERISTICS High tolerance of alkalinity and salinity.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-45 m</p> <p>18 DESCRIPTION ..... Thorny; deciduous; dioecious.</p> <p>19 FORM ..... Acceptable (varied).</p> <p>20 LIGHT REQUIREMENTS ... Light demanding.</p> <p>21 OTHER CHARACTERISTICS Coppices; frost resistant; root suckers vigorously; drought hardy; thrives in irrigated plantations; <u>G. triacanthos var. inermis</u> is an aggressive coloniser.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... -</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Erosion control; shade; hedges; agroforestry.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. = 0.75-0.80</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Difficult</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... Strong</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; light construction; furniture; railway sleepers.</p> <p>31 ROUNDWOOD ..... Posts; firewood.</p> <p>32 OTHER PRODUCTS ..... Fodder (450 kg dry pods/tree/year; choose varieties with pods of high nutritive value); honey flora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... USA; Spain; Uruguay; France; Turkey.</p> <p>34 SEEDS PER KILOGRAMME . 4,000-9,000</p> <p>35 STORAGE ..... Fumigate seed; store up to 2 years.</p> <p>36 PRE-TREATMENT ..... Boiling water till cool; soak 1 hr. in conc. H<sub>2</sub>SO<sub>4</sub>.</p> <p>37 PLANTING STOCK ..... Potted; root cuttings.</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH 75% germination in 30-40 days. Rapid early growth.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... <u>Mimosa webworm Homadaula albizziae</u> (defoliator). <u>Thyronectria austro-americana</u> (Canker).</p>	
<p><b>PRINCIPAL REFERENCES:</b> 62 71 120 134 150</p>	

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) , . . . . -	
<b>ROLE IN LAND USE:</b> 23 . . . . . Land stabilisation prior to re-afforestation; live-fences; agricultural shade.	
<b>TIMBER:</b> 24 DENSITY . . . . . - 25 NATURAL DURABILITY . . . . . Very durable 26 PRESERVATION . . . . . - 27 SAWING . . . . . Difficult 28 SEASONING . . . . . Easy 29 OTHER FEATURES . . . . . Hard; tough; irregular grain; termite resistant.	
<b>UTILIZATION:</b> 30 SAW TIMBER . . . . . Railway sleepers; heavy construction; locally for furniture. 31 ROUNDWOOD . . . . . Posts; tools; fuelwood (c.v. 20,570 kJ/kg). 32 OTHER PRODUCTS . . . . . Honeyflora; green manure; fodder (N.B. leaves toxic to horses; roots, bark and seed toxic to man); rat poison (seeds).	
<b>NURSERY:</b> 33 SEED SOURCES . . . . . Nicaragua; Costa Rica. 34 SEEDS PER KILOGRAMME . . . . . 6,500-7,000 35 STORAGE . . . . . Up to 12 months. 36 PRE-TREATMENT . . . . . Soak overnight in hot water, plant immediately. 37 PLANTING STOCK . . . . . Potted; branch cuttings. 38 SPECIAL REQUIREMENTS . . . . . - 39 GERMINATION AND GROWTH . . . . . 90-100% germination in 7 days. Plantable size in 3 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 . . . . . Termites; scale insects <sup>1</sup> in E. Africa.	
<b>PRINCIPAL REFERENCES:</b> 16 48 121 131	

SPECIES: Gliricidia sepium (Jacq.) Walp.

<b>TAXONOMY:</b> 1 FAMILY . . . . . Papilionaceae 2 SYNONYMS . . . . . <u>G. maculata</u> Kunth 3 LOCAL OR TRADE NAMES . . . . . Madre de cacao (S. Am.); Kakawate (Philippines).	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES . . . . . 6-19°N 5 AREAS . . . . . Tropical Americas: Naturalised in Philippines and W. Nigeria.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE . . . . . 0-900 m 7 MEAN ANNUAL RAINFALL . . . . . 800-2,300 mm 8 RAINFALL REGIME . . . . . Summer/uniform 9 DRY SEASON . . . . . 4-6 months 10 MEAN MAX. TEMP. . . . . HOTTEST MONTH . . . . . 34-41°C 11 MEAN MIN. TEMP. . . . . COLDEST MONTH . . . . . 14-20°C 12 MEAN ANNUAL TEMP. . . . . 22-28°C	
<b>SOILS:</b> 13 TEXTURE . . . . . Medium 14 REACTION . . . . . Alkaline/neutral/acid 15 DRAINAGE . . . . . Free draining; moist. 16 OTHER CHARACTERISTICS . . . . . Tolerates poor fertility soils.	
<b>SILVICULTURE:</b> 17 SIZE . . . . . h = 5-15 m 18 DESCRIPTION . . . . . Deciduous 19 FORM . . . . . Poor 20 LIGHT REQUIREMENTS . . . . . - 21 OTHER CHARACTERISTICS . . . . . Coppices; fire resistant; fixes nitrogen; requires wide spacing; tolerates browsing and lopping; uses water economically during dry season; fast growing.	

SPECIES: <u>Gmelina arborea</u> Roxb.	
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) . . . . .	18-32
ROLE IN LAND USE:	
23 . . . . .	Agroforestry
TIMBER:	
24 DENSITY . . . . .	S.G. 0.40-0.57
25 NATURAL DURABILITY . . . . .	Moderately durable
26 PRESERVATION . . . . .	Fair
27 SAWING . . . . .	Easy
28 SEASONING . . . . .	Easy
29 OTHER FEATURES . . . . .	White; odour-free.
UTILIZATION:	
30 SAW TIMBER . . . . .	Light construction; boxes; furniture; tools.
31 ROUNDWOOD . . . . .	Building poles; fuel (c.v. = 20,757 kJ/kg) and charcoal; shortfibre pulp; veneer/plywood; matches.
32 OTHER PRODUCTS . . . . .	Honeyflora; cattle fodder (fruit and leaves).
NURSERY:	
33 SEED SOURCES . . . . .	Most tropical or sub-tropical countries.
34 SEEDS PER KILOGRAMME . . . . .	150 kernels, 700-1400 fresh seed or 2,500 dry seeds per kilogramme.
35 STORAGE . . . . .	Short viability, up to 6 months.
36 PRE-TREATMENT . . . . .	Soak in cold water for one to two days.
37 PLANTING STOCK . . . . .	Stumps; potted; direct sown; cuttings.
38 SPECIAL REQUIREMENTS . . . . .	-
39 GERMINATION AND GROWTH . . . . .	65-80% germination in 14-28 days. Plantable size in 6 months.
PRINCIPAL PESTS AND DISEASES:	
40 . . . . .	In Latin America Atta ants can cause serious defoliation but seldom death. Young trees damaged by cattle browsing.
PRINCIPAL REFERENCES:	
	4 5 16 23 61 69 85 102 107 109 121 128 134 152

SPECIES: <u>Gmelina arborea</u> Roxb.	
TAXONOMY:	
1 FAMILY . . . . .	Verbenaceae
2 SYNONYMS . . . . .	-
3 LOCAL OR TRADE NAMES . . . . .	Yemane; Gmelina; Gamari; White Teak.
NATURAL OCCURRENCE:	
4 LATITUDES . . . . .	5-30°N
5 AREAS . . . . .	S.E. Asia, from Pakistan to Cambodia and S. China.
CLIMATE:	
6 ALTITUDINAL RANGE . . . . .	0-1,200 m
7 MEAN ANNUAL RAINFALL . . . . .	1,000-4,500 mm
8 RAINFALL REGIME . . . . .	Summer
9 DRY SEASON . . . . .	2-4 months
10 MEAN MAX. TEMP. . . . .	24-35°C
11 MEAN MIN. TEMP. . . . .	18-24°C
12 MEAN ANNUAL TEMP. . . . .	21-28°C
SOILS:	
13 TEXTURE . . . . .	Light/medium/heavy
14 REACTION . . . . .	Neutral/acid
15 DRAINAGE . . . . .	Free draining; moist.
16 OTHER CHARACTERISTICS . . . . .	Better growth on fertile soils.
SILVICULTURE:	
17 SIZE . . . . .	h = 20-30m; d = 60-100 cm
18 DESCRIPTION . . . . .	Deciduous; shortlived.
19 FORM . . . . .	Poor to acceptable.
20 LIGHT REQUIREMENTS . . . . .	Strongly demanding
21 OTHER CHARACTERISTICS . . . . .	Coppices; termite resistant; frost resistant; substantial provenance variation; plantations rapidly shade out competing species.

SPECIES: <u>Grevillea robusta</u> A. Cunn. ex R.Br.	
TAXONOMY:	
1 FAMILY .....	Proteaceae
2 SYNONYMS .....	<u>Grevillea umbricata</u> A. Cunn.
3 LOCAL OR TRADE NAMES .....	Silky oak.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27-36°N
5 AREAS .....	Australia: Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	800-2,100 m
7 MEAN ANNUAL RAINFALL .....	700-1,200 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	6-14°C
12 MEAN ANNUAL TEMP. ....	13-21°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils, but adaptable.
SILVICULTURE:	
17 SIZE .....	h = 25-35 m; d = 90-120 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; poor coppice but can be pollarded; tolerates salt winds; drought hardy; frost tender; termite resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	5-15
ROLE IN LAND USE:	
23 .....	Agricultural shade; ornamental; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.54-0.66
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Quarter sawn resembles oak. <u>Lyctus</u> susceptible.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; joinery; boxes.
31 ROUNDWOOD .....	Fuel (c.v. = 20,395 kJ/kg) and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	Honeyflora.
NURSERY:	
33 SEED SOURCES .....	Most sub-tropical countries.
34 SEEDS PER KILOGRAMME ..	80,000-105,000
35 STORAGE .....	Dry, cold and airtight for up to one year.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS ..	Deep roots require pruning in nursery.
39 GERMINATION AND GROWTH	60-70% germination in 20-28 days. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported, but subject to dieback on excessively dry sites.
PRINCIPAL REFERENCES:	
	4 5 16 52 57 59 71 96 121 128 152

SPECIES: <u>Grevillea robusta</u> A. Cunn. ex R.Br.	
TAXONOMY:	
1 FAMILY .....	Proteaceae
2 SYNONYMS .....	<u>Grevillea umbricata</u> A. Cunn.
3 LOCAL OR TRADE NAMES .....	Silky oak.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27-36°N
5 AREAS .....	Australia: Queensland and New South Wales.
CLIMATE:	
6 ALTITUDINAL RANGE .....	800-2,100 m
7 MEAN ANNUAL RAINFALL .....	700-1,200 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	6-14°C
12 MEAN ANNUAL TEMP. ....	13-21°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils, but adaptable.
SILVICULTURE:	
17 SIZE .....	h = 25-35 m; d = 90-120 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; poor coppice but can be pollarded; tolerates salt winds; drought hardy; frost tender; termite resistant.



<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 1-3	
<b>ROLE IN LAND USE:</b> 23 ..... Windbreaks; dune fixation (after initial stabilization); anti-erosion; pasture improvement	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 1.02 25 NATURAL DURABILITY ... - 26 PRESERVATION ..... - 27 SAWING ..... - 28 SEASONING ..... - 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... - 31 ROUNDWOOD ..... Fuel and charcoal. 32 OTHER PRODUCTS ..... Fodder (leaves); potash.	
<b>NURSERY:</b> 33 SEED SOURCES ..... USSR; China; Iran. 34 SEEDS PER KILOGRAMME , - 35 STORAGE ..... Dry (4% moisture) and airtight for 1 year. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Direct sown; bare rooted plants. 38 SPECIAL REQUIREMENTS , None 39 GERMINATION AND GROWTH Easily established; good competitor with weeds.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Liable to attack by many insects and fungi, but none cause great damage.	
<b>PRINCIPAL REFERENCES:</b> 121	

SPECIES: Haloxylon aphyllum (Minkw.) Iljin

<b>TAXONOMY:</b> 1 FAMILY ..... Chenopodiaceae 2 SYNONYMS ..... <u>H. ammodendron</u> (C.A. Mey.) Bunge 3 LOCAL OR TRADE NAMES , Black saxaul; Odzhar (Turkmeni).	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 30-45°N 5 AREAS ..... Deserts of Central Asia from Mongolia to Asia Minor.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE ..... 200-2,500 m 7 MEAN ANNUAL RAINFALL , 100-400 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 8-10 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 25-40°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 0-8°C 12 MEAN ANNUAL TEMP. .... 10-25°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium/heavy 14 REACTION ..... Alkaline/neutral 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS Tolerates high salinity and low nutrient levels; requires groundwater at less than 15 m depth.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 5-8 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Poor 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; frost resistant; drought hardy.	

SPECIES: <u>Hieronyma chochoensis</u> Cuatrec.	
TAXONOMY:	
1 FAMILY .....	Euphorbiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Mascarey; pantano.
NATURAL OCCURRENCE:	
4 LATITUDES .....	4°N-4°S
5 AREAS .....	From the Ecuador coast to the Amazon Basin.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-500 m
7 MEAN ANNUAL RAINFALL ,	3,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	24-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	24-32°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Acid/very acid
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 25-35 m; d = 50-60 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately light demanding.
21 OTHER CHARACTERISTICS	Coppices; requires wide spacing.
PRODUCTION:	
22 VOLUME (m <sup>3</sup> /HA/AN) ....	10-20
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.7-0.8
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Grain straight, to interlocked; medium texture.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; railway sleepers.
31 ROUNDWOOD .....	Suitable for plywood/veneer.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Colombia; Costa Rica; Ecuador.
34 SEEDS PER KILOGRAMME ,	30,000-50,000
35 STORAGE .....	Dry and cold for several months.
36 PRE-TREATMENT .....	Soak for 12-24 hours in cold water.
37 PLANTING STOCK .....	Potted; stumps; cuttings.
38 SPECIAL REQUIREMENTS ,	-
39 GERMINATION AND GROWTH	Germinates in 15-30 days; plantable size in 3-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	

SPECIES: <u>Hieronyma chochoensis</u> Cuatrec.	
TAXONOMY:	
1 FAMILY .....	Euphorbiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Mascarey; pantano.
NATURAL OCCURRENCE:	
4 LATITUDES .....	4°N-4°S
5 AREAS .....	From the Ecuador coast to the Amazon Basin.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-500 m
7 MEAN ANNUAL RAINFALL ,	3,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	24-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	24-32°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Acid/very acid
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 25-35 m; d = 50-60 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately light demanding.
21 OTHER CHARACTERISTICS	Coppices; requires wide spacing.
PRODUCTION:	
22 VOLUME (m <sup>3</sup> /HA/AN) ....	10-20
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.7-0.8
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Grain straight, to interlocked; medium texture.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; railway sleepers.
31 ROUNDWOOD .....	Suitable for plywood/veneer.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Colombia; Costa Rica; Ecuador.
34 SEEDS PER KILOGRAMME ,	30,000-50,000
35 STORAGE .....	Dry and cold for several months.
36 PRE-TREATMENT .....	Soak for 12-24 hours in cold water.
37 PLANTING STOCK .....	Potted; stumps; cuttings.
38 SPECIAL REQUIREMENTS ,	-
39 GERMINATION AND GROWTH	Germinates in 15-30 days; plantable size in 3-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	

SPECIES: <u>Jacaranda copaia</u> (Aubl.) D. Don	
TAXONOMY:	
1 FAMILY .....	Bignoniaceae
2 SYNONYMS .....	<u>Bignonia copaia</u> Aubl.
3 LOCAL OR TRADE NAMES .....	Futui; Para-para; Copaia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25° S-18° N
5 AREAS .....	Tropical America: Belize to Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	600-2,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	27-38°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	14-22°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Moist; seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates saline conditions and poor soils.
SILVICULTURE:	
17 SIZE .....	h = 27 m; d = 40-90 cm
18 DESCRIPTION .....	Trunk swollen at base.
19 FORM .....	Good
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS .....	Coppices
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Ornamental
TIMBER:	
24 DENSITY .....	S.G. 0.35-0.5
25 NATURAL DURABILITY .....	Perishable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Soft; prone to blue-stain.
UTILIZATION:	
30 SAW TIMBER .....	Boxes; light construction.
31 ROUNDWOOD .....	Matches; plywood/veneer; shortfibre pulp.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Cyprus; France; Kenya; Pakistan; Uruguay.
34 SEEDS PER KILOGRAMME .....	-
35 STORAGE .....	Dry, cold, sealed for 1-2 years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; cuttings.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH .....	Grows well through post-harvest slash and weed-growth.
PRINCIPAL PESTS AND DISEASES:	
40 .....	No serious pests reported.
PRINCIPAL REFERENCES:	

SPECIES: <u>Jacaranda copaia</u> (Aubl.) D. Don	
TAXONOMY:	
1 FAMILY .....	Bignoniaceae
2 SYNONYMS .....	<u>Bignonia copaia</u> Aubl.
3 LOCAL OR TRADE NAMES .....	Futui; Para-para; Copaia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25° S-18° N
5 AREAS .....	Tropical America: Belize to Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	600-2,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	27-38°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	14-22°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Moist; seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates saline conditions and poor soils.
SILVICULTURE:	
17 SIZE .....	h = 27 m; d = 40-90 cm
18 DESCRIPTION .....	Trunk swollen at base.
19 FORM .....	Good
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS .....	Coppices

SPECIES: <u>Jacaranda mimosifolia</u> D. Don	
TAXONOMY:	
1 FAMILY .....	Bignoniaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Jacaranda (N.B. This is the local name; <u>Dalbergia nigra</u> is known commercially as jacaranda).
NATURAL OCCURRENCE:	
4 LATITUDES .....	-
5 AREAS .....	Western S. America; naturalised in Zimbabwe.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	650-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-34 °C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	8-15 °C
12 MEAN ANNUAL TEMP. ....	19-26 °C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Sandy loams
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Deciduous tree with spreading crown.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ....	-
21 OTHER CHARACTERISTICS	Termite resistant; tolerates salt winds; drought hardy; frost tender when young; withstands pruning.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	Shade in streets and gardens.
TIMBER:	
24 DENSITY .....	S.G. 0.45-0.72
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Slow
29 OTHER FEATURES .....	Hard; fine texture.
UTILIZATION:	
30 SAW TIMBER .....	Carpentry; boxes.
31 ROUNDWOOD .....	Fuel; particle-board; veneer/plywood; shortfibre pulp.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Most tropical countries.
34 SEEDS PER KILOGRAMME .	50,000-100,000
35 STORAGE .....	Dry, cold, sealed for 1-2 years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Cuttings; potted; bare-rooted if conditions good.
38 SPECIAL REQUIREMENTS .	Pollard when young to produce dense crown.
39 GERMINATION AND GROWTH	60-80% germination. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	
	16

SPECIES: <u>Jacaranda mimosifolia</u> D. Don	
TAXONOMY:	
1 FAMILY .....	Bignoniaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Jacaranda (N.B. This is the local name; <u>Dalbergia nigra</u> is known commercially as jacaranda).
NATURAL OCCURRENCE:	
4 LATITUDES .....	-
5 AREAS .....	Western S. America; naturalised in Zimbabwe.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,500 m
7 MEAN ANNUAL RAINFALL .	650-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-34 °C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	8-15 °C
12 MEAN ANNUAL TEMP. ....	19-26 °C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Sandy loams
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Deciduous tree with spreading crown.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ....	-
21 OTHER CHARACTERISTICS	Termite resistant; tolerates salt winds; drought hardy; frost tender when young; withstands pruning.

SPECIES: <i>Khaya senegalensis</i> (Desr.) A. Juss.	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Acajou; Frimu; Ono; African mahogany; Khaya wood; Bisselon.
NATURAL OCCURRENCE:	
4 LATITUDES .....	8-15°N
5 AREAS .....	West and Central Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,800 m
7 MEAN ANNUAL RAINFALL	700-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	5-7 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	37-40°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	11-19°C
12 MEAN ANNUAL TEMP. ....	19-29°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist
16 OTHER CHARACTERISTICS	Better growth on deep fertile soils; tolerates dry and lateritic soils.
SILVICULTURE:	
17 SIZE .....	h = 15-40 m; d = 90-150 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable above slight buttressing.
20 LIGHT REQUIREMENTS ...	Shade bearing when young; light demanding later.
21 OTHER CHARACTERISTICS	Drought hardy; fire tender when young; good natural regeneration.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	Shade; agroforestry.
TIMBER:	
24 DENSITY .....	S.G. 0.60-0.85
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Fair
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Interlocking grain; gum and crystal deposits common; slightly aromatic; variable with locality; termite resistant.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; railway sleepers; flooring.
31 ROUNDWOOD .....	Pulp; fuelwood (c.v. = 19,988 kJ/kg); plywood/veneer.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Indonesia; Ghana; Nigeria; Sudan.
34 SEEDS PER KILOGRAMME	3,000-7,000
35 STORAGE .....	For up to 3 months.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Bare-rooted plants; potted seedlings; stumps.
38 SPECIAL REQUIREMENTS	Careful weeding.
39 GERMINATION AND GROWTH	90% germination of fresh seed in 18 days.
PRINCIPAL PESTS AND DISEASES:	
40 .....	<i>Hypsipyla robusta</i> shoot borer.
PRINCIPAL REFERENCES:	
	6

SPECIES: <i>Khaya senegalensis</i> (Desr.) A. Juss.	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Acajou; Frimu; Ono; African mahogany; Khaya wood; Bisselon.
NATURAL OCCURRENCE:	
4 LATITUDES .....	8-15°N
5 AREAS .....	West and Central Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,800 m
7 MEAN ANNUAL RAINFALL	700-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	5-7 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	37-40°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	11-19°C
12 MEAN ANNUAL TEMP. ....	19-29°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moist
16 OTHER CHARACTERISTICS	Better growth on deep fertile soils; tolerates dry and lateritic soils.
SILVICULTURE:	
17 SIZE .....	h = 15-40 m; d = 90-150 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Acceptable above slight buttressing.
20 LIGHT REQUIREMENTS ...	Shade bearing when young; light demanding later.
21 OTHER CHARACTERISTICS	Drought hardy; fire tender when young; good natural regeneration.

SPECIES: Leucaena leucocephala (Lam.) de Wit (Hawaiian type)

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Mimosaceae</p> <p>2 SYNONYMS ..... <u>Leucaena glauca</u> Benth.</p> <p>3 LOCAL OR TRADE NAMES , <u>Leucaena</u>; <u>Ipil-Ipil</u>.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 13-27°N</p> <p>5 AREAS ..... Central America, from Mexico to Salvador. Naturalized in Philippines, Hawaii and parts of Asia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-800 m</p> <p>7 MEAN ANNUAL RAINFALL , 600-1,000 mm</p> <p>8 RAINFALL REGIME ..... Winter/summer</p> <p>9 DRY SEASON ..... 2-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 24-32°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 16-24°C</p> <p>12 MEAN ANNUAL TEMP. .... 20-26°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral</p> <p>15 DRAINAGE ..... Moderately free draining.</p> <p>16 OTHER CHARACTERISTICS Tolerates shallow soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 3-5 m</p> <p>18 DESCRIPTION ..... Evergreen; deciduous; open-crowned shrub.</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding; shade tolerant in youth.</p> <p>21 OTHER CHARACTERISTICS Aggressive coloniser; coppices; tolerates salt winds; fixes nitrogen; frost tender.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20-25</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Windbreaks; anti-erosion; soil improvement; agricultural shade; green manure.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.50-0.59</p> <p>25 NATURAL DURABILITY ... Perishable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... -</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... Only produces fuel and fence posts.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... -</p> <p>31 ROUNDWOOD ..... Fence posts; fuel (c.v. = 19,492 kJ/kg) and charcoal.</p> <p>32 OTHER PRODUCTS ..... Fodder (toxic to ruminants if not mixed with other feeds), 12-20 dry tonnes/ha/ann.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Hawaii; Philippines.</p> <p>34 SEEDS PER KILOGRAMME . 27,000-30,000</p> <p>35 STORAGE ..... Ambient temperature for several years.</p> <p>36 PRE-TREATMENT ..... Soak in water heated to 80°C, for two minutes.</p> <p>37 PLANTING STOCK ..... Potted; cuttings.</p> <p>38 SPECIAL REQUIREMENTS . Soil may require inoculation with a <u>Rhizobium</u> strain, for nitrogen fixation.</p> <p>39 GERMINATION AND GROWTH Germinates in 8-10 days.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... High resistance to pests and disease.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 79 109 119 120 121</p>	

SPECIES: Leucaena leucocephala (Lam) de Wit (Salvador type)

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Leucaena glauca</u> Benth.
3 LOCAL OR TRADE NAMES ,	Leucaena
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-17°N
5 AREAS .....	S.W. Mexico and Central Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE , , , ,	0-800 m
7 MEAN ANNUAL RAINFALL ,	600-1,000 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP, HOTTEST MONTH .....	24-32°C
11 MEAN MIN. TEMP, COLDEST MONTH .....	16-24°C
12 MEAN ANNUAL TEMP. , , , ,	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Moderately free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 15-20 m
18 DESCRIPTION .....	Evergreen/deciduous
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS , , ,	Strongly demanding; shade tolerant in youth.
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; fixes nitrogen; frost tender.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) , , , ,	30-40
ROLE IN LAND USE:	
23 .....	Soil improvement; agricultural shade; agroforestry.
TIMBER:	
24 DENSITY .....	S.G. 0.50-0.59
25 NATURAL DURABILITY , , ,	-
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boxes.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. = 19,492 kJ/kg) and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Fodder (toxic to ruminants if not mixed with other feeds).
NURSERY:	
33 SEED SOURCES .....	Philippines; Hawaii; Australia; Costa Rica; Mexico.
34 SEEDS PER KILOGRAMME ,	26,000-30,000
35 STORAGE .....	Ambient temperature for several years.
36 PRE-TREATMENT .....	Soak in water heated to 80°C, for two minutes.
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ,	Soil may require inoculation with a <u>Rhizobium</u> strain for nitrogen fixation.
39 GERMINATION AND GROWTH	Germinates in 8-10 days.
PRINCIPAL PESTS AND DISEASES:	
40 .....	The high resistance of the Hawaiian type has yet to be confirmed for this type. <u>Camptomeris leucaenae</u> ; potentially serious leaf-spot disease in Latin America.
PRINCIPAL REFERENCES:	
	79 109 119 120 121 329

<b>PRODUCTION:</b>	
22 VOLUME (M <sup>3</sup> /HA/AN) . . . . .	21
<b>ROLE IN LAND USE:</b>	
23 . . . . .	Shade
<b>TIMBER:</b>	
24 DENSITY . . . . .	S.G. 0.50-0.65
25 NATURAL DURABILITY . . . . .	Moderately durable
26 PRESERVATION . . . . .	-
27 SAWING . . . . .	-
28 SEASONING . . . . .	Fair
29 OTHER FEATURES . . . . .	Irregular grain; sometimes figured.
<b>UTILIZATION:</b>	
30 SAW TIMBER . . . . .	Furniture; crates; doors; panels.
31 ROUNDWOOD . . . . .	Veneer/plywood; matches; pulp.
32 OTHER PRODUCTS . . . . .	'Storax' gum for medicines and perfumes.
<b>NURSERY:</b>	
33 SEED SOURCES . . . . .	USA; Central America; France.
34 SEEDS PER KILOGRAMME . . . . .	130,000-200,000
35 STORAGE . . . . .	Up to 4 years at 2-4°C and 5-15% moisture.
36 PRE-TREATMENT . . . . .	Stratify in damp sand at 4°C for 30-60 days.
37 PLANTING STOCK . . . . .	Potted; bare rooted plants.
38 SPECIAL REQUIREMENTS . . . . .	-
39 GERMINATION AND GROWTH . . . . .	30-70% germination.
<b>PRINCIPAL PESTS AND DISEASES:</b>	
40 . . . . .	Rodents in American plantations. Generally very resistant to disease and insect attack.
<b>PRINCIPAL REFERENCES:</b>	

SPECIES: Liquidambar styraciflua L.

<b>TAXONOMY:</b>	
1 FAMILY . . . . .	Hamamelidaceae
2 SYNONYMS . . . . .	-
3 LOCAL OR TRADE NAMES . . . . .	Bilisted; Sweetgum; Redgum; Alligator tree; Ocozotl (Mex).
<b>NATURAL OCCURRENCE:</b>	
4 LATITUDES . . . . .	11-40°N
5 AREAS . . . . .	Connecticut to E. Texas (Southern USA); Mexico to Nicaragua.
<b>CLIMATE:</b>	
6 ALTITUDINAL RANGE . . . . .	1,000-2,000 m
7 MEAN ANNUAL RAINFALL . . . . .	1,000-1,500 mm
8 RAINFALL REGIME . . . . .	Summer
9 DRY SEASON . . . . .	5-6 months
10 MEAN MAX. TEMP. . . . .	25-36°C
11 MEAN MIN. TEMP. . . . .	-11-+5°C
12 MEAN ANNUAL TEMP. . . . .	8-20°C
<b>SOILS:</b>	
13 TEXTURE . . . . .	Medium/heavy
14 REACTION . . . . .	Neutral/alkaline
15 DRAINAGE . . . . .	Moist
16 OTHER CHARACTERISTICS . . . . .	Often in river bottoms; tolerates some salinity.
<b>SILVICULTURE:</b>	
17 SIZE . . . . .	h = 17-50 m
18 DESCRIPTION . . . . .	Deciduous
19 FORM . . . . .	Acceptable
20 LIGHT REQUIREMENTS . . . . .	-
21 OTHER CHARACTERISTICS . . . . .	Coppices; windfirm on drier soils; tolerates salt winds; frost resistant; strong tap root; fire sensitive; longlived.



<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 8-20</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... Agricultural shade.</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.38-0.48</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Interlocked grain; knotty near core.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light construction; furniture; boxes.</p> <p>31 ROUNDWOOD ..... Building poles; shortfibre pulp; veneer/plywood.</p> <p>32 OTHER PRODUCTS ..... Bark for roofing material.</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Uganda; Tanzania.</p> <p>34 SEEDS PER KILOGRAMME . 550-1,100</p> <p>35 STORAGE ..... -</p> <p>36 PRE-TREATMENT ..... Soak in cold water for one-two days.</p> <p>37 PLANTING STOCK ..... Potted; stripings; stumps; direct sown.</p> <p>38 SPECIAL REQUIREMENTS . Care of strong taproot.</p> <p>39 GERMINATION AND GROWTH Germinates in 14-28 days. Plantable size in 12-24 months.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Stem canker caused by <u>Fusarium solani</u> in E. Africa. Cerambicid beetle, <u>Monochamus scabiosus</u> attacks plantations in Zaire.</p>	
<p>PRINCIPAL REFERENCES: 43 45 57 59 128 149 152 155</p>	

SPECIES: Maesopsis eminii Engl.

<p>TAXONOMY:</p> <p>1 FAMILY ..... Rhamnaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES . Musizi</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 2°S-8°N</p> <p>5 AREAS ..... Tropical Central Africa from Liberia to Uganda.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 100-700 m</p> <p>7 MEAN ANNUAL RAINFALL . 1,200-3,000 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP. .... 26-32°C</p> <p>11 MEAN MIN. TEMP. .... 16-24°C</p> <p>12 MEAN ANNUAL TEMP. .... 22-27°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Better growth on fertile and deep soils.</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 30-40 m; d = 120-180 cm</p> <p>18 DESCRIPTION ..... Deciduous; wide crowned.</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; shortlived; self-pruning; prolific natural regeneration.</p>	

SPECIES: Melaleuca leucadendron (L.) L.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Myrtaceae</p> <p>2 SYNONYMS ..... <u>M. leucadendra</u> Linn., <u>M. quinquenervia</u> (Cav.) S.T. Blake.</p> <p>3 LOCAL OR TRADE NAMES . Paperbark; Cajeput oil tree; Broad-leaved tea-tree.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 25°S-20°N</p> <p>5 AREAS ..... S.E. Asia from Burma to Indonesia, Philippines and tropical Australia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-800 m</p> <p>7 MEAN ANNUAL RAINFALL . 800-1,600 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 0-4 months</p> <p>10 MEAN MAX. TEMP. .... 28-34°C</p> <p>11 MEAN MIN. TEMP. .... 18-22°C</p> <p>12 MEAN ANNUAL TEMP. .... 22-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS Tolerates saline soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 10-20 m; d = 30-60 cm</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Coppices; fire resistant; tolerates salt winds; drought hardy; termite resistant.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-16</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Shade and shelter; windbreaks; anti-erosion.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.60-0.80</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Non-fissile; thick corky bark; resists attack by termites and marine borers.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; railway sleepers.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fuel and charcoal; shortfibre pulp; mining timber.</p> <p>32 OTHER PRODUCTS ..... Oils (cajeput oil; medicinal); honeyflora.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Australia; Malaya; Hawaii; Fiji; Indonesia.</p> <p>34 SEEDS PER KILOGRAMME . 250,000-350,000</p> <p>35 STORAGE ..... Ambient temperature for several years.</p> <p>36 PRE-TREATMENT ..... Soak in cold water for one to two days.</p> <p>37 PLANTING STOCK ..... Potted; cuttings.</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH Plantable size in 6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 49 59 69 96 134 152</p>	

SPECIES: <u>Musanga cecropioides</u> R. Br.	
TAXONOMY:	
1 FAMILY .....	Moraceae
2 SYNONYMS .....	<u>M. smithii</u> R. Br.
3 LOCAL OR TRADE NAMES	Umbrella tree; Parasolier; African corkwood.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-8°N
5 AREAS .....	West and Central tropical Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-200 m
7 MEAN ANNUAL RAINFALL .....	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	25-30°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 12-15 m
18 DESCRIPTION .....	Prop roots.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; can spread by aerial runners; short-lived.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	30-35
ROLE IN LAND USE:	
23 .....	Soil improvement.
TIMBER:	
24 DENSITY .....	S.G. 0.20-0.35
25 NATURAL DURABILITY .....	Perishable
26 PRESERVATION .....	Easy; heartwood difficult.
27 SAWING .....	Easy
28 SEASONING .....	-
29 OTHER FEATURES .....	Mainly used for pulp.
UTILIZATION:	
30 SAW TIMBER .....	Insulation.
31 ROUNDWOOD .....	Shortfibre pulp; fishing floats; carving; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Ivory Coast; Nigeria; Uganda.
34 SEEDS PER KILOGRAMME	850,000-100,000
35 STORAGE .....	Ambient temperature for up to one year.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 14-21 days. Plantable size in 3-4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	23 39 49 155

SPECIES: <u>Musanga cecropioides</u> R. Br.	
TAXONOMY:	
1 FAMILY .....	Moraceae
2 SYNONYMS .....	<u>M. smithii</u> R. Br.
3 LOCAL OR TRADE NAMES	Umbrella tree; Parasolier; African corkwood.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-8°N
5 AREAS .....	West and Central tropical Africa.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-200 m
7 MEAN ANNUAL RAINFALL .....	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	28-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	20-26°C
12 MEAN ANNUAL TEMP. ....	25-30°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 12-15 m
18 DESCRIPTION .....	Prop roots.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; can spread by aerial runners; short-lived.

SPECIES: *Nauclea diderrichii* (De Wild. and Th. Dur.) Merrill

TAXONOMY:	
1 FAMILY .....	Rubiaceae
2 SYNONYMS .....	<i>Sarcocephalus trillesii</i> A. Chev.
3 LOCAL OR TRADE NAMES .	Opepe; Bilinga.
NATURAL OCCURRENCE:	
4 LATITUDES .....	5°S-10°N
5 AREAS .....	West and Central tropical Africa.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-500 m
7 MEAN ANNUAL RAINFALL .	2,000-4,500 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.,	28-34°C
11 MEAN MIN. TEMP.,	22-26°C
12 MEAN ANNUAL TEMP. ....	24-30°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Moderately free draining.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-50 m; d = 90-150 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	3-10
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.63-0.78
25 NATURAL DURABILITY ...	Very durable
26 PRESERVATION .....	Fair
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Decorative; interlocked grain; contains an alkaloid potentially toxic to woodworkers; moderately termite resistant.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; boat building; marine timbers; flooring; furniture.
31 ROUNDWOOD .....	Transmission poles; fuel (c.v. = 20,867 kG/kg) and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	Bark used medicinally.
NURSERY:	
33 SEED SOURCES .....	Most West African countries, especially Nigeria.
34 SEEDS PER KILOGRAMME .	60,000-100,000
35 STORAGE .....	-
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; striplings; stumps.
38 SPECIAL REQUIREMENTS .	Some shade required in first weeks.
39 GERMINATION AND GROWTH	Germinates in 14-18 days. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Several different borers attack timber.
PRINCIPAL REFERENCES:	
	21 25 57 100 128 152 155

SPECIES: Ochroma pyramidale (Cav. ex Lam.) Urban

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Bombacaceae</p> <p>2 SYNONYMS ..... <u>O. lagopus</u> Sw.</p> <p>3 LOCAL OR TRADE NAMES . Balsa</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 20°S-19°N</p> <p>5 AREAS ..... Central America, West Indies and South America to Bolivia.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 1,500-3,000 mm</p> <p>8 RAINFALL REGIME ..... Uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP. .... Hottest month ..... 24-30°C</p> <p>11 MEAN MIN. TEMP. .... Coldest month ..... 20-25°C</p> <p>12 MEAN ANNUAL TEMP. .... 22-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Free draining; moist.</p> <p>16 OTHER CHARACTERISTICS Better growth on fertile and deep soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 15-25 m; d = 60-70 cm</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Frost tender; shortlived.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 17-30</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.10-0.30</p> <p>25 NATURAL DURABILITY ... Perishable</p> <p>26 PRESERVATION ..... Fair</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Optimum growth rates essential to meet commercial density requirements of S.G. 0.10-0.17; most of commercial timber is sapwood.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Insulation and special.</p> <p>31 ROUNDWOOD ..... Shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Central America; Ecuador; Peru.</p> <p>34 SEEDS PER KILOGRAMME . 70,000-100,000</p> <p>35 STORAGE ..... Dry, cold and airtight for one-two years.</p> <p>36 PRE-TREATMENT ..... Boiling water till cool.</p> <p>37 PLANTING STOCK ..... Potted or direct sown.</p> <p>38 SPECIAL REQUIREMENTS . Requires 50% shade.</p> <p>39 GERMINATION AND GROWTH Germinates in 5-18 days. Plantable size in 3-4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Very liable to fungal and insect attack via any damage to bark. Susceptible to damping off in the nursery.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 5 25 52 57 100 109 152 169</p>	

SPECIES: <u>Octomeles sumatrana</u> Miq.	
TAXONOMY:	
1 FAMILY .....	Datiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Binuang; Erima.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°S-10°N
5 AREAS .....	Indonesia, Philippines, New Guinea and Solomon Islands.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-1 month
10 MEAN MAX. TEMP. ....	30-34 °C
11 MEAN MIN. TEMP. ....	20-26 °C
12 MEAN ANNUAL TEMP. ....	24-30 °C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 40-50 m; d = 150-180 cm
18 DESCRIPTION .....	Evergreen; buttressed.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Moderately fire resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	25-40
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.27-0.47
25 NATURAL DURABILITY ...	Perishable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Very liable to stain and borers.
UTILIZATION:	
30 SAW TIMBER .....	Boxes
31 ROUNDWOOD .....	Plywood; fuelwood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Sabah; Solomon Islands; Papua New Guinea.
34 SEEDS PER KILOGRAMME ..	4,000,000
35 STORAGE .....	Short viability.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ..	-
39 GERMINATION AND GROWTH	No information available on germination. Plantable size in 4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Liable to severe attack by defoliators.
PRINCIPAL REFERENCES:	
	49 59

SPECIES: <u>Parkia biglobosa</u> (Jacq.) Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>P. africana</u> R.Br.
3 LOCAL OR TRADE NAMES	Locust bean tree; Nété.
NATURAL OCCURRENCE:	
4 LATITUDES .....	5-15° N
5 AREAS .....	Africa: Senegal to Ghana.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-300 m
7 MEAN ANNUAL RAINFALL	400-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-7 months
10 MEAN MAX. TEMP.	28-40°C
11 MEAN MIN. TEMP.	8-20°C
12 MEAN ANNUAL TEMP. ....	24-28°C
SOILS:	
13 TEXTURE .....	-
14 REACTION .....	Acid
15 DRAINAGE .....	-
16 OTHER CHARACTERISTICS	Latosols
SILVICULTURE:	
17 SIZE .....	h = 15-20 m
18 DESCRIPTION .....	Deciduous; gnarled bole; dense crown.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Thick bark; bat pollinated.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.58-0.64
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Tough; liable to blue-stain.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boxes; furniture; tools.
31 ROUNDWOOD .....	Plywood; shortfibre pulp; matches; poles; fuelwood.
32 OTHER PRODUCTS .....	Crushed seeds are a valuable food; fodder (pods); tannin.
NURSERY:	
33 SEED SOURCES .....	West Africa.
34 SEEDS PER KILOGRAMME	5,000
35 STORAGE .....	-
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Budded onto rootstock; potted stock.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	75% germination in 15 days. Slow growth.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	

SPECIES: <u>Parkia biglobosa</u> (Jacq.) Benth.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>P. africana</u> R.Br.
3 LOCAL OR TRADE NAMES	Locust bean tree; Nété.
NATURAL OCCURRENCE:	
4 LATITUDES .....	5-15° N
5 AREAS .....	Africa: Senegal to Ghana.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-300 m
7 MEAN ANNUAL RAINFALL	400-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-7 months
10 MEAN MAX. TEMP.	28-40°C
11 MEAN MIN. TEMP.	8-20°C
12 MEAN ANNUAL TEMP. ....	24-28°C
SOILS:	
13 TEXTURE .....	-
14 REACTION .....	Acid
15 DRAINAGE .....	-
16 OTHER CHARACTERISTICS	Latosols
SILVICULTURE:	
17 SIZE .....	h = 15-20 m
18 DESCRIPTION .....	Deciduous; gnarled bole; dense crown.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	-
21 OTHER CHARACTERISTICS	Thick bark; bat pollinated.

SPECIES: <i>Parkinsonia aculeata</i> L.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Horsebean; Jerusalem thorn.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°S-30°N
5 AREAS .....	Central and South America, from Texas to Peru.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL .....	250-800 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	22-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils but not waterlogging.
SILVICULTURE:	
17 SIZE .....	h = 4-5 m
18 DESCRIPTION .....	Deciduous/evergreen; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; tolerates light frosts; drought hardy; short-lived; withstands heavy pruning or pollarding.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Windbreaks; anti-erosion; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.60
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal.
32 OTHER PRODUCTS .....	Fodder (pods and leaves).
NURSERY:	
33 SEED SOURCES .....	Israel; Cyprus; Central and South America; USA.
34 SEEDS PER KILOGRAMME .	12,000
35 STORAGE .....	Ambient temperature for up to one year.
36 PRE-TREATMENT .....	Soak in cold water for three-six days.
37 PLANTING STOCK .....	Potted; root or shoot cuttings.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 10-14 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported but young plants subject to termite damage.
PRINCIPAL REFERENCES:	
	69 71 94 95 121 134 152

SPECIES: <i>Parkinsonia aculeata</i> L.	
TAXONOMY:	
1 FAMILY .....	Caesalpinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Horsebean; Jerusalem thorn.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°S-30°N
5 AREAS .....	Central and South America, from Texas to Peru.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,400 m
7 MEAN ANNUAL RAINFALL .....	250-800 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	22-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	20-28°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils but not waterlogging.
SILVICULTURE:	
17 SIZE .....	h = 4-5 m
18 DESCRIPTION .....	Deciduous/evergreen; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; tolerates light frosts; drought hardy; short-lived; withstands heavy pruning or pollarding.



SPECIES: <u>Paulownia tomentosa</u> Steud.	
TAXONOMY:	
1 FAMILY .....	Scrophulariaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Kiri; Royal Paulownia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	32-40°N
5 AREAS .....	Japan
CLIMATE:	
6 ALTITUDINAL RANGE ....	500-1,200 m
7 MEAN ANNUAL RAINFALL .	1,200-1,800 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	26-30°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	16-20°C
12 MEAN ANNUAL TEMP. ....	20-24°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 12-16 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm; tolerates salt winds; frost resistant; drought hardy; requires wide spacing.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	25-35
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.45
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Tree requires pruning if timber is to meet high market specifications. Decorative.
UTILIZATION:	
30 SAW TIMBER .....	Furniture
31 ROUNDWOOD .....	-
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Root cuttings from Brazil and Japan. Seed from Argentina. Origin and species very important if timber is to be marketable.
34 SEEDS PER KILOGRAMME .	-
35 STORAGE .....	-
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Cuttings
38 SPECIAL REQUIREMENTS ,	-
39 GERMINATION AND GROWTH	Germinates in 20-30 days. Plantable size in 4-5 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Reports of stem canker. Very liable to defoliator attacks including Atta ants.
PRINCIPAL REFERENCES: 115 127	

SPECIES: <u>Paulownia tomentosa</u> Steud.	
TAXONOMY:	
1 FAMILY .....	Scrophulariaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Kiri; Royal Paulownia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	32-40°N
5 AREAS .....	Japan
CLIMATE:	
6 ALTITUDINAL RANGE ....	500-1,200 m
7 MEAN ANNUAL RAINFALL .	1,200-1,800 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	26-30°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	16-20°C
12 MEAN ANNUAL TEMP. ....	20-24°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 12-16 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm; tolerates salt winds; frost resistant; drought hardy; requires wide spacing.

SPECIES: <u>Peltophorum pterocarpum</u> (DC.) Heyne	
TAXONOMY:	
1 FAMILY .....	Caesalpiniaceae
2 SYNONYMS .....	<u>P. ferrugineum</u> (Decne.) Benth., <u>P. inerme</u> (Roxb.) Naves
3 LOCAL OR TRADE NAMES .....	Jemerlang laut (Malaysia); Copper pod; Yellow flame.
NATURAL OCCURRENCE:	
4 LATITUDES .....	1-15°N
5 AREAS .....	Sri Lanka; S. India; Malaysia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	1,000-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	32-36°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	9-16°C
12 MEAN ANNUAL TEMP. ....	24-27°C
SOILS:	
13 TEXTURE .....	Medium/light
14 REACTION .....	-
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates poor soils.
SILVICULTURE:	
17 SIZE .....	h = 20-30 m
18 DESCRIPTION .....	Spreading, ornamental tree. Deciduous.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; windfirm; fast growing.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	-
ROLE IN LAND USE:	
23 .....	Shade in coffee and cacao plantations; reclamation of <u>Imperata</u> grasslands.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Hard
UTILIZATION:	
30 SAW TIMBER .....	Boxes; furniture.
31 ROUNDWOOD .....	Fuelwood
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Malaysia; Franca; Cambodia.
34 SEEDS PER KILOGRAMME .....	12,000-20,000
35 STORAGE .....	-
36 PRE-TREATMENT .....	Boiling water, soak till cool.
37 PLANTING STOCK .....	Potted; stumps; large branch cuttings.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH	60-80% germination in 7 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	-
PRINCIPAL REFERENCES:	

SPECIES: <u>Peltophorum pterocarpum</u> (DC.) Heyne	
TAXONOMY:	
1 FAMILY .....	Caesalpiniaceae
2 SYNONYMS .....	<u>P. ferrugineum</u> (Decne.) Benth., <u>P. inerme</u> (Roxb.) Naves
3 LOCAL OR TRADE NAMES .....	Jemerlang laut (Malaysia); Copper pod; Yellow flame.
NATURAL OCCURRENCE:	
4 LATITUDES .....	1-15°N
5 AREAS .....	Sri Lanka; S. India; Malaysia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,000 m
7 MEAN ANNUAL RAINFALL .....	1,000-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	4-6 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	32-36°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	9-16°C
12 MEAN ANNUAL TEMP. ....	24-27°C
SOILS:	
13 TEXTURE .....	Medium/light
14 REACTION .....	-
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates poor soils.
SILVICULTURE:	
17 SIZE .....	h = 20-30 m
18 DESCRIPTION .....	Spreading, ornamental tree. Deciduous.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	-
21 OTHER CHARACTERISTICS	Coppices; windfirm; fast growing.

SPECIES: Pericopsis elata (Harms) van Meeuwen

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Papilionaceae</p> <p>2 SYNONYMS ..... <u>Afromosia elata</u> Harms</p> <p>3 LOCAL OR TRADE NAMES . Afrormosia; Kokrodua; Asamela.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 1-8°N</p> <p>5 AREAS ..... West and Central Africa: Ivory Coast, Ghana and Zaïre.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 150-1,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 750-1,500 mm</p> <p>8 RAINFALL REGIME ..... Bimodal (May/June and Sept./Oct.) to uniform.</p> <p>9 DRY SEASON ..... 2-4 months</p> <p>10 MEAN MAX. TEMP. .... 30-35°C</p> <p>    HOTTEST MONTH ..... 20-23°C</p> <p>11 MEAN MIN. TEMP. .... 25-26°C</p> <p>    COLDEST MONTH ..... 25-26°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light</p> <p>14 REACTION ..... Neutral</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Tolerates poor and eroded soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 30-45 m; d = 90-180 cm</p> <p>18 DESCRIPTION ..... Deciduous; spreading crown; buttressed; fluted.</p> <p>19 FORM ..... Poor/acceptable</p> <p>20 LIGHT REQUIREMENTS ... -</p> <p>21 OTHER CHARACTERISTICS Fixes nitrogen; substantial provenance variation; slow growing.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... -</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Taungya</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.62-0.85</p> <p>25 NATURAL DURABILITY ... Very durable</p> <p>26 PRESERVATION ..... Difficult</p> <p>27 SAWING ..... Easy/fair</p> <p>28 SEASONING ..... Easy/fair</p> <p>29 OTHER FEATURES ..... Recognised teak-substitute; resists termites; sawdust irritates skin and eyes.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; boat-building; flooring; joinery; railway sleepers.</p> <p>31 ROUNDWOOD ..... Building poles; veneer/plywood.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Ghana (viable seed difficult to obtain).</p> <p>34 SEEDS PER KILOGRAMME . 2,200-4,500</p> <p>35 STORAGE ..... Up to 3 months.</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Bare-rooted plants; direct sown; stem cuttings.</p> <p>38 SPECIAL REQUIREMENTS . Shade beneficial during germination.</p> <p>39 GERMINATION AND GROWTH Unreliable germination; up to 87% in 11-13 days.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... <u>Lamprosema lateritalis</u> caterpillar defoliates nursery and plantation trees.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 90 106</p>	

SPECIES: <i>Pinus ayacahuite</i> Ehrenb.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Mexican white pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	14-21°N
5 AREAS .....	Central America, from S. Mexico to Honduras.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,800-3,100 m
7 MEAN ANNUAL RAINFALL .	1,200-2,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-24°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	6-12°C
12 MEAN ANNUAL TEMP. ....	13-17°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 30-35 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost hardy
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	8-15
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.40-0.46
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Soft
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes.
31 ROUNDWOOD .....	Longfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Mexico; S. Africa.
34 SEEDS PER KILOGRAMME .	-
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	-
PRINCIPAL PESTS AND DISEASES:	
40 .....	Generally very resistant.
PRINCIPAL REFERENCES:	
	4 30 34 52 53 110 114 152

SPECIES: <i>Pinus ayacahuite</i> Ehrenb.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Mexican white pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	14-21°N
5 AREAS .....	Central America, from S. Mexico to Honduras.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,800-3,100 m
7 MEAN ANNUAL RAINFALL .	1,200-2,500 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-24°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	6-12°C
12 MEAN ANNUAL TEMP. ....	13-17°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 30-35 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Moderately demanding
21 OTHER CHARACTERISTICS	Frost hardy

PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 2-6	
ROLE IN LAND USE: 23 ..... Windbreaks; anti-erosion.	
TIMBER: 24 DENSITY ..... S.G. 0.50-0.60 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Easy 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
UTILIZATION: 30 SAW TIMBER ..... Heavy construction; light construction; furniture; boxes. 31 ROUNDWOOD ..... Transmission poles; fence posts. 32 OTHER PRODUCTS ..... Resins	
NURSERY: 33 SEED SOURCES ..... Cyprus; Israel; Turkey. 34 SEEDS PER KILOGRAMME , 15,000-35,000 35 STORAGE ..... Ambient temperature for one to two years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH ..... Germinates in 12-26 days. Plantable size in 18-24 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... The processionary caterpillar <i>Thaumetopoea wilkinsoni</i> is a major pest in the Mediterranean region.	
PRINCIPAL REFERENCES: 30 34 71 84 95 152 154	

SPECIES: Pinus brutia Ten.

TAXONOMY: 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... <u>P. halepensis</u> var. <u>brutia</u> (Ten.) Elwes & Henry. 3 LOCAL OR TRADE NAMES , -	
NATURAL OCCURRENCE: 4 LATITUDES ..... 33-45°N 5 AREAS ..... N.E. Mediterranean, Cyprus, Turkey, Syria and Northern Iraq.	
CLIMATE: 6 ALTITUDINAL RANGE .... 1,500-2,500 m 7 MEAN ANNUAL RAINFALL , 400-900 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 5-6 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 24-35°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 0-14°C 12 MEAN ANNUAL TEMP. .... 15-20°C	
SOILS: 13 TEXTURE ..... Light/medium 14 REACTION ..... Alkaline/neutral/acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS ..... Tolerates shallow soils and is adaptable.	
SILVICULTURE: 17 SIZE ..... h = 20-30 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS ..... Moderately fire resistant; termite resistant; very frost resistant. The closely related <u>P. eldarica</u> , originating from the Caucasus, is reported to be even more frost and drought resistant.	

SPECIES: <i>Pinus canariensis</i> C. Sm.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Canary Island pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-29°N
5 AREAS .....	Canary Islands.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,500-2,500 m
7 MEAN ANNUAL RAINFALL .	600-1,750 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	21-29°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-14°C
12 MEAN ANNUAL TEMP. ....	14-19°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Growth better on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; tolerates salt winds; moderately frost resistant; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	8-18
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.50-0.60
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Ideal for transmission poles.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction.
31 ROUNDWOOD .....	Building poles; transmission poles; fuelwood.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Spain; S. Africa; Australia; USA.
34 SEEDS PER KILOGRAMME .	8,000-9,000
35 STORAGE .....	Ambient temperature for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 18-21 days. Plantable size in 24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Only major disease is attack by <i>Dothistroma pini</i> after hail damage. Liable to damping off.
PRINCIPAL REFERENCES:	
	30 34 71 84 128 133 152

SPECIES: <i>Pinus canariensis</i> C. Sm.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ,	Canary Island pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-29°N
5 AREAS .....	Canary Islands.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,500-2,500 m
7 MEAN ANNUAL RAINFALL .	600-1,750 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	21-29°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-14°C
12 MEAN ANNUAL TEMP. ....	14-19°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Growth better on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; tolerates salt winds; moderately frost resistant; drought hardy.

SPECIES: *Pinus caribaea* Morelet var. *bahamensis* (Griseb.) Barr. & Golf.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES . Caribbean pine.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 21-27°N</p> <p>5 AREAS ..... Bahama Islands.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,000 m</p> <p>7 MEAN ANNUAL RAINFALL . 1,000-1,500 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-5 months</p> <p>10 MEAN MAX. TEMP. .... 30-32°C</p> <p>HOTTEST MONTH ..... 16-20°C</p> <p>11 MEAN MIN. TEMP. .... 22-26°C</p> <p>COLDEST MONTH ..... 22-26°C</p> <p>12 MEAN ANNUAL TEMP. ....</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS . Tolerates shallow soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 15-20 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS . Moderately windfirm; tolerates salt winds; frost tender.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 10-28</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.35-0.50</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... -</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; light construction; boat-building.</p> <p>31 ROUNDWOOD ..... Transmission poles; fence posts; longfibre pulp; fuelwood (c.v. = 20,298 kJ/kg).</p> <p>32 OTHER PRODUCTS ..... Resins</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Bahamas; Australia; Brazil.</p> <p>34 SEEDS PER KILOGRAMME . 80,000-85,000</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . Mycorrhizae essential.</p> <p>39 GERMINATION AND GROWTH . Germinates in 8-20 days. Plantable size in 5-7 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... As for var. <i>hondurensis</i>. Damping off in nursery.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 30 34 74 99 100 104 107 152</p>	

SPECIES: <u>Pinus caribaea Morelet var. caribaea</u>	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Caribbean pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	21-22.5°N
5 AREAS .....	Western Cuba and Isle of Pines.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL	1,050-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	30-34°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	16-20°C
12 MEAN ANNUAL TEMP. ....	24-26°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 20-27 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Tolerates salt winds; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-20
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.35-0.50
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boat-building.
31 ROUNDWOOD .....	Transmission poles; fence posts; longfibre pulp; fuelwood (c.v. = 20,298 kJ/kg).
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Cuba; Australia.
34 SEEDS PER KILOGRAMME	55,000-60,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Mycorrhizae essential.
39 GERMINATION AND GROWTH	Germinates in 8-21 days. Plantable size in 5-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	As for var. <u>hondurensis</u> . Damping off in nursery.
PRINCIPAL REFERENCES:	
	30 34 52 74 99 100 104 107 114



SPECIES: Pinus caribaea Morelet var. hondurensis (Sénécl.) Barr. & Golf.

TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES :	Caribbean pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	12-18°N
5 AREAS .....	Atlantic coast of Central America from Belize to N. Nicaragua.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-1,000 m
7 MEAN ANNUAL RAINFALL .	660-4,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	0-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	29-34°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	15-23°C
12 MEAN ANNUAL TEMP. ....	21-27°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; occasionally seasonally waterlogged
16 OTHER CHARACTERISTICS	Better growth on moderately fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 35-45 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable; variable between provenances.
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Moderately fire resistant; tolerates salt winds; substantial provenance variation; frost tender.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-40
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.35-0.50
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boat-building.
31 ROUNDWOOD .....	Transmission poles; fence posts; longfibre pulp; fuelwood (c.v. = 20,290 kJ/kg).
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Honduras; Guatemala; Belize; S. Africa; Fiji; Australia.
34 SEEDS PER KILOGRAMME .	52,000-72,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .	Mycorrhizae essential.
39 GERMINATION AND GROWTH	Germinates in 8-21 days. Plantable size in 5-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Needle blight <u>Cercospora pini-densiflorae</u> can seriously attack exotic plantations. <u>Dendroctonus</u> beetles are major pests in Central America. Damping off in nursery.
PRINCIPAL REFERENCES:	
	4 30 34 52 74 99 100 104 107 109 110 128 133 152

SPECIES: <i>Pinus chiapensis</i> (Martínez) Andresen	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<i>Pinus strobus</i> L. var. <i>chiapensis</i> (Martínez)
3 LOCAL OR TRADE NAMES ..	-
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-20°N
5 AREAS .....	Southern Mexico and Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE ....	600-1,800 m
7 MEAN ANNUAL RAINFALL ..	1,000-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	24-28°C
11 MEAN MIN. TEMP.	14-20°C
12 MEAN ANNUAL TEMP. ....	17-23°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen; light, feathery crown.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.40-0.45
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes.
31 ROUNDWOOD .....	Longfibre pulp.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Mexico; Guatemala.
34 SEEDS PER KILOGRAMME ..	55,000-65,000
35 STORAGE .....	Dry, cold and airtight for one to two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ..	Requires mycorrhizae.
39 GERMINATION AND GROWTH	Germinates in 12-30 days. Plantable size in 5-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported. Damping off in nursery.
PRINCIPAL REFERENCES:	
	4 30 34 52 53 100 152

SPECIES: <i>Pinus chiapensis</i> (Martínez) Andresen	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<i>Pinus strobus</i> L. var. <i>chiapensis</i> (Martínez)
3 LOCAL OR TRADE NAMES ..	-
NATURAL OCCURRENCE:	
4 LATITUDES .....	15-20°N
5 AREAS .....	Southern Mexico and Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE ....	600-1,800 m
7 MEAN ANNUAL RAINFALL ..	1,000-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	24-28°C
11 MEAN MIN. TEMP.	14-20°C
12 MEAN ANNUAL TEMP. ....	17-23°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen; light, feathery crown.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	-

SPECIES: *Pinus elliottii* Engelm. var. *elliottii*

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Slash pine.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 28-33°N</p> <p>5 AREAS ..... Coastal plains of South Eastern USA.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 500-2,500 m</p> <p>7 MEAN ANNUAL RAINFALL , 650-2,500 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-4 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 23-32°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 4-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 15-24°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Acid</p> <p>15 DRAINAGE ..... Free draining; occasionally seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS Tolerates shallow soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-30 m; d = 60-100 cm</p> <p>18 DESCRIPTION ..... Evergreen; light crowned.</p> <p>19 FORM ..... Acceptable/exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Fire resistant; tolerates salt winds; frost resistant; drought hardy; termite resistant.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) ..... 10-20</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.50-0.64</p> <p>25 NATURAL DURABILITY ... Moderately durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... -</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Heavy construction; light construction; boxes; boat-building.</p> <p>31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; longfibre pulp; fuelwood.</p> <p>32 OTHER PRODUCTS ..... Resins</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... USA; S. Africa; Australia.</p> <p>34 SEEDS PER KILOGRAMME , 27,000-34,000; or 14,500 plants/kg of seed.</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... Stratify in damp sand for thirty days.</p> <p>37 PLANTING STOCK ..... Potted; bare-rooted plants.</p> <p>38 SPECIAL REQUIREMENTS , Requires mycorrhizae.</p> <p>39 GERMINATION AND GROWTH Germinates in 15-20 days. Plantable size in 6-8 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... The most resistant pine to <i>Diplodia pinea</i>. Susceptible to damping off in nursery.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 30 34 52 62 85 96 109 116 128 133</p> <p>142</p>	

SPECIES: *Pinus greggii* Engelm.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS ..... <i>P. pseudopatula</i> (Bois.) Hort.</p> <p>3 LOCAL OR TRADE NAMES . -</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 20-26°N</p> <p>5 AREAS ..... Mountains of Mexico.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 1,700-3,100 m</p> <p>7 MEAN ANNUAL RAINFALL . 650-800 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 3-5 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 16-24°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 5-10°C</p> <p>12 MEAN ANNUAL TEMP. .... 10-17°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Better growth on deep soils, but is adaptable.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 15-18 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Frost resistant</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 5-13</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Windbreaks</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.40-0.44</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Soft and weak timber.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Fence posts; longfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Mexico; S. Africa.</p> <p>34 SEEDS PER KILOGRAMME . 70,000-80,000</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH -</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 30 34 52 53 110 152</p>	

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 5-11	
<b>ROLE IN LAND USE:</b> 23 ..... Shade and shelter; windbreaks; dune-fixation; anti-erosion.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.50-0.53 25 NATURAL DURABILITY ... Moderately durable 26 PRESERVATION ..... - 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Heavy construction; light construction; boxes. 31 ROUNDWOOD ..... Building poles; fence posts; fuelwood. 32 OTHER PRODUCTS ..... Resins.	
<b>NURSERY:</b> 33 SEED SOURCES ..... Most Mediterranean countries and Australia. 34 SEEDS PER KILOGRAMME . 30,000-60,000 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted or direct sown. 38 SPECIAL REQUIREMENTS . - 39 GERMINATION AND GROWTH Germinates in 15-30 days. Plantable size in 12-18 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Susceptible to <i>Diplodia pinea</i> and heavily attacked by processionary caterpillar <i>Thaumetopoea wilkinsoni</i> in the Mediterranean.	
<b>PRINCIPAL REFERENCES:</b> 4 30 34 52 71 84 95 121 128 134 152 154	

SPECIES: *Pinus halepensis* Mill.

<b>TAXONOMY:</b> 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES . Aleppo pine	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 30-44°N 5 AREAS ..... Throughout the Mediterranean, from Spain to Turkey.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 1,500-2,500 m 7 MEAN ANNUAL RAINFALL . 400-800 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 5-6 months 10 MEAN MAX. TEMP. .... 24-34°C HOTTEST MONTH ..... 11 MEAN MIN. TEMP. .... 2-10°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP. .... 15-20°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Alkaline/neutral/acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS Adaptable to most soil conditions including shallow soils and slightly saline soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 15-18 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Poor 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Moderately fire resistant; termite resistant; tolerates salt winds; frost resistant; drought hardy; generally used for protection rather than production planting.	

SPECIES: <i>Pinus kesiya</i> Royle ex Gordon	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<i>P. khasya</i> Royle; <i>P. insularis</i> Endl.
3 LOCAL OR TRADE NAMES	<i>Khasya</i> pine; <i>Khasi</i> pine; Benguet pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-30°N
5 AREAS .....	Luzon Island, Philippines; India; Burma; Thailand, Vietnam.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL	700-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	26-30°C
HOTTEST MONTH .....	10-18°C
11 MEAN MIN. TEMP.	17-22°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-35 m; d = 80-120 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Termite resistant; substantial provenance variation; frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.50-0.72
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Good quality timber.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Building poles; fuel (c.v. = 23,161 kJ/kg); veneer/plywood; longfibre pulp.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	India; Madagascar; Philippines; Thailand; Zambia
34 SEEDS PER KILOGRAMME	55,000-62,000; or 25,000 plants/kg of seed.
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Requires mycorrhizae.
39 GERMINATION AND GROWTH	Germinates in 8-10 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Liabile to <i>Dothistroma pini</i> attack in Africa and shoot borers in Asia. Damping off in nursery.
PRINCIPAL REFERENCES:	
	3 4 30 34 85 96 107 109 128 152

SPECIES: <i>Pinus kesiya</i> Royle ex Gordon	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<i>P. khasya</i> Royle; <i>P. insularis</i> Endl.
3 LOCAL OR TRADE NAMES	<i>Khasya</i> pine; <i>Khasi</i> pine; Benguet pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-30°N
5 AREAS .....	Luzon Island, Philippines; India; Burma; Thailand, Vietnam.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,000 m
7 MEAN ANNUAL RAINFALL	700-1,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	26-30°C
HOTTEST MONTH .....	10-18°C
11 MEAN MIN. TEMP.	17-22°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-35 m; d = 80-120 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Termite resistant; substantial provenance variation; frost tender.

SPECIES: <i>Pinus merkusii</i> Jungh & de Vriese (continental provenances)	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tenasserim pine; Merkus pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-21°N
5 AREAS .....	Mainland S.E. Asia from N.W. India to Cambodia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-900 m
7 MEAN ANNUAL RAINFALL .....	1,000-2,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-5 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	24-32°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 60-90 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Windfirm; fire resistant; termite resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	8-18
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.65-0.80
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; longfibre pulp; veneer/plywood; fuel (c.v. = 22,876 kJ/kg).
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Thailand.
34 SEEDS PER KILOGRAMME .....	30,000-40,000
35 STORAGE .....	Short viability.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	Grass stage in seedling. Requires mycorrhizae.
39 GERMINATION AND GROWTH .....	Germinates in 10-12 days. Plantable size in 8-10 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Less prone to shoot borer attack than <i>P. kesiya</i> . Susceptible to damping off in nursery.
PRINCIPAL REFERENCES:	
	29 30 34 107 152

SPECIES: <i>Pinus merkusii</i> Jungh & de Vriese (continental provenances)	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tenasserim pine; Merkus pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	11-21°N
5 AREAS .....	Mainland S.E. Asia from N.W. India to Cambodia.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-900 m
7 MEAN ANNUAL RAINFALL .....	1,000-2,800 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-5 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	24-32°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 60-90 cm
18 DESCRIPTION .....	Evergreen
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Windfirm; fire resistant; termite resistant.

SPECIES: <i>Pinus merkusii</i> Jungh & de Vriese (island provenances)	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tenasserim pine; Merkus pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	3°S-5°N
5 AREAS .....	Sumatra
CLIMATE:	
6 ALTITUDINAL RANGE .....	800-1,600 m
7 MEAN ANNUAL RAINFALL .....	2,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	16-22°C
12 MEAN ANNUAL TEMP. ....	19-23°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 50-60 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Termite resistant
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	12-27
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.58-0.80
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Frequent knots.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; longfibre pulp; veneer/plywood; matches; fuelwood (c.v. = 22,876 kJ/kg)
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Sumatra; Java.
34 SEEDS PER KILOGRAMME .....	60,000
35 STORAGE .....	Dry for one to two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	No grass stage. Requires mycorrhizae
39 GERMINATION AND GROWTH .....	Germinates in 10-12 days. Plantable size in 8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Attacked by 'Looper' caterpillars in Indonesia. Damping off in nursery.
PRINCIPAL REFERENCES:	
	29 30 34 107 149 152

SPECIES: <i>Pinus merkusii</i> Jungh & de Vriese (island provenances)	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tenasserim pine; Merkus pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	3°S-5°N
5 AREAS .....	Sumatra
CLIMATE:	
6 ALTITUDINAL RANGE .....	800-1,600 m
7 MEAN ANNUAL RAINFALL .....	2,000-3,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	24-30°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	16-22°C
12 MEAN ANNUAL TEMP. ....	19-23°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 50-60 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Termite resistant



SPECIES: <u>Pinus michoacana</u> Martínez	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Michoacan pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	16-23°N
5 AREAS .....	Central and Southern Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,300 m
7 MEAN ANNUAL RAINFALL	1,000-1,700 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	24-28°C
11 MEAN MIN. TEMP.	6-12°C
12 MEAN ANNUAL TEMP. ....	14-21°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Moderately resistant to fire and frost.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	6-12
ROLE IN LAND USE:	
23 .....	Windbreaks.
TIMBER:	
24 DENSITY .....	S.G. 0.48-0.50
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; longfibre pulp; veneer / plywood.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Mexico; S. Africa.
34 SEEDS PER KILOGRAMME	25,000-35,000
35 STORAGE .....	Dry, cold and airtight for one to two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	-
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	4 30 34 53 110 152

SPECIES: <u>Pinus michoacana</u> Martínez	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Michoacan pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	16-23°N
5 AREAS .....	Central and Southern Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,300 m
7 MEAN ANNUAL RAINFALL	1,000-1,700 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	24-28°C
11 MEAN MIN. TEMP.	6-12°C
12 MEAN ANNUAL TEMP. ....	14-21°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on deep soils.
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Moderately resistant to fire and frost.

SPECIES: <i>Pinus montezumae</i> Lamb.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Montezuma pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	14-23°N
5 AREAS .....	Highlands of Mexico and Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,400-3,000 m
7 MEAN ANNUAL RAINFALL ..	900-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	18-24°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-12°C
12 MEAN ANNUAL TEMP. ....	11-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding; moderately shade tolerant in youth.
21 OTHER CHARACTERISTICS	Moderately resistant to fire and frost.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	6-12
ROLE IN LAND USE:	
23 .....	Windbreaks
TIMBER:	
24 DENSITY .....	S.G. 0.40-0.50
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Knotty if not pruned.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Fence posts; fuel and charcoal; longfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Mexico; Guatemala; S. Africa.
34 SEEDS PER KILOGRAMME ..	35,000-50,000
35 STORAGE .....	Dry, cold and airtight for one to two years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS ..	Mycorrhizae required.
39 GERMINATION AND GROWTH	No information available on germination. Plantable size in 18-24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	4 30 34 52 53 110 128 152

SPECIES: <i>Pinus montezumae</i> Lamb.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES ..	Montezuma pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	14-23°N
5 AREAS .....	Highlands of Mexico and Guatemala.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,400-3,000 m
7 MEAN ANNUAL RAINFALL ..	900-1,600 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	18-24°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-12°C
12 MEAN ANNUAL TEMP. ....	11-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding; moderately shade tolerant in youth.
21 OTHER CHARACTERISTICS	Moderately resistant to fire and frost.

SPECIES: <u>Pinus occidentalis</u> Swartz	
<b>TAXONOMY:</b> 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... <u>P. cubensis</u> Griseb. 3 LOCAL OR TRADE NAMES , West Indian pine.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 18-21°N 5 AREAS ..... Island of Hispaniola and Eastern Cuba.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 0-1,500 m 7 MEAN ANNUAL RAINFALL , 1,300-1,500 mm 8 RAINFALL REGIME ..... Summer 9 DRY SEASON ..... 2-4 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 26-32°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 10-16°C 12 MEAN ANNUAL TEMP. .... 18-24°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium/heavy 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining; moist. 16 OTHER CHARACTERISTICS Adaptable to most soil conditions.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 25-35 m 18 DESCRIPTION ..... Evergreen; light crowned. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Termite resistant	
<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) .... 5-10	
<b>ROLE IN LAND USE:</b> 23 ..... -	
<b>TIMBER:</b> 24 DENSITY ..... - 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Easy 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Heavy construction; light construction; boxes. 31 ROUNDWOOD ..... Transmission poles; fence posts; longfibre pulp. 32 OTHER PRODUCTS ..... Resins	
<b>NURSERY:</b> 33 SEED SOURCES ..... Cuba; Dominican Republic; Haiti. 34 SEEDS PER KILOGRAMME , 35,000-40,000 35 STORAGE ..... - 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted 38 SPECIAL REQUIREMENTS , Mycorrhizae required. 39 GERMINATION AND GROWTH Plantable size in 10-12 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... None of importance reported. Susceptible to damping off in nursery.	
<b>PRINCIPAL REFERENCES:</b> 30 34 52 152	

TAXONOMY: 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... <u>P. cubensis</u> Griseb. 3 LOCAL OR TRADE NAMES , West Indian pine.	
NATURAL OCCURRENCE: 4 LATITUDES ..... 18-21°N 5 AREAS ..... Island of Hispaniola and Eastern Cuba.	
CLIMATE: 6 ALTITUDINAL RANGE .... 0-1,500 m 7 MEAN ANNUAL RAINFALL , 1,300-1,500 mm 8 RAINFALL REGIME ..... Summer 9 DRY SEASON ..... 2-4 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 26-32°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 10-16°C 12 MEAN ANNUAL TEMP. .... 18-24°C	
SOILS: 13 TEXTURE ..... Light/medium/heavy 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining; moist. 16 OTHER CHARACTERISTICS Adaptable to most soil conditions.	
SILVICULTURE: 17 SIZE ..... h = 25-35 m 18 DESCRIPTION ..... Evergreen; light crowned. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Termite resistant	

SPECIES: <u>Pinus oocarpa</u> Schiede	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Ocoti pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	13-28°N
5 AREAS .....	Central America, from North Mexico to Nicaragua.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,400 m
7 MEAN ANNUAL RAINFALL .....	750-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	8-16°C
12 MEAN ANNUAL TEMP. ....	13-21°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 20-40 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Exceptional to poor (depending on provenance).
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Termite resistant; substantial provenance variation; slightly frost tender.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	10-40
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.45-0.60
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; fence posts; longfibre pulp.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	Béize; Guatemala; Honduras; Nicaragua.
34 SEEDS PER KILOGRAMME .....	41,000-55,000
35 STORAGE .....	Dry and cold for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS .....	Mycorrhizae required.
39 GERMINATION AND GROWTH	Germinates in 14-21 days. Plantable size in 6-8 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Generally similar to <u>P. caribaea</u> var. <u>hondurensis</u> .
PRINCIPAL REFERENCES:	
4	30 34 52 53 75 85 99 100 101 110 152

SPECIES: <u>Pinus oocarpa</u> Schiede	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Ocoti pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	13-28°N
5 AREAS .....	Central America, from North Mexico to Nicaragua.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,400 m
7 MEAN ANNUAL RAINFALL .....	750-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	20-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	8-16°C
12 MEAN ANNUAL TEMP. ....	13-21°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates shallow soils.
SILVICULTURE:	
17 SIZE .....	h = 20-40 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Exceptional to poor (depending on provenance).
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	Termite resistant; substantial provenance variation; slightly frost tender.

SPECIES: <u>Pinus palustris</u> Mill.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<u>P. australis</u> Michx.
3 LOCAL OR TRADE NAMES	Longleaf pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27-36°N
5 AREAS .....	Atlantic and Gulf States of USA.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	1,000-2,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	HOTTEST MONTH .....
	27-31°C
11 MEAN MIN. TEMP.	COLDEST MONTH .....
	8-12°C
12 MEAN ANNUAL TEMP. ....	16-22°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm; moderately frost resistant.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	6-12
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.54-0.58
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Suffers from resin checks.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes; boat building.
31 ROUNDWOOD .....	Transmission poles; fence posts; fuel and charcoal; longfibre pulp.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	USA; S. Africa.
34 SEEDS PER KILOGRAMME	8,000-11,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Seedlings with grass stage. Requires mycorrhizae.
39 GERMINATION AND GROWTH	Germinates in 7-11 days. Plantable size in 12-18 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported. Susceptible to damping off in nursery.
PRINCIPAL REFERENCES:	
	4 30 34 62 116 133 152

SPECIES: <u>Pinus palustris</u> Mill.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	<u>P. australis</u> Michx.
3 LOCAL OR TRADE NAMES	Longleaf pine.
NATURAL OCCURRENCE:	
4 LATITUDES .....	27-36°N
5 AREAS .....	Atlantic and Gulf States of USA.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-1,500 m
7 MEAN ANNUAL RAINFALL	1,000-2,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	2-3 months
10 MEAN MAX. TEMP.	HOTTEST MONTH .....
	27-31°C
11 MEAN MIN. TEMP.	COLDEST MONTH .....
	8-12°C
12 MEAN ANNUAL TEMP. ....	16-22°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 25-30 m
18 DESCRIPTION .....	Evergreen; light crowned.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm; moderately frost resistant.

SPECIES: Pinus patula Schiede and Deppe subsp. patula

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 15-40</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... Windbreaks</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.38-0.50</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Light and of only moderate strength.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Transmission poles; fence posts; longfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Most Eastern and Southern African countries and Mexico</p> <p>34 SEEDS PER KILOGRAMME , 100,000-140,000; or 69,000 plants/kg of seed.</p> <p>35 STORAGE ..... Dry, cold and airtight for several years.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted; bare-rooted plants.</p> <p>38 SPECIAL REQUIREMENTS , Requires mycorrhizae.</p> <p>39 GERMINATION AND GROWTH Germinates in 15-16 days. 6-12 months in nursery.</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Attract by <u>Diplodia pinea</u> causing cankers and dieback. Susceptible to damping off in nursery.</p>	
<p>PRINCIPAL REFERENCES: 4 30 34 52 53 109 128 133 152 175</p>	

<p>TAXONOMY:</p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Patula pine.</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 18-20°N</p> <p>5 AREAS ..... South Central Mexico.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 1,400-3,200 m</p> <p>7 MEAN ANNUAL RAINFALL , 750-2,000 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 0-3 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 20-29°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 6-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 12-18°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining; moist.</p> <p>16 OTHER CHARACTERISTICS Better growth on deep soils.</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 20-30 m</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Acceptable/exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS Moderately frost resistant.</p>	

SPECIES: Pinus patula subsp. tecunumanii (Schwerdt.) Mittak & Styles

<p>TAXONOMY:</p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS ..... Formerly thought to be some southern provenance of <u>P. oocarpa</u>.</p> <p>3 LOCAL OR TRADE NAMES .</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 12-19°N</p> <p>5 AREAS ..... Guatemala; Honduras; Nicaragua.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 1,000-2,500 m</p> <p>7 MEAN ANNUAL RAINFALL . 1,000-3,000 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-4 months</p> <p>10 MEAN MAX. TEMP. .... 22-32°C</p> <p>HOTTEST MONTH ..... 10-18°C</p> <p>11 MEAN MIN. TEMP. .... 15-23°C</p> <p>COLDEST MONTH ..... 15-23°C</p> <p>12 MEAN ANNUAL TEMP. ....</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Medium/light</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Deep</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 40-55 m</p> <p>18 DESCRIPTION ..... Evergreen; light crowned.</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ...</p> <p>21 OTHER CHARACTERISTICS Drought susceptible on shallow soils; frost tender.</p>	

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... -</p>	
<p>ROLE IN LAND USE:</p> <p>23 .....</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.41-0.57 (increases with age).</p> <p>25 NATURAL DURABILITY ... Poor; attacked by borers and termites.</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Frequent knots. Relatively low resin content for <u>Pinus</u> species.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light structural uses; flooring; vehicles; food containers; furniture; boxes.</p> <p>31 ROUNDWOOD ..... Veneer/plywood; pulp; particleboard; poles; turnery.</p> <p>32 OTHER PRODUCTS .....</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... Honduras; Guatemala; Nicaragua.</p> <p>34 SEEDS PER KILOGRAMME . 90,000</p> <p>35 STORAGE ..... Dry, cold, sealed.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted; bare-rooted plants.</p> <p>38 SPECIAL REQUIREMENTS . -</p> <p>39 GERMINATION AND GROWTH -</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... Similar to <u>Pinus patula</u> subsp. <u>patula</u>.</p>	
<p>PRINCIPAL REFERENCES:</p>	

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) .... 12-24	
<b>ROLE IN LAND USE:</b> 23 ..... Windbreaks; dune fixation.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.45-0.48 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Easy 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Heavy construction; light construction; boxes. 31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; longfibre pulp; fuel (c.v. = 20,176 kJ/kg). 32 OTHER PRODUCTS ..... Resins	
<b>NURSERY:</b> 33 SEED SOURCES ..... Portugal; Australia. 34 SEEDS PER KILOGRAMME . 14,000-26,000 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Potted; direct sown; bare-rooted plants. 38 SPECIAL REQUIREMENTS . Requires mycorrhizae. 39 GERMINATION AND GROWTH Germinates in 24-30 days. Plantable size in 12-18 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... None of importance reported. Susceptible to damping off in nursery.	
<b>PRINCIPAL REFERENCES:</b> 4   30   34   52   71   84   128   133   152	

<b>SPECIES:</b> <u>Pinus pinaster</u> Aiton (Portuguese provenances)	
<b>TAXONOMY:</b> 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... <u>P. maritima</u> Poir.	
3 LOCAL OR TRADE NAMES . Maritime pine; Cluster pine.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 38-42°N 5 AREAS ..... Portugal	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 1,400-2,500 m 7 MEAN ANNUAL RAINFALL . 625-1,300 mm 8 RAINFALL REGIME ..... Winter/uniform 9 DRY SEASON ..... 1-3 months 10 MEAN MAX. TEMP. .... 21-30°C HOTTEST MONTH ..... 11 MEAN MIN. TEMP. .... 3-13°C COLDEST MONTH ..... 12 MEAN ANNUAL TEMP. .... 12-18°C	
<b>SOILS:</b> 13 TEXTURE ..... Light 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS Tolerates shallow soil and is adaptable to most soil conditions.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 20-30 m 18 DESCRIPTION ..... Evergreen 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Windfirm; moderately tolerant of salt winds and frost.	



SPECIES: <u>Pinus pinea</u> L.	
<b>TAXONOMY:</b> 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES . Umbrella or Stone pine.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 33-44°N 5 AREAS ..... Iberian peninsula; N. and E. Mediterranean.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 1,500-2,500 m 7 MEAN ANNUAL RAINFALL . 400-800 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 4-6 months 10 MEAN MAX. TEMP. .... HOTTEST MONTH ..... 25-35°C 11 MEAN MIN. TEMP. .... COLDEST MONTH ..... 4-14°C 12 MEAN ANNUAL TEMP, .... 14-18°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS . Tolerates shallow soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 15-25 m 18 DESCRIPTION ..... Evergreen; open-crowned. 19 FORM ..... Poor 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS . Fire resistant; termite resistant; tolerates salt winds; moderately frost resistant; drought hardy; requires wide spacing.	
<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) .... 3-5	
<b>ROLE IN LAND USE:</b> 23 ..... Shade and shelter; windbreaks; dune fixation; anti-erosion.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.50 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... - 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... -	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Light construction; boxes. 31 ROUNDWOOD ..... Fence posts; fuel and charcoal. 32 OTHER PRODUCTS ..... Edible seeds.	
<b>NURSERY:</b> 33 SEED SOURCES ..... Most Mediterranean countries. 34 SEEDS PER KILOGRAMME . 1,200-1,400 35 STORAGE ..... Dry, cold and airtight for several years. 36 PRE-TREATMENT ..... Soak in cold water for one to two days. 37 PLANTING STOCK ..... Potted; bare-rooted plants. 38 SPECIAL REQUIREMENTS . - 39 GERMINATION AND GROWTH . Germinates in 13-23 days. Plantable size in 18-24 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Heavily attacked by processionary caterpillar <u>Thaumetopoea wilkinsoni</u> in Mediterranean region. Susceptible to damping off in nursery.	
<b>PRINCIPAL REFERENCES:</b> 4 30 34 71 84 95 152	

SPECIES: <u>Pinus pinea</u> L.	
<b>TAXONOMY:</b> 1 FAMILY ..... Pinaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES . Umbrella or Stone pine.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 33-44°N 5 AREAS ..... Iberian peninsula; N. and E. Mediterranean.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 1,500-2,500 m 7 MEAN ANNUAL RAINFALL . 400-800 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 4-6 months 10 MEAN MAX. TEMP. .... HOTTEST MONTH ..... 25-35°C 11 MEAN MIN. TEMP. .... COLDEST MONTH ..... 4-14°C 12 MEAN ANNUAL TEMP, .... 14-18°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS . Tolerates shallow soils.	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 15-25 m 18 DESCRIPTION ..... Evergreen; open-crowned. 19 FORM ..... Poor 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS . Fire resistant; termite resistant; tolerates salt winds; moderately frost resistant; drought hardy; requires wide spacing.	





SPECIES: Pinus radiata D. Don

TAXONOMY:

- 1 FAMILY ..... Pinaceae
- 2 SYNONYMS ..... P. insignis Dougl.
- 3 LOCAL OR TRADE NAMES . Radiata; Monterey pine.

NATURAL OCCURRENCE:

- 4 LATITUDES ..... 35-37°N
- 5 AREAS ..... Isolated localities on the Californian coast.

CLIMATE:

- 6 ALTITUDINAL RANGE .... 1,500-3,000 m
- 7 MEAN ANNUAL RAINFALL . 650-1,600 mm
- 8 RAINFALL REGIME ..... Winter/uniform
- 9 DRY SEASON ..... 2-3 months
- 10 MEAN MAX. TEMP. .... 20-30°C
- 11 MEAN MIN. TEMP. .... 2-12°C
- 12 MEAN ANNUAL TEMP. .... 11-18°C

SOILS:

- 13 TEXTURE ..... Light/medium
- 14 REACTION ..... Neutral/acid
- 15 DRAINAGE ..... Free draining
- 16 OTHER CHARACTERISTICS -

SILVICULTURE:

- 17 SIZE ..... h = 25-35 m
- 18 DESCRIPTION ..... Evergreen
- 19 FORM ..... Acceptable
- 20 LIGHT REQUIREMENTS ... Moderately demanding
- 21 OTHER CHARACTERISTICS Tolerates salt winds; drought hardy; frost tender.

PRODUCTION:

- 22 VOLUME (M<sup>3</sup>/HA/AN) .... 12-30 or more

ROLE IN LAND USE:

- 23 ..... Windbreaks

TIMBER:

- 24 DENSITY ..... S.G. 0.38-0.50
- 25 NATURAL DURABILITY ... -
- 26 PRESERVATION ..... Easy
- 27 SAWING ..... Easy
- 28 SEASONING ..... Easy
- 29 OTHER FEATURES ..... -

UTILIZATION:

- 30 SAW TIMBER ..... Heavy construction; light construction; boxes.
- 31 ROUNDWOOD ..... Building poles; transmission poles; fence posts; longfibre pulp; veneer/plywood; fuelwood (c.v. = 20,469 kJ/kg).
- 32 OTHER PRODUCTS ..... -

NURSERY:

- 33 SEED SOURCES ..... Australia; Chile; New Zealand; Spain; S. Africa; USA.
- 34 SEEDS PER KILOGRAMME . 33,000-50,000
- 35 STORAGE ..... Dry, cold and airtight for several years.
- 36 PRE-TREATMENT ..... None
- 37 PLANTING STOCK ..... Potted; bare-rooted plants.
- 38 SPECIAL REQUIREMENTS . Requires mycorrhizae.
- 39 GERMINATION AND GROWTH Germination is rapid and uniform. Plantable size in 12 months or less.

PRINCIPAL PESTS AND

DISEASES:

- 40 ..... Attack by *Diplodia pinea* can be very serious causing death of tree. Susceptible to damping off in nursery.

PRINCIPAL REFERENCES:

- 4 30 34 51 52 62 71 128 134 148 152 160

SPECIES: <u>Pinus roxburghii</u> Sarg.	
TAXONOMY:	
1	FAMILY ..... Pinaceae
2	SYNONYMS ..... <u>P. longifolia</u> Roxb.
3	LOCAL OR TRADE NAMES • Chir pine
NATURAL OCCURRENCE:	
4	LATITUDES ..... 26-35°N
5	AREAS ..... The Himalayas, from Afghanistan to Bhutan.
CLIMATE:	
6	ALTITUDINAL RANGE .... 1,200-2,500 m
7	MEAN ANNUAL RAINFALL , 750-1,100 mm
8	RAINFALL REGIME ..... Summer
9	DRY SEASON ..... 2-4 months
10	MEAN MAX. TEMP. HOTTEST MONTH ..... 20-30°C
11	MEAN MIN. TEMP. COLDEST MONTH ..... 4-12°C
12	MEAN ANNUAL TEMP. .... 12-20°C
SOILS:	
13	TEXTURE ..... Light/medium/heavy
14	REACTION ..... Neutral/acid
15	DRAINAGE ..... Free draining
16	OTHER CHARACTERISTICS Tolerates shallow soils.
SILVICULTURE:	
17	SIZE ..... h = 30-35 m
18	DESCRIPTION ..... Evergreen; open crowned.
19	FORM ..... Acceptable
20	LIGHT REQUIREMENTS ... Strongly demanding
21	OTHER CHARACTERISTICS Fire resistant; frost resistant; drought hardy.
PRODUCTION:	
22	VOLUME (M <sup>3</sup> /HA/AN) .... 7-14
ROLE IN LAND USE:	
23	..... Anti-erosion
TIMBER:	
24	DENSITY ..... S.G. 0.45-0.55
25	NATURAL DURABILITY ... Moderately durable
26	PRESERVATION ..... Easy
27	SAWING ..... Easy
28	SEASONING ..... Easy
29	OTHER FEATURES ..... Spiral grain
UTILIZATION:	
30	SAW TIMBER ..... Light construction; boxes.
31	ROUNDWOOD ..... Building poles; fence posts; longfibre pulp.
32	OTHER PRODUCTS ..... Resins
NURSERY:	
33	SEED SOURCES ..... India; Pakistan; Nepal; S. Africa.
34	SEEDS PER KILOGRAMME , 11,000-13,000
35	STORAGE ..... Dry, cold and airtight for several years.
36	PRE-TREATMENT ..... None
37	PLANTING STOCK ..... Potted; direct sown; bare-rooted plants.
38	SPECIAL REQUIREMENTS , -
39	GERMINATION AND GROWTH Germinates in 25-30 days. Plantable size in 24 months.
PRINCIPAL PESTS AND DISEASES:	
40	..... None of importance reported.
PRINCIPAL REFERENCES: 30 34 128 133 152 154	

SPECIES: <u>Pinus roxburghii</u> Sarg.	
TAXONOMY:	
1	FAMILY ..... Pinaceae
2	SYNONYMS ..... <u>P. longifolia</u> Roxb.
3	LOCAL OR TRADE NAMES • Chir pine
NATURAL OCCURRENCE:	
4	LATITUDES ..... 26-35°N
5	AREAS ..... The Himalayas, from Afghanistan to Bhutan.
CLIMATE:	
6	ALTITUDINAL RANGE .... 1,200-2,500 m
7	MEAN ANNUAL RAINFALL , 750-1,100 mm
8	RAINFALL REGIME ..... Summer
9	DRY SEASON ..... 2-4 months
10	MEAN MAX. TEMP. HOTTEST MONTH ..... 20-30°C
11	MEAN MIN. TEMP. COLDEST MONTH ..... 4-12°C
12	MEAN ANNUAL TEMP. .... 12-20°C
SOILS:	
13	TEXTURE ..... Light/medium/heavy
14	REACTION ..... Neutral/acid
15	DRAINAGE ..... Free draining
16	OTHER CHARACTERISTICS Tolerates shallow soils.
SILVICULTURE:	
17	SIZE ..... h = 30-35 m
18	DESCRIPTION ..... Evergreen; open crowned.
19	FORM ..... Acceptable
20	LIGHT REQUIREMENTS ... Strongly demanding
21	OTHER CHARACTERISTICS Fire resistant; frost resistant; drought hardy.

SPECIES: <u>Pinus taeda</u> L.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES :	Loblolly pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-29°N
5 AREAS .....	Eastern and South-Eastern USA.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,300-2,400 m
7 MEAN ANNUAL RAINFALL :	900-2,200 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-25°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-18°C
12 MEAN ANNUAL TEMP. ....	14-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 40-50 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Frost resistant; substantial provenance variation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	12-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.47-0.51
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; boxes.
31 ROUNDWOOD .....	Transmission poles; longfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	Resins
NURSERY:	
33 SEED SOURCES .....	USA; Australia; New Zealand; S. Africa.
34 SEEDS PER KILOGRAMME :	35,000-40,000; or 20,000 plants/kg of seed.
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	Stratify in damp sand for sixty days.
37 PLANTING STOCK .....	Potted; bare-rooted plants.
38 SPECIAL REQUIREMENTS :	Requires mycorrhizae.
39 GERMINATION AND GROWTH	Germinates in 18-22 days. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Canker forming rust <u>Cronartium fusiforme</u> in USA. Resistant to <u>Diplodia pinea</u> .
PRINCIPAL REFERENCES:	
	4 30 34 62 116 128 133 152 165

SPECIES: <u>Pinus taeda</u> L.	
TAXONOMY:	
1 FAMILY .....	Pinaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES :	Loblolly pine
NATURAL OCCURRENCE:	
4 LATITUDES .....	28-29°N
5 AREAS .....	Eastern and South-Eastern USA.
CLIMATE:	
6 ALTITUDINAL RANGE ....	1,300-2,400 m
7 MEAN ANNUAL RAINFALL :	900-2,200 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-25°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	4-18°C
12 MEAN ANNUAL TEMP. ....	14-20°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 40-50 m
18 DESCRIPTION .....	Evergreen
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Frost resistant; substantial provenance variation.

SPECIES: Populus deltoides Bartr. var. deltoides

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Salicaceae</p> <p>2 SYNONYMS ..... <u>P. deltoides</u> Bartr. var. <u>missouriensis</u> (Henry) Henry.</p> <p>3 LOCAL OR TRADE NAMES ..... Carolina poplar; Eastern cottonwood.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 30-50°N</p> <p>5 AREAS ..... The Missouri-Mississippi basin of USA.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE ..... 2,000-3,000 m</p> <p>7 MEAN ANNUAL RAINFALL ..... 1,200-3,000 mm</p> <p>8 RAINFALL REGIME ..... Uniform</p> <p>9 DRY SEASON ..... 0-1 month</p> <p>10 MEAN MAX. TEMP. .... 22-30°C</p> <p>11 MEAN MIN. TEMP. .... 2-12°C</p> <p>12 MEAN ANNUAL TEMP. .... 12-16°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium</p> <p>14 REACTION ..... Neutral/moderately acid</p> <p>15 DRAINAGE ..... Free draining; moist; occasionally seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS ..... Better growth on fertile and deep soils; tolerates slightly saline soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 25-30 m</p> <p>18 DESCRIPTION ..... Deciduous</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ..... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS ..... Frost resistant; root suckers vigorously; substantial provenance variation; requires wide spacing.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20-40</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Shade and shelter; windbreaks; ornamental; erosion control.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.37-0.43</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Difficult</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Fair</p> <p>29 OTHER FEATURES ..... Soft, mainly used for matchmaking.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Boxes</p> <p>31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood; matches; fuelwood (c.v. = 19,949 kJ/kg).</p> <p>32 OTHER PRODUCTS ..... Fodder</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... USA; Argentina.</p> <p>34 SEEDS PER KILOGRAMME ..... 770,000</p> <p>35 STORAGE ..... Short viability</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Cuttings; bare-rooted plants.</p> <p>38 SPECIAL REQUIREMENTS ..... Sow uncovered.</p> <p>39 GERMINATION AND GROWTH ..... Germinates in 1-4 days. Rapid growth in nursery. Cuttings plantable size after 6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... Susceptible to defoliators and leaf rusts. Borer's cause degrade of timber. Susceptible to damping off in nursery.</p>	
<p><b>PRINCIPAL REFERENCES:</b></p> <p>4 16 50 62 128 133 134 152 160 162</p>	

SPECIES: <i>Prosopis chilensis</i> (Mol.) Stunz	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Algarrobo blanco; Algarrobo de Chile.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-15°C
5 AREAS .....	Pacific coast of South America from southern Peru to central Chile.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-2,500 m
7 MEAN ANNUAL RAINFALL .	200-600 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8-10 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	22-30°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	10-20°C
12 MEAN ANNUAL TEMP. ....	15-25°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Poor soils
SILVICULTURE:	
17 SIZE .....	h = 5-15 m
18 DESCRIPTION .....	Evergreen; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive colonizer; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	-
ROLE IN LAND USE:	
23 .....	Shade and shelter; ornamental; erosion control.
TIMBER:	
24 DENSITY .....	S.G. 0.80-0.92
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	-
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal; fenceposts; turnery.
32 OTHER PRODUCTS .....	Fodder (pods).
NURSERY:	
33 SEED SOURCES .....	Peru; Chile; Hawaii.
34 SEEDS PER KILOGRAMME .	35,000
35 STORAGE .....	Without difficulty at ambient temperature.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Potted; direct sown.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germinates in 3-4 days. Plantable size in 4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Seed crop often badly damaged by beetles.
PRINCIPAL REFERENCES: 52 69 71 121	

SPECIES: <i>Prosopis chilensis</i> (Mol.) Stunz	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Algarrobo blanco; Algarrobo de Chile.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-15°C
5 AREAS .....	Pacific coast of South America from southern Peru to central Chile.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-2,500 m
7 MEAN ANNUAL RAINFALL .	200-600 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8-10 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	22-30°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	10-20°C
12 MEAN ANNUAL TEMP. ....	15-25°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Poor soils
SILVICULTURE:	
17 SIZE .....	h = 5-15 m
18 DESCRIPTION .....	Evergreen; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive colonizer; drought hardy.



SPECIES: <u>Prosopis cineraria</u> (L.) Druce	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>P. spicigera</u> L.
3 LOCAL OR TRADE NAMES .....	Jand (Punjab); Ghaf (Arabia); Shumi; Khejri (India).
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-30°N
5 AREAS .....	India and the Near East.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-600 m
7 MEAN ANNUAL RAINFALL .....	400-800 mm
8 RAINFALL REGIME .....	Summer/winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP. ....	40-50°C
11 MEAN MIN. TEMP. ....	-4-6°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS .....	Tolerates high alkalinity and some salinity.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m; d = 120-160 cm
18 DESCRIPTION .....	Shortly deciduous; spiny; xerophilous.
19 FORM .....	Poor unless pruned.
20 LIGHT REQUIREMENTS .....	Strongly light demanding.
21 OTHER CHARACTERISTICS .....	Aggressive coloniser; coppices; fixes nitrogen; drought hardy; pollards; casts little shade during growing season; frost resistant; root suckers vigorously.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	2.9-11.4
ROLE IN LAND USE:	
23 .....	Agroforestry; soil improver; erosion control; dune fixation.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Hard
UTILIZATION:	
30 SAW TIMBER .....	Construction; boat-building.
31 ROUNDWOOD .....	Fence posts; fuel (c.v. = 16,800-20,400 kJ/kg) and charcoal; tools.
32 OTHER PRODUCTS .....	Fodder (leaves lopped in winter); edible pods.
NURSERY:	
33 SEED SOURCES .....	India; Pakistan; Netherlands.
34 SEEDS PER KILOGRAMME .....	10,000-28,000
35 STORAGE .....	Dry for several years.
36 PRE-TREATMENT .....	Mechanical scarification or soak in water 24 hrs.
37 PLANTING STOCK .....	Direct sown; bare-rooted plants.
38 SPECIAL REQUIREMENTS .....	Care of taproot. Irrigate.
39 GERMINATION AND GROWTH .....	50-90% germination in two weeks. Plantable size in 2 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Locust attack reported.
PRINCIPAL REFERENCES:	

SPECIES: <u>Prosopis cineraria</u> (L.) Druce	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>P. spicigera</u> L.
3 LOCAL OR TRADE NAMES .....	Jand (Punjab); Ghaf (Arabia); Shumi; Khejri (India).
NATURAL OCCURRENCE:	
4 LATITUDES .....	10-30°N
5 AREAS .....	India and the Near East.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-600 m
7 MEAN ANNUAL RAINFALL .....	400-800 mm
8 RAINFALL REGIME .....	Summer/winter
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP. ....	40-50°C
11 MEAN MIN. TEMP. ....	-4-6°C
12 MEAN ANNUAL TEMP. ....	21-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/alkaline
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS .....	Tolerates high alkalinity and some salinity.
SILVICULTURE:	
17 SIZE .....	h = 8-10 m; d = 120-160 cm
18 DESCRIPTION .....	Shortly deciduous; spiny; xerophilous.
19 FORM .....	Poor unless pruned.
20 LIGHT REQUIREMENTS .....	Strongly light demanding.
21 OTHER CHARACTERISTICS .....	Aggressive coloniser; coppices; fixes nitrogen; drought hardy; pollards; casts little shade during growing season; frost resistant; root suckers vigorously.

SPECIES: Prosopis juliflora (Sw.) DC.

TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Mimosa juliflora</u> Swartz
3 LOCAL OR TRADE NAMES	Mesquite; Algarrobo.
NATURAL OCCURRENCE:	
4 LATITUDES .....	4° S-35° N
5 AREAS .....	Southern Western USA through Central America to Ecuador.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-2,000 m
7 MEAN ANNUAL RAINFALL	150-1,200 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	6-8 months
10 MEAN MAX. TEMP.	22-34°C
11 HOTTTEST MONTH .....	
11 MEAN MIN. TEMP.	14-22°C
12 COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	16-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 5-10 m
18 DESCRIPTION .....	Evergreen; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; root suckers vigorously; drought hardy; competes strongly with ground flora; 10-15 year rotation for fuelwood.

PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	3-9
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; dune fixation; anti-erosion.
TIMBER:	
24 DENSITY .....	S.G. 0.70
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Tough
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fence posts; fuel (c.v. = 17,710 kJ/kg) and charcoal.
32 OTHER PRODUCTS .....	Fodder (pods); 6-7 tonnes/ha/ann; honeyflora.
NURSERY:	
33 SEED SOURCES .....	Available throughout its natural range.
34 SEEDS PER KILOGRAMME	20,000-26,000
35 STORAGE .....	Without difficulty; ambient temperature.
36 PRE-TREATMENT .....	Boiling water till cool.
37 PLANTING STOCK .....	Potted; direct sown; stumps.
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	80-90% germination in 5-6 days. Plantable size in 3-4 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Seed crop often badly damaged by beetles.
PRINCIPAL REFERENCES:	
	52 71 95 107 109 120 121 152

SPECIES: <u>Prosopis tamarugo</u> F. Phil.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tamarugo
NATURAL OCCURRENCE:	
4 LATITUDES .....	21-18°S
5 AREAS .....	Northern Chile
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,500 m
7 MEAN ANNUAL RAINFALL .....	100-300 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8-10 months
10 MEAN MAX. TEMP. ....	24-32°C
11 MEAN MIN. TEMP. ....	-1-+5°C
12 MEAN ANNUAL TEMP. ....	15-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates highly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 8-12 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Aggressive coloniser in less harsh climates; coppices; drought hardy; root exudate acts as natural herbicide preventing growth of nearby plants.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	2-4
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; erosion control.
TIMBER:	
24 DENSITY .....	S.G. 0.80
25 NATURAL DURABILITY .....	Durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Tough
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Fodder
NURSERY:	
33 SEED SOURCES .....	Chile
34 SEEDS PER KILOGRAMME .....	65,000-75,000
35 STORAGE .....	Without difficulty; ambient temperature.
36 PRE-TREATMENT .....	Boiling water till cool; or cold water soak for 48 hours; or conc. H <sub>2</sub> SO <sub>4</sub> for 7 minutes.
37 PLANTING STOCK .....	Bare rooted plants; potted.
38 SPECIAL REQUIREMENTS .....	Care of long taproot. In surface-saline soils, plant in 40 cm deep pits.
39 GERMINATION AND GROWTH .....	Germination 35-45%. Plantable size in 3-6 months. Requires regular irrigation in first year when planted at minimum rainfall level.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Seed frequently attacked by beetles.
PRINCIPAL REFERENCES:	
	52 71 80 95 120 121

SPECIES: <u>Prosopis tamarugo</u> F. Phil.	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Tamarugo
NATURAL OCCURRENCE:	
4 LATITUDES .....	21-18°S
5 AREAS .....	Northern Chile
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-2,500 m
7 MEAN ANNUAL RAINFALL .....	100-300 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	8-10 months
10 MEAN MAX. TEMP. ....	24-32°C
11 MEAN MIN. TEMP. ....	-1-+5°C
12 MEAN ANNUAL TEMP. ....	15-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Seasonally waterlogged
16 OTHER CHARACTERISTICS .....	Tolerates highly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 8-12 m
18 DESCRIPTION .....	Deciduous
19 FORM .....	Poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Aggressive coloniser in less harsh climates; coppices; drought hardy; root exudate acts as natural herbicide preventing growth of nearby plants.

SPECIES: <u>Robinia pseudoacacia</u> L.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Black locust; False Acacia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	34-40°N
5 AREAS .....	Appalachian and Ozark regions of USA.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,500-2,500 m
7 MEAN ANNUAL RAINFALL .	500-700 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-35°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	0-5°C
12 MEAN ANNUAL TEMP. ....	10-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Deciduous; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; tolerates salt winds; fixes nitrogen; root suckers vigorously; drought hardy.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	4-10(-20)
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; dune fixation; anti-erosion; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.70-0.80
25 NATURAL DURABILITY ...	Durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Fair
29 OTHER FEATURES .....	Good bending properties; resists termites.
UTILIZATION:	
30 SAW TIMBER .....	Light construction
31 ROUNDWOOD .....	Fence posts; fuel and charcoal; fibreboard; veneer/plywood.
32 OTHER PRODUCTS .....	Fodder (pods and leaves); honeyflora.
NURSERY:	
33 SEED SOURCES .....	USA; Isreal and many warm temperate areas.
34 SEEDS PER KILOGRAMME .	35,000-70,000
35 STORAGE .....	Dry, ambient temperature for several years. Boiling water till cool; or conc. sulphuric acid for 20 minutes.
36 PRE-TREATMENT .....	Potted; cuttings.
37 PLANTING STOCK .....	-
38 SPECIAL REQUIREMENTS .	70-90% germination in 10-20 days. Plantable size in 6-12 months.
39 GERMINATION AND GROWTH	
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	16 52 57 62 71 84 95 134 152

SPECIES: <u>Robinia pseudoacacia</u> L.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .	Black locust; False Acacia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	34-40°N
5 AREAS .....	Appalachian and Ozark regions of USA.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,500-2,500 m
7 MEAN ANNUAL RAINFALL .	500-700 mm
8 RAINFALL REGIME .....	Winter/summer
9 DRY SEASON .....	2-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-35°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	0-5°C
12 MEAN ANNUAL TEMP. ....	10-18°C
SOILS:	
13 TEXTURE .....	Light/medium
14 REACTION .....	Alkaline/neutral/acid
15 DRAINAGE .....	Free draining; moist.
16 OTHER CHARACTERISTICS	Tolerates slightly saline soils.
SILVICULTURE:	
17 SIZE .....	h = 20-25 m
18 DESCRIPTION .....	Deciduous; spiny.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Aggressive coloniser; coppices; tolerates salt winds; fixes nitrogen; root suckers vigorously; drought hardy.

SPECIES: Roseodendron donnell-smithii (Rose) Miranda

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Bignoniaceae</p> <p>2 SYNONYMS ..... <u>Tabebuia donnell-smithii</u> Rose; <u>Cybistax donnell-smithii</u> (Rose) Seibert</p> <p>3 LOCAL OR TRADE NAMES ..... Primavera</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 13-17°N</p> <p>5 AREAS ..... Southern Mexico and Pacific coast of Guatemala.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE ..... 0-600 m</p> <p>7 MEAN ANNUAL RAINFALL ..... 1,000-3,000 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-3 months</p> <p>10 MEAN MAX. TEMP. .... HOTTEST MONTH ..... 23-31°C</p> <p>11 MEAN MIN. TEMP. .... COLDEST MONTH ..... 17-23°C</p> <p>12 MEAN ANNUAL TEMP. .... 23-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS ..... Better growth on deep soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 25-33; d = 60-100 cm</p> <p>18 DESCRIPTION ..... Deciduous</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ..... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS ..... Coppices.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20-30</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Agricultural shade.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.35-0.50</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Easy</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Interlocked grain.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; furniture; boxes.</p> <p>31 ROUNDWOOD ..... Veneer/plywood; fuelwood.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Mexico; Guatemala.</p> <p>34 SEEDS PER KILOGRAMME ..... -</p> <p>35 STORAGE ..... Dry, airtight at ambient temperature for up to one year.</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Potted; stumps; bare-rooted plants.</p> <p>38 SPECIAL REQUIREMENTS ..... -</p> <p>39 GERMINATION AND GROWTH ..... Germinates in 12-18 days. Plantable size in 6 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 49 96 120</p>	

SPECIES: <u>Salix babylonica</u> L. var. <u>sacramenta</u>	
TAXONOMY:	
1 FAMILY .....	Salicaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Sauce americano
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-35°N
5 AREAS .....	Far East. Naturalised in Europe and many warm-temperate to sub-tropical countries. This variety developed in Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-500 m
7 MEAN ANNUAL RAINFALL	800-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	1-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	21-26°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	8-12°C
12 MEAN ANNUAL TEMP. ....	15-22°C
SOILS:	
13 TEXTURE .....	Medium/light
14 REACTION .....	Neutral
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Dioecious; briefly deciduous.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ....	-
21 OTHER CHARACTERISTICS	-
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	16-17
ROLE IN LAND USE:	
23 .....	Erosion control.
TIMBER:	
24 DENSITY .....	S.G. 0.74
25 NATURAL DURABILITY ....	Moderately durable.
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Soft
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Shortfibre pulp; matches.
32 OTHER PRODUCTS .....	Fodder (leaves); baskets.
NURSERY:	
33 SEED SOURCES .....	-
34 SEEDS PER KILOGRAMME	-
35 STORAGE .....	Seed viable for a few days only.
36 PRE-TREATMENT .....	-
37 PLANTING STOCK .....	Cuttings
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	-
PRINCIPAL PESTS AND DISEASES:	
40 .....	Good resistance to anthracosis.
PRINCIPAL REFERENCES:	

SPECIES: <u>Salix babylonica</u> L. var. <u>sacramenta</u>	
TAXONOMY:	
1 FAMILY .....	Salicaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Sauce americano
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-35°N
5 AREAS .....	Far East. Naturalised in Europe and many warm-temperate to sub-tropical countries. This variety developed in Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE ....	0-500 m
7 MEAN ANNUAL RAINFALL	800-1,500 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	1-2 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	21-26°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	8-12°C
12 MEAN ANNUAL TEMP. ....	15-22°C
SOILS:	
13 TEXTURE .....	Medium/light
14 REACTION .....	Neutral
15 DRAINAGE .....	Moist; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 8-15 m
18 DESCRIPTION .....	Dioecious; briefly deciduous.
19 FORM .....	Acceptable
20 LIGHT REQUIREMENTS ....	-
21 OTHER CHARACTERISTICS	-

SPECIES: <u>Samanea saman</u> Merrill	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Pithecolobium saman</u> (Jacq.) Benth.
3 LOCAL OR TRADE NAMES	Raintree; Saman.
NATURAL OCCURRENCE:	
4 LATITUDES .....	5° S-11° N
5 AREAS .....	Ecuador; Guatemala; Venezuela; S. Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-700 m
7 MEAN ANNUAL RAINFALL	760-3,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	24-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	18-22°C
12 MEAN ANNUAL TEMP. ....	22-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 15-30 m; d = 100-200 m
18 DESCRIPTION .....	Open crowned
19 FORM .....	Acceptable/poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	-
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	25-35
ROLE IN LAND USE:	
23 .....	Shade and shelter; agricultural shade.
TIMBER:	
24 DENSITY .....	S.G. 0.42-0.64
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Difficult
29 OTHER FEATURES .....	Interlocked grain.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes.
31 ROUNDWOOD .....	Fence posts; veneer/plywood; fuelwood.
32 OTHER PRODUCTS .....	Fodder (pods).
NURSERY:	
33 SEED SOURCES .....	Philippines; Hawaii; Fiji; Colombia.
34 SEEDS PER KILOGRAMME	4,400-7,000
35 STORAGE .....	Dry, cold and airtight for several years.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 14-20 days. Plantable size in 4-6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	49 52 100 106

SPECIES: <u>Samanea saman</u> Merrill	
TAXONOMY:	
1 FAMILY .....	Mimosaceae
2 SYNONYMS .....	<u>Pithecolobium saman</u> (Jacq.) Benth.
3 LOCAL OR TRADE NAMES	Raintree; Saman.
NATURAL OCCURRENCE:	
4 LATITUDES .....	5° S-11° N
5 AREAS .....	Ecuador; Guatemala; Venezuela; S. Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-700 m
7 MEAN ANNUAL RAINFALL	760-3,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	2-4 months
10 MEAN MAX. TEMP., HOTTEST MONTH .....	24-30°C
11 MEAN MIN. TEMP., COLDEST MONTH .....	18-22°C
12 MEAN ANNUAL TEMP. ....	22-28°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining; seasonally waterlogged.
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 15-30 m; d = 100-200 m
18 DESCRIPTION .....	Open crowned
19 FORM .....	Acceptable/poor
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS	-

SPECIES: <u>Schinus molle</u> L.	
TAXONOMY:	
1 FAMILY .....	Anacardiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Pepper tree; Molle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-23°S
5 AREAS .....	Highlands of Pacific coast of South America. Naturalised in South USA and Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-3,500 m
7 MEAN ANNUAL RAINFALL	300-620 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-15°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-15 m
18 DESCRIPTION .....	Evergreen; open crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; drought hardy; requires wide spacing; moderately frost tender; shallow root system; shortlived.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	3-5
ROLE IN LAND USE:	
23 .....	Shade and shelter; windbreaks; ornamental.
TIMBER:	
24 DENSITY .....	-
25 NATURAL DURABILITY ...	Moderately durable
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	-
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fence posts; fuel and charcoal.
32 OTHER PRODUCTS .....	Not usable for culinary pepper; honeyflora.
NURSERY:	
33 SEED SOURCES .....	Western South America; Mexico.
34 SEEDS PER KILOGRAMME	35,000-65,000
35 STORAGE .....	Ambient temperature for 3 months.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	Sow seed shallowly.
39 GERMINATION AND GROWTH	Low germination capacity. Seed 50% viable.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Termites attack young plants.
PRINCIPAL REFERENCES:	
	52 71 84 95 128 134 152

SPECIES: <u>Schinus molle</u> L.	
TAXONOMY:	
1 FAMILY .....	Anacardiaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Pepper tree; Molle.
NATURAL OCCURRENCE:	
4 LATITUDES .....	25-23°S
5 AREAS .....	Highlands of Pacific coast of South America. Naturalised in South USA and Mexico.
CLIMATE:	
6 ALTITUDINAL RANGE .....	1,000-3,500 m
7 MEAN ANNUAL RAINFALL	300-620 mm
8 RAINFALL REGIME .....	Winter/summer/uniform
9 DRY SEASON .....	4-8 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	20-28°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	5-15°C
12 MEAN ANNUAL TEMP. ....	12-20°C
SOILS:	
13 TEXTURE .....	Light
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Tolerates moderately saline soils.
SILVICULTURE:	
17 SIZE .....	h = 10-15 m
18 DESCRIPTION .....	Evergreen; open crowned.
19 FORM .....	Poor
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; termite resistant; tolerates salt winds; drought hardy; requires wide spacing; moderately frost tender; shallow root system; shortlived.



SPECIES: Schizolobium parahybum (Vell.) Blake

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Caesalpiniaceae</p> <p>2 SYNONYMS ..... -</p> <p>3 LOCAL OR TRADE NAMES , Brazilian fire tree; Faveira; Guapurua (Brazil); Judío (Mexico).</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 35-23°S</p> <p>5 AREAS ..... South Brazil Coast between Rio de Janeiro and Rio Grande do Sul. Naturalised S. Mexico to S.E. Brazil.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-2,200 m</p> <p>7 MEAN ANNUAL RAINFALL . 1,000-1,800 mm</p> <p>8 RAINFALL REGIME ..... Summer/uniform</p> <p>9 DRY SEASON ..... 0-3 months</p> <p>10 MEAN MAX. TEMP., HOTTEST MONTH ..... 20-26°C</p> <p>11 MEAN MIN. TEMP., COLDEST MONTH ..... 5-9°C</p> <p>12 MEAN ANNUAL TEMP. .... 14-22°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Medium/heavy</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Better growth on rich soils; but very adaptable.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 20-35 m; d = 80-100 cm</p> <p>18 DESCRIPTION ..... Deciduous; may buttress.</p> <p>19 FORM ..... Acceptable to exceptional above buttresses.</p> <p>20 LIGHT REQUIREMENTS ... -</p> <p>21 OTHER CHARACTERISTICS Fixes nitrogen; drought hardy; 6-8 year pulp-wood rotation; self-pruning.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 20</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Ornamental</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.30-0.40</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Easy/fair</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Variable density and workability; weak.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Boxes.</p> <p>31 ROUNDWOOD ..... Fuelwood; shortfibre pulp.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... France; Central America.</p> <p>34 SEEDS PER KILOGRAMME , 5,500-6,000</p> <p>35 STORAGE ..... -</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... -</p> <p>38 SPECIAL REQUIREMENTS , -</p> <p>39 GERMINATION AND GROWTH Good germination and rapid early growth.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... -</p>	
<p><b>PRINCIPAL REFERENCES:</b> 140</p>	

SPECIES: <u>Sesbania grandiflora</u> (L.) Poir.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	<u>Agati grandiflora</u> (L.) Desv.
3 LOCAL OR TRADE NAMES .	Agati; Gallito.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°S-20°N
5 AREAS .....	South East Asia from India, through Malaysia, Indonesia to the Philippines.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-800 m
7 MEAN ANNUAL RAINFALL .	1,000-2,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	26-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	22-30°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Tolerates seasonal waterlogging.
16 OTHER CHARACTERISTICS	Very adaptable
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Small tree
19 FORM .....	Moderate
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Vigorous coppice; fixes nitrogen; frost tender; requires very close spacing in plantation.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	20-25
ROLE IN LAND USE:	
23 .....	Anti-erosion; windbreaks; soil improvement; agroforestry; ornamental.
TIMBER:	
24 DENSITY .....	S.G. 0.42
25 NATURAL DURABILITY ...	-
26 PRESERVATION .....	-
27 SAWING .....	-
28 SEASONING .....	-
29 OTHER FEATURES .....	Soft
UTILIZATION:	
30 SAW TIMBER .....	-
31 ROUNDWOOD .....	Fuel and charcoal; shortfibre pulp.
32 OTHER PRODUCTS .....	Fodder and green manure; gum; tannins.
NURSERY:	
33 SEED SOURCES .....	Indonesia; Philippines; Taiwan; USA (Florida).
34 SEEDS PER KILOGRAMME .	17,000 (cleaned, viable seed)
35 STORAGE .....	1-2 years
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Direct sown; cuttings; bare-rooted plants.
38 SPECIAL REQUIREMENTS .	None
39 GERMINATION AND GROWTH	85-90% germination
PRINCIPAL PESTS AND DISEASES:	
40 .....	Susceptible to nematodes.
PRINCIPAL REFERENCES:	
	16 121

SPECIES: <u>Sesbania grandiflora</u> (L.) Poir.	
TAXONOMY:	
1 FAMILY .....	Papilionaceae
2 SYNONYMS .....	<u>Agati grandiflora</u> (L.) Desv.
3 LOCAL OR TRADE NAMES .	Agati; Gallito.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°S-20°N
5 AREAS .....	South East Asia from India, through Malaysia, Indonesia to the Philippines.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-800 m
7 MEAN ANNUAL RAINFALL .	1,000-2,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-3 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	26-36°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	22-30°C
SOILS:	
13 TEXTURE .....	Light/medium/heavy
14 REACTION .....	Acid
15 DRAINAGE .....	Tolerates seasonal waterlogging.
16 OTHER CHARACTERISTICS	Very adaptable
SILVICULTURE:	
17 SIZE .....	h = 8-10 m
18 DESCRIPTION .....	Small tree
19 FORM .....	Moderate
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Vigorous coppice; fixes nitrogen; frost tender; requires very close spacing in plantation.

SPECIES: *Simmondsia chinensis* (Link) Schneid.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Simmondsiaceae</p> <p>2 SYNONYMS ..... <i>S. californica</i> Nutt.</p> <p>3 LOCAL OR TRADE NAMES . Jojoba; Buck nut.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 25-31°N</p> <p>5 AREAS ..... Arizona desert; N. Mexico.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,500 m</p> <p>7 MEAN ANNUAL RAINFALL . 250-500 mm</p> <p>8 RAINFALL REGIME ..... Winter/spring</p> <p>9 DRY SEASON ..... 4-6 months</p> <p>10 MEAN MAX. TEMP. .... 35-45°C</p> <p>11 MEAN MIN. TEMP. .... -2-4°C</p> <p>12 MEAN ANNUAL TEMP. .... 18-25°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/alkaline</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Well aerated; high phosphate; dune sands and alluvia; tolerates saline soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 2-3 m</p> <p>18 DESCRIPTION ..... Evergreen; dioecious, desert shrub.</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Light demander</p> <p>21 OTHER CHARACTERISTICS Drought hardy; frost tender when young; longlived.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... -</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... -</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... -</p> <p>25 NATURAL DURABILITY ... -</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... -</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... -</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... -</p> <p>31 ROUNDWOOD ..... -</p> <p>32 OTHER PRODUCTS ..... Important seed crop (2,250 kg/ha/an) yields an industrial liquid wax; browse for livestock.</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Central America.</p> <p>34 SEEDS PER KILOGRAMME . -</p> <p>35 STORAGE ..... 1-2 years</p> <p>36 PRE-TREATMENT ..... -</p> <p>37 PLANTING STOCK ..... Direct sown; potted (pots 40 cm deep); stem cuttings.</p> <p>38 SPECIAL REQUIREMENTS , Irrigate for first two years.</p> <p>39 GERMINATION AND GROWTH Ensure sufficient female (seed bearing) plants by planting several seeds at each spot, or by using cuttings.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... -</p>	
<p><b>PRINCIPAL REFERENCES:</b> 117</p>	

SPECIES: <i>Swietenia macrophylla</i> King	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Honduras Mahogany; Acajou; Caoba.
NATURAL OCCURRENCE:	
4 LATITUDES .....	18°S-20°N
5 AREAS .....	From Yucatan, Mexico through Central America to Venezuela and Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE .....	50-1,400 m
7 MEAN ANNUAL RAINFALL .....	1,600-4,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP.	26-35°C
11 MEAN MIN. TEMP.	11-22°C
12 MEAN ANNUAL TEMP. ....	23-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 100-200 cm
18 DESCRIPTION .....	Deciduous; buttressed.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding; shade tolerant in youth.
21 OTHER CHARACTERISTICS	Coppices; moderately windfirm.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) .....	7-11
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.51-0.57
25 NATURAL DURABILITY .....	Moderately durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Decorative
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boat-building.
31 ROUNDWOOD .....	Fuelwood (c.v. = 19,588 kJ/kg); veneer/plywood; turnery.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Central America and Trinidad.
34 SEEDS PER KILOGRAMME	2,000-2,500
35 STORAGE .....	Dry, cold and airtight for up to one year.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; stripings.
38 SPECIAL REQUIREMENTS	Requires full shade for two-three weeks then half shade for one month.
39 GERMINATION AND GROWTH	40% germination in 14-28 days. Plantable size in 6-24 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Hypsipyla shoot borer is a major pest limiting use in plantation in Americas, Africa and Asia. Attack is deterred by growth in mixture with other fast growing light demanders.
PRINCIPAL REFERENCES:	
	4 5 52 100 109 152

SPECIES: <i>Swietenia macrophylla</i> King	
TAXONOMY:	
1 FAMILY .....	Meliaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Honduras Mahogany; Acajou; Caoba.
NATURAL OCCURRENCE:	
4 LATITUDES .....	18°S-20°N
5 AREAS .....	From Yucatan, Mexico through Central America to Venezuela and Brazil.
CLIMATE:	
6 ALTITUDINAL RANGE .....	50-1,400 m
7 MEAN ANNUAL RAINFALL .....	1,600-4,000 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	0-4 months
10 MEAN MAX. TEMP.	26-35°C
11 MEAN MIN. TEMP.	11-22°C
12 MEAN ANNUAL TEMP. ....	23-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	-
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 100-200 cm
18 DESCRIPTION .....	Deciduous; buttressed.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding; shade tolerant in youth.
21 OTHER CHARACTERISTICS	Coppices; moderately windfirm.

PRODUCTION: 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 10-20	
ROLE IN LAND USE: 23 ..... Agricultural shade; ornamental.	
TIMBER: 24 DENSITY ..... S.G. 0.52-0.62 25 NATURAL DURABILITY ... Durable 26 PRESERVATION ..... - 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Decorative	
UTILIZATION: 30 SAW TIMBER ..... Light construction; furniture. 31 ROUNDWOOD ..... Veneer/plywood 32 OTHER PRODUCTS ..... -	
NURSERY: 33 SEED SOURCES ..... Colombia; Guatemala; Belize. 34 SEEDS PER KILOGRAMME , 40,000-72,000 35 STORAGE ..... Dry, cold and airtight for one-two years. 36 PRE-TREATMENT ..... Soak in cold water for one-two days. 37 PLANTING STOCK ..... Potted; stumps; bare-rooted plants. 38 SPECIAL REQUIREMENTS , - 39 GERMINATION AND GROWTH Germinates in 12-14 days. Plantable size in 6 months.	
PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported.	
PRINCIPAL REFERENCES: 49 52 100 152 160	

SPECIES: Tabebuia rosea (Bertol.) DC.

TAXONOMY: 1 FAMILY ..... Bignoniaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES , Mayflower; Apamate; Roble.	
NATURAL OCCURRENCE: 4 LATITUDES ..... 2°S-20°N 5 AREAS ..... Southern Mexico to Venezuela and Ecuador including West Indies.	
CLIMATE: 6 ALTITUDINAL RANGE ..... 100-1,000 m 7 MEAN ANNUAL RAINFALL , 1,250-2,500 mm 8 RAINFALL REGIME ..... Summer/uniform 9 DRY SEASON ..... 0-3 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 23-30°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 17-22°C 12 MEAN ANNUAL TEMP. .... 22-27°C	
SOILS: 13 TEXTURE ..... Light/medium 14 REACTION ..... Alkaline/neutral/acid 15 DRAINAGE ..... Free draining; seasonally waterlogged. 16 OTHER CHARACTERISTICS Adaptable to most soil conditions.	
SILVICULTURE: 17 SIZE ..... h = 25-30 m 18 DESCRIPTION ..... Deciduous; open crowned; buttressed. 19 FORM ..... Acceptable 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices.	

<p>SPECIES: <u>Tamarix aphylla</u> (L.) Karst.</p>	<p>PRODUCTION: 22 VOLUME (M<sup>3</sup>/HA/AN) ..... 3-5</p>
<p>TAXONOMY: 1 FAMILY ..... Tamaricaceae 2 SYNONYMS ..... <u>Tamarix articulata</u> Vahl; <u>T. orientalis</u> Forsk. 3 LOCAL OR TRADE NAMES . Tamarisk; Athel tree; Saltcedar; Tarfa.</p>	<p>ROLE IN LAND USE: 23 ..... Windbreaks; dune fixation; anti-erosion; firebreaks.</p>
<p>NATURAL OCCURRENCE: 4 LATITUDES ..... 25-40°N 5 AREAS ..... Central Asia, from Arabia to Afghanistan.</p>	<p>TIMBER: 24 DENSITY ..... - 25 NATURAL DURABILITY ... Durable 26 PRESERVATION ..... - 27 SAWING ..... - 28 SEASONING ..... - 29 OTHER FEATURES ..... -</p>
<p>CLIMATE: 6 ALTITUDINAL RANGE .... 0-1,400 m 7 MEAN ANNUAL RAINFALL . 200-500 mm 8 RAINFALL REGIME ..... Winter 9 DRY SEASON ..... 6-8 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 27-40°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 3-8°C 12 MEAN ANNUAL TEMP. .... 18-28°C</p>	<p>UTILIZATION: 30 SAW TIMBER ..... Furniture 31 ROUNDWOOD ..... Fuel (c.v. = 18,890 kJ/kg) and charcoal. 32 OTHER PRODUCTS ..... -</p>
<p>SOILS: 13 TEXTURE ..... Light/medium 14 REACTION ..... Alkaline/neutral 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS Tolerates very saline soils.</p>	<p>NURSERY: 33 SEED SOURCES ..... Cuttings available from some parts of natural range. 34 SEEDS PER KILOGRAMME . - 35 STORAGE ..... Loses viability within a few days. 36 PRE-TREATMENT ..... - 37 PLANTING STOCK ..... Rooted cuttings. 38 SPECIAL REQUIREMENTS . - 39 GERMINATION AND GROWTH Plantable size in 12 months.</p>
<p>SILVICULTURE: 17 SIZE ..... h = 10-15 m 18 DESCRIPTION ..... Practically evergreen 19 FORM ..... Poor 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; moderately frost resistant. Commonly reduces growth of nearby plants and is considered a wasteful user of deep ground-water reserves.</p>	<p>PRINCIPAL PESTS AND DISEASES: 40 ..... None of importance reported.</p> <p>PRINCIPAL REFERENCES: 52 71 84 95 121 152 154</p>

SPECIES: Taxodium distichum (L.) Rich.

<p>TAXONOMY:</p> <p>1 FAMILY ..... Pinaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES , Swamp cypress; Sabino; Ahuehuete.</p>	
<p>NATURAL OCCURRENCE:</p> <p>4 LATITUDES ..... 24-36°N</p> <p>5 AREAS ..... South Eastern USA.</p>	
<p>CLIMATE:</p> <p>6 ALTITUDINAL RANGE .... 0-1,500 m</p> <p>7 MEAN ANNUAL RAINFALL , 1,000-1,600 mm</p> <p>8 RAINFALL REGIME ..... Winter/summer/uniform</p> <p>9 DRY SEASON ..... 0-2 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 20-30°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 8-18°C</p> <p>12 MEAN ANNUAL TEMP. .... 16-22°C</p>	
<p>SOILS:</p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Alkaline/neutral/acid</p> <p>15 DRAINAGE ..... Seasonally waterlogged</p> <p>16 OTHER CHARACTERISTICS Adaptable to most soil conditions including slight salinity.</p>	
<p>SILVICULTURE:</p> <p>17 SIZE ..... h = 30-40 m</p> <p>18 DESCRIPTION ..... Deciduous</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Shade tolerant in youth.</p> <p>21 OTHER CHARACTERISTICS Coppices; frost resistant; root suckers vigorously; longlived.</p>	

<p>PRODUCTION:</p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 4-8</p>	
<p>ROLE IN LAND USE:</p> <p>23 ..... Ornamental</p>	
<p>TIMBER:</p> <p>24 DENSITY ..... S.G. 0.48-0.54</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Good bending properties; soft.</p>	
<p>UTILIZATION:</p> <p>30 SAW TIMBER ..... Light construction; furniture.</p> <p>31 ROUNDWOOD ..... Fence posts; fuel and charcoal.</p> <p>32 OTHER PRODUCTS ..... Bark (medicinal).</p>	
<p>NURSERY:</p> <p>33 SEED SOURCES ..... USA; Argentina.</p> <p>34 SEEDS PER KILOGRAMME , 20,000</p> <p>35 STORAGE ..... Short viability; store in ambient conditions. Stratify in damp sand for thirty days; or 4 hrs. soak in conc. H<sub>2</sub>SO<sub>4</sub>.</p> <p>36 PRE-TREATMENT ..... Potted; stumps; bare-rooted plants.</p> <p>37 PLANTING STOCK ..... -</p> <p>38 SPECIAL REQUIREMENTS , Germinates in 40-90 days. No information on growth in nursery.</p> <p>39 GERMINATION AND GROWTH</p>	
<p>PRINCIPAL PESTS AND DISEASES:</p> <p>40 ..... None of importance reported.</p>	
<p>PRINCIPAL REFERENCES: 52 62 152</p>	

SPECIES: <u>Tectona grandis</u> L.f.	
TAXONOMY:	
1 FAMILY .....	Verbenaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Teak; Tec; Teca.
NATURAL OCCURRENCE:	
4 LATITUDES .....	12-25°N
5 AREAS .....	The Indian subcontinent, Burma, Cambodia and Thailand.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-900 m
7 MEAN ANNUAL RAINFALL .....	1,250-3,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils. Often leads to soil erosion in pure stands.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 90-250 cm
18 DESCRIPTION .....	Deciduous; older trees fluted.
19 FORM .....	Acceptable/exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; substantial provenance variation; drought sensitive; early flowering spoils form.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	6-18
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.58-0.82
25 NATURAL DURABILITY ...	Very durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Fair
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Premier fine hardwood. Decorative, tough and strong; silica in wood; dust may irritate skin.
UTILIZATION:	
30 SAW TIMBER .....	Heavy construction; light construction; furniture; boxes; boat-building.
31 ROUNDWOOD .....	Building poles; transmission poles; fence posts; fuel (c.v. = 21,353 kJ/kg) and charcoal; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	India; Thailand; Trinidad and elsewhere where established as an exotic.
34 SEEDS PER KILOGRAMME .	800-2,000
35 STORAGE .....	Dry; without difficulty for several years.
36 PRE-TREATMENT .....	Alternate soaking and drying frequently practised.
37 PLANTING STOCK .....	Stumps; potted stock.
38 SPECIAL REQUIREMENTS .	-
39 GERMINATION AND GROWTH	Germination often protracted; up to 60 days. 70% viability. Several embryos per seed. Plantable size in 12 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Generally healthy. Atta ants may cause defoliation in first year. Root rots in Africa. Leaf skeletonizer in Asia.
PRINCIPAL REFERENCES:	
	4 5 16 51 52 57 69 100 107 109 128 152

SPECIES: <u>Tectona grandis</u> L.f.	
TAXONOMY:	
1 FAMILY .....	Verbenaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Teak; Tec; Teca.
NATURAL OCCURRENCE:	
4 LATITUDES .....	12-25°N
5 AREAS .....	The Indian subcontinent, Burma, Cambodia and Thailand.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-900 m
7 MEAN ANNUAL RAINFALL .....	1,250-3,000 mm
8 RAINFALL REGIME .....	Summer
9 DRY SEASON .....	3-6 months
10 MEAN MAX. TEMP.	
HOTTEST MONTH .....	25-32°C
11 MEAN MIN. TEMP.	
COLDEST MONTH .....	18-24°C
12 MEAN ANNUAL TEMP. ....	22-26°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile and deep soils. Often leads to soil erosion in pure stands.
SILVICULTURE:	
17 SIZE .....	h = 30-40 m; d = 90-250 cm
18 DESCRIPTION .....	Deciduous; older trees fluted.
19 FORM .....	Acceptable/exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Coppices; moderately fire resistant; substantial provenance variation; drought sensitive; early flowering spoils form.



SPECIES: Terminalia brassii Exell

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Combretaceae</p> <p>2 SYNONYMS .....</p> <p>3 LOCAL OR TRADE NAMES : Dafo; Swamp oak.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 10-4° S</p> <p>5 AREAS ..... Solomon Islands, Bougainville and New Ireland.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-500 m</p> <p>7 MEAN ANNUAL RAINFALL : 2,000-5,000 mm</p> <p>8 RAINFALL REGIME ..... Uniform</p> <p>9 DRY SEASON ..... 0-1 month</p> <p>10 MEAN MAX. TEMP. .... 28-34 °C</p> <p>11 MEAN MIN. TEMP. .... 20-24 °C</p> <p>12 MEAN ANNUAL TEMP. .... 23-28 °C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Heavy/medium</p> <p>14 REACTION ..... Acid</p> <p>15 DRAINAGE ..... Moist; seasonally waterlogged.</p> <p>16 OTHER CHARACTERISTICS : Better growth on deep soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 30-35 m; d = 100-150 cm</p> <p>18 DESCRIPTION ..... Evergreen</p> <p>19 FORM ..... Exceptional</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding</p> <p>21 OTHER CHARACTERISTICS -</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 25-35</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 .....</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.33-0.51</p> <p>25 NATURAL DURABILITY ... Non-durable</p> <p>26 PRESERVATION ..... Difficult</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy</p> <p>29 OTHER FEATURES ..... Very susceptible to stain and borers.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; boxes.</p> <p>31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood.</p> <p>32 OTHER PRODUCTS ..... -</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Solomon Islands; Papua New Guinea.</p> <p>34 SEEDS PER KILOGRAMME : 60 000-70,000</p> <p>35 STORAGE ..... Very short-lived.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Potted</p> <p>38 SPECIAL REQUIREMENTS : Requires some shade in first few weeks.</p> <p>39 GERMINATION AND GROWTH : Germinates in 10-20 days. Plantable size in 4 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... None of importance reported.</p>	
<p><b>PRINCIPAL REFERENCES:</b> 59 96 111 112 158</p>	

SPECIES: <u>Terminalia salamansani</u> (Blanco) Rolfe	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Kwako; Yellow Terminalia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°N-10°S
5 AREAS .....	Philippines; Papua New Guinea; Solomon Islands.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	28-34°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.	20-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	23-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 cm; d = 80-120 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	25-30
ROLE IN LAND USE:	
23 .....	-
TIMBER:	
24 DENSITY .....	S.G. 0.30-0.46
25 NATURAL DURABILITY ...	Non-durable
26 PRESERVATION .....	Easy
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Susceptible to stain and borer attack. Weak.
UTILIZATION:	
30 SAW TIMBER .....	Light construction; joinery; boxes.
31 ROUNDWOOD .....	Shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	Papua New Guinea; Solomon Islands.
34 SEEDS PER KILOGRAMME	13,000-14,000
35 STORAGE .....	Shortlived: up to 1 month.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted
38 SPECIAL REQUIREMENTS	-
39 GERMINATION AND GROWTH	Germinates in 3-10 days (80% from fresh seed). Plantable size in 6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	Liabile to unidentified dieback in nursery.
PRINCIPAL REFERENCES:	
	59 111 112 158

SPECIES: <u>Terminalia salamansani</u> (Blanco) Rolfe	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES	Kwako; Yellow Terminalia.
NATURAL OCCURRENCE:	
4 LATITUDES .....	10°N-10°S
5 AREAS .....	Philippines; Papua New Guinea; Solomon Islands.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL	2,000-5,000 mm
8 RAINFALL REGIME .....	Uniform
9 DRY SEASON .....	0-2 months
10 MEAN MAX. TEMP.	28-34°C
HOTTEST MONTH .....	
11 MEAN MIN. TEMP.	20-24°C
COLDEST MONTH .....	
12 MEAN ANNUAL TEMP. ....	23-28°C
SOILS:	
13 TEXTURE .....	Medium/heavy
14 REACTION .....	Neutral/acid
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS	Better growth on fertile soils.
SILVICULTURE:	
17 SIZE .....	h = 30-40 cm; d = 80-120 cm
18 DESCRIPTION .....	Deciduous
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS ...	Strongly demanding
21 OTHER CHARACTERISTICS	Windfirm

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) ..... 8-17	
<b>ROLE IN LAND USE:</b> 23 ..... Agricultural shade.	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.45-0.62 25 NATURAL DURABILITY ... Moderately durable 26 PRESERVATION ..... Difficult 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Decorative; "brittleheart" common; dust may irritate skin.	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Heavy construction; light construction; furniture. 31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood. 32 OTHER PRODUCTS ..... -	
<b>NURSERY:</b> 33 SEED SOURCES ..... West Africa, especially Ivory Coast. 34 SEEDS PER KILOGRAMME . 5,500-6,600 35 STORAGE ..... Dry, cold and airtight for up to one year. 36 PRE-TREATMENT ..... Alternate soaking and drying. 37 PLANTING STOCK ..... Potted; striplings; stumps. 38 SPECIAL REQUIREMENTS . Requires light shade after germination. 39 GERMINATION AND GROWTH Germinates in 14-50 days. Plantable size in 4 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 ..... Termites attack young plants. Liable to attack by many defoliators but none very serious.	
<b>PRINCIPAL REFERENCES:</b> 20 25 57 59 100 105 128 152 155	

<b>SPECIES:</b> <i>Terminalia ivorensis</i> A. Chev.	
<b>TAXONOMY:</b> 1 FAMILY ..... Combretaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES . Idigbo; Framiré.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 4-11°N 5 AREAS ..... West Africa, from Guinea to Cameroons.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 0-700 m 7 MEAN ANNUAL RAINFALL . 1,300-3,000 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 26-30°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 22-24°C 12 MEAN ANNUAL TEMP. .... 24-26°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Free draining; occasionally seasonally waterlogged 16 OTHER CHARACTERISTICS -	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 35-45 m; d = 90-150 cm 18 DESCRIPTION ..... Deciduous; buttressed; open, wide crown. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS Coppices; requires wide spacing.	

SPECIES: <i>Terminalia superba</i> Engl. & Diels	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Afara; Limba; Korina.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-10°N
5 AREAS .....	West Africa, from Sierra Leone to Zaire.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	1,300-1,900 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	1-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	26-32°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	22-26°C
12 MEAN ANNUAL TEMP. ....	24-27°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Better growth on deep soils but is adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 40-60 m; d = 120-240 cm
18 DESCRIPTION .....	Practically evergreen; buttressed.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; wide crowned requiring wide spacing.
PRODUCTION:	
22 VOLUME (M <sup>3</sup> /HA/AN) ....	10-14
ROLE IN LAND USE:	
23 .....	Agricultural shade.
TIMBER:	
24 DENSITY .....	S.G. 0.48-0.64
25 NATURAL DURABILITY .....	Non-durable
26 PRESERVATION .....	Difficult
27 SAWING .....	Easy
28 SEASONING .....	Easy
29 OTHER FEATURES .....	Decorative
UTILIZATION:	
30 SAW TIMBER .....	Light construction; furniture; boxes; boat-building.
31 ROUNDWOOD .....	Shortfibre pulp; veneer/plywood.
32 OTHER PRODUCTS .....	-
NURSERY:	
33 SEED SOURCES .....	West Africa, especially Nigeria.
34 SEEDS PER KILOGRAMME .....	8,500-9,500
35 STORAGE .....	Dry, cold and airtight for up to one year.
36 PRE-TREATMENT .....	None
37 PLANTING STOCK .....	Potted; stripings; stumps.
38 SPECIAL REQUIREMENTS .....	-
39 GERMINATION AND GROWTH .....	No information available on germination. Plantable size in 6 months.
PRINCIPAL PESTS AND DISEASES:	
40 .....	None of importance reported.
PRINCIPAL REFERENCES:	
	4 5 18 57 59 100 128 143 152 155

SPECIES: <i>Terminalia superba</i> Engl. & Diels	
TAXONOMY:	
1 FAMILY .....	Combretaceae
2 SYNONYMS .....	-
3 LOCAL OR TRADE NAMES .....	Afara; Limba; Korina.
NATURAL OCCURRENCE:	
4 LATITUDES .....	6°S-10°N
5 AREAS .....	West Africa, from Sierra Leone to Zaire.
CLIMATE:	
6 ALTITUDINAL RANGE .....	0-500 m
7 MEAN ANNUAL RAINFALL .....	1,300-1,900 mm
8 RAINFALL REGIME .....	Summer/uniform
9 DRY SEASON .....	1-3 months
10 MEAN MAX. TEMP. HOTTEST MONTH .....	26-32°C
11 MEAN MIN. TEMP. COLDEST MONTH .....	22-26°C
12 MEAN ANNUAL TEMP. ....	24-27°C
SOILS:	
13 TEXTURE .....	Medium
14 REACTION .....	Alkaline/neutral
15 DRAINAGE .....	Free draining
16 OTHER CHARACTERISTICS .....	Better growth on deep soils but is adaptable to most soil conditions.
SILVICULTURE:	
17 SIZE .....	h = 40-60 m; d = 120-240 cm
18 DESCRIPTION .....	Practically evergreen; buttressed.
19 FORM .....	Exceptional
20 LIGHT REQUIREMENTS .....	Strongly demanding
21 OTHER CHARACTERISTICS .....	Coppices; wide crowned requiring wide spacing.

SPECIES: Toona ciliata M.J. Roem.

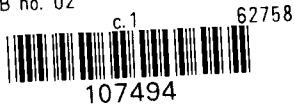
<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Meliaceae</p> <p>2 SYNONYMS ..... <u>Cedrela toona</u> Roxb.</p> <p>3 LOCAL OR TRADE NAMES : Toon; Burma cedar.</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 15-25°N</p> <p>5 AREAS ..... S.E. Asia, from India to Thailand. (<u>T. ciliata</u> var. <u>australis</u> occurs in N. Queensland).</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-1,200 m</p> <p>7 MEAN ANNUAL RAINFALL . 850-4,000 mm</p> <p>8 RAINFALL REGIME ..... Summer</p> <p>9 DRY SEASON ..... 2-6 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 28-45°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 6-18°C</p> <p>12 MEAN ANNUAL TEMP. .... 22-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium</p> <p>14 REACTION ..... Neutral/acid</p> <p>15 DRAINAGE ..... Free draining</p> <p>16 OTHER CHARACTERISTICS Best growth on deep, rich soils.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 30-35 m; d = 90-180 cm</p> <p>18 DESCRIPTION ..... Deciduous/evergreen; sometimes buttressed.</p> <p>19 FORM ..... Acceptable</p> <p>20 LIGHT REQUIREMENTS ... Strongly demanding; shade tolerant in youth.</p> <p>21 OTHER CHARACTERISTICS Coppices; resists termites; root suckers vigorously; fire sensitive.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) .... 7-18</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Windbreaks</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... S.G. 0.42-0.64</p> <p>25 NATURAL DURABILITY ... Moderately durable.</p> <p>26 PRESERVATION ..... Fair</p> <p>27 SAWING ..... Easy</p> <p>28 SEASONING ..... Easy in kilns.</p> <p>29 OTHER FEATURES ..... Decorative; scented.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; furniture; boxes; flooring; boat-building; carts.</p> <p>31 ROUNDWOOD ..... Veneer/plywood.</p> <p>32 OTHER PRODUCTS ..... Fodder (lopped branches).</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... India</p> <p>34 SEEDS PER KILOGRAMME . 300,000-380,000</p> <p>35 STORAGE ..... Short viability: 6 months-1 year.</p> <p>36 PRE-TREATMENT ..... None</p> <p>37 PLANTING STOCK ..... Stripplings; potted; direct sown; stumps. Heavy shade for two months after germination.</p> <p>38 SPECIAL REQUIREMENTS Care of taproot.</p> <p>39 GERMINATION AND GROWTH 40-60% germination when fresh. Slow early growth. Potted stock plantable size at 18-24 months.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... <u>Hypsipyla</u>, a shoot borer, causes severe damage. Plant Toona in mixtures on optimum sites, as vigorous growth reduces susceptibility. (N.B. <u>Toona ciliata</u> var. <u>australis</u> appears to resist <u>Hypsipyla</u>).</p>	
<p><b>PRINCIPAL REFERENCES:</b> 16 49 59 61 96 109 152</p>	

<b>PRODUCTION:</b> 22 VOLUME (M <sup>3</sup> /HA/AN) .... 6-18	
<b>ROLE IN LAND USE:</b> 23 ..... -	
<b>TIMBER:</b> 24 DENSITY ..... S.G. 0.35-0.40 25 NATURAL DURABILITY ... Non-durable 26 PRESERVATION ..... Difficult 27 SAWING ..... Easy 28 SEASONING ..... Easy 29 OTHER FEATURES ..... Susceptible to borers and stain. Premier quality, white, odour-free hardwood..	
<b>UTILIZATION:</b> 30 SAW TIMBER ..... Light construction; boxes; furniture. 31 ROUNDWOOD ..... Shortfibre pulp; veneer/plywood; blockboard; fuelwood. 32 OTHER PRODUCTS ..... -	
<b>NURSERY:</b> 33 SEED SOURCES ..... West Africa (N.B. seed years are irregular). 34 SEEDS PER KILOGRAMME . 3,000 35 STORAGE ..... - 36 PRE-TREATMENT ..... None 37 PLANTING STOCK ..... Stumps; potted; cuttings. 38 SPECIAL REQUIREMENTS . - 39 GERMINATION AND GROWTH Germinates in 10-12 days. Plantable size in 15 months.	
<b>PRINCIPAL PESTS AND DISEASES:</b> 40 .....	
<b>PRINCIPAL REFERENCES:</b> 22 57 100 128 155	

SPECIES: Triplochiton scleroxylon K. Schum.

<b>TAXONOMY:</b> 1 FAMILY ..... Sterculiaceae 2 SYNONYMS ..... - 3 LOCAL OR TRADE NAMES . Obeche; Samba; Kawa; Ayous.	
<b>NATURAL OCCURRENCE:</b> 4 LATITUDES ..... 0-10°N 5 AREAS ..... West Africa, from Sierra Leone to Zaire.	
<b>CLIMATE:</b> 6 ALTITUDINAL RANGE .... 0-500 m 7 MEAN ANNUAL RAINFALL . 1,600-3,000 mm 8 RAINFALL REGIME ..... Uniform 9 DRY SEASON ..... 0-2 months 10 MEAN MAX. TEMP. HOTTEST MONTH ..... 26-32°C 11 MEAN MIN. TEMP. COLDEST MONTH ..... 20-26°C 12 MEAN ANNUAL TEMP, .... 24-29°C	
<b>SOILS:</b> 13 TEXTURE ..... Light/medium 14 REACTION ..... Neutral/acid 15 DRAINAGE ..... Free draining 16 OTHER CHARACTERISTICS -	
<b>SILVICULTURE:</b> 17 SIZE ..... h = 40-50 m; d = 100-150 cm 18 DESCRIPTION ..... Deciduous; buttressed. 19 FORM ..... Exceptional 20 LIGHT REQUIREMENTS ... Strongly demanding 21 OTHER CHARACTERISTICS -	



SPECIES: Zizyphus spina-christi (L.) Willd.

<p><b>TAXONOMY:</b></p> <p>1 FAMILY ..... Rhamnaceae</p> <p>2 SYNONYMS ..... <u>Rhamnus spina-christi</u> L.</p> <p>3 LOCAL OR TRADE NAMES , Christ-thorn; Kurna; Sidr (Arabic).</p>	
<p><b>NATURAL OCCURRENCE:</b></p> <p>4 LATITUDES ..... 25-38°N</p> <p>5 AREAS ..... N. Africa and Near East.</p>	
<p><b>CLIMATE:</b></p> <p>6 ALTITUDINAL RANGE .... 0-2,000 m</p> <p>7 MEAN ANNUAL RAINFALL , 100-500 mm</p> <p>8 RAINFALL REGIME ..... Winter</p> <p>9 DRY SEASON ..... 8-10 months</p> <p>10 MEAN MAX. TEMP. HOTTEST MONTH ..... 30-35°C</p> <p>11 MEAN MIN. TEMP. COLDEST MONTH ..... 4-15°C</p> <p>12 MEAN ANNUAL TEMP. .... 19-28°C</p>	
<p><b>SOILS:</b></p> <p>13 TEXTURE ..... Light/medium/heavy</p> <p>14 REACTION ..... Neutral/alkaline</p> <p>15 DRAINAGE ..... Moist</p> <p>16 OTHER CHARACTERISTICS Tolerates some salinity; better growth on deep alluvia.</p>	
<p><b>SILVICULTURE:</b></p> <p>17 SIZE ..... h = 5-10 m</p> <p>18 DESCRIPTION ..... Thorny; evergreen; pendulous branches.</p> <p>19 FORM ..... Poor</p> <p>20 LIGHT REQUIREMENTS ... Light demanding</p> <p>21 OTHER CHARACTERISTICS Aggressive coloniser; coppices; drought hardy; frost tender; deep rooting; long-lived.</p>	

<p><b>PRODUCTION:</b></p> <p>22 VOLUME (M<sup>3</sup>/HA/AN) , .... -</p>	
<p><b>ROLE IN LAND USE:</b></p> <p>23 ..... Erosion control; windbreaks; shade; dune fixation.</p>	
<p><b>TIMBER:</b></p> <p>24 DENSITY ..... -</p> <p>25 NATURAL DURABILITY ... Durable</p> <p>26 PRESERVATION ..... -</p> <p>27 SAWING ..... -</p> <p>28 SEASONING ..... -</p> <p>29 OTHER FEATURES ..... Hard; heavy; termite resistant.</p>	
<p><b>UTILIZATION:</b></p> <p>30 SAW TIMBER ..... Light construction; furniture.</p> <p>31 ROUNDWOOD ..... Posts; tools; fuel (c.v. = 19,800-20,100 kJ/kg).</p> <p>32 OTHER PRODUCTS ..... Edible fruit; fodder (leaves).</p>	
<p><b>NURSERY:</b></p> <p>33 SEED SOURCES ..... Netherlands; Near East.</p> <p>34 SEEDS PER KILOGRAMME , 15,000</p> <p>35 STORAGE ..... Dry, cold, sealed.</p> <p>36 PRE-TREATMENT ..... Scarify mechanically or in conc. H<sub>2</sub>SO<sub>4</sub> for 2 hours, then cold stratify.</p> <p>37 PLANTING STOCK ..... Bare-rooted seedlings; cuttings.</p> <p>38 SPECIAL REQUIREMENTS , Care of taproot.</p> <p>39 GERMINATION AND GROWTH 60-80% germination; medium growth rate in nursery.</p>	
<p><b>PRINCIPAL PESTS AND DISEASES:</b></p> <p>40 ..... -</p>	
<p><b>PRINCIPAL REFERENCES:</b></p>	