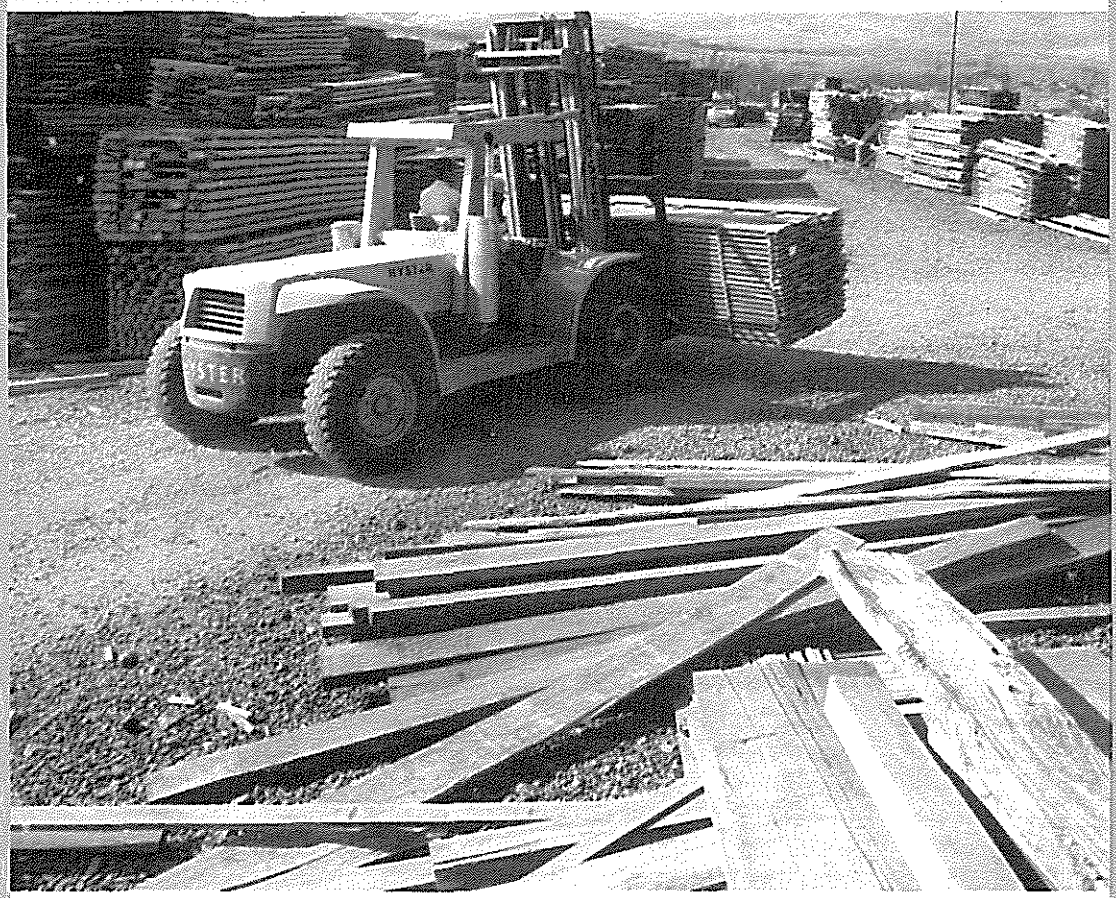
The marketing of tropical wood in South America

FAO
FORESTRY
PAPER
5



FOOD
AND
AGRICULTURE
ORGANIZATION
OF THE
UNITED NATIONS

The marketing of tropical wood in South America

FAO
FORESTRY
PAPER
5

by
T. Erfurth
and
H. Rusche

FAO Forestry Department

FOOD
AND
AGRICULTURE
ORGANIZATION
OF THE
UNITED NATIONS
Rome, 1978

First printing 1978
Second printing 1984

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

M-37

ISBN 92-5-100215-0

TABLE OF CONTENTS

INTRODUCTORY REMARKS

The present study "The Marketing of Tropical Wood: Wood Species from South American Tropical Moist Forests" is the second special FAO study in the field of tropical timber marketing. The first study dealing with wood species from African moist forests was issued and reprinted twice in 1973, and appeared in an expanded and updated version early in 1976.

In the series of publications on "The Marketing of Tropical Wood" a variety of subjects will be covered which are related to FAO's development work in this field. A third paper is at present under preparation, dealing with Southeast Asian wood species. Since the same approach methodology and reference year have been, and are being used throughout these studies, it will be possible to arrive in due course at an interregional comparison and evaluation of all data, particularly of those presented in the Appendices.

The primary purpose of the present study is to provide information to all those concerned with planning and carrying out forest surveys and inventories; industrial feasibility and market studies; tropical timber testing, research, development and promotion work on the national and regional level. It also provides basic information for practical marketing, trade development and market promotion work. Useful information might also be extracted from the study by forest management experts and silviculturists who are concerned with planting, and forest regeneration work in general.

The Appendices of this study were presented in the form of a background document to the Twelfth Session of the Latin American Forestry Commission, held in Havana, Cuba 2-7 February 1976. From its report, page 4, para. 28 we quote: "There was commendation for the efforts made by the Forestry Department of FAO to study the problems and potential of forest species that had not yet gained the desired acceptance on markets, and it was recommended that efforts in this direction be intensified in the second stage of the study."

Statistical data for production and trade for the basic reference year 1973 were incomplete and in several cases 1971 or 1972 data had to be used instead in order to show the distribution of wood species. In a few cases where gaps in regular country statistics occurred, available unpublished material was used. For veneer and plywood, data by wood species are not available. Both products are fully considered in Chapters 1 and 6, but because of lack of data are excluded from the detailed considerations in Chapters 2 to 5. In view of the above remarks the respective data should only be considered as provisional to be improved and expanded in due course.

It would have been most desirable to include local marketing aspects in this study, but data are either not available, or are insufficient to support similarly detailed considerations. Whenever possible and appropriate, aspects related to domestic markets have been included.

The special study has been prepared by T. Erfurth, Forest Products Marketing Officer, Forestry Department of FAO, and H. Rusche, Forestry Officer recruited by FAO under the Associate Expert Scheme of the Federal Republic of Germany, who also travelled in the area under consideration for the collection of information.

The authors, on behalf of FAO, express their gratitude to government forest services, forest products research institutes, tropical forest products industries and trade firms and associations which have contributed to the study through information and advice.

SUMMARY

1973 was selected as the basic reference year for this study since at that time the impact of the recession on wood supply and marketing patterns had not yet been felt. During this year log production in South American tropical forests reached 10.8 million m3 which were harvested almost entirely in the moist tropical forests of Bolivia, Peru, Colombia, Venezuela, Guyana, Surinam, French Guiana and in the Brazilian Amazon area.

Forest products exports from these eight countries attained in 1973 a total value of US$193 million and remained substantially below the level of other tropical wood exporting regions. Sawnwood, with 862 000 m3, was the largest single item, followed by logs - 461 000 m3, veneer 73 000 m3 and plywood 58 000 m3. Only 4 per cent of the total saw- and veneer log supplies were exported, and more than 10 million m3 were converted locally into wood products, most of which were absorbed by domestic markets.

The study analyses production and trade of the above nine countries by species. All wood species produced in quantities above 1 000 m3 per year are arbitrarily defined as commercial, all other species as "lesser-used" provided that they are produced in quantities below 1 000 m3 or, if not used commercially, have been identified - through an evaluation system specifically designed for this purpose - as having potential for use in the form of sawnwood, veneer and plywood.

The varying heterogeneity of species composition in these forests entails unfavourable diversifications in wood properties. So far about 210 different wood species are commercialized under 125 trade names, and another 263 wood species are more or less known to the trade. While many commercial wood species are reported to be found widely distributed over the area, none of the 210 commercial species is produced in all nine countries. In fact, most of the wood species are commercialized only in one or two countries, and are either not or only little used in the other countries. Preferences for wood species may vary considerably from country to country, and often from mill to mill.

Medium density timbers made up for 65 per cent of the total saw- and veneer log production. VIROLA alone accounted for 24 per cent, followed by CAOBA-Mahogany, one of the finest veneer and joinery timbers which only reached 6 per cent, followed by CEDRO - 3.8 per cent - and ANDIROBA 3.2 per cent. Low and medium density timbers together add up to 79 per cent and consequently the upper and high density species only account for 21 per cent of the total log production. This pattern of utilization is adverse to the actual wood density distribution in the forests, where the average density specific weight lies substantially higher.

An analysis of the market acceptance of commercial timbers based on property groups and value classes reveals that qualities and related values are not differentiated in the same measure as, for instance, in the case of African tropical woods. In view of this it is assumed that the potential of the forests in the wider Amazon basin has still to be fully appraised, not only from the quantitative, but also from the qualitative point of view. Efforts aimed at expanding the marketable wood base comprise the possibilities of (i) optimizing wood values, (ii) grouping of wood species, and (iii) the promotion of mixed species for integrated industrial use, which implies that combined action with (i) and (ii) is possible and often necessary.

Knowledge of the properties, uses and marketing of wood species is an essential basis for the various planning and management activities related to investments in the tropical forestry and forest industries sector. Details need to be defined for each particular area selected for development, since local resource and market conditions as well as possibilities for export trade may vary considerably. For the support of this work, the present study provides guidance and pertinent information. It is restricted to mechanical wood products.

The following points are singled out for special consideration:

(i) in resource and preinvestment surveys attention should be given to commercial and lesser-used species alike, and to problems related to provenance, market acceptance and promotion, wood values and use classification - with the overall objective of improving forest utilization;

(ii) the evaluation of use properties (Chapters 4 and 5) point at the need to support further research and data collection activities aimed at clarifying the use potential of lesser-used wood species as a basic requirement for the promotion of individual or groups of wood species and their products, and to establishing common criteria for grouping to be based on internationally comparable standards for the use properties of lesser-used species;

(iii) grading rules play a central role in product and market development. Average density of wood in tropical forests is substantially higher than in temperate forests. Therefore increased efforts should be made to develop new or adopt existing techniques allowing in particular the use of tropical hardwoods in housing and construction, in order to directly improve domestic socio-economic conditions. Grading rules and standards might more usefully be developed in close relation with other regional and international initiatives with a view to harmonizing efforts;

(iv) wood preservation whenever appropriate should be part of the overall concept for industry and marketing planning in tropical forest countries, and receive suitable technical support by timber research and development institutions; also,

(v) wood seasoning is an efficient tool for marketing development particularly of processed sawnwood and in this context it is suggested to use a system approach in individual case studies demonstrating how to optimize the techno-economic complex:

contract stipulations - wood product standards - dimensional accuracy and tolerances - moisture content - impermeable and invulnerable packaging - possible shipping in containers - constant quality - direct and immediate application by consumer.

1. South American tropical forest products in world production and trade

World trade of forest products slightly more than doubled between the years 1961 to 1970. It expanded remarkably quickly between the years 1970 to 1973, when an increase of 78 per cent was registered. Over these thirteen years the relative growth of forest products exports from developing countries was notably above the world average, although the bulk of this growth must be attributed to unprocessed wood in the form of logs. Between 1973 and 1974, i.e. at the beginning of the recent world-wide recession, total world trade of forest products continued to rise from US$22 360 million to US$ 29 078 million, or by 30 per cent in one single year. Taking into account the inflationary impact and the rather accentuated increases of forest products prices during this period, the rise in total export value may appear less spectacular than it is. However, the negative fact remains that the value of forest products exports from developing countries virtually stagnated, implying that trade volumes - for which data were not available at the time of writing this paper - had already declined during 1974 because of the recession which started to make itself felt strongly during the second half of 1974. This consideration served as a basis in selecting 1973 in the present study as a reference year, rather than the following years 1974 or 1975. It can be assumed that the depressed market conditions during the latter two years would not reflect a "close to average" marketing and utilization pattern of tropical woods.

In the global picture of world trade the position of forest products exports from all developing countries emerges, generally speaking, rather favourably. In 1973, their forest products exports amounted to a total value of US$ 3 598, or 16 per cent of the world total, and thus are six per cent higher than exports from the centrally planned economies, which amounted to US$ 2 237 million. Forest products exports from developing countries appear to be rather modest with regard to exports from the developed market economy countries, which accounted during the same year for 74 per cent of the total world exports of forest products, a large portion of which consists of pulp and paper.

Table 1. VALUE OF FOREST PRODUCTS EXPORTS IN WORLD TRADE (In million US dollars)

	1961	1970	1973	1974	Increase in per cent 1961-1970	1970-1973
World	6 042	12 549	22 360	29 078	108	78
Developed Market Economies-Ec.Cl.I	4 929	9 743	16 525	22 541	98	70
Developing Market Economies-Ec.Cl.II	526	1 468	3 598	3 678	179	145
Centrally Planned Economies-Ec.Cl.III	587	1 338	2 237	2 859	128	67
East Asia developing	230	895	2 420	2 340	289	170
Africa developing	188	336	748	747	79	123
Latin America	100	218	390	524	118	79
Tropical South America 1/	25	103	193	..	312	87

1/ Brazilian-Amazon, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Surinam, French Guiana

The growth of forest products trade - according to Table 1 - has been fastest in the developing countries. Between 1961, 1970 and 1973 exports rose from US$ 526 million to US$ 1 468 million and US$3 598 million, or by 179 and 145 per cent respectively. Within the three major tropical timber exporting regions the first position - both in growth and size - is taken by East Asian developing countries with exports of US$2 420 million in 1973, which made up for two-thirds of the total tropical log and wood products exports.

The forest products exports of the nine South American countries under review in this study amounted in 1973 to US$193 million and thus accounted for 49 per cent of the total forest products exports from Latin America. Although the tropical moist forests of South America represent an area of almost 7 million square kilometers, or about 25 per cent of the total forest cover of the world, its contribution to world trade in 1973 remained below 1 per cent. It appears that South American tropical moist forests are less well-endowed with resources of commercial woods, and conditions compare less favourably with those of Southeast Asia and tropical Africa. Another reason for the little importance South American tropical woods have on world markets is the relatively high local consumption, as is evident from Table 3.

The spectacular growth of forest products exports from developing countries has to be attributed in the first place to log exports which in 1973 accounted for 61 per cent of the world total as shown in Table 2. In this context it must be noted that the logs and sawnwood produced in, and subsequently exported from, tropical countries are almost exclusively broadleaved species. Exports of broadleaved logs and sawnwood during the same year accounted for 93 and 57 per cent respectively. It is also interesting to note that developing countries' exports of veneer and plywood had reached 50 per cent and 43 per cent of the respective world total in 1973. The share of the moist tropical South American region in the world total of the respective exports was very low indeed: 1 per cent for broadleaved logs, 6 per cent for broadleaved sawnwood, 6 per cent for veneer, and 1 per cent for plywood

Table 2. THE SHARE OF DEVELOPING COUNTRIES' EXPORTS IN WORLD TRADE OF FOREST PRODUCTS IN 1973, BY MAJOR PRODUCTS

	All developing countries		Tropical South America	
	1000 m3 or m.t.	Percentage in world trade	1000 m3 or m.t.	Percentage in world trade
Logs	49 480	61 (93)1/	461	0.6 (1.0)1/
Sawnwood	8 119	11 (57)2/	862	1.2 (6.0)2/
Veneer	616	50	73	6.0
Plywood	2 806	43	58	1.0
Particle board	128	3	10	0.2
Fibreboard	128	4	-	-
Pulpwood and chips	1 054	4	-	-
Pulp	508	3	-	-
Paper and paper board	450	2	33	0.1

1/ Percentages for broadleaved logs only
2/ Percentages for broadleaved sawnwood only

Developing countries' exports of board products, pulp and paper, i.e. all products which are based on wood in its disintegrated form as chips and fibres, are insignificant at present. Exports in these categories from tropical South American countries so far are either non-existent or negligible.

The contribution of the above moist tropical South American region to world trade of forest products varies considerably from country to country as does the share of exports in domestic production. Generally speaking, saw- and veneer log exports from tropical South Amerida has not been and is not expected to become important. In 1973, according to Table 3, only 4 per cent of its production was exported in log form.

Table 3. PRODUCTION AND EXPORTS OF SAW- AND VENEER LOGS FROM MAJOR TROPICAL TIMBER PRODUCING REGIONS, IN 1973, BY 1000 M3

Region or country	Log production	Apparent local industrial use of logs	Log exports	Share of log exports in production
				%
East Asia developing	76 744	29 928	46 816	61
Tropical Africa	17 951	9 541	8 410	47
Tropical Latin America	19 099	17 538	1 561	8
Tropical South America 1/	10 774	10 316	458	4
Brazilian Amazon (in 1972)	3 300	2 924	376	11
Bolivia	216	216	-	-
Peru	629	629	-	-
Ecuador	1 800	1 800	-	-
Colombia	3 980	3 943	37	1
Venezuela	470	470	-	-
Guyana	212	181	31	15
Surinam	140	133	7	5
French Guiana	27	20	7	26

1/ Figures originate from the 1973 FAO Forestry Yearbook, they may differ from those mentioned later as different source had to be used for species breakdown

Exports of logs from Bolivia, Ecuador, Peru and Venezuela are either very small or non-existent. Log exports from Colombia accounted for 1 per cent and those of Surinam for 5 per cent of the log production. Only from the Brazilian Amazon, Guyana and French Guiana log exports exceeded 10 per cent of log production and amounted to 11, 15 and 26 per cent respectively. The bulk of tropical timber is produced in and exported from East Asian developing countries which make up for 67 per cent of the log produotion and 82 per cent of the log exports of the three regions whereas the share of moist tropical South America in log production and log exports accounted for 9 and 1 per cent respectively.

Before going into the detailed analysis of tropical South American wood species it seems appropriate to examine more closely the main features of log production between tropical South America and the two other principal tropical forest areas Southeast Asia and tropical Africa. Ten of the most important commercial woods were selected and are presented in Table 4 to illustrate the reliance of log production of the three regions on only a relatively few species. Furthermore, it is interesting to note - and reference is made to this grouping of species in the following chapters - that the ten Southeast Asian commercial woods mentioned in Table 4 comprise more than 150 individual wood species belonging to 11 different genera. On the other hand, the 10 most important South American tropical timbers are made up of 18 wood species which are related to 9 genera. It is not the intention of this study to analyse Table 4, as this can only be done after the studies of all three regions have been finished. But those who are interested in the present study on moist tropical South American woods will find it useful at this stage to obtain this brief information for comparative purposes.

Table 4. SAW AND VENEER LOG PRODUCTION OF PRINCIPAL COMMERCIAL WOODS - 1000 M3 - BY MAJOR REGIONS AND PRODUCING COUNTRIES IN OR ABOUT 1973

Pilot name	Scientific name	No. of 2/ possible species	Log production	BRA (Amazon)	BOL	PER	ECU	COL	VEN	GUY	SUR	GUF
TROPICAL SOUTH AMERICA				1972	1973	1973	1973	1971	1972	1973	1973	1971
1. VIROLA	Virola spp.	7	1662 (24) 1/	1105	3	0.8	5	510	-	3	35	0.4
2. CAOBA	Swietenia macrophylla	1	411 (6)	204	150	34	-	-	23	-	-	-
3. CEDRO	Cedrela spp.	2	265 (4)	107	0.7	130	13	12	-	-	0.3	2
4. BALSA	Ochroma lagopus	1	246 (3)	-	-	-	246	-	-	-	-	-
5. ANDIROBA	Carapa spp.	2	219 (3)	151	-	-	13	34	-	5	16	0.4
6. SAJO	Campnosperma panamensis	1	182 (3)	-	-	-	-	182	-	-	-	-
7. LOURO INHAMUY	Ocotea cymbarum	1	149 (2)	149	-	-	-	-	-	-	-	-
8. SAQUI-SAQUI	Bombacopsis quinatum	1	125 (2)	-	-	-	-	1	124	-	-	-
9. GREENHEART	Ocotea rodiaei	1	117 (2)	-	-	-	-	-	-	117	-	-
10. MIJAO	Anacardium excelsum	1	106 (1)	-	-	-	6	8	92	-	-	-
WEST AND CENTRAL AFRICA 3/				LIB	IVC	GHA	NIG	CAM	GAB	CGO	ZAI	
1. OBECHE	Triplochiton scleroxylon	1	1960 (16) 1/	21	1109	520	229	69	-	5	7	
2. OKOUME	Aucoumea klaineana	1	1782 (15)	-	-	-	-	-	1571	211	-	
3. SIPO	Entandrophragma utile	1	661 (5)	49	430	107	2	26	9	7	31	
4. ACAJOU-MAHOG.	Khaya spp.	3	586 (5)	3	195	161	136	18	19	28	26	
5. SAPELLI	Entandrophragma cyclindri-	1	552 (4)	7	172	190	7	84	-	61	31	
6. LIMBA	Terminalia superba (cum	1	462 (4)	-	51	1	265	16	39	65	24	
7. IROKO	Chlorophora excelsa	1	349 (3)	9	184	95	17	18	-	6	20	
8. TIAMA	Entandrophragma angolense	1	308 (3)	2	179	83	6	4	5	3	26	
9. AZOBE	Lophira alata	1	284 (2)	16	5	1	1	261	-	-	-	
10. MAKORE-DOUKA	Tieghemelia spp.	2	274 (2)	20	166	56	-	2	15	15	-	
SOUTHEAST ASIA 3/				THAI	MAL	SAR	SAB	IDO	PHIL			
1. MERANTI(unsp.)	Shorea 92, Parashorea 3	95	17688 (27) 1/	-	3312	455	-	13901	-			
2. PHIL.MAHOGANY	Shorea 5, Parashorea 1,	7	7084 (11)	-	-	-	-	-	7084			
3. RED SERAYA	Shorea spp. (Pentacme 1	32	5934 (9)	-	-	-	5934	-	-			
4. KERUING	Dipterocarpus spp.	52	4749 (7)	-	2042	85	1205	1417	-			
5. KAPUR	Dryobalanops spp.	9	3516 (5)	-	1313	85	1867	251	-			
6. WHITE SERAYA	Parashorea spp.	5	3091 (5)	-	-	-	3091	-	-			
7. RAMIN	Gonystylus spp.	8	2748 (4)	-	-	640	1	2107	-			
8. APITONG	Dipterocarpus spp.	10	1597 (2)	-	-	-	-	-	1597			
9. ALAN	Shorea albida	1	1399 (2)	-	-	1399	-	-	-			
10. YELLOW SERAYA	Shorea spp.	10	949 (1)	-	-	-	949	-	-			

1/ Percentages in brackets
2/ Species grouping in Southeast Asia may involve double employment of individual wood species
3/ All production data refer to year 1973 except for Tropical South America
Note: For explanations of symbols and abbreviations see Appendix VI.

2. Occurrence and provenance of wood species

The most significant feature of the tropical moist forest is the heterogeneity of its botanical composition. This is particularly valid for the South American tropical moist forests as the multiplicity of species is extremely accentuated.

Variations of the tropical moist forest type are the riparian and swamp forest near the main rivers and the sea coast especially suitable for water logging. The semi-deciduous forests occurring in areas with a pronounced dry period during the year should also be mentioned. These latter forest types show a less luxuriant vegetation cover. However, restricted ecological conditions show the adaptation of specific tree species resulting in a more gregarious growth and consequently higher volumes per species per ha which often made them more interesting from an economic point of view. In several countries in the region these swamp and riparian forests are even more important than the rain forest proper.

Detailed information on its composition and utilization are not yet available for many parts of the South American tropical forests. However, the following general conclusions may be drawn from experience and the data so far obtained:

i) the number of tree species growing on a given forest area is high, but a major portion, two-thirds or more, of the standing volume is formed by 30 to 50 species only, out of which few species may be considered as dominant;

ii) there are considerable variations from place to place in the botanical composition of the rain forest. These local variations entail diversifications in wood properties which have a particularly unfavourable impact on utilization;

iii) the growing stock may vary between 100-270 m3/ha;

iv) uncontrolled activities have often changed natural vegetation patterns. A considerable portion yet to be defined of the original forest cover has been degraded through shifting cultivation and other uncontrolled activities;

v) the volume of commercial wood removed from natural forests may in a few cases exceed 40 m3/ha, but ranges normally between 5 and 20 m3/ha;

vi) there are about 470 wood species which are more or less known to the trade; of which about 210 are regularly used in appreciable quantities, and about 260 species which are less used.

It is the last point (vi) which is the core of consideration in this study. This point is further substantiated in Appendix I which shows - under A - the names and occurrence of 210 wood species as extracted from the 1971/73 production statistics of Brazil (Amazon), Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Surinam, and French Guiana, which are largely representative of the tropical rain forests in South America. A further 263 species were added - under B - after detailed screening of specialized literature. The technical and commercial aspects related to this grouping are discussed in the following chapters.

For each of the 473 species enumerated in Appendix I the occurrence in a particular country is indicated by what appeared to be the most familiar of the vernacular names used in the country. Broader indications in the literature on the occurrence of individual species referring to ranges and regions etc., were neglected. While this is a safe approach to avoid the introduction of undesirable generalizations, the resulting indications may be somewhat incomplete. Additions regarding the occurrence of individual species will be made as and when detailed information becomes available. Exact boundaries determing the occurrence of individual species in the wider

Amazone Region are generally not known. However, some countries have made investigations for a few commercial timbers such as VIROLA (192-198), CAOBA (175), CEDRO (48-49), BALSA (122) and GREENHEART (131). This means that in cases where resource surveys are carried out in hitherto untouched areas, species may occur which originally had not been expected in the area (see above points (i) and (ii)). Therefore, the inventory specialist may find it appropriate to study the botanical and other pertinent characteristics of commercial species before starting specific surveys.

No attempt is made in this study to relate country data on forest production with those on occurrence. The resulting information would have been of some use but not fully conclusive because of the lack of quantitative resource data. However, comparisons of occurrence and trade are possible, based on data contained in Appendices I, III IV and V. Comparisons could disclose discrepancies showing for instance the occurrence of a specific species in a particular country where there is no indication of produotion or trade. One reason for neglecting such species may be quality problems related to provenance. Other reasons could be insufficient supplies or under-utilization of resources in a given area.

Provenance is indeed for several species a significant factor for commercial acceptance, but specific information or knowledge by species and countries is scarce. Some information indicates that for low and medium density wood species which occur in the "terra firme forests" as well as in the "varzea forests" along the rivers of the wider Amazon region species of the "varzea forests" show slightly inferior quality and lower density than those of the "terra firme forests". However this phenomenon has not been confirmed as yet and further specific investigations are needed. Problems arise normally only in relation to the decorative value of the veneer surface and are generally less accentuated with regard to sawnwood. However, in the context of this study, it is necessary to draw attention to the existence of possible quality differences in wood species from various provenances. This aspect should not be neglected in forest surveys and preinvestment studies.

It is only natural that commercial wood species are better known than those species which as yet have only been partly or not at all introduced into trade. This fact is clearly demonstrated in Appendix I through a comparison of part A with part B. The various columns in part A reveal a more compact pattern than the distribution in part B where empty spaces occur between the vernacular names. In several cases individual wood species under B may in fact occur less frequently than under A, but the prevailing "empty space" pattern under B suggests that knowledge on occurrence of species is generally much smaller.

Knowledge is also restricted with regard to properties, characteristics and other technical information, which is dealt with in Chapters 4 and 5 in more detail. However, in order to get an impression of the species mix and the requirements for log conversion into sawnwood and veneer, the following results of a survey made by Hallewas et al in 1966 in the mature forest of Caxuana (Amazon) might be taken as an example, but not applied in general.

Total volume per ha:	in m3	or per cent
trees above 25 cm BHD 1/	219	100
trees above 45 cm BHD	155	71
(1) species which can be sawn		
(a) without hardmetal sawteeth	45	21
(b) with hardmetal sawteeth	135	62
(2) species which can be peeled and sliced	28	13

1/ Diameter at breast height

3. The performance of wood species in production and trade

In this study considerations of the commercial performance of wood species are based on statistical information obtained from nine South American countries in the Amazon forest area. These countries are Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, Surinam and French Guiana. Their production and export statistics for the period between 1971 and 1973 reveal the names of 125 commercial timbers, but rather incomplete indications of the quantities exported. The ten most important timbers of each country are summarized in Table 5, and further specified in Appendices I to V. The item "unspecified" summarizes wood species which are only produced in very small quantities.

For the purpose of this study the term "commercial" is used for timbers with production or exports exceeding 1000 m3/year. The term "lesser-used" is applied to all those species which are either not used at all, or only in quantities up to 1000 m3 annually, or exported. Chapter 5 deals specifically with lesser-used species.

One wood species - VIROLA (192-198) - accounted for 24 per cent of the aggregate saw- and veneer log production and 37 per cent of the total exports in the period from 1971 to 1973. The first ten commercial woods including VIROLA (192-198), CAOBA (175), CEDRO (48,49), BALSA (122), ANDIROBA (36,37), SAJO (35), LOURO INHAMUY (125), SAQUI-SAQUI (24), EUCALIPTO (88), and GREENHEART (131), accounted for 50 per cent of the saw- and veneer log production, and 68 per cent of the exports.

The above term "commercial" - particularly when applied to species produced in quantities above 10 000 m3/year - is by no means an indication of the potential for individual species, but an indication of their present and past position on the market. However, it seems reasonable to assume that a particular wood species which has been exported in quantities above 1000 m3, or even 10 000 m3 per year as sawn and/or roundwood, should be sufficiently well known to both industry and trade to exclude doubts as to its future suitability - at least for the purposes it has been used for so far. Moreover, it should be possible - provided the parties concerned agree to collaborate - to derive sufficient experience from the use of quantities above 1000 m3 per year and to indicate more clearly what the prospects for an individual species on a given market might be. Such investigations might, however, become somewhat complex and difficult if the exports of the species concerned are scattered over several receiving countries and various end-users.

The grouping of "commercial" species into quantities (a) above 10 000 m3/year, and (b) from 1000 to 10 000 m3/year - useful as it may be for the purpose of this study - throws up a further consideration related to the "market ceiling" of individual species. Although realizing the hypothetical nature of market ceilings, which cannot be assessed in quantitative terms, it is useful to refer to it in this context in order to illustrate the slight reservation with regard to the above grouping. For utility timbers the market ceiling on a given market is much higher than for decorative veneer qualities. For example, the market ceiling for SUCUPIRA (72,73) - a reasonably well-known medium value and decorative wood species - is probably much lower than for PEINEMONO (12-14) which is a relatively little known utility type wood species. Both were produced in 1971-73 in similar quantities.

The exchange of information is of great importance for promoting the market acceptance of South American tropical woods. Many wood species occur in all nine countries, but most species are produced and made use of only in a few. Most of the timbers - 83 per cent - are produced in commercial quantities in only one or two countries and are lesser-used wood species, or non-existent, in the remaining countries. Not one single species is produced in all nine countries. Another interesting aspect is that most of the countries involved in this study have different preferences for commercial timbers, and that the ten most important timbers in each country account for 73 to 97 per cent of the total saw- and veneer log production as shown in Table 5.

Table 5 : SAW- AND VENEER LOG PRODUCTION IN PER CENT OF TOTAL LOCAL PRODUCTION[1] OF THE TEN MOST IMPORTANT TIMBERS BY COUNTRIES

Pilot name	Ref.No. Appendix I	1972	1973	1973	1973	1971	1972	1973	1973	1971	Percentage of total production	Accumulated Percentage
Virola	192-198	34	2	..[2]	1	41	+	1	29	1	24.0	24.0
Caoba	175	6	68	5	+[3]	+	4	+			6.0	30.0
Cedro	48,49	3	..	20	2	1	..	+	..	8	3.8	33.8
Balsa	122	+	+	+	44	+	+	+		+	3.5	37.3
Andiroba	36,37	5		+	2	3	+	2	13	1	3.2	40.5
Sajo	35	+			+	15					2.6	43.1
Louro inhamuy	125	5									2.2	45.3
Saqui-saqui	24	+		+		..	22				1.8	47.1
Eucalipto	88			18		..					1.7	48.8
Greenheart	131	+		+			+	50	+		1.7	50.5
Mijao	8	+		+	1	1	17			+	1.5	52.0
Andiroba jareua	9	3					+				1.5	53.5
Muiratinga	134	3									1.4	54.9
Assacu	98	1	11	..		+	4	+	..	+	1.3	56.2
Cuangare	66-68			+	16	+	+				1.2	57.4
Cativo	161		+			7	+				1.2	58.6
Laurel	59	+	+	+	10	+	4	+			1.1	59.7
Ceiba	51	1	+	+	+	3	+	+	+	+	1.0	60.7
Saman	147			+			13				1.0	61.7
Cupiuba	92	1		+		+	+	11	13	11	1.0	62.7
Louro	123	2		..	+	+	+	+	+	+	1.0	63.7
Roble corriente	123	..		10	+	+	+	+	+	+	0.9	64.6
Tornillo	50	..		9		+					0.9	65.5
Maparanjuba	111,112	2		+		+					0.9	66.4
Apamate	178		+			2	6				0.9	67.3
Jacareuba	31-34	1	..	2	1	1	+	+	+	+	0.8	68.1
Sucupira mata	26	2									0.7	68.8
Abarco	38	+				4	+				0.7	69.5
Lupuna	54	+	+	7							0.7	70.2
Sande	30	+			4	2	+				0.7	70.9
Moreillo	80	+					7				0.6	71.5
Caraño	63,162	..	13	+	+	1					0.5	72.0
Quaruba	200,208	1	+	+	+	+	+	+	+	43	0.5	72.5
Wallaba	76-79	+					+	9	12	+	0.5	73.0
Guayabo	181,182,184	+		2	1	1	+	+			0.5	73.5
Carretto	17-20	+		+		2	+	+	+	+	0.4	73.9
Marupa	172	1	+	..	+	+	+	2	1	1	0.4	74.3
Charo	27,28	..	+	+	+	1	3				0.4	74.7
Copaiba	55-58	..		2		+	+				0.4	75.1

Table 5: contd.

Pilot name	Ref.No. Appendix I	1972	1973	1973	1973	1971	1972	1973	1973	1971	Percentage of total production	Accumulated percentage
Purpleheart	140-145	..	+	+		+	+	5	+	+	0.4	75.5
Acapu	209	1		+				+	5	+	0.4	75.9
Sucupira	72,73	1		+			+	2	1	+	0.3	76.2
Peinemono	12-14	+		+	+	2	+	+	+		0.3	76.5
Fernan Sanchez	188			+	4						0.3	76.8
Moena	124,128-130	+		4				+	+	+	0.3	77.1
Chanul	97				4	+					0.3	77.4
Cedro rojo	47						4				0.2	77.6
Wana	132	..		+				+	4	22	0.2	77.8
Mora	115						+	6	+	+	0.2	78.0
Basralokus	69	+							10	1	0.2	78.2
Dukali	136	..						4	+		0.2	78.4
Jigua	120,121	+		+	2	+					0.1	78.5
Kereti	127,130	+		+				4	+	+	0.1	78.6
Anime	64,65,163				1						0.1	78.7
Mandioqueira	164-170	..		+			+		2	1	0.1	78.8
Moradillo	109	+	2		+	+	+				0.1	78.9
Pisi	126-130,133	+		+				+	3	+	..	
Manbarklak	83-87	..		+	+		+	..	3	+	..	
Almendrillo	180	+	1							+	..	
Sub-total in per cent		73	97	79	93	87	84	96	96	89	78.9	

1/ For production figures by quantity see Appendix III
2/ .. Local production less than 1 per cent
3/ + Occurrence of wood species, but no indication of actual production available

These timbers and their local production indicated in percentage, are as follows:

Brazilian Amazone, 1972: VIROLA (192, 197,198) - 34%, Mogno (CAOBA 175) - 6%, ANDIROBA (36) - 5%, LOURO INHAMUY (125) - 5%, CEDRO (48) - 3%, ANDIROBA JAREUA (9) - 3%, MUIRATINGA (134) - 3%, LOURO (123) - 2%, MAPARANJUBA (111,112) - 2%, SUCUPIRA MATA (26) - 2%.

Bolivia, 1973: Mara (CAOBA 175) - 68%, Laurel (CARANO 162) - 10%, Ochoo (ASSACU 98) - 11%, MORADILLO (109) - 2%, Sangre de toro (VIROLA 192) - 2%, ALMENDRILLO (180) - 1%.

Peru, 1973: CEDRO (48) - 20%, EUCALIPTO (88) - 18%, ROBLE CORRIENTE (123) - 10%, TORNILLO (50) - 9%, LUPUNA (54) - 7%, CAOBA (175) - 5%, MOENA (124,128-130) - 4%, COPAIBA (56-58) - 2%, Alfaro (JACAREUBA 32) - 2%, Roble amarillo (GUAYABO 181,184) - 2%.

Ecuador, 1973: BALSA (122) - 44%, CUANGARE (66-68) - 16%, LAUREL (59) - 10%, FERNAN SANCHEZ (188) - 4%, SANDE (30) - 4%, CHANUL (97) - 4%, CEDRO (48) - 2%, Tangere (ANDIROBA 36) - 2%, JIGUA (120,121) - 2%, ANIME (64,65,163) - 1%.

Colombia, 1971: VIROLA (192) - 41%, SAJO (35) - 15%, CATIVO (161) - 7%, ABARCO (38) - 4%, Guino Tangere (ANDIROBA 36) - 3%, CEIBA (51) - 3%, Roble (APAMATE 178) - 2%, CARRETTO (17-20) - 2%, SANDE (30) - 2%, PEINEMONO (12-14) - 2%.

Venezuela, 1972: SAQUI-SAQUI (24) - 22%, MIJAO (8) - 17%, SAMAN (147) - 13%, MOREILLO (80) - 7%, APAMATE (178) - 6%, CAOBA (175) - 4%, Jabillo (ASSACU 98) - 4%, CEDRO ROJO (47) - 4%, Pardillo (LAUREL 59) - 4%, CHARO (27,28) - 3%.

Guyana, 1973: GREENHEART (131) - 50%, Kabukalli (CUPIUBA 92) - 11%, WALLABA (76-79) - 9%, MORA (115) - 6%, PURPLEHEART (140-145) - 5%, KERETI (127,130) - 4%, DUKALI (136) - 4%, Crabwood (ANDIROBA 36,37) - 2%, Simarupa (MARUPA 172) - 2%, Tatabu (SUCUPIRA 73) - 2%.

Surinam, 1972: Baboen (VIROLA 195-197) - 29%, Krapa (ANDIROBA 36) - 13%, Kopi (CUPIUBA 92) - 13%, WALLABA (76-79) - 12%, BASRALOKUS (69) - 10%, Bruinheart (ACAPU 209) - 5%, WANA (132) - 4%, PISI (130) - 3%, MANBARKLAK (83-87) - 3%, Gronfolo (MANDIOQUEIRA 164-170) - 2%.

French Guiana, 1971: Kouali (QUARUBA 200-208) - 43%, Grignon franc (WANA 132) - 22%, Goupi (CUPIUBA 92) - 11%, Cedrat (CEDRO 48) - 8%, Yayamadou (VIROLA 192-198) - 1%, Carapa (ANDIROBA 36,37) - 1%, Simarouba (MARUPA 172) - 1%, Angelique (BASRALOKUS 69) - 1%, Grignon feu (MANDIOQUEIRA 165-170) - 1%, Manil (ANANI 176) - 1%.

Of the various species mentioned above, the first three to five timbers in each country are low or medium density woods which represent more than fifty per cent of the total saw and veneer log production in the respective countries. However, in Guyana the first five timbers, notably GREENHEART (131), are high density woods representing 81 per cent of the saw- and veneer log production of Guyana. This exceptional utilization of high density timbers in the Guyana market throws some light on the complexity of market acceptance of wood species, and on how resources composition and the resulting supply situation influences end use patterns.

Grouping of wood species by timbers of the same family and/or genus is occasionally practiced in South American trade. The most important example of grouping practices seems to be within the Myristicaceae genera Dialyanthera, Iryanthera, Osteophloem and Virola. Among a great number of different trade- and vernacular names the most appropriate name used in the country is indicated below. The reference numbers in brackets refer to Appendix I. In Brazil, the above-mentioned Myristicaceae are grouped under the names VIROLA (192,197,198) and Ucuúbarana (135,1120,1157), in Peru under Cumala (192,197,1120). In Ecuador CUANGARE (66-68) and Chalviande (135,193,196,197, 1120,1157) are applied. In Colombia Cuangare (68,1121) is common, together with Sangre

de toro (196,1157) which is also used in Bolivia for Virola sp. (192). In Guyana, Surinam and French Guiana only species of Virola spp. are grouped together under the trade names Dalli (195-197), Baboen (195-197) and Yayamadou (192,196,197) respectively.

The compilations of Table 6 show that Myristicaceae timbers do not always have the same use properties, and the existing gaps indicate that in some cases use properties still need to be determined. Similar inconsistencies and information gaps seem to exist also in other grouping practices, i.e. Sapoteceae under ABIURANA (114,157-160) in Brazil, Burseraceae under ANIME (64,65,163) in Ecuador and Lauraceae in nearly all countries concerned. These groups therefore appear to be more the result of local sales practices than of the application of sound technical criteria based on similarity of use properties. Another point which has also caused some uncertainty in both domestic and export markets is the selling of lesser-used wood species under the name of a similar commercial timber, instead of promoting these lesser-used species with a view to establishing their own market on the merits of their own properties.

However, as long as no more detailed and comprehensive information on the use properties by wood species is available, grouping practices are likely to be based more on general appearance and market customs than on well-defined criteria which must still be established. In this context it is emphasized that detailed studies should be carried out to clarify the market potential of species or groups of species. Such detailed information would be needed to support specific preinvestment studies, but in order to be meaningful, market studies must be complemented by appropriate resource data.

Table 6. USE PROPERTIES[1/] OF MYRISTICACEAE OF TROPICAL SOUTH AMERICA

Scientific Name	Ref.No. Appendix I	DENS	WORK	SHRI	FINI	STRE	DURA
Dialianthera gordoniaefolia	66	L	A		A	C	C
" gracilipes	67	L		C		C	
" otoba	68	L	A				C
" parvifolia	1075	M	A	B	A		
Iryanthera spp.	1120						
" juruensis	1121	L	A	B	A	B	C
Osteophloem platispermum	135	L		B			C
" sp.	1157	M					
Virola sp.	192						
" dixonii	193						
" kuchakana	194	L		B			
" melinonii	195	M	A	B	A	B	C
" sebifera	196	M	A	B	A	B	C
" surinamensis	197	M	A	C	A	B	C
" venosa	198	U	A		A		

1/ For explanations of symbols and abbreviations see Appendix VI

Table 7 shows the position of the 125 commercial timbers and the degree of their actual acceptance in export markets which is marked by ** when exported quantities exceeded 10 000 m3 per year, or * when exports remained below 10 000 m3 per year (see Appendices III, IV and V for further details).

Table 7: PERFORMANCE OF WOOD SPECIES IN TRADE

A. Commercial timbers - production above 10 000 m3 per year:

** CEDRO	48,49	** VIROLA	192-198
** BALSA	122	** CAOBA	175
** ANDIROBA	36,37	* SANDE	30
SAJO	35	* PAU AMARELO	89

Table 7: contd.

	LOURO INHAMUY	125
	SAQUI-SAQUI	24
	EUCALIPTO	88
**	GREENHEART	131
	MIJAO	8
**	ANDIROBA JAREUA	9
*	MUIRATINGA	134
*	ASSACU	98
*	CUANGARE	66-68
	CATIVO	161
*	LAUREL	59
*	CEIBA	51
	SAMAN	147
*	CUPIUBA	92
*	LOURO	123
*	ROBLE CORRIENTE	123
	TORNILLO	50
**	MAPARANJUBA	111,112
	APAMATE	178
	JACAREUBA	31-34
	SUCUPIRA MATA	26
	ABARCO	38
	LUPUNA	54
*	CEREJEIRA	7,110
	NATO	116,117
**	WANA	132
*	MORA	115
	MORILLO	80
	CARANO	63,162
*	QUARUBA	200-208
**	WALLABA	76-79
*	GUAYABO	181,182,184
**	COURBARIL	99
	CARRETTO	17-20
*	ANGELIM	101-103
*	MARUPA	172
*	PIQUIA	41
	CHARO	27,28
*	COPAIBA	55-58
*	PURPLEHEART	140-145
*	FREIJO VERMELHO	60
*	ACAPU	209
*	SUCUPIRA	72,73
	PEINEMONO	12-14
*	PAU D'ARCO	177
	FERNAN SANCHEZ	188
	MORENA	124,128-130
	CHANUL	97
	CEDRO ROJO	47
*	MACACAUBA	150-153
**	BASRALOKUS	69
*	DUKALI	136
	VARA PIEDRA	42-44

B. Commercial timbers - production between 1000 and 10 000 m3 per year:

	JIGUA	120,121
	KERETI	127,130
	ULCUMANO	156
	ENCENILLO	210
	PARICARANA (L)	148
	PERILLO BLANCO	94
	CAMORUCO	173
*	SERINGA	93
	ANIME	64,65,163
	SANGRE DE GALLINA	199
	SEBO	135
*	MANDIOQUEIRA	164-170
*	ARARACANGA	15,16
	MOROTOTO	70
	AMARILLO	119
	CHAQUIRO	155
	CHAGUACA	191
*	ANANI	176
	MORADILLO	109
	HIGUERON	90,91
	CONGONA	29
	SAJO (M)	52
	DIABLO FUERTE	154
	MONDEY	82
*	PAU MARFIM	1
*	LOURO AMARELO	10
*	MUIRACATIARA	21
*	TATAJUBA	22
*	ANGELIM PEDRA	71
	CUMARU	74
	SUCUPIRA AMARELA	75
	CATAUBA	81
	UMIRI	96
*	JUTAI	100
	CAROBA	104
	ITAUBA	113
	ANGELIM RAJADO	146
*	ABIURANA	114,157-160
	ITAUBARANA	174
*	TACHI PRETO	179
	TANIBOUCA	183
	FAVEIRA	137-139,190
*	TAURONIRO	95
*	PISI	126-130,133
*	MANBARKLAK	83-87
	COPAL	187
	ISHPINGO	6,7
*	NOGAL	105,106
*	ALMENDRILLO	180
*	BAROMALLI	45,46
	PERILLO NEGRO	61
*	MANNIBALLI	118
	DUKURIA	171
*	HUBUBALLI	108
*	PARCOURI	149
*	SALI	185,186

Table 7: contd.

CASTANHA PARA	23	* HAIARI	3-5
PARICARANA (H)	25	DRAGO	62
PIQUIARANA	39,40	* SILVERBALLI	11,107
AMOEIRA	53	ANGELIM AMARGOSO	189

4. Evaluation of use properties and commercial acceptance

The description of properties in the specialized literature is sometimes incomplete and data are often incomparable. Under these circumstances it is rather difficult to conduct a detailed analysis of wood properties, which is aimed at comparability. However, a certain degree of comparability can be achieved by establishing groups of properties and by using a simple classification system. This approach still implies that the specialized literature needs to be reviewed and scrutinized carefully, only the results are presented in a summary fashion. Appendix II summarizes use properties for 210 commercial and 263 lesser-used species for which a simple use classification into A - good, B - medium, and C - bad is used. The 210 commercial wood species as is apparent from Appendix III, are partly grouped, and result in 125 "commercial timbers".

The following appraisal of commercial acceptance of these commercial timbers employs data extracted from Appendices II to VI on use properties, wood values, and indications on production and trade. The appraisal is based on density grouping because of the general significance of density for the uses of wood. However, there are a few problems: the two genera (62) Croton spp. - DRAGO - and (88) Eucalyptus spp. - EUCALIPTO - could not be grouped within this pattern due to the great density variation among the various species of the respective genus. Another problem arises when classifying use properties because of the considerably high number of commercial species for which no, or very little basic technical information is available. Moreover there are 18 timbers which are not yet botanically specified. Accordingly only 89 commercial wood species - less than one-half - have complete records on all use properties and only these species could be fully evaluated.

The analysis of the 125 commercial timbers revealed that the following gaps exist for the respective use properties:

Density	:	for 2	commercial timbers
Workability	:	for 19	" "
Shrinkage	:	for 36	" "
Finishing	:	for 25	" "
Strength	:	for 43	" "
Durability	:	for 22	" "
Logform	:	for 15	" "

From this ennumeration it is apparent that the greatest gap in information occurs for strength and shrinkage properties, with 35 per cent and 29 per cent respectively, followed by finishing (20 per cent), durability (18 per cent), workability (15 per cent) and log form (12 per cent). The information on density is fairly complete. Of course, for some of the more frequently occurring wood species, in particular, it seems advisable to study density in relation to provenances, and possibly to sites. In some cases it might be necessary to study variations of density within individual trees for determining the technical suitability of difficult species.

The low density wood species accounted in 1971/73 for 14 per cent of the total saw- and veneer log production and 4 per cent of log exports, including the roundwood equivalent of sawnwood exports. The species generally show good workability and finishing properties, good to medium log form and shrinkage properties, medium to low strength properties and low durability. However, it should be noted that the durability of most of the low density timbers can easily be improved through preservation with the exception of CEDRO ROJO (47) which could not be treated by means of the diffusion process and with creosote, according to test results so far available.

Most light species are utility woods for peeled and occasionally sliced veneer production and fetch low to medium prices. Degrade logs are sawn and only obtain low prices. BALSA (122) which accounts for 3.5 per cent of 1971/73 production and exports is the lightest commercial timber and is traditionally used for insulation, patterns and toys. It became popular during the first World War, and large quantities have been

Table 8. LOW DENSITY WOOD SPECIES (up to 0.5 g/cm3)

Pilot name	Ref. No.	WORK	SHRI	FINI	STRE	DURA	LOGF	Wood Value S P V	Percentage in 1971/73 2/ Production Logs	Exports Logs and Sawnwood
BALSA	122	B	B	B	C	C	A	2 2 2	3.5	3.5
SAJO	35	A	A	A	C	C	B	1 1 -	2.6	-
MIJAO	8	A	A	A	C	B	A	1 1 -	1.5	-
ASSACU	98	A	A	A	B	B	A	1 1 2	1.3	0.1
CUANGARE	66-68	A	C		C		A	2 3 -	1.2	0.3
CEIBA	51	A	B	A	C	C	A	1 1 -	1.0	0.1
LUPUNA	54	A		A		C	A	1 1 -	0.7	-
MARUPA	172	A	B	A	B	C	A	1 1 -	0.4	0.1
FREIJO VERMELHO	60	A	A	A		B	A	2 3 3	0.4	0.1
PEINEMONO	12-14		A			C	B	1 - -	0.3	-
CEDRO ROJO	47		B		B	B	B	2 2 -	0.3	-
PARICARANA	148	A		A		C	B	1 2 -	0.1	-
CAMORUCO	173							1 - -	0.1	-
SERINGA	93	A	A			C	A	1 1 -	0.1	..
SEBO	135		B			C	A	1 - -	0.1	-
HIGUERON	90,91	A		A		C	A	1 - -	0.1	-
CAROBA	104	A	B	A	C	C	A	1 1 -	.. 1/	-
COPAL	187		A					1 - -	..	-
HAIARI	305	A	B	A	B	B	B	1 1 -	..	..

Evaluation of properties for above wood species:

	Good A	Medium B	Bad C	No indications
Workability	13	1	-	5
Shrinkage	7	7	1	4
Finishing	11	1	-	7
Strength	-	4	6	9
Durability	-	5	11	3
Log form	12	5	-	2

1/ Below 0.1 per cent or exact figures not available
2/ For details see Appendix III

consumed since then in the manufacture of lifebuoys and rafts. SAJO(35) and ASSACU(98) to some extent resemble the two most important tropical timbers of Africa, Okoume and Obeche respectively, and have been used for box board and plywood manufacture, furniture, moulding and carpentry. MIJAO (8), is suitable for veneer, inexpensive furniture, general carpentry and light constructions, but the most important product of this species is the Cashew nut and therefore it is protected from exploitation in Brazil. CUANGARE (66-68) and FREIJO VERMELMO (60) furnish the more valuable veneers of the low density wood species and furthermore are utilized locally to a limited extent for boxes and interior construction. CEIBA (51) and MARUPA (172) although fairly well known tropical timbers for core veneer, boxes and other low grade uses, were exported only in small quantities. The remaining timbers LUPUNA (54), CEDRO ROJO (47), PARICARANA (148), SERINGA (93), CAROBA (104), and HAIARI (3-5) have been used almost exclusively locally for low cost veneer and plywood manufacture and together with PEINEMONO 912-14), CAMORUCO (173), SEBO (135), HIGUERON (90,91) and COPAL (187) as low cost sawnwood for general utility purposes.

It should be noted that for CAMORUCO and COPAL very little, if any, information is available with regard to use properties.

Table 9. MEDIUM DENSITY WOOD SPECIES (0.5 to 0.65 g/cm3)

Pilot name	Ref. No.	WORK	SHRI	FINI	STRE	DURA	LOGF	Wood Value S P V	Percentage in 1971/73 1/ Production Logs	Exports Logs and Sawnwood
VIROLA	192-198	A	B	A	B	C	A	1 2 -	24.0	37.0
CAOBA	175	A	A	A	B	B	A	1/2 2 3	6.0	18.0
CEDRO	48,49	A	A	A	B	B	A	2 2 3	3.8	2.2
ANDIROBA	36,37	A	B	A	A	B	A	1 1 -	3.2	6.4
LOURO INHAMUY	125	A		A			A	1 - -	2.2	-
SAQUI-SAQUI	24	A	B	A	B	B	A	1 1 -	1.8	-
CATIVO	161	A	C	A	B	C	A	1 1 2	1.2	-
LAUREL	59	A	B	A	B	A	A	2 2 2	1.1	..
SAMAN	147	A	A	A		A	A	1 1 -	1.0	-
LOURO	123	A	B	A	B	B	A	1 - -	1.0	0.1
ROBLE CORRIENTE	123	A	B	A	B	B	A	1 - -	0.9	-
APAMATE	178	A	B	A	B	B	B	1/2 - 2	0.9	-
JACAREUBA	31-34	A	B	A	B	B	A	1 1 2	0.8	-
SANDE	30	A	B	A	C	C	B	1 1 -	0.7	..
MORELLO	80	A	C		B	B	A	1 1 -	0.6	-
CARANO	63,162	A	B	A	A	C	A	1 1 -	0.5	-
QUARUBA	200-208	A	C	A	B	B	A	1 1 -	0.5	0.1
PAU D'ARCO	177							1 - -	0.3	0.1
FERNANSANCHEZ	188	A	A	A		C	B	1 - -	0.3	-
MORNA	124,128-130	A	B	A	C	B	A	1 - -	0.3	-
CEREJEIRA	7,110							1 1 -	0.2	0.1
WANA	132	A	B	A	B	A	A	1 - -	0.2	0.6
DUKALI	136	A		A		C	A	1 - -	0.2	0.4
JIGUA	120,121							1 - -	0.1	-
ULCUMANO	156							1 1 -	0.1	-
ENCENILLO	210	A		A		B	B	1 - -	0.1	-
PERILLO BLANCO	94	A	C	A	B	C	A	1 - -	0.1	-
ANIME	64,65,163	A	B	A	B	C	A	1 1 -	0.1	-
MOROTOTO	70	A	B	A	C	C	A	1 1 1	0.1	-
AMARILLO	119	A	B	A	B	B	B	1 - -	0.1	-
CHAQUIRO	155	A	B	A	A	C	B	1 - -	0.1	-
SAJO	52	A	B	A	B	A	B	1 - -	0.1	-
DIABLO FUERTE	154							1 1 -	..	-
MONDEY	82	A		A		B	B	1 - -	..	-
FAVEIRA	137-139,190	A	B	A	B	C	A	1 - -	..	-
PISI	126-130,133	A	B	A	C	B	A	1 - -	..	..
ISHPINGO	6,7	A	B	A		B	B	1 1 -	..	-
NOGAL	105,106	A	B	A	B	A	A	1 2 2	..	..
BAROMALLI	45,46	A	C	A	B	C	A	1 1 -	..	..
PERILLO NEGRO	61	A	B	A	A	C	A	1 - -	..	-

Evaluation of properties for above wood species:

	Good A	Medium B	Bad C	No indications
Workability	35	-	-	5
Shrinkage	4	22	5	9
Finishing	34	-	-	6
Strength	4	20	4	12
Durability	5	16	13	6
Log form	26	9	-	5

1/ For details see Appendix III

The medium density wood species as shown in Table 9 accounted in 1971/73 for 53 per cent and 65 per cent of the total saw- and veneer log production and exports respectively; they show particularly good workability and finishing properties and generally have a good log form and medium shrinkage, strength and durability properties. This group comprises the most important commercial timbers of the region.

VIROLA (192-198) - a traditional commercial timber - accounted for 24 per cent of the total production and 37 per cent of the exports. It is very suitable for veneer and plywood manufacture and is generally used for these purposes, but also for cases, cheap furniture, matches, etc. CAOBA (175) and CEDRO (48,49) are the classic timbers of Latin America and could be used wherever attractive and dimensionally stable wood is required. The more important applications for CAOBA are for house and office furniture, architectural woodwork and panelling, cabinets, models and foundry patterns, boats and ships, sculpture, turning, carving and decorative veneers whereas CEDRO is recommended for cabinets, patterns, musical instruments, boats, decorative veneer and millwork. ANDIROBA (36,37) or Crabwood, is in demand for general construction and carpentry, housebuilding, panelling, flooring, furniture and cabinet making.

These four timbers - VIROLA, CAOBA, CEDRO, ANDIROBA - cover 99 per cent of the exports of the medium density timbers or 64 per cent of the total exports. The remaining 36 medium density timbers have so far only been accepted by the local markets. LOURO (123), QUARUBA(200-208), PAU D'ARCO (177), CEREJEIRA (7,110), WANA (132), and DUKALI (136) were exported in small quantities. These general utility timbers are used as sawnwood for interior construction and general manufacturing, QUARUBA and CEREJEIRA have already been peeled satisfactorily.

Of the local timbers, without any reported exports, the following species, CATIVO (161), LAUREL (59), JACAREUBA (31-34), and NOGAL (105,106) are suitable for decorative veneer production, SAQUI-SAQUI (24), SAMAN (147), SANDE (30), MORELLO (80), CARAÑO (63,162), ULCUMANO (156), ANIME (64,65,163), MOROTOTO (70), DIABLO FUERTE (154), ISHPINGO (6,7), BAROMALLI (45,46), are used for veneer manufacture, but also as sawnwood together with LOURO INHAMUY (125), ROBLE CORRIENTE (123), APAMATE (178), FERNAN-SANCHEZ (188), MOENA (124,128-130), JIGUA (120,121), ENCENILLO (210), PERILLO BLANCO (94), AMARILLO (119), CHAQUIRO (155), SAJO (52), MONDEY (82), FAVEIRA (137-139,190), PISI (126-130,133), and PERILLO NEGRO (61) known as medium-heavy utility timbers. With regard to use properties, no or only slight information is available for PAU D'ARCO (177), JIGUA (120,121), ULCUMANO (156), DIABLO FUERTE (154), and CEREJEIRA (7,110).

The medium density wood species, as well as the low density species, are the preferred timbers for veneer and plywood manufacture and fetch low to medium prices. The value of saw- or peeler quality species mentioned in this group does not exceed class 2-medium. This is also valid for the sliced veneer category where only CAOBA (175) and CEDRO (48,49) fetch class 3-intermediate price levels (Appendix VI).

The upper density wood species as shown in Table 10 accounted for 7 per cent of the 1971/73 total saw- and veneer log production and thus only one-eighth of the quantity of the medium density species. Their average properties seem to be superior to those of the medium density group, as wood species with good to medium properties prevail. Workability is somewhat below average, but most species show good finishing and strength properties, good log form, good to medium durability and medium shrinkage properties.

ANDIROBA JAREUA (9), ARARCO (38), COPAIBA (55-58), and BASRALOKUS (69), are suitable for a variety of purposes which either capitalize on the woods' attractive appearance which lead them to decorative sliced veneer production, or on their strength and durability which suit them for heavy, marine and bridge construction, house-framing and exterior siding, furniture and cabinet work, parquet flooring etc. CASTANHA PARA (23) also furnishes both good joinery timber and decorative sliced veneer and is known as one of the largest trees of northern South America. It is of prime importance economically in the Amazon region, though its main value is not in its timber, but in its seeds, the Brazil nuts. MUIRATINGA (134) is exclusively used for plywood manufacture. PAU AMARELO (89), a very attractive timber, is used for decorative work, generally as sawn-

Table 10. UPPER DENSITY WOOD SPECIES (0.85 to 0.80 g/cm3)

Pilot name	Ref. No.	WORK	SHRI	FINI	STRE	DURA	LOGF	Wood Value S P V	Percentage in '71/3 Production Logs	Exports Logs and Sawnwood
ANDIROBA JAREUA	9	B			A	A	B	1 - 2	1.5	2.4
MUIRATINGA	134	B					A	- 1 -	1.4	..
TORNILLO	50	A		A		B	A	1 - -	0.9	-
ARARCO	38	A	B	A	A	A	A	1 - 2	0.7	-
PAU AMARELO	89	B		A		B	A	2 - -	0.6	0.1
CHARO	27,28	A	B	A	A	C	A	1 1 -	0.4	-
COPAIBA	55-58	B	B	A	B	A	A	1 - 2	0.4	..
BASRALOKUS	69	A	B	A	B	A	A	1 - 2	0.2	0.6
KERETI	127,130	A	B	A	B	B	A	1 - -	0.1	-
SANGRE DE GALLINA	199							1 1 -	0.1	-
MANDIOQUEIRA	164-170	B	B	A	B	B	A	1 1 -	0.1	0.1
ANANI	176	A	B	A	A	B	A	1 1 -	0.1	..
CONGONA	29							1 - -	0.1	-
LOURO AMARELO	10							1 - -	..	0.1
TATAJUBA	22	A	A	A	A	A	A	1 1 -	..	..
CASTANHA PARA	23	A	B	A		B	A	2 - 3	..	-
AMOEIRA	53	B	A	A	A	A	A	1 - -	..	-
ITAUBA	113	A	B	A		A	A	1 1 -	..	-
TACHI PRETO	179	A						1 1 -	..	..
HUBUBALLI	108	B	B	A	A	B	A	1 - -	..	..
ANGELIM AMARGOSO	189							1 - -	..	-

Evaluation of properties for above wood species:

	Good A	Medium B	Bad C	No indications
Workability	10	7	-	4
Shrinkage	2	10	-	9
Finishing	14	-	-	7
Strength	7	4	-	10
Durability	7	7	1	6
Log form	15	1	-	5

wood. Of the remaining wood species CHARO (27,28), SANGRE DE GALLINA (199), MANDIOQUEIRA (164-170), ANANI (176), TATAJUBA (22), ITAUBA (113), and TACHI PRETO (179) are suitable and occasionally used for peeled veneer and plywood manufacture, together with TORNILLO (50), KERETI (127,130), CONGONA (29), LOURO AMARELO (10), AMOEIRA (53), HUBUBALLI (108), and ANGELIM AMARGOSO (189) used as general-purpose timbers.

With regard to the use properties of MUIRATINGA (134), SANGRE DE GALLINA (199), CONGONA (29), LOURO AMARELO (10), TACHI PRETO (179), and ANGELIM AMARGOSO (189), no or only ligtle information is available.

The value of the upper density wood species on the average is the same of the previous categories. However, it should be noted that because of their greater weight, transport costs also increase. Rising transport costs become an increasingly important economic criteria for market acceptance, particularly for utility qualities.

Such disadvantages might be partially offset by exporting heavy timbers in the form of sawnwood, and this is what actually happens in general with the heavier timbers Moreover, heavy timbers used for specific purposes such as GREENHEART (131) are often cut into pre-ordered dimensions which allows the timber to be more directly and immediately applied by the consumer.

Transport costs are less critical for high value woods. Here efforts are more

concerned with maintaining the optimum value of wood until it can be utilized to its best advantage. This is common practice for many high quality woods - tropical and temperate - such as Black Walnut from the USA, and Sen from Japan. But in the tropical timber trade of South America there has so far been very little demand for the higher valued woods. More recently, exports of Letterwood (1037) from Guyana, have been reported.

Table 11. HIGH DENSITY WOOD SPECIES (0.8 g/cm3 and up)

Pilot name	Ref. No.	WORK	SHRI	FINI	STRE	DURA	LOGF	Wood Value S P V	Percentage in '71/3 Production Logs	Percentage in '71/3 Exports Logs and Sawnwood
GREENHEART	131	B	B	A	A	A	A	1 - 2	1.7	1.5
CUPIUBA	92	A	B	A	A	A	A	1 - 2	1.0	0.4
MAPARANJUBA	111,112	A	C	A		A	A	2 - -	0.9	0.9
SUCUPIRA MATA	26	C	B	B	A	A	A	2 - 3	0.7	-
WALLABA	76-79	B	B	B	A	A	A	1 - -	0.5	0.7
GUAYABO	181,182,184	B	C	A	A	A	A	1 - 3	0.5	..
COURBARIL	99	B	B	A	A	A	A	1 - 2	0.4	1.1
CARRETTO	17-20	B	B	A	A	B	B	1 - -	0.4	-
ANGELIM	101-103	C		A			A	2 - -	0.4	..
PIQUIA	41	A		A			A	1 - -	0.4	0.1
PURPLEHEART	140-145	B	B	A	A	A	A	2 - 3	0.4	0.1
ACAPU	209	B	B	A	A	A	A	2 - -	0.4	..
SUCUPIRA	72,73	B	B	A	A	A	B	2 - 3	0.3	0.1
CHANUL	97	B	B	A	A	A	A	1 - -	0.3	-
MACACAUBA	150-153	B	B	A	A	A	B	3 - 3	0.3	0.1
NATO	116,117			A		A	A	1 - 2	0.2	-
MURA	115	B	B	A	A	A	A	1 - 2	0.2	0.1
VARA PIEDRA	42,44	B	B	A	A	B	B	1 - -	0.2	-
ARARACANGA	15,16	B	B	A	A	A	A	1 - -	0.1	0.1
CHAGUACA	191	A		A		A	B	1 - -	0.1	-
MORADILLO	109	A			A	A	B	1 - -	0.1	-
PAU MARFIM	1	B		A	A	B	B	1 - 2	..	..
MUIRACATIARA	21	A	B	A	A	A	A	2/3 - 3	..	..
PARICARANA	25	C		B	A	A	A	2 - 3	..	-
PIQUIARANA	39,40	B	C	A	A	A	A	1 - -	..	-
ANGELIM PEDRA	71	C		A		A	A	2 - -	..	0.1
CUMARU	74	C	B	A	A	A	A	1 - -	..	-
SUCUPIRA AMARELA	75	B	C	A	A	A	A	2 - 3	..	-
CATAUBA	81		C				B	1 - -	..	-
UMIRI	96							1 - -	..	-
JUTAI	100							2 - 2	..	..
ANGELIM RAJADO	146	C	B	A	B	A	A	2 - -	..	-
ABIURANA	114,157-160	B	B	A	A	B	A	1 - -	..	0.1
ITAUBARANA	174	B		A		A	B	1 - -	..	-
TANIBOUCA	183							1 - -	..	-
TAURONIRO	95	B	B	A	A	A	A	1 - -	..	..
MANBARKLAK	83-87	C	B	B	A	A	B	1 - -	..	..
ALMENDRILLO	180	C		A	A	A	B	1 - -	..	..
MANNIBALLI	118	B		A			A	1 - -	..	..
DUKURIA	171	A	C	A	A	A	B	1 - -	..	-
PARCOURI	149	A	C	A	A	A	A	2 - -	..	..
SALI	185,186	A	B	A	A	A	B	1 - -	..	..
SILVERBALLI	11,107	C	B	A	A	A	B	1 - -	..	0.1

Table 11. contd.

Evaluation of properties for above wood species:

	Good A	Medium B	Bad C	No indications
Workability	9	20	9	5
Shrinkage	-	22	7	14
Finishing	34	4	-	5
Strength	30	1	-	12
Durability	32	4	-	7
Log form	26	14	-	3

The high density wood species accounted for 10 per cent in the aggregate production of saw- and veneer logs in 1971/73 and 5 per cent of the total exports. These timbers are generally used for special purposes and/or heavy construction.

GREENHEART (131) from Guyana - in competition with BASRALOKUS (69) from Surinam and AZOBE from West and Central Africa - due to its resistance to Teredo and marine borers and good strength properties, has a continuous market in marine construction, and because of its fire resistance is the building timber preferred locally for framing, cladding and flooring. CUPIUBA (92) is an excellent all-round purpose timber for general and heavy construction, framing members, furniture, panelling etc. Freshly cut, it has a foetid odour which disappears on drying. Many of the high density timbers such as GREENHEART (131), CUPIUBA (92), SUCUPIRA MATA (26), GUAYABO (181,182, 184), COURBARIL (99), PURPLE HEART (140-145), SUCUPIRA (72,73), MACACAUBA (150-153), NATO (116,117), MORA (115), PAU MARFIM (1), MUIRACATIARA (21), PARICARANA (25), SUCUPIRA AMARELA (75), and JUTAI (100) are suitable for decorative veneer manufacture and fetch medium to intermediate prices. MAPARANJUBA (111,112), ANGELIM (101,103), ACAPU (209), ANGELIM PEDRA (71), ANGELIM RAJADO (146), and PARCOURI (149) are suitable for internal and external joinery being highly resistant and of medium cost. One of the remaining high density timbers which fetch a rather low price is WALLABA (76-79) which has excellent properties for transmission poles, flagstaffs etc., and is particularly used for these purposes. All these timbers, with the exception of CARRETTO (17-20), VARA PIEDRA (42,44), PAU MARFIM (1), and ABIURANA (114,157-160), are suitable for railway sleepers because of their good durability and strength properties.

With regard to the use properties of CATAUBA (81), UMIRI (96), JUTAI (100), and TANIBOUCA (183) no, or only slight information is available.

A comparison between the property evaluation tables of light to high density wood species reveals a completely adverse picture with regard to workability and shrinkage properties on the one hand, and strength and durability properties on the other. Some aspects of this property "switch" between light and heavy woods are based on scientifically established property-density correlations. Strength properties in particular are often closely related to density. The key role which density or specific weight plays in market acceptance is emphasized by the fact that out of a total number of 210 commercial wood species the 102 low and medium density wood species accounted for 67 per cent of the total saw- and veneer log production, and for 69 per cent of total exports, whereas the 108 upper and high density wood species only accounted for 17 and 8 per cent of saw- and veneer log production and exports respectively. In this context it should be noted that a considerable portion of the reported exports of South American tropical woods has not been specified by wood species, i.e. 92 per cent of the saw- and veneer log exports, and 23 per cent of sawnwood exports, were unspecified.

5. The problem of lesser-used wood species

There is hardly any subject related to tropical forestry which has found such wide spread interest in recent years as lesser-used wood species. Yet very little information clarifying the magnitude of the problem has become available. The management of heterogeneous tropical rain forests involves intricate and complex issues, many of which are related to marketing. The presence of many wood species with different and widely varying properties and characteristics poses stubborn problems impeding the full utilization and better management of these forests.

In the course of time various terms have been employed to characterize insufficiently used wood species such as secondary species, lesser-known wood species, weed species, little-used species, etc. None of these terms is associated with an exact description of the circumstances which make a particular species lesser-known, little used or secondary. There are several reasons which make it difficult to arrive at plausible and generally valid definitions, for instance, it may happen that a particular species is little used in one country and fully commercialized in another. Also, in some countries statistics on wood species are insufficiently covered, mainly because of insufficient attention given to collecting production trade and consumption data.

The consequence of applying the term "lesser-used" or "lesser-known" is the implication to make species better known to the forester, the manufacturer and the user. This implies that basic knowledge must be available to support action which is taken to promote better knowledge, with the ultimate aim to obtain better market acceptance. An essential prerequisite for promotional action is the provision of basic knowledge on the qualitative as well as the quantitative or supply aspects of individual and/or groups of species. On the other hand, basic knowledge on wood species should be sufficiently comprehensive to allow conclusions as to whether promotional action is worthwhile.

In Chapter 3 it was suggested to apply the term "lesser-used" wood species in all cases where log production has been below 1000 m3 per annum. Furthermore, all those species were earmarked as "lesser-used" species - at least preliminarily - which have been identified as having commercial potential.

The second part of Appendix II, entitled "Use Properties of South American Tropical Wood Species - B. Lesser-used Species" presents the results of detailed investigations aimed at narrowing down the problem and specifically at assessing the number of species in the "lesser-used" category, i.e., to identify those species which are either used in small quantities or not at all, but which - at least preliminarily - qualify for use in the form of sawnwood, veneer and plywood. The total number so far identified in Appendix II.B amounts to 263. For their selection the following criteria were applied either individually or in combination:

a) wood species which are reported to be produced in quantities below 1000 m3 during the year of reference;

b) wood species which are botanically related to already commercialized wood species;

c) wood species with log form and diameter (LOGF) not below medium (b);

d) average of all use properties not below medium (B).

Selection of lesser-used species is based on 30 publications as mentioned in the bibliography, Appendix VIII. From the relatively ample literature available it is assumed that the number of really unknown wood species which would qualify for inclusion in the "lesser-used" category must be relatively small. It can be seen from Appendix II, that indications on use properties are not always available in sufficient detail to allow classification into either A, B or C corresponding to the three classes

of average use properties as explained in Appendix VI: Explanation of Symbols, Abbreviations and Methods Used.

The classification into A, B and C is an essential basis for the comparison of use properties between the various categories of wood referred to in this study. It also allows - with the reservations made in Chapter 4 - for the comparison of use properties between lesser-used and commercial species, as shown in Table 12.

It is very interesting to see from Table 12 that there are only a few substantial differences in use properties between commercial and lesser-used species. There is first the increase of C in the DURAbility category of Section I which indicates that 72 per cent of the lesser-used species are of low durability, against 45 per cent in the commercial species category. Since percentages are high in both relative and absolute terms, the need for introducing and maintaining the application of suitable wood preservation methods must again be emphasized, particularly for low and medium density species. Secondly, shrinkage properties are somewhat better for commercial species. In the upper and high density species category problems of durability are less accentuated, but those of shrinkage and form stability are moving into the foreground indicating the need to pay attention to proper seasoning. Surprisingly, workability and finishing properties of lesser-used species prove to be almost equal, or sometimes even better, than those of the commercial species.

Table 12. COMPARISON OF USE-PROPERTIES BETWEEN 211 [1/] LESSER-USED AND 172 [1/] COMMERCIAL SOUTH AMERICAN TROPICAL WOOD SPECIES

I. Low and medium density species

	81 Commercial Species			81 Lesser-used Species		
	A	B	C	A	B	C
	.. in per cent ..			.. in per cent ..		
WORK	92	8	-	90	10	-
SHRI	19	59	22	4	78	18
FINI	98	2	-	97	3	-
STRE	8	63	29	9	69	22
DURA	10	45	45	7	21	72
LOGF	72	28	-	49	51	-

II. Upper and high density species

	91 Commercial Species			130 Lesser-used Species		
	A	B	C	A	B	C
	.. in per cent ..			.. in per cent ..		
WORK	35	47	18	53	37	10
SHRI	4	78	18	3	61	36
FINI	92	8	-	100	-	-
STRE	91	9	-	88	12	-
DURA	76	22	2	54	38	8
LOGF	67	33	-	50	50	-

1/ The figures do not add up with the total number of species contained in Appendix II as those species with information gaps on properties had to be omitted.

Note: For explanations of symbols and abbreviations please see Appendix VI.

For all species in the lesser-used species category one factor appears to be of particular significance, namely the characteristics summarized under LOGF - log form and size. As mentioned before, all species with LOGF - grade C have been eliminated from the active list of lesser-used species contained in Appendix II.B, and consequently only those species with A - good and B - medium log form are included in the list. Table 12 reveals that the percentages of good log form (A) change drastically in the low and medium density category from 72 per cent to 49 per cent, and in the upper and high density from 67 per cent to 50 per cent. It is thus obvious that LOGF

- characteristics play a decisive role at present in the market acceptance of tropical woods. This fact is probably related to the higher requirements of the export trade, as for domestic industrial use and processing log form and size requirements are generally less stringent.

Another interesting feature emerges from Table 12 in that the total number of species contained in the upper and high density group with 91 and 130 species is considerably larger than the species in the low and medium density group which are normally finding better market acceptance (see Chapter 4). The above 211 lesser-used species fall under the following density groups:

L - 33
M - 48
U - 49
H - 81

It follows that any promotional effort in favour of lesser-used species must aim at overcoming the technical problems which are related to using heavier woods.

In this context, and in addition to what has been mentioned above on the preparation and conduct of promotional efforts it is emphasized again that use properties of the respective species need to be studied in depth before starting action. It is not the purpose of this study to provide detailed guidelines for the promotion of lesser-used species. However, it is obvious that the study itself provides a useful basis for planning action in this field which would suit individual conditions.

The data on use properties of lesser-used species as can be seen from Appendix II, pages 5 to 9, are not always complete. In many cases information even of a purely empirical nature is not available, and quite often property tests have not been carried out. On the other hand, generally speaking, ample results from research and testing work have been widely published in many languages, not only for commercial woods but also for many lesser-used species. One of the purposes of the present study is to provide, through Appendix II, indications on which species require further investigations and which gaps need to be filled. An analysis of the 263 lesser-used wood species revealed the lack of use property information, as follows:

Density	52	wood species
Workability	98	" "
Shrinkage	120	"
Finishing	141	"
Strength	136	"
Durability	93	"
Log form	76	"

Finishing - 54 per cent, strength - 52 per cent, and shrinkage - 46 per cent, show the greatest lack of information followed by workability (37 per cent), durability (35 per cent), log form (23 per cent) and density (20 per cent). In this context it should also be noted that 41 lesser-used wood species, or 16 per cent, have not yet been botanically specified. (See Appendix I, e.g. Ref.Nos. 6,27,31,62,123 etc.)

Earlier in this chapter reference was made to the fact that it may happen that a particular species is little used in one country and fully commercialized in another. in this respect Appendices I to V allow an exact definition and it is suggested that in Tropical South American countries, those concerned with using or promoting the use of wood species, find out first in which other countries the wood species occur (Appendix I), and then look up the production and trade tables of Appendices III, IV, and V in order to find out in which order of magnitude the species is produced and marketed in other countries. Appendix II on wood properties, together with Appendix VIII on Bibliography, allow them to obtain a picture of the properties and uses of the species concerned which could be further amplified by obtaining supplementary informa-

tion from countries where the species is produced and used in commercial quantities.

The FAO Committee on Forest Development in the Tropics, at its Third Session, agreed that the experience gained in establishing or improving classification by wood properties and in marketing systems could be expected to complement each other and be used in the development of a market strategy for the promotion of lesser-used species. Two major complementary lines of action emerge. One centres on establishing common uses for utility timbers with similar properties, the other on optimizing the values of wood species with assumed higher quality potential. In order to support action at the national and international level the Committee recommended that "FAO, in conjunction with IUFRO, and in collaboration with other specialized institutions should establish internationally comparable standards for the use properties of lesser-used species".

The first step in this direction has already been made and consists of the establishment of active lists on use properties of A. Commercial, and B. Lesser-used species, as contained in Appendix II. The A-B-C classification system used therein represents a first approach to the problem of establishing comparability between the various items. It fulfills this purpose within the framework and objectives of the present study. Further steps in pursuing the above recommendation are based on the "Checklist on Properties and Characteristics for the Evaluation of Lesser-used Wood Species", contained in Appendix VII of the present study.

6. Possibilities for expanding the marketable wood base

The present study has so far been essentially geared towards analysing and evaluating use property characteristics and market acceptance of commercial and lesser-used wood species. The results allow us to draw conclusions and to bring into focus possibilities for the expanded marketing and use of South American tropical wood and wood products.

Before doing so it seems appropriate to review briefly the main features of resource potential and market prospects including actual trends in industry and trade development as they are generally known or anticipated:

(a) medium and long-term demand for tropical forest products is expected to expand further, both overseas and locally; rising domestic requirements and local processing will improve the diversification of products and widen the scope of wood utilization;

(b) resources of commercial woods are dwindling and increasing efforts are needed to introduce lesser-used wood species, and to intensify regeneration;

(c) wood supply requirements for individual mills tend to increase; this trend is supported by the orientation towards horizontal and/or vertical integration in wood processing;

(d) more uniform qualities and better quality control are required, particularly for serial and mass-manufacture of consumer goods such as furniture, prefab windows, wall panels; increased trade in processed products implies the harmonization of respective grading rules and standards;

(e) improved transport economics call for larger ships and more mechanized handling, which in turn influence sizes of loads and parcels, and the kind and type of packaging, but also facilitates shipping of processed products.

The above points suggest that changes in industry and market requirements have a particularly vigorous impact on the supply pattern of tropical woods. Of course, this applies to all - not only tropical - wood supplies since requirements for quantity and quality have been changing and are also expected to change in future. But there is also the fact that forests are a renewable resource and changes in wood requirements are increasingly recognized as being a principal parameter for decision-making in tropical forest management.

The following two tables, 13 and 14, throw into relief recent utilization patterns for South American tropical wood. Table 13 assesses the quantities and percentages of wood processed locally and overseas into sawnwood, veneer and plywood as follows:

Table 13. PROCESSING OF SAW- AND VENEER LOGS REMOVED FROM SOUTH AMERICAN TROPICAL FORESTS (estimate based on 1971/73 production data, roundwood equivalents)

	Sawnwood		Veneer		Plywood		Total	
	1000 m3	%	1000 m3	%	1000 m3	%	1000 m3	%
Domestic processing:								
Local consumption	4 050	59	4	..	400	6	4 454	65
Exports	1 704	25	92	1	132	2	1 928	28
Processed in importing countries	191	3	54	1	222	3	467	7
Total	5 945	87	150	2	754	11	6 849	100

Table 13 indicates that most of the saw- and veneer log production is processed into sawnwood (87 per cent), followed by plywood (11 per cent) and veneer (2 per cent). Due to the structure and state of the forest products industries in Tropical South America a substantial portion of sawnwood was processed in rather small sawmills - daily production below 50 m3 - and consumed locally. Only relatively few mills in the countries of origin are fairly large, i.e. with a daily production above 100 m3. These larger mills cover almost all of the exports of processed products.

A relatively large portion of the 1971/73 saw- and veneer log production was processed locally - 93 per cent, and only 7 per cent, or one-fifth of the total exports in roundwood equivalents was processed in importing countries.

Table 14. MAJOR USES OF SAW- AND VENEER LOGS REMOVED FROM SOUTH AMERICAN TROPICAL FORESTS (estimate based on 1971/73 production data - Appendix III)

Products	Uses	Wood value classification average	Roundwood equivalents in per cent
Sawnwood:	General construction including windows etc.	1/2	51
	Fine joinery, including mouldings etc.	1/2	21
	Specific utility internal/external	1	15 (87)
Veneer:	Utility	1/2	.. 1/
	Decorative	2/3	2
Plywood:	Internal	1/2	11
	External	1/2	.. 1/
			100

1/ Production below 1 per cent

Table 14 shows that the bulk of the production (51 per cent) is used for general and building construction purposes, and 21 per cent in joinery, furniture etc. Utility and decorative veneer production is at rather low levels, and plywood is so far almost exclusively produced in internal grades.

Recent investigations in the Amazone basin revealed that the average number of wood species processed in sawmills is surprisingly low. Some sawmills have specialized in one species, and the number of sawmills which use up to 25 species is small. About 75 per cent of the sawmills reported that they are still sawing the same species as three years ago, 12 per cent are using more species, and the rest reported changes in the species mix. Species selection is generally based on three criteria, i.e. those species which (a) are considered easy to sell, (b) are requested by customers, and (c) are readily available. On the other hand it should be noted that the species composition may change from mill to mill, with the result that the total number of species used in the wider Amazone basin has reached at least 210 wood species as counted in Appendices I and II.

Industrial investors in the wider Amazone basin - in view of the foregoing - are faced with a widely varying pattern of mixed species distribution, which may change in each individual locality. On the other hand, with regard to use properties of these species, there is - generally speaking - a high degree of flexibility in the use of most wood species, and lists indicating possible uses for individual wood species could be endlessly repetitive, particularly for those with good average properties.

If a wood species is marketed at elevated or premium prices it is normally because of good average properties and at least one additional outstanding feature, often related to the decorative aspects. Also other characteristics such as a combination of

good strength and durability properties, e.g. greenheart, find their appreciation on the market. There are of course many examples for the excellent performance of individual tropical wood species in specific end-uses, which cannot be met by conifers and hardwoods from the temperate zone because there are no species with equivalent properties. On the other hand, examples have been reported where wood values because of ignorance or negligence did not materialize, e.g. the use of fine joinery timbers for railway sleepers, but also cases are known where quality and wood value differences are much narrower, as for instance when peeler logs were used as construction timber.

Every reason and world-wide experience speak for continuing with marketing practices which optimize wood values. On the other hand, the rising demand for utility timbers, not only in domestic but also increasingly on overseas markets, requires a different approach in promoting tropical timbers, as:

- it is unthinkable for technical and economic reasons that a large number of wood species could be handled individually in the various stages of harvesting, processing and trade;

- major uses for utility timbers and their technical requirements can be identified and specified relatively easily.

It follows - and this was emphasized by the Committee on Forest Development in the Tropics - that more attention must be given to the grouping of wood species and to the establishment of common use-property oriented criteria for grouping. The success or failure of grouping wood species for promotional purposes largely depends on the degree of similarity in use properties. If properties are identical, different species could be marketed together, perhaps even for highly sophisticated uses. However, a few deviations from average properties for example in colour or surface finishing, may cause severe disturbances in the chain linking producers, traders and users. Larger differences seriously and adversely affect prices and often result in breaking up the grouping, with the consequence that those species with deviating or varying properties have to be singled out. To some extent utility grades and similar assortments might tolerate deviations from a given average quality, but at the expense of price. There is no doubt that grouping of wood species has been commercially very successful - although this success has so far been restricted to only one of the major producing regions of tropical wood, namely Southeast Asia. In this region the bulk of the commercial timbers is traded in a few major groups, the most important of which belong to the Dipterocarp family.

Efforts aimed at expanding the marketable wood base, in addition to the above two possibilities of (i) optimizing values of individual species, and (ii) grouping of wood species, need to take into account (iii) the promotion of mixed tropical hardwoods for integrated industrial use, which implies that combined action with (i) and (ii) is possible and often necessary. The need for promoting integrated industrial usage is related to the fact that certain tropical wood species will also in future not, or only insufficiently, be used in their solid form, i.e. for sawnwood, veneer and/or plywood. However, prospects are becoming increasingly favourable for using such species in their disintegrated form as chips and fibres and it must be expected that in future board and/or pulp factories will compete in individual localities with sawmills, veneer and plywood mills for utility and low-grade wood materials. In certain areas in Southeast Asia developments are very close to such a situation already.

Knowledge of the use and marketing of wood species is an essential basis for the various planning and management activities in the tropical forestry and forest industries sector. In this respect investment studies usually centre their interest on the following points:

(a) For resource surveys and industrial identification and pre-feasibility studies in specific tropical forest areas the need arises to provide a use property screening pattern for the evaluation of unknown or incompletely known wood

species. At this stage basic requirements are that the testing pattern should be relatively simple and the number of tests should be reduced to a few essential ones. Already known results of tests and research on individual species properties need to be available at this stage only in a summary fashion for the assessment of the commercial potential of the resource, and to define the kind and depth of further technical investigations.

(b) For industrial feasibility studies and the subsequent industrial management phase specific technical as well as resource and market information is essential for deciding on the product mix to be manufactured and marketed. Experience with and documentation on the properties of already commercialized species is normally plentiful and efforts need to centre on the lesser-used species. On the other hand even many of the commercial species are frequently not, or only insufficiently, known in neighbouring countries, and there is need for exchanging experience and knowledge between foresters, researchers and industries and marketing specialists.

The above considerations on forest industries development in the tropics reveal the complexity of the various issues involved. Veneer, plywood and sawmills which would exclusively produce for export will face the rather rigid framework of species and qualities which is explained in Chapter 4. As in the importing countries, also mills to be established in tropical countries will have to find - within the raw material resources available - an economically viable and technically appropriate proportion of various wood species and qualities as a basis for selecting the product mix to be manufactured. Since tropical wood resources are varying greatly in their composition (Chapter 2) it is unlikely that experience gained, say in Europe, with regard to modern, integrated mills, can be easily and readily transferred to tropical countries. The very fact that these mills are located in a different environment implies many differences with regard to their planning and management. Indeed there is no unique formula which can be applied and all factors underlying the planning and fugure management of an industrial project need to be studied in each particular case.

The choice of the product mix - in addition to the above resource related considerations - is also the result of market studies on both local and export markets. In view of the fact that wood production in the countries of the wider Amazone basis compared with other major tropical forest regions is small and mainly relies on domestic outlets, the promotion of wood products exports deserves particular attention. There is also the fact that domestic markets so far absorb mainly utility grade sawnwood which suggests that special efforts need to be made to diversify. Otherwise industrial developments, particularly those based on mixed tropical hardwoods cannot reap the advantages of different and possibly integrated industrial operations through which it would be possible to use a wider range of wood species, and also to use wood, including residues, more efficiently.

Wood preservation is an excellent means to widen the range of utility timbers to be used in building and construction, not to speak of the many specialty uses such as fencing, poles, posts and railway sleepers. Even the commercial timbers of the low density category (Table 8) show a very high percentage of non-durable species, and the lower qualities, often considered of little value, might well be used after treatment for a variety of purposes in the construction field. In the initial stages the amount of technical knowledge and experience required to establish the necessary routine in treating and marketing treated timber should not be under-estimated. Wood preservation should be part of the overall concept for forest industry planning in tropical forest countries and receive appropriate technical support by timber research and development institutions.

Similar support is also required for wood seasoning which has several rather significant implications on timber marketing. Firstly, the reduction of moisture content brings about a considerable reduction in weight - affecting freight costs favourably. Secondly, moisture contents below the fibre saturation point, or more specifically below 20 per cent, act as a protection against attack by fungi. Thirdly, drying sawn-

wood to the moisture content requirements of the consumer - and maintaining it during transport - stabilizes dimensions, avoids possible degrade and thus in particular facilitates shipment of processed products.

All the above advantages are already taken into account in plywood marketing since veneer drying has become an essential part of the production process. Some of the utility veneer peeling mills established in the middle of tropical forest resources do not use drying facilities. At this stage it is difficult to foresee whether the export of "green" veneer will remain acceptable, both technically and economically, to producers and consumers of veneers. Even today the marketing of green veneer is not commonly practised, particularly as far as decorative veneers are concerned.

Although the bulk of the world's sawnwood trade is still marketed "shipping-dry" which implies air-seasoning before shipment, there is a clear trend towards kiln drying. Except for the typical utility and common construction timbers, this trend is expected to develop further, because of the obvious advantages enumerated above. South America's tropical sawnwood exports consist mainly of wood species and qualities suitable for furniture making, window manufacture and other specific uses, which require low wood moisture contents. Considering these end-use requirements in connection with the second and third points above hints at possibilities for expanding processed wood products trade.

However, changing from one product to marketing another more processed one, inevitably implies different marketing practices and often other marketing channels. The problem really is how the semi-processed product can be more readily integrated into the respective stages of the customer's production lines, or the finished one into final application. Since tropical forest products normally have to be transported over long distances specific problems arise because several months of transport between producer and consumer are involved. The timing of delivery needs special attention but generally problems prevail which are related to product specification and standardization, dimensional accuracy, tolerances and quality control and to the type and quality of packaging. While in the field of common sawnwood trade, the matter of grading and specification has so far been taken care of by a few more or less similar grading rules, international rules and practices for sawnwood products are virtually not established. Experience obtained from the still rather limited international trade suggests that practices would have to be much more exacting, particularly as far as international rules or standards are concerned. As a first step it appears appropriate to establish a list of products which would be suitable for international standardization as opposed to those products which also in future would have to be individually specified at the time of ordering because of frequently changing dimensional and/or quality requirements, and perhaps because quantities are too small. Any further consideration of this matter needs to be made within the framework of individual market studies, with the objective of providing the parties involved with information on the feasibility of expanding trade in processed products.

As to shipping processed products air-tight wrapping of kiln-dried timber is essential and should be practiced whenever possible. Transport in containers offers additional advantages. Apart from the viewpoint of economic handling, it provides invulnerable packaging, protection against sea water and rain, and this helps maintaining the predetermined moisture content and dimensional stability which are an essential part of contracted product quality and a precondition for ready employment of products by consumers. While these technical advantages need to be kept in mind for possible application, the lack of infrastructure and of other factors supporting the use of containers, often precludes their immediate introduction in many developing countries. In each case particular investigations are needed on how to optimize the techno-economic complex involved. Finally, more experience is needed on how to avoid the cold wall phenomenon which occurs in individual containers during transport and storage under tropical sun.

A significant conclusion may be drawn from Tables 8,9, 13 and 14 above. Low and medium density species make up for 67 per cent of the total saw- and veneer log pro-

duction in South America, and the majority of these timbers are used as sawnwood for building and structural purposes. On the other hand, from the analysis of wood species made in chapter 4 and from inventory work so far carried out it may be assumed that the average density of wood species in South American tropical moist forests is substantially higher than in temperate forests, where conifers are prevailing. It is obvious that the tropical forests lack the content of lower density species which would be needed to supplement the demand for utility and peeling timbers. Therefore attention should be given to species within this range of density in planning the regeneration of forest resources and when evaluating the use potential of lesser-used wood species.

Grading rules play a central role in product and market development. The fact that the average density of wood in tropical forests is substantially higher than in temperate forests, implies that increased efforts should be made to develop new or to adapt existing techniques allowing for the use of higher density broadleaved timbers in applications which have so far been traditionally met by coniferous timbers. The Committee on Forest Development in the Tropics at its 4th Session emphasized that increasing attention be given to structural uses for tropical timber, particularly in view of the direct impact this could have on improving socio-economic conditions in the developing countries. Efforts need to be increased to introduce grading rules and standards which can meet satisfactorily domestic needs. They should be developed in close relation with other initiatives on a regional and international level, with the objective of harmonizing efforts as much as possible. In this context it was suggested that the Malaysian Grading Rules might be used as an example. Particular attention should be paid to the training of graders and to the establishment of grading control systems.

In conclusion, there are many distinct possibilities for expanding the marketable wood base in South American tropical moist forests. They need to be defined for each particular forest area selected for development, since local resource conditions and domestic market requirements as well as possibilities for export trade may vary considerably. Each case needs to be studied in the light of rather complex implications aimed at clarifying the feasibility of developing industries in the light of the resources on which they will be based. The efforts directed towards establishing local processing industries need to be supplemented by market and product promotion efforts. There is an increasing awareness for this need. Five Latin American countries, Venezuela, Colombia, Ecuador, Peru and Bolivia as members of the Andean Pact Commission are combining in a major effort to make more effective use in the local construction industry of the vast resources of the tropical rain forests in the Andes region. The cooperative research includes investigating the technical properties of about 100 wood species. This effort is part of a regional strategy for the building up of a science and technology programme that would stimulate economic and social development.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	[illegible]
1	Agonandra brasiliensis	Olaca.	PAU MARFIM*		Caimancillo		Caimancillo	Aceituno			
2	Alexa grandiflora	Legum.P.	Melancieriira								
3	Alexa imperatricis	Legum.P.						Leche de [illegible]	MAIAN*	Aroemata	Nekoeboto
4	Alexa leiopetala	Legum.P.							MAIAN*	Aroemata	
5	Alexa wachenheimii	Legum.P.							MAIAN*	Aroemata	
6	Amburana sp.	Legum.F.	Amburana (1)	Roble (4)	ISHPINGO (2)						
7	Amburana cearensis	Legum.P.	CEREJEIRA**	Sorioco	ISHPINGO* (2)						
8	Anacardium excelsum	Anaca.	Caju assu (5)		Cashu	Caracoli*(2)	Caracoli*(2)	MIJAO**			Cassiu
9	Andira retusa	Legum.P.	ANDIROBA JAR.**					Caneito negro			
10	Aniba sp.	Laura.	LOURO AMARELO*	Coto (3)	Moena puchiri(5)	Jigua sanguita		Laurel capuchino			
11	Aniba ovalifolia	Laura.			Moena puchiri				SILVERBALLI*		
12	Apeiba spp.	Tilia.	Pacote (5)		Maquisapa (2)	Sacchacaspi(2)	PEINEMONO**(3)		Duru	Dore (5+)	
13	Apeiba aspera	Tilia.			Maquisapa (2)	Peine de mono(2)					
14	Apeiba tibourbou	Tilia.	Pacote					Cabeza de mono			
15	Aspidosperma album	Apocy.	ARARACANGA					Mielillo negro	Shibadan	Aromanti kopi	Bois macaque (2
16	Aspidosperma desmanthum	Apocy.	ARARACANGA*(5)	Gavetillo			Copachi (2)		Shibadan*		
17	Aspidosperma dugandii	Apocy.	Carapanauba(5)				CARRETTO(2)		Paddle wood	Parelhout (14)	Bois pagaie (2
18	Aspidosperma excelsum	Apocy.			quillo bordom(2)		CARRETTO(3)	Canjillon negro	Paddle wood (2)	Parelhout (14)	Bois pagaie
19	Aspidosperma nitidum	Apocy.	Caraipe				CARRETTO(3)		Paddle wood(2)	Parelhout (14)	Bois pagaie (2
20	Aspidosperma polyneuron	Apocy	Peroba (6)				CARRETTO** 3				
21	Astronium leocintei	Anaca.	MUIRACATIARA*	Almendro macho	Bolaquiro (2)	Guasango	Guayacan 4	Guayacan 4	Bauwana		Satine rubane
22	Bagassa guianensis	Morac	TATAJUBA*(3)						Bagasse	Bagasse 4	bagasse (2)
23	Bertholletia excelsa	Lecyt.	CASTANHA PARA*	Almendro (2)	Castaña		Almendro 3	Turury 5	Tuvia	Brazilnoot (5)	
24	Bombacopsis quinatum	Bomba.	Sumauma		Huimba		Ceiba tolua*(5)	SAQUI SAQUI**(8)			
25	Bowdichia sp.	Legum.P.	PARICARANA(H)*					Alcornoque	Mach		
26	Bowdichia nitida	Legum.P.	SUCUPIRA MATA**								
27	Brosimum sp.	Morac.	Caucho* (4)	Murure	Palo sangre		Guayacan*(2)	CHAN**			
28	Brosimum alicastrum	Morac.	Muiratinga (2)			Tillo	Mare (7)	CHARO**(2)			
29	Brosimum ulleanum	Morac.			CUNCONA* (2)						
30	Brosimum utile	Morac.	Amapadoce (3)			SANDE**	SANDE**(2)	SANDE (7)			
31	Calophyllum sp.	Gutti.		Palo Maria	Lagarto caspi		Mario*(6)				
32	Calophyllum brasiliense	Gutti.	JACAREUBA**(4)	Balsamaria	Alfaro*(3)	Bella Maria*	Mario*(4)	Palo Maria 4	Gold [illegible]	[illegible]	Edaba..i
33	Calophyllum longifolium	Gutti.				Bella Maria*	Mario*				
34	Calophyllum lucidum	Gutti.	JACAREUBA**				Mario*		Purahara 5	Poera.(3)	
35	Campnosperma panamensis	Anaca.	Orey			Bajo	SAJO**				
36	Carapa guianensis	Melia.	ANDIROBA**(4)		ANDIROBA	Tangare**(2)	Guino Tangare 3	Carapa	[illegible]rabwood(1)2	Krapa**(6	Carapa(3
37	Carapa procera	Melia	ANDIROBA						Crabwood	Krapa	Carapa
38	Cariniana pyriformis	Lecyt	Jequitiva				ABARCO**(7)	Bacu (2)			
39	Caryocar amigdaliferum	Caryo					Cagui				
40	Caryocar glabrum	Caryo	PIQUIARANA*(5)		Almendro (2)		Cagui (4)	Jigua	Bataburi (7)	Kasarie	Ibawari (4)
41	Caryocar villosum	Caryo.	PIQUIA** (5)		Almendro (2)						
42	Casearia sp.	Flaco	Cacouba (3)		Naranjilla (5)	Rompesto	VARA PIEDRA *	Limoncillo**			
43	Casearia oblongifolia	Flaco.				Rompesto	Sa no blanco				
44	Casearia praecox	Flaco.					VARA PIEDRA**				
45	Catostemma commune	Bomba						paraman	BAKAMALLI* 3		
46	Catostemma fragans	Bomba.							BAKAMALLI* 3		
47	Cedrela augustifolia	Melia.						CEDR [illegible]			
48	Cedrela odorata	Melia.	CEDRO**(12)	CEDRO	CEDRO**(3)	CEDRO** (2)	CEDRO**	CEDRO (2)	red [illegible]	Ceder (9	Cedrat*
49	Cedrela rossei	Melia.				CEDRO					
50	Cedrelinga catanaeformis	Legum.M.	Cedrorana*(4)		Tornillo**(2)		Achapo				
51	Ceiba pentandra	Bomba.	Sumauma**	CEIBA(2)	Huimba	CEIBA	CEIBA** 3	EIBA	Kumaka	Bankantri (2	Fromager 4
52	Cespedesia spathulata	Ochna.	Malefata			SAJO* (2)					
53	Chlorophora tinctoria	Morac.	AMOREIRA*(12)	Palo amarillo(2)	Ineira caspi(3)	Moral fino (2	Linde (9	Moral 4	Fustic		
54	Chorisia integrifolia	Bomba.	Barriguda(2)	Toborache	LUPUNA**						
55	Copaifera martii	Legum.C.	COPAIBA								
56	Copaifera multijuga	Legum.C.	COPAIBA**(15+)		COPAIBA**		COPAIBA (5	COPAIBA 7			
57	Copaifera officinalis	Legum.C.			COPAIBA**			Aceite			
58	Copaifera reticulata	Legum.C.	COPAIBA		COPAIBA**						
59	Cordia alliodora	Borag.	Louro amarillo	Ajo ajo	Ajo ajo (3)	LAUREL** (8)	Canalete 10	Pardillo** 3	Silvertalli		
60	Cordia goeldiana	Borag.	FREIJO VERMELHO**		Tahuampa						

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
61	Couma macrocarpa	Apocy.	Sorva grande(3)		Leche caspi (4)		PERILLO NEGRO*	Guaimaro macho	Pukaballi 4	Doralli (4)	Couma (2
62	Croton spp.	Eupho.	Sangue de drago		Yurac-siprena(10)	Sangre de drago	DRAGO*(6)	Sangre de drago		Boko wiwirie(3)	
63	Dacryodes colombiana	Burse.					CARANO*				
64	Dacryodes cupupularis	Burse.				ANIME					
65	Dacryodes occidentalis	Burse.				ANIME					
66	Dialyanthera gordoniaefolia	Myris.				CUANGARE**(2)					
67	Dialyanthera gracilipes	Myris.				CUANGARE**(2)					
68	Dialyanthera otoba	Myris.			Sacsa (2)	CUANGARE**(2)	CUANGARE(3)	Otoba (3)			
69	Dicorynia guianensis	Legum.P.	Angélica (2)							BASRALOKUS**(1)	Angelique (6)
70	Didymopanax morototoni	Arali.	MOROTOTO*(4)	Guitarrero	Sancha uva (2)		Yarumero(2)	Sun sun (3)	Karohoro*(3)	MOROTOTO*(6)	Saint Jean (3)
71	Diniziia excelsa	Legum.M.	ANGELIN PEDRA*(3)						kuraru (3)		
72	Diplotropis martiusii	Legum.P.	SUCUPIRA**(4)		Chontaquiero						
73	Diplotropis purpurea	Legum.P.	SUCUPIRA**(5)					Congrio	Tatabu*	Zwarte wabbes*	Coeur dehors
74	Dipteryx odorata	Legum.P.	CUMARU* (15)		Charapilla (2)		Camará (2)	Camará (3)	Tonka-bean(5)	Tonka (5)	Gaiac (8)
75	Enterolobium schomburkii	Legum.M.	SUCUPIRA AMARELA*		Espina		Carito (8)	Curarina(3)	Brown uya		Acacia franc(2)
76	Eperua falcata	Legum.P.	Apa					Uapa tabaco	WALLABA**(4)	WALLABA**(2)	Wapa (2)
77	Eperua grandiflora	Legum.P.	Apa (2)					Uapa tabaco(2)	WALLABA**(4)	WALLABA**(8)	Wapa (6)
78	Eperua jenmanii	Legum.P.	Apa (2)					Uapa tabaco(2	WALLABA**(4)	WALLABA**(8)	Wapa (6)
79	Eperua schomburgkiana	Legum.P.	Muirapiranga(14)					Uapa tabaco	WALLABA**(2)	WALLABA**(15+)	Wapa (7)
80	Erisma uncinatum	Vochy.	Quarubarana					MURILLO**			
81	Erythroxylon sp.	Eryth.	CATAUBA* (14)	Coca coquilla	Catahua (9)		Coca (9)				
82	Escallonia sp.	Escal.	Canudo de pito(2)		Chachacoma (3)	Chachacoma	NOGUET*(3)	Jarillo (6)			
83	Eschweilera amara	Lecyt.								MANBARKLAK*	Mahot rouge
84	Eschweilera corrugata	Lecyt.	Mata mata		Machimango			Guacharaco ros.	Kakaralli wina.	MANBARKLAK*	Mahot rouge
85	Eschweilera longipes	Lecyt.			Machimango				Kakaralli blk.	MANBARKLAK*	
86	Eschweilera odora	Lecyt.	Mata matá (15+)		Machimango	Piñuela		Coco de mono(5)	kakaralli(5)	MANBARKLAK*(15+)	Mahot noir
87	Eschweilera subglandulosa	Lecyt.						Majagüillo	Kakaralli blk.	MANBARKLAK*	
88	Eucalyptus spp.	Myrta.			EUCALIPTO**		EUCALIPTO*				
89	Euxylophora paraensis	Rutac.	PAU AMARELO**(3)								
90	Ficus insipida	Morac.			Oje	HIGUERON	HIGUERON*(12)	Higuerote			
91	Ficus maxima	Morac.	Caxinguba(12)		Zaucharo caspi	HIGUERON	HIGUERON*(12)	HIGUERON(12)	Kumakaballi(2)	Doekoelia(2)	Figuier grand bois
92	Goupia glabra	Celas.	CUPIUBA**(2)		Capricornia		Saino (3)	Congrio blanco	Kabukalli**(4)	Kopi**	Goupi*
93	Hevea guianensis	Eupho.	SERINGA*(2)	Siringa (2)	Siringa		Siringa		Seringueira		Seringueira
94	Himatanthus articulatus	Apocy.	Carabina (6)	Leche leche	Bellaco caspi		PERILLO BLANCO*	Mapolo			Balata blanc
95	Humiria balsamifera	Humir.	Turamira(2)		Quinilla		Oloroso	Nina	TAURONIRO*(3)	Basra bolletrie	Bois rouge (8)
96	Humiria floribunda	Humir.	UMIRI* (9)		Quinilla				Muri (6)	Tauroniro (9)	UMIMI (15+)
97	Humiria procera	Humir.				CHANUL**	Chand				
98	Hura crepitans	Eupho.	ASSACU**	Ochoo**(3)	Catahua (3)		Ceiba amarilla	Jabillo**(3)	Sandbox	Possentrie (2)	Sablier
99	Hymenaea courbaril	Legum.C.	Jatoba**(15+)	Sirari	COURBARIL (3)	Copal	Algarrobo(2)	Algarrobo*(2)	Locust*(7)	Hode locus(11)	COURBARIL(10)
100	Hymenaea parvifolia	Legum.C.	JUTAI* (3)								
101	Hymenolobium sp.	Legum.P.	ANGELIN**								
102	Hymenolobium excelsum	Legum.P.	ANGELIN**(4)								
103	Hymenolobium petraeum	Legum.P.	ANGELIN**(4)								
104	Jacaranda copaia	Bigno.	CARORA* (14)		Amobi ponga (3)	Arabisco(3)	Chingalé	Simaruba(5)	Futui(4)	Goebaja(15)	Copaia (4)
105	Juglans sp.	Jugla.		NOGAL	NOGAL*	NOGAL	NOGAL	NOGAL			
106	Juglans neotropica	Jugla.			NOGAL						
107	Licaria camella	Laura.							SILVERBALLI tr.*	Kaneelhart	Bois canelle
108	Loxopterygium sagotii	Anaca.						Picaton	HUBUBALLI*	Slangenhout	Kocel pialli
109	Machaerium sp.	Legum.P.	Aturia (15+)	MORADILLO*(5)		Chiche (2)	Magui (14)	Cumaricá (4)			
110	Malpighia punicifolia	Malpi.	CEREJEIRA**				Ceroso (5)	Ceroso (3)		Kersenboom	
111	Manilkara amazonica	Sapot.	MAPARANJUBA**								
112	Manilkara huberi	Sapot.	MAPARANJUBA**(3)		quinilla		Masaranduba				
113	Mezilaurus itauba	Laura.	ITAUBA*	ITAUBA	ITAUBA						
114	Micropholis williamii	Sapot.	ABIURANA*(10)								
115	Mora excelsa	Legum.C.						Peto	MORA**(2)	MORA (5)	MORA
116	Mora megistosperma	Legum.C.				NATO	NATO**				
117	Mora paraensis	Legum.C.	Paracuuba			NATO	NATO**	MORA	Morabukea(2)	Morahoekea(5)	
118	Moronobea coccinea	Cutti.	Bacuri bravo (2)						MANNIBALLI*(2)		
119	Nectandra sp.	Laura.		Laurel (3)	Moena (7)	AMARILLO*(2)	Canelo (3)	Laurel			
120	Nectandra acutifolia	Laura.	Nomebe tuina		Mundshuy (2)	JIGUA* (2)	JIGUA (5)				

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
121	Nectandra pisi	Laura.				JIGUA*					
122	Ochroma lagopus	Bombe.	BALSA (3)	BALSA (2)	Topa (2)	BALSA**	BALSA (4)	Palo de lanas(4)	BALSA		quattier (3)
123	Ocotea spp.	Laura.	LOURO** (12)		ROBLE CORRIENTE**	Quadaripo(2)	Jigua (2)				Cedre
124	Ocotea costulata	Laura.			MOENA**						
125	Ocotea cymbarum	Laura.	LOURO INHAMUY**								
126	Ocotea globifera	Laura.								PISI	
127	Ocotea glomerata	Laura.							Kereti* 2)	PISI	Cedre noir
128	Ocotea guianensis	Laura.	Louro branco		MOENA**					ZILVER-PISI	Cedre argenté
129	Ocotea petalanthera	Laura.			MOENA**					PISI	
130	Ocotea puberula	Laura.			MOENA**				Kereti*	PISI*	Cedre gris
131	Ocotea rodiaei	Laura.	Itauba		Ispingo moena			Virarú	GREENHEART**	Beeberoe	
132	Ocotea rubra	Laura.	Louro vermelho*		Iebpingo maraco				Determa	AAMA* (2	Grignon franc*
133	Ocotea wachenheimii	Laura.			Canelo				kereti*	Pisi	cedre gris
134	Olmediophaena spp.	Morac.	MURIATINGA**(2)								
135	Osteophloeum platispermum	Myris.	Ucuúbarana (3)		Llianchama	Chalviande	SEBO* (2)				
136	Parahancornia amapa	Apocy.	Amapá amargoso*						TUALI*	Amapa (3)	
137	Parkia gigantocarpa	Legum.M.	FAVEIRA								
138	Parkia multijuga	Legum.M.	FAVEIRA*						Iya	Aboewa (4	Acacia mâle
139	Parkia pendula	Legum.M.	FAVEIRA		Goma pashaca		Bayo	macaron			
140	Peltogyne catingae var.glabra	Legum.C.	Pau roxo**	Morado			Tananeo	Morado (4	PURPLEHEART** (7	Purperhart	Amarante
141	Peltogyne lecointei	Legum.C.	Pau roxo**(2)								
142	Peltogyne porphyrocardia	Legum.C						Capatero	PURPLEHEART** 4		
143	Peltogyne pubescens	Legum.C.	Pau roxo**(2)		Palo violeta (3)			Morado	PURPLEHEART** 4	Purperhart	Amarante
144	Peltogyne purpurea	Legum.C	Pau roxo**(6)				Nazareno	Nazareno	PURPLEHEART**	Purperhart	
145	Peltogyne venosa var.densi-	Legum.C.	Pau roxo**(2)					Morado	PURPLEHEART**	Purperhart	Amarante (4
146	Pithecolobium racemosum (flora	Legum.M.	ANGELIM RAJADO*(2)						Guarembod	Saetamarinde	pois serpent
147	Pithecolobium saman	Legum.M.			Algarrobo			SAMAN**			
148	Pityrocarpa pteroclada	Legum.M	PAHICARANA*(2)								
149	Platonia insignis	Guttí	Bacuri-acu (6)		Matazana	Matazana			Pasure	Pakoeli	PAmi mI
150	Platymiscium spp.	Legum.P.	MACACAUBA**		Cumaseba						
151	Platymiscium pinnatum	Legum.P	MACACAUBA**			Caota*	Trebol	noble (4)		Koeratepie	
152	Platymiscium trinitatis var.	Legum.P.	MACACAUBA**		Macahuba negra				noble	koeratepi	
153	Platymiscium ulei (durum	Legum.P.	MACACAUBA**		Cumaseba		Trebol (1	noble 6		koeratepi.4	
154	Podocarpus sp.	Podoc.	Pau de cobra		ITABO FUENTE*	Romerillo					
155	Podocarpus coriaceus	Podoc.				Sisin	romerillo 9	Pino 7			
156	Podocarpus utilior	Podoc.			LLOCMAN**						
157	Pouteria sp.	Sapot.	ABIURANA*(15+)		Pucima caspi 6)	Colorado 2					
158	Pouteria caimito	Sapot.	ABIURANA*(3)	Madera verde		Caimitillo 2	Caimo	apure	Amijerotalli		
159	Pouteria engleri	Sapot.	ABIURANA*						Kenepe	Pienhout blanc	
160	Pouteria guianensis	Sapot.	ABIURANA*						Anepowe		Jaune d'oeuf
161	Prioria copaifera	Legum.C		Algarrobillo			Alcornoque 7	Kurano (1			
162	Protium sp.	Burse.	Breu*(15)	Laurel**	Aimesca (3)	Copa (2	Caran* (3				
163	Protium insigne	Burse.				ANIME*					
164	Qualea acuminata	Vochy	MANDIOQUEIRA*		quaruba			Pirecillo			
165	Qualea albiflora	Vochy.	MANDIOQUEIRA*(12)		quaruba					Gronfolo*.1	Grignon fou 4
166	Qualea coerulea	Vochy.	MANDIOQUEIRA*							Gronfolo*	Grignon fou
167	Qualea dinizii	Vochy.	MANDIOQUEIRA*					Guarapo		kwari	grignon fou
168	Qualea homosipelia	Vochy.	MANDIOQUEIRA*(12)		quaruba						
169	Qualea paraensis	Vochy.	MANDIOQUEIRA*(12)		quaruba						
170	Qualea rosea	Vochy.	MANDIOQUEIRA*							Gronfolo*	Grignon fou
171	Sacoglottis guianensis	humir	Paruru(15)						DUKALI* 2		Bofo oubu
172	Simaruba amara	Simar.	MARUPA**(8)	Amaro	MARUPA	Cuña (3)	MARUPA 2	cedro blanco 2	Simarupa* 5	Cosmarobeta* 10	Simarouba
173	Sterculia apetala	Sterc.						AMARGO*			
174	Swartzia nitens	Legum.P.	ITAUBARANA* 4						Hazaraballi	Aataargroenhart	
175	Swietenia macrophylla	Melia.	Mogno**(3)	Mara** 2	CAOBA**(2)	CAOBA	CAOBA	A A**	Mahogany		
176	Symphonia globulifera	Guttí.	ANANI*		Azufre (2	Machare	Machare	Fermin 5	Manni* 2	Matabali 8	Manil (4
177	Tabebuia spp.	Bigno.	PAU D'ARCO**	Tajibo 2			Palo de arco				
178	Tabebuia rosea	Bigno.					noble**	APAMATE**			
179	Tachigalia paniculata	Legum.C.	TACHI PRETO*(6)		Tachi blanco 2)					cedre	Tachigali
180	Taralea oppositifolia	Legum.P.	Cumaruruna	ALMENDRILLO*							Tarala

Note: For explanations of symbols and abbreviations see Appendix VI

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA
181	Terminalia amazonia	Combr.	Pau mulato branco		Roble amarillo**	Roble*	GUAYABO**(2)	Guacharaco(2)	Fukadi (2)		
182	Terminalia oblonga	Combr.			Sacha chamiso (2)	Roble*		GUAYABO (6)			
183	Terminalia tanibouca	Combr.	TANIBOUCA*(5)								
184	Terminalia tarapotensis	Combr.			Roble amarillo**						
185	Tetragastris hostmannii	Burse.								SALI*	
186	Tetragastris panamensis	Burse.						Arsebo	Haiawaballi	SALI	
187	Trattinickia lawrancei	Burse.			COPAL* (3)						
188	Triplaris guayaquilensis	Polyg.			FERNANSANCHEZ	FERNANSANCHEZ**(3)					
189	Vatairea sp.	Legum.P.	ANGELIM AMARGOSO*				Maqui				
190	Vataireopsis speciosa	Legum.P.	FAVEIRA*								
191	Viburnum sp.	Capri.					CHUGUACA*(2)				
192	Virola sp.	Myris.	VIROLA**(3)	Sangre de toro*	Cumala	Dendel (2)	VIROLA** (4)				Yayamadou
193	Virola dixonii	Myris.				Chalviande*	Chalviande				
194	Virola kuchakana	Myris.			Cumula caupari						
195	Virola melinonii	Myris.							Dalli*	Baboen**(2)	
196	Virola sebifera	Myris.	Couuba (3)			Chalviande(2)	Sangre de toro	Sangrino(4)	Dalli*	Baboen**(2)	Yayamadou
197	Virola surinamensis	Myris.	VIROLA**(9		Cumala (4)	Chalviande(2)		Cuajo (3)	Dalli*(1	Baboen**(3)	Yayamadou (5)
198	Virola venosa	Myris.	VIROLA**(9)								
199	Vismia baccifera	Gutti.				MANOS DE GALLINA*					
200	Vochysia spp.	Vochy.	QUARUBA**(15+)								Kouali* (2)
201	Vochysia densiflora	Vochy.	QUARUBA**							Appel-kwari	Kouali* (2)
202	Vochysia ferruginea	Vochy.	QUARUBA**		Quillu-sisa (2)	Laguno (2)	Dormilon (3)	Saladillo		Kwari	
203	Vochysia guianensis	Vochy.	QUARUBA**		Killu sisa (2)	Chimbuya		Tintin	Itebalii (3	Wana-kwari(15+	Kouali* (3)
204	Vochysia maxima	Vochy.	QUARUBA**(15+)		Ocme amarilla						
205	Vochysia surinamensis	Vochy.	QUARUBA**						Itebalii	Kwari	Kouali* (2)
206	Vochysia tetraphylla	Vochy.	QUARUBA**					Lorjena	Itebalii	Watra-kwari	Kouali* (2)
207	Vochysia tomentosa	Vochy.	QUARUBA**						Itebalii	Wana-kwari	Kouali* (2)
208	Vochysia vismiaefolia	Vochy.	QUARUBA**					Lacre montañero	(2)		
209	Vouacapoua americana	Legum.C.	ACAPU** (2)		Guacapu				Sara (3)	Bruinhart*(3)	Wacapou (3)
210	Weinmannia sp.	Cunon.			Huichullu (3)		ENCENILLO*(2)	Sal-sal (3)			

Note: For explanations of symbols and abbreviations see Appendix VI.

OCCURRENCE AND DENOMINATION OF SOUTH AMERICAN TROPICAL WOOD SPECIES - B. LESSER-USED SPECIES

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA Fr.
1001	Alnus jorullensis	Betul.		Aliso*	Aliso (3)	Aliso	Aliso (3)	Aliso			
1002	Alseis eggersii	Rubia.	Serrilha			Palo de vaca		Totumillo			
1003	Alseis peruviana	Rubia.			Palo de vaca (2)						
1004	Anacardium giganteum	Anaca.	Caju assu (3)						Wild cashew (2)	Boskasjoe (2)	Bois cajou (2)
1005	Anacardium occidentale	Anaca.	Caju manso (6)		Maranon casho (2)						
1006	Anacardium spruceanum	Anaca.	Caju assu (3)			Caracoli	Caracoli			Boskasjoe	
1007	Andira sp.	Legum.P.		Roble (3)	Quinillo colorado		Amarillo (6)				
1008	Andira coriacea	Legum.P.			Ishpingo				Korako (2)	Rode kabbes	Saint Martin*
1009	Andira inermis	Legum.P.	Angelim morcego	Ajunado	Angelim (2)	Moton	Congo (5)	Pilón (1)	Korako (2)	Rode kabbes*	Saint Martin*
1010	Andira parviflora	Legum.P.	Sucupira verm.								
1011	Andira surinamensis	Legum.P.			Angelim				Korako (2)	Rode kabbes	Saint Martin*
1012	Aniba amazonica	Laura.			Moena amarilla (2)						
1013	Aniba canelilla	Laura.	Casca preciosa (8)				Canelo	Canelilla (2)	Aratairai (2)		
1014	Aniba duckei	Laura.	Pau rosa							Rosenhout	Bois de rose (2)
1015	Aniba parutilis	Laura.					Comino real (3)				
1016	Aniba roseodora	Laura.	Pau rosa							Rosenhout	Bois de rose (2)
1017	Anona spp.	Anona.	Envira poror.	Chirimoya del m.	Anona (3)	Anona	Gallina gorda	Chirimoya (3)			
1018	Anona reticulata	Anona.				Anona					
1019	Anthodiscus pilosus	Caryo.			Tahuari		Cheepo				
1020	Apuleia molaris	Legum.C.	Garapa* (15)		Muirajuba (3)			Rateado (2)			
1021	Aspidosperma sp.	Apocy.		Gavetillo* (2)		Naranjo de monte					
1022	Aspidosperma capitatum	Apocy.			Chintaquiro						
1023	Aspidosperma cylindrocarpon	Apocy.			Puca quiro						
1024	Aspidosperma laxiflorum	Apocy.	Carapanauba								
1025	Aspidosperma macrocarpum	Apocy.	Pau de arara (2)		Pumaquiro (2)			Vieja o blanco		[illegible]	Bois macaque
1026	Aspidosperma marcgravianum	Apocy.						Carapacho amarillo			
1027	Aspidosperma oblongum	Apocy.	Carapanauba (5)						Yarura	Tarenhout	
1028	Aspidosperma obscurinervium	Apocy.	Piquia marfim (5)								
1029	Aspidosperma tomentosa	Apocy.	Piquia (8)		Beniquiro (2)						
1030	Aspidosperma vargasii	Apocy.			Quillo bordon		Guarcone (2)	Amarillo (2)			
1031	Astronium fraxinifolium	Anaca.	Goncalo alves*	Almendro macho	Palo de cruz (2)	Guasango	Gusanero (4)	Gusanero	Bauwana		
1032	Astronium graveolens	Anaca.	Goncalo alves	Almendro macho	Palo de cruz (2)	Gusango	Gusanero (7)	Gusanero (5)	Bauwana		
1033	Astronium urundeuva	Anaca.	Arveira* (15)	Cuchi* (2)							
1034	Bagassa tiliaefolia	Morac.							Bagasse		Bagasse (2)
1035	Beilschmiedia sp.	Laura.	Canella tapinha		Alcanfor (3)	Aguacatillo	Laurel canime (4)		Kara a.		
1036	Beilschmiedia rohliana	Laura.				Guaba ardita		Laurel negro	[illegible]		
1037	Brosimum guianense	Morac.				Marequende			Letterwood	Letterhout	
1038	Brosimum paraense	Morac.	Muirapiranga* (2)		Palo sangre	Marequende			Tora. [illegible]	[illegible]	Satiné [illegible]
1039	Brosimum parinarioides	Morac.	Amapa (3)								
1040	Bursera sp.	Burse.	Imburana (2)		Caraña		Sasafrás	Sasafrás (7)			
1041	Bursera graveolens	Burse.			Caraña						
1042	Bursera simarouba	Burse.			Caraña caspi (4)		Indio en cuero	Indio desnudo			
1043	Calycophyllum candidissimum	Rubia.					Guayabo (4)				
1044	Calycophyllum spruceanum	Rubia.	Pau mulato* (2)	Bayabochi (2)	Capirona	Corusicad					
1045	Campsiandra laurifolia	Legum.C.	Acapurana (5)		Huacapurana (2)		Guacapurana	[illegible]			
1046	Cariniana micrantha	Lecyt.	Tauary (2)								
1047	Castilla ulei	Morac.	Caucho	Caucho	Caucho	Caucho					
1048	Catostemma alstonii	Bomba.			Huimba		Arenillo				
1049	Cecropia garciae	Morac.			Cetico	Guaruma (2)	Yarumo				
1050	Cecropia sciadoph. var. jura	Morac.	Imbauba (7)	Ambaibo	Imbauba (9)		Guaruma (3)	Guarura			
1051	Centrolobium paraense	Legum.P.	Arariba (4)			Amarillo lagarto	Guayacan hobo	Cartan (2)	Kartang (2)		
1052	Clarisia racemosa	Morac.	Guariúba amarela		Capinuri (13)	Moral bobo (4)	Capinuri (3)	Cajimán (2)			
1053	Clathrotropis brachypetala	Legum.C.					Sapan (2)		Aromata		
1054	Clathrotropis macrocarpa	Legum.C.	Cabary (3)						Aromata		
1055	Clathrotropis nitida	Legum.C.	Acapu (2)								
1056	Clinostemon mahuba	Laura.	Mauba*								
1057	Conocarpus erectus	Combr.	Mangue (3)			Mangle (2)	Mangle (2)	Mangle (3)			
1058	Copaifera canime	Legum.C.				Canime					
1059	Cordia exaltata	Borag.	Freijo branco					Alatrique blanco			
1060	Cordia fallax	Borag.						Alatrique			

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
1061	Couepia caryophylloides	Rosac.C.								Anaura (9)	Coudpia
1062	Couepia longipendula	Rosac.C.	Castanha de g.								
1063	Couepia versicolor	Rosac.C.							Kauta	Anaura(9)	Coudpia
1064	Couma guianensis	Apocy.	Sorva amarga								
1065	Couratari guianensis	Lecyt.	Tauary*(2)		Cachimbo caspi		Coco cabuyo	Capa de tabaco	Wadara(3)	Wadara(4)	Coatari (2)
1066	Couratari multiflora	Lecyt.						Tampipio			
1067	Coureupita guianensis	Lecyt.	Castanha de m*(2)		Haya huma (2)			Mucurutu(5)	Cannonball tree	Bosch Kalabas	Calabasse colin
1068	Croton xanthochloros	Eupho.						Canelon			
1069	Cryptocarya sp.	Laura.	Canella (14)			Pacche (2)					Cedre canelle(2)
1070	Cybistax sp.	Bigno.	Ipê branco*(8)		Yangua						
1071	Cyclolobium sp.	Legum.P.	Amarelinho*(2)								
1072	Dacryodes canalensis	Burse.				Mantos	Anime incienso	Guacharaco(2)			
1073	Dacryodes peruviana	Burse.			Copal caspi (3)						
1074	Dalbergia spruceana	Legum.P.	Jacaranda (2)	Jacaranda (2)							
1075	Dialyanthera parvifolia	Myris.			Cumala blanca (2)						
1076	Dimorphandra sp.	Legum.C			Zapatilla						
1077	Dimorphandra conjugata	Legum.C.	Atana*(2)						Dakama(2)	Dakama(6)	
1078	Dimorphandra hohenkerkii	Legum.C.									Aiequeko (2)
1079	Endlicheria sp.	Laura.	Canela*(15+)	Laurel blanco	Moena clara (5)				Bastard Silverb.	Siroeaballi(5)	
1080	Endlicheria occuiray	Laura.						Laurel negro			
1081	Endlicheria formosa	Laura.				Jigua					
1082	Enterolobium sp.	Legum.M.	Tamboril*(15+)				Riñón				
1083	Enterolobium cyclocarpum	Legum.M.	Timbauba					Caro			
1084	Erisma sp.	Vochy.	Quarubatinga*				Flor morao				
1085	Erisma lanceolatum	Vochy.	Quarubarana (6)								
1086	Erythrina glauca	Legum.P.	Mulungu (14)		Amasisa (2)	Mamba (2)	Bucaro (15)	Bucare (7)		Kofimama	
1087	Eschweilera sp.	Lecyt.				Guasca (2)	Coco cristal				
1088	Eschweilera decolorans	Lecyt.						Cacao			
1089	Eschweilera grata	Lecyt.						Cacaito			
1090	Eschweilera hologyne	Lecyt.						Guacharaco amarillo			
1091	Eschweilera jarana	Lecyt.	Jarana		Machimango						
1092	Eschweilera trinitensis	Lecyt.						Majaquillo negro			
1093	Fagara martinicense	Rutac.						Bocsuo			
1094	Fagara pentandra	Rutac.								Pritjari	
1095	Fagara rhoifolia	Rutac.	Laranjeiro (2)			Tachuelo					
1096	Ficus sp.	Morac.		Biboci* (4)							
1097	Ficus killipii	Morac.			Shimico negro(2)						
1098	Fusaea longifolia	Anona.	Envira preta*								
1099	Geissospermum sericeum	Apocy.	Acariquara*(5)			Naranjo			Marisabo(3)	Bitterbout (2)	
1100	Genipa americana var.carub	Rubia.	Jenipapo	Bi	Huito (3)	Jagua (2)		Caruto (2)	Genipa (3)	Taproepa (4)	Genipa
1101	Guarea guara	Melia.	Gito* (15+)	Trompillo	Requia*(4)	Pialde macho(4)	Trompillo(4)	Trompillo(5)	Carababalli(2)	Dofieserie	Bois balé (3)
1102	Guatteria sp.	Anona.	Envira preta(3)		Carahuasca (7)		Carrapato	Yaya			
1103	Guazuma ulmifolia	Sterc.	Mutamba	Coco	Bolaina (7)	Guacimo(2)	Guacimo(2)	Guacimo(3)	Wonan		Anhuiba (3)
1104	Hernandia sp.	Herna.	Ventosa*						Hoa Noa		
1105	Hieronyma alchorneoides	Eupho.	Urucurana(6)		Uricana (3)	Mascary	Candelo(2)	Aquacatillo(7)	Suradan(4)	Sorodon (15+)	
1106	Hieronyma laxiflora	Eupho.	Urucurana(6)		Uricana (3)		Candelo(2)	Aquacatillo(7)	Suradan(4)	Sorodon(4)	
1107	Himatanthus sucuuba	Apocy.	Sucuuba (7)	Leche leche	Sucuuba (3)						
1108	Hologyxidium jarana	Lecyt.	Jarana*								
1109	Hologyxidium latifolium	Lecyt.	Jarana								
1110	Humiriastrum colombianum	Humir.					Aceituno				
1111	Humiriastrum excelsum	Humir.			Quinilla colorado						
1112	Hymenaea sp.	Legum.C.	Pau oleo*(2)				Azucar guayo				
1113	Hymenaea palustris	Legum.C.			Azucar huayo (2)						
1114	Hymenolobium heterocarpum	Legum.P.						Alcornoque			
1115	Inga alba	Legum.M.	Inga*	Pacay (3)	Shimbillo			Guamo colorado	Maporokon(2)	Prokonie(15+)	Bois pagoda (8)
1116	Inga edulis	Legum.M.	Inga cipo*(2)		Inga cipo (2)	Guaba mauss(2)	Guamo rabo(3)	Guamo rado(5)			
1117	Inga floribunda	Legum.M.						Guamo blanco(3)			
1118	Inga ingoides	Legum.M.						Guamo rabo			
1119	Inga marginata	Legum.M.	Inga feijão*(2)		Huaro	Guabo (3)	Guamo frijol(2)		Guamo(2)	Maporokon	
1120	Iryanthera spp.	Myris.	Ucuubarana(6)		Cumala (3)	Chalviande(2)	Cumala		Kirikaua(15+)		Mouchigo rouge

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
1121	Iryanthera juruensis	Myris.					Cuangare (3)				
1122	Lecythis sp.	Lecyt.	Sapucaia(5)		Machin mango		Coco de mono(5)	Coco de mono(4)			
1123	Lecythis ampla	Lecyt.				Salero					
1124	Lecythis davisii	Lecyt.						Timajito	Monkey pot		
1125	Lecythis usitata var.paraens.	Lecyt.	Sapucaia*(2)		Machin mango	Coco de mono(5)	Coco de mono(5)				
1126	Licania spp.	Rosac.C.	Anaura (15+)		Apacha rama			Hierro (3)	Kariah (4)	Anaura (3)	Gris gris rouge
1127	Licaria spp.	Laura.	Louro*(15+)	Louro preto	Canela (6)					Kaneelhart (15)	
1128	Licaria cayennensis	Laura.							Kabaita	Kaneelhart	Bois canelle
1129	Licaria guianensis	Laura.								Kaneel-Pisi(15)	
1130	Licaria limbosa	Laura.				Canela	Canelo	Sassafrás(3)			
1131	Luetzelburgia trialata	Legum.P.	Sucupira vermelha								
1132	Machaerium millei	Legum.P.				Cabo de hacha					
1133	Macrolobium acaciaefolium	Legum.C.	Arapari (15+)		Arapari				Kater Kabata	Kabaka(6)	Aapa-sec.
1134	Macrolobium stenosiphon	Legum.C.				Chipero dormil.	Chipero dormilon				
1135	Manilkara sp.	Sapot.		Kasaranduba*							
1136	Manilkara bidentata	Sapot.	Kasaranduba*(2)		Quinilla panashto		Balata(2)	Purguo (7)	Bulletwood (3)	Bolletri (3)	Balata franc (4)
1137	Manilkara surinamensis	Sapot.	Kacaranduba*(7)								
1138	Mezilaurus sp.	Laura.					Aguiche				
1139	Micropholis sp.	Sapot.	Caraziro*(1)		Quinilla				Koraballi	Grexhout (1)	Balata blanc (2)
1140	Micropholis guianensis	Sapot.	Rosadinha							Pierrout	Balata franc
1141	Micropholis venulosa	Sapot.			Quinilla						
1142	Minquartia guianensis	Olaca.	Acariquara (6)		Huacapu	Guayacan pech	Acapu (2)		Kincoa 2	Ironhout (4)	Ainguar (3)
1143	Mora gonggrijpii	Legum.C.						Mora	Koraburea	Koraboerea	Kabot rouge
1144	Moronobea pulchra	Gutti.	Avani da terra f.								
1145	Myrocarpus sp.	Legum.P.	Cabreuva*(5)								
1146	Myroxylon balsamum	Legum.P.	Balsamo*(3)		Estoraque (3)	Bálsamo (2)	Balsamo (2)				
1147	Nectandra grandis	Laura								Pisi	Cèdre jaune
1148	Nectandra mollis	Laura.	Louro prêto								
1149	Ocotea canaliculati	Laura.	Louro canela* (2)								
1150	Ocotea floribunda	Laura				Jigua					
1151	Ocotea tomentella	Laura.							Baradan		
1152	Olmedioperebea sclerophylla	Morac.	Muiratinga(2)								
1153	Ormosia coccinea	Legum.P.	Tento*		Huairuro		Chocho	Pionia	Parakara	Corkwood (2)	Bamacoco blanc
1154	Ormosia coutinhoi	Legum.P.	Buiucu						Corkwood		
1155	Ormosia lignivalvis	Legum.P.						Pionia			
1156	Ormosia micrantha	Legum.P.	Tento								
1157	Osteophloem sp.	Myris.	Ucuúbarana(3)			Chanviande	Sangre toro (1)				
1158	Panopsis rubescens	Prote.	Louro faia*(7)		Colombo		Colombo (3)	Kiao de lapa (5)	Kabokalli	Kabokalli	
1159	Parahancornia peruviana	Apocy.			Naranjo podrido						
1160	Parinarium spp.	Rosac.C.	Parinari (7)		Uchpa umari	Cuero de sapo	Parinari	Kerecurillo	Hiraia (3)	Koengoe (4)	Parinari(3)
1161	Parkia sp.	Legum.M.	Arara*(15+)		Coma		Guarango				
1162	Parkia oppositifolia	Legum.M.	Bengue(3)		Coma pashaco			Caro montañero	Oya		
1163	Peltogyne paniculata	Legum.C.	Pau ferro (15+)	Morado			Tananeo	Palo concha (4)	Purpleheart(2)	Purperhart(10)	Bois violet (4)
1164	Persea sp.	Laura.	Louro abacate(2)		Aguacate (4)	Guadaripo(3)	Aguacatillo (5)			Avocaat	Avocat(4)
1165	Piptadenia sp.	Legum.M.	Angico*(3)	Curupad (5)	Angico			Palo blanco(2)			
1166	Pithecolobium sp.	Legum.M.	Paricarana(6)			Papayuelo					
1167	Pithecolobium coryzbosum	Legum.M.			Yiriguinche						
1168	Pithecolobium jupunba	Legum.M.	Axuí (2)				Carbonero (3)	Saman montañero			
1169	Pithecolobium latifolium	Legum.M.	Ingarana		Buschilla (2)						
1170	Pithecolobium pedicellaris	Legum.M.	Ingarana(2)		Algarrobo			Dueño de pescado		Tamarin	Bois cerf (2)
1171	Podocarpus glomeratus	Podoc.			Romerillo*						
1172	Pourouma sp.	Morac.	Imbauba(4)	Uvilla	Sacha uvilla(6)		Cirpo (4)		Boruna		
1173	Pourouma aspera	Morac.	Imbadbarana				Uvilla				
1174	Pourouma chocoana	Morac.				Uva (2)					
1175	Pourouma laurancei	Morac.	Imbadba(4)						Boruna		Pourouma
1176	Pouteria egregia	Sapot.						Purguillo (3)			
1177	Pouteria eugenifolia	Sapot.						Chicle rosado			
1178	Pouteria pomifera	Sapot.						Capure			
1179	Pouteria speciosa	Sapot.							Suya		
1180	Protium colombianum	Burse.				Anime blanco					

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
1181	Protium decandrum	Burse.	Elimi		Copal caspi			Azucarito (2)	Kurokai	Tingimoni	
1182	Protium heptaphyllum	Burse.	Breu (15)				Anime	Sipuede (4)	Haiawa	Tingimoni	Encens grie
1183	Protium hostmannii	Burse.							Haiawa	Tingimoni	Encens grie
1184	Protium neglectum	Burse.						Caraño negro			
1185	Protium puncticulatum	Burse.	Breu vermelho(15)		Copal caspi (4)						
1186	Protium sagotianum	Burse.	Breu branco					Caraño	Kurokai (2	Tingimoni	
1187	Protium schomburgkianum	Burse.						Azucarito blanco	Kurokai	Tingimoni	
1188	Pseudobombax millei	Bomba.				Beldaco					
1189	Pseudobombax munguba	Bomba.	Munguba (2)		Huira						
1190	Pterocarpus officinalis	Legum.P.	Mututi (11)	Mogal falso		Bambulo	Sangre de drago	Cacu (6)	Corkwood(6)	Bebe (15+)	Moutouchi (4)
1191	Pterocarpus rohrii	Legum.P.	Mututi (11)					Sangrito(2)	Corkwood	Bébé (2)	Moutouchi
1192	Pterocarpus vernalis	Legum.P.			Mututi			Drago			
1193	Qualea sp.	Vochy.	Lacrão*				Aranillo				
1194	Rheedia sp.	Gutti.	Bacuri-pari (2)		Brea caspi (4)				Asacchi		
1195	Rheedia benthamiana	Gutti.								Pakoeli	
1196	Rheedia kappleri	Outti.								Pakoeli	
1197	Rheedia macrophylla	Outti.								Pakoeli	
1198	Rheedia madruno	Gutti.				Madroño	Madroño	Madroño (2)			
1199	Rhizophora mangle	Rhizo.	Mangue (10)			Mangle (5)	Mangle	Mangle	Mangrove	Mangro (3)	
1200	Rollinia sp.	Anona.	Embira (7)	Embira (2)	Anona	Chirimoya	Mulato		Kaboe-black.(2)		
1201	Rollinia exsucca	Anona.						Anoncillo			
1202	Rollinia insignis var.pallida	Anona.	Envira bobo (4)								
1203	Sacoglottis amazonica	Humir.	Uxirana*								
1204	Sacoglottis cydonicides	Humir.						Pomique montañero			
1205	Sapium jenmannii	Eupbo.	Caucho (13)	Peloto (6)	Caucho masha (3)	Caucho blanco	Lechoso(4)	Caucho(4)	Kabua (5)	Mabowaballi(7)	
1206	Sapium marmieri	Eupho.	Murupita (2)		Caucho masha (2)						
1207	Schefflera paraensis	Arali.	Paraparé						Karchero	Morototo,12)	Saint Jean
1208	Schinopsis balansea	Anaca.	Quebracho h.(3)	Quebracho c.*	Cocobalo (2)						
1209	Schinus sp.	Anaca.	Coracao de n.*(5)		Molle (4)		Muelle (2)	Arbol de pimienta			
1210	Schizolobium amazonicum	Legum.C.	Bacurubd (5)		Pashaco						
1211	Sclerolobium albiflorum	Legum.C.								Hode Djedoe	
1212	Sclerolobium guianense	Legum.C.						Guanillo	Yawaredan(2)	Witte Djedoe	Diaguidia
1213	Sclerolobium melinii	Legum.C.	Tachy						Yawaredan (2)	Djedoe	Tachi (2)
1214	Sclerolobium micranthum	Legum.C.			Copaiba						
1215	Sclerolobium paniculatum	Legum.C.						Guanillo rojo			
1216	Sclerolobium setiferum	Legum.C.			Paliasnto						
1217	Soleronema micranthum	Bomba.	Cordeiro (3)								
1218	Soleronema praecox	Bomba.	Castanha de paca								
1219	Sickingia standleyi	Rubia.				Manglillo					
1220	Sickingia tinctora	Rubia.	Araribs(12)		Pucaquiro(2)	Manglillo	Brasilete	Paraguatan(13)			
1221	Sickingia williamsii	Rubia.			Pucaquiro						
1222	Simaruba versicolor	Simar.	Pau parahyba								
1223	Sloanea sp.	Elaeo.	Urucurana (5)		Cutana (2)	Sapotillo	Guebo de gato.2)	Almendon(2)	Aruadan	Akossi(10)	Chataigner (4)
1224	Spondias mombin	Anaca.	Caja (12)		Uvos (2)	Hobo (3)	Hobo (4)	Jobo (3)	Jobo (3)	Mope (3)	Mombin (3)
1225	Spondias purpurea	Anaca.			Hahuba (3)		Jobo colorado	Ciruelo de hueso			
1226	Sterculia pruriens	Sterc.	Arixa (12)		Zapote (2)	Cacao de monte(3)	Camajuro(3)	Mayagua(6)	Mabo (2)	Kobehe (9)	Kobe (3)
1227	Swartsia sp.	Legum.	Ombeira (15+)	Orori	Nina caspi (5)	Canelón	Mulato		banya (15)	Ijzerhart (15+)	Boco (15+)
1228	Swartsia jenmanii	Legum.							Parakusan (15)		
1229	Swartsia leiocalycina	Legum.							Wamara*(15)		Montouchi (15+)
1230	Swartsia polyphylla	Legum.			Remo caspi (5)				Parakusan(15)		
1231	Swartsia schomburgkii	Legum.							Parakusan(15)		
1232	Tabebuia guayacan	Bigno.				Guayacan	Guayacan(3)				
1233	Tabebuia insignis var.mono.	Bigno.							Cedar white	Zwamp panta	Cedre blanc (2)
1234	Tabebuia ipe	Bigno.	Ipe	Lapacho*							
1235	Tabebuia pentaphylla	Bigno.				Roble de Guaya.	Roble flor mor.	Roble (4)			
1236	Tabebuia serratifolia	Bigno.	Ipê preta*(15+)		Tahuari (3)	Madera negra	Guayacan polvi.	Araguaney(2)	Hakia (7)	Groenhart*(15+)	Ebène vert(7)
1237	Tabebuia stenocalyx	Bigno.						Purguillo blanco	Cedar white		Cedre blanc
1238	Tapirira guianensis	Anaca.	Tatapiririca*(4)		Isamaritei (3)						Tapiriri (2)
1239	Tapirira marchandii	Anaca.							Duka		
1240	Terminalia sp.	Combr.	Cinzeiro*(7)	Verdolago		Seique					

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	FAMILY	BRAZIL	BOLIVIA	PERU	ECUADOR	COLOMBIA	VENEZUELA	GUYANA	SURINAM	GUIANA F.
1241	Terminalia catappa	Combr.	Amendoeira(4)		Castaña	Almendro	Almendro		Arond	Arenda (2	Amandier
1242	Terminalia guianensis	Combr.						Pata de danto			
1243	Tetragastris sp.	Burse.	Almesca		Aguarras	quema pecho	Anime				Sali (2)
1244	Tetragastris altissima	Burse.	Breu grande		Incre de bajo			Azucarito (1).	Balamatalli	Cali rote	Encens rouge
1245	Tetragastris balsamifera	Burse.			Aguarras moena c						
1246	Trattinickia sp.	Burse.				Anime pulverde					Bois encens (4)
1247	Trattinickia demerarae	Burse.							Cru	Tingimoni (15+)	
1248	Trattinickia rhoifolia	Burse.	Breu sucuruba					Naro	Cru	Tingimoni	
1249	Trichilia sp.	Melia.	Catigua (6)		Uchumullaca (8)	Pialde	Tayo (8)		Cru		
1250	Trichilia japurensis	Melia.			Shibo caspi						
1251	Trichilia propinqua	Melia.						S zconhueso a.			
1252	Triplaris surinamensis	Polyg.	Formigueiro(3)		Tangarana (4)			Santa Maria	Long John	Wierenhout (1)	Bois fourmi
1253	Vantanea sp.	Humir.	Achuarana*(3)		Loro wingo		Mazabalo				
1254	Vantanea micrantha	Humir.	quebra machado 3(								Lourantan
1255	Vatairea guianensis	Legum.P.	Fava amargosa*(7)							Gele wabbea	
1256	Vatairea parasensis	Legum.P.	Faveira bolacha(7)								
1257	Virola guianensis	Gutti.	Incre		Pichirana		Sangre (5	Sangre (6		Pienaa (1)+.	Bois cossais(7)
1258	Vitex sp.	Verbe.	Taruma (3)	Cedrillo (2)	Favorita (3)	Tumbingue 2)	Aceituno (4)		Machiemalli		
1259	Vitex stahelii	Verbe.						Caratero (1) amarillo			
1260	Vochysia lehmannii	Vochy.									
1261	Vochysia macrophylla	Vochy.				Laguno (2	Laguno (2				
1262	Vouacapoua macropetala	Legum.C.							Sara (2)		
1263	Xylopia aromatica	Anona.	Envireira*(8		Espintana oscura		Espintana	Yaya (5	Koyuma white	Perre boe piria	

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
1	Agonandra brasiliensis	H	B		A	A	B	B	C
2	Alexa grandiflora								
3	Alexa imperatricis	L	A	B	A	B	B	B	B
4	Alexa leiopetala	L	A		A		B	B	B
5	Alexa wachenheimii							B	C
6	Amburana sp.	M	A	B	A		B	B	B
7	Amburana cearensis	M		B				B	
8	Anacardium excelsum	L	A	A	A	C	B	A	B
9	Andira retusa	U	B			A	A	B	
10	Aniba sp.								
11	Aniba ovalifolia	U		B					
12	Apeiba spp.								
13	Apeiba aspera	L		A				A	
14	Apeiba tibourbou	L		B			C	B	
15	Aspidosperma album	H	A	B	A	A	A	A	C
16	Aspidosperma desmanthum	H	B				A	A	B
17	Aspidosperma dugandii	H	B	B	A	A	A	B	B
18	Aspidosperma excelsum	H	B	C			B	B	
19	Aspidosperma nitidum	H	B				B	B	B
20	Aspidosperma polyneuron	U	A	B	A		B	A	
21	Astronium lecointei	H	A	B	A	A	A	A	A
22	Bagassa guianensis	U	A	A	A	A	A	A	B
23	Bertholletia excelsa	U	A	B	A		B	A	A
24	Bombacopsis quinatum	M	A	B	A	B	B	A	B
25	Bowdichia sp.	H	C		B	A	A	A	C
26	Bowdichia nitida	H	C	B	B	A	A	A	B
27	Brosimum sp.								
28	Brosimum alicastrum	U	A	B	A	A	C	A	
29	Brosimum uleanum								
30	Brosimum utile	M	A	B	A	C	C	B	B
31	Calophyllum sp.								
32	Calophyllum brasiliense	M	A	B	A	B	B	A	B
33	Calophyllum longifolium	M	A		A			B	
34	Calophyllum lucidum	U	A		A		B		
35	Campnosperma panamensis	L	A	A	A	C	C	B	B
36	Carapa guianensis	M	A	B	A	A	B	A	A
37	Carapa procera	M	A	B	A	B	B	B	C
38	Cariniana pyriformis	U	A	B	A	A	A	A	B
39	Caryocar amigdaliferum								
40	Caryocar glabrum	H	B	C	A	A	A	A	B
41	Caryocar villosum	H	A		A			A	A
42	Casearia sp.								
43	Casearia oblongifolia	H	B	B	A	A	B	B	C
44	Casearia praecox								
45	Catostemma commune	M	A	C	A	B	C	A	B
46	Catostemma fragans	M	A	C	A	B	C	A	B
47	Cedrela augustifolia	L		B		B	B	B	
48	Cedrela odorata	M	A	A	A	B	B	A	B
49	Cedrela rossei								
50	Cedrelinga catanaeformis	U	A		A		B	A	B
51	Ceiba pentandra	L	A	B	A	C	C	A	B
52	Cespedesia spathulata	M	A	B	A	B	A	B	C
53	Chlorophora tinctoria	U	B	A	A	A	A	A	B
54	Chorisia integrifolia	L	A		A		C	A	B
55	Copaifera martii								
56	Copaifera multijuga	H	B		A		A	A	A
57	Copaifera officinalis	U	B		A	B	A	A	C
58	Copaifera reticulata	M	B	B	A				
59	Cordia alliodora	M	A	B	A	B	A	A	B
60	Cordia goeldiana	L	A	A	A		B	A	B

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
61	Couma macrocarpa	M	A	B	A	A	C	A	A
62	Croton spp.								
63	Dacryodes colombiana								
64	Dacryodes cupupularis	L	A	C	A	C		A	
65	Dacryodes occidentalis	M	A	B	A	B		A	
66	Dialyanthera gordoniaefolia	L	A		A	C		A	
67	Dialyanthera gracilipes	L		C		C		A	
68	Dialyanthera otoba	L	A				C	B	
69	Dicorynia guianensis	U	A	B	A	B	A	A	B
70	Didymopanax morototoni	M	A	B	A	C	C	A	B
71	Dinizzia excelsa	H	C		A		A	A	B
72	Diplotropis martiusii	H	C		A		A	B	B
73	Diplotropis purpurea	H	B	B	A	A	A	B	B
74	Dipteryx odorata	H	C	B	A	A	A	A	B
75	Enterolobium schomburkii	H	B	C	A	A	A	A	A
76	Eperua falcata	H	B	B	B	A	A	A	B
77	Eperua grandiflora	H	B			A	A	A	B
78	Eperua jenmanii	H	B			A	A	A	B
79	Eperua schomburgkiana	H	B		B	A	A	A	B
80	Erisma uncinatum	M	A	C		B	B	A	
81	Erythroxylon sp.	H		C				B	C
82	Escallonia sp.	M	A		A		B	B	C
83	Eschweilera amara	H	C	B	A	A	B	B	B
84	Eschweilera corrugata	H	C	B		A	B	B	B
85	Eschweilera longipes	H	C	C	B		A	B	B
86	Eschweilera odora	H	B	C	B	A	A	B	A
87	Eschweilera subglandulosa	H	C	B	B	A	A	B	B
88	Eucalyptus spp.								
89	Euxylophora paraensis	U	B		A		B	A	B
90	Ficus insipida		A				C	A	
91	Ficus maxima	L	A		A		C	A	
92	Goupia glabra	H	A	B	A	A	A	A	A
93	Hevea guianensis	L	A	A			C	A	A
94	Himatanthus articulatus	M	A	C	A	B	C	A	B
95	Humiria balsamifera	H	B	B	A	A	A	A	B
96	Humiria floribunda								
97	Humiria procera	H	B	B	A	A	A	A	C
98	Hura crepitans	L	A	A	A	B	B	A	A
99	Hymenaea courbaril	H	B	B	A	A	A	A	B
100	Hymenaea parvifolia								
101	Hymenolobium sp.								
102	Hymenolobium excelsum	H	C		A			A	B
103	Hymenolobium petraeum	H	C		A			A	B
104	Jacaranda copaia	L	A	B	A	C	C	A	B
105	Juglans sp.	M	A	B	A	B	A	A	B
106	Juglans neotropica	M	A	B	A		A	A	B
107	Licaria canella	H	C	B	A	A	A	B	C
108	Loxopterygium sagotii	U	B	B	A	A	B	A	C
109	Machaerium sp.	H	A			A	A	B	B
110	Malpighia punicifolia	M						B	B
111	Manilkara amazonica								
112	Manilkara huberi	H	A	C	A		A	A	A
113	Mezilaurus itauba	U	A	B	A		A	A	A
114	Micropholis williamii	H	B		A			B	B
115	Mora excelsa	H	B	B	A	A	A	A	B
116	Mora megistosperma	H	C				A	A	
117	Mora paraensis	H	A		A		A	A	B
118	Moronobea coccinea	H	B		A			A	B
119	Nectandra sp.	M	A	B	A	B	B	B	B
120	Nectandra acutifolia							B	

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
121	Nectandra pisi								
122	Ochroma lagopus	L	B	B	B	C	C	A	A
123	Ocotea spp.								
124	Ocotea costulata								
125	Ocotea cymbarum	M	A		A			A	B
126	Ocotea globifera	U	A	B	A	B	B	A	B
127	Ocotea glomerata	U	A	B	A	B	B	A	B
128	Ocotea guianensis	M	A	B	A	C	B	A	B
129	Ocotea petalanthera	M	A	B	A	C	B	A	B
130	Ocotea puberula	M	A	B	A	C	B	A	B
131	Ocotea rodiaei	H	B	B	A	A	A	A	B
132	Ocotea rubra	M	A	B	A	B	A	A	B
133	Ocotea wachenheimii	M	A	B	A	C	B	A	B
134	Olmediophaena spp.	U	B					A	B
135	Osteophloem platispermum	L		B			C	A	B
136	Parahancornia amapa	M	A		A		C	A	B
137	Parkia gigantocarpa								
138	Parkia multijuga	M	A		A		C	A	B
139	Parkia pendula	M	A	B		B	C	A	
140	Peltogyne catingae var.glabra	H	B		A		A	A	B
141	Peltogyne lecointei								
142	Peltogyne porphyrocardia	H	B	B	A	A	A	B	C
143	Peltogyne pubescens	H	B	B	A	A	A	A	B
144	Peltogyne purpurea	H	B	B	A	A	A	A	B
145	Peltogyne venosa var.densi-	H	B	B	A	A	A	A	C
146	Pithecolobium racemosum (flora	H	C	B	A	B	A	A	B
147	Pithecolobium saman	M	A	A	A		A	A	
148	Pityrocarpa pteroclada	L	A		A		C	B	C
149	Platonia insignis	H	A	C	A	A	A	A	B
150	Platymiscium spp.								
151	Platymiscium pinnatum	H	B	B	A	A	A	A	B
152	Platymiscium trinitatis var.	H	B	B	A	A	A	B	C
153	Platymiscium ulei (durum	H	B	B	A	A	A	B	B
154	Podocarpus spp.								
155	Podocarpus coriaceus	M	A	B	A	A	C	B	B
156	Podocarpus utilior								
157	Pouteria sp.								
158	Pouteria caimito							B	
159	Pouteria engleri	H	B	B	A	A	B	A	B
160	Pouteria guianensis	H	C	B		A	A	A	C
161	Prioria copaifera	M	A	C	A	B	C	A	B
162	Protium sp.	M	A	B	A	A	C	A	B
163	Protium insigne	M	A		A	B	C	B	B
164	Qualea acuminata	U	A		A			A	A
165	Qualea albiflora	M	B	C	A	B	B	A	B
166	Qualea coerulea	M	B	B	A		B	A	B
167	Qualea dinizii	U	B	B	A	A	B	B	B
168	Qualea homosipalia	U						A	B
169	Qualea paraensis	U	A		A			A	A
170	Qualea rosea	M	A	C	A	B	B	A	C
171	Sacoglottis guianensis	H	A	C	A	A	A	B	B
172	Simaruba amara	L	A	B	A	B	C	A	B
173	Sterculia apetala	L							
174	Sweetia nitens	H	B		A		A	B	C
175	Swietenia macrophylla	M	A	A	A	B	B	A	B
176	Symphonia globulifera	U	A	B	A	A	B	A	A
177	Tabebuia spp.								
178	Tabebuia rosea	M	A	B	A	B	B	B	C
179	Tachigalia paniculata	U	A						
180	Taralea opositifolia	H	C		A	A	A	B	A

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
181	Terminalia amazonia	U	A	B	A	A	A	A	B
182	Terminalia oblonga	H	B	C	A	A	A	A	
183	Terminalia tanibouca								
184	Terminalia tarapotensis								
185	Tetragastris hostmannii	H	A	B	A	A	A	B	B
186	Tetragastris panamensis	H	A	B	A	A	A	B	B
187	Trattinickia laurencei	L		A					
188	Triplaris guayaquilensis	M	A	A	A		C	B	
189	Vatairea sp.								
190	Vataireopsis speciosa	M	B					A	B
191	Viburnum sp.	H	A		A		A	B	C
192	Virola sp.								
193	Virola dixonii							A	
194	Virola kuchakana	L		B					A
195	Virola melinonii	M	A	B	A	B	C	A	B
196	Virola sebifera	M	A	B	A	B	C	A	B
197	Virola surinamensis	M	A	C	A	B	C	A	A
198	Virola venosa	U	A		A			B	B
199	Vismia baccifera	U							
200	Vochysia spp.								
201	Vochysia densiflora	L	A	C	A	C	C	A	B
202	Vochysia ferruginea	M	A	C	A	B	B	A	B
203	Vochysia guianensis	M	A	B	A	B	B	A	B
204	Vochysia maxima	M	A	B	A			A	A
205	Vochysia surinamensis	M	A		A	B	B	A	B
206	Vochysia tetraphylla	M	A	C	A	B	B	A	B
207	Vochysia tomentosa	L	B	C	A	C	C	A	B
208	Vochysia vismiaefolia	U	A		A			B	B
209	Vouacapoua americana	H	B	B	A	A	A	A	B
210	Weinmannia sp.	M	A		A		B	B	

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOOF	OCCU
1001	Alnus jorullensis	M	A	B	A	B	C		
1002	Alseis eggersii	U	A		A			B	B
1003	Alseis peruviana	U		B					
1004	Anacardium giganteum	M	A		A	B	B	A	
1005	Anacardium occidentale	L		A					
1006	Anacardium spruceanum	M	A		A	B	B	B	B
1007	Andira sp.								
1008	Andira coriacea	H	B	B	A	A	A	B	B
1009	Andira inermis	U	B	B	A	B	A	B	B
1010	Andira parviflora	H	C		A		A	B	B
1011	Andira surinamensis	H	B	B	A	A	A	B	B
1012	Aniba amazonica	U	A	C	A	A	A	A	
1013	Aniba canelilla	H	A		A	A	A	A	A
1014	Aniba duckei	H	A		A		A	A	
1015	Aniba perutilis	U	A	B	A	A	A	A	B
1016	Aniba roseodora								
1017	Anona spp.	M		B				B	A
1018	Anona reticulata								
1019	Anthodiscus pilosus	U	A	C	A		B	A	C
1020	Apuleia molaris	H	A		A	A	A	A	B
1021	Aspidosperma sp.	H			A			B	C
1022	Aspidosperma capitatum								
1023	Aspidosperma cylindrocarpon	H		C					
1024	Aspidosperma laxiflorum								
1025	Aspidosperma macrocarpum	H	A	B	A	A	B	A	C
1026	Aspidosperma marcgravianum	H		B		A		A	
1027	Aspidosperma oblongum	H	B				A	B	
1028	Aspidosperma obscurinarvium	H	B				A	A	
1029	Aspidosperma tomentosa	U	A	B			B	A	B
1030	Aspidosperma vargessii	U	A				B	B	B
1031	Astronium fraxinifolium	U	A	B	A			B	
1032	Astronium graveolens	H	A	B	A	A	A	A	B
1033	Astronium urundeuva	H	B		A	A	A	A	
1034	Bagassa tiliaefolia	H	A	A	A	B	A	A	C
1035	Beilschmiedia sp.	M	A	B			A	A	B
1036	Beilschmiedia rohliana	M		B	A	B		A	
1037	Brosimum guianense	H	B	B	A	A	A	B	
1038	Brosimum paraense	H	B	B	A	A	A	A	B
1039	Brosimum parinarioides	M	A		A			A	B
1040	Bursera sp.								
1041	Bursera graveolens								
1042	Bursera simarouba	M	A	B	A		C	A	
1043	Calycophyllum candidissimum	H	C	B	A	A	B	B	C
1044	Calycophyllum spruceanum				A			A	C
1045	Campsiandra laurifolia	H	B		A		A	B	A
1046	Cariniana micrantha	M	A					A	B
1047	Castilla ulei	L	A				C	A	
1048	Catostemma alstonii	M	B	C	A	B	C	A	B
1049	Cecropia garciae	L						B	B
1050	Cecropia sciadoph. var.jur.	L	A				C	B	A
1051	Centrolobium paraense	U	A	B	A	A	A	A	C
1052	Clarisia racemosa	U	A	B	A	A	B	A	B
1053	Clathrotropis brachypetata	H	B	B	A	A	A	A	C
1054	Clathrotropis macrocarpa	H	B		A	A	B	B	C
1055	Clathrotropis nitida	H	B		A	A	A	B	C
1056	Clinostemon mahuba								
1057	Conocarpus erectus	H	B		A	A	A	B	B
1058	Copaifera canime								
1059	Cordia exaltata	M		C		B	C	B	
1060	Cordia fallax	L		C		B	C	B	

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
1061	Couepia caryophylloides	H	C		A	A	B	B	B
1062	Couepia longipendula	H			A			B	B
1063	Couepia versicolor	H	C		A	A	B	B	B
1064	Couma guianensis								
1065	Couratari guianensis	M	A	B	A	B	C	A	B
1066	Couratari multiflora	U	A	B		A	C	B	
1067	Couroupita guianensis	L	A		A		C	A	B
1068	Croton xanthochloros	M	A	C		B	C	B	C
1069	Crypotocarya sp.	M	A		A			A	C
1070	Cybistax sp.	M						B	B
1071	Cyclolobium sp.	H	A		A		A	B	C
1072	Dacryodes canalensis	U	B	B	A	A	B	A	B
1073	Dacryodes peruviana	M		B					
1074	Dalbergia spruceana	H	A		A			B	B
1075	Dialyanthera parvifolia	M	A	B	A			A	B
1076	Dimorphandra sp.	U		C					
1077	Dimorphandra conjugata	H	B				B	B	B
1078	Dimorphandra hohenkerkii	U	A	B	A	B	A	B	C
1079	Endlicheria sp.	L	A	B			C	B	B
1080	Endlicheria cocuirey	L	B	B		B	B	B	
1081	Endlicheria formosa							B	
1082	Enterolobium sp.								
1083	Enterolobium cyclocarpum	L		B		C	B		
1084	Erisma sp.								
1085	Erisma lanceolatum	M	A		A			A	B
1086	Erythrina glauca	L		C	B		C	B	B
1087	Eschweilera sp.	H	B	C	A	A	A	A	B
1088	Eschweilera decolorans	H	A	B		A	B	B	
1089	Eschweilera grata	H	A	C		A	B	B	
1090	Eschweilera hologyne	H	A	B		A	A	A	
1091	Eschweilera jarana	H		C					
1092	Eschweilera trinitensis	H	A	C		A	B	B	
1093	Fagara martinicense	L	A	C		B	B	B	
1094	Fagara pentandra	H	A	B	A		B	B	C
1095	Fagara rhoifolia								
1096	Ficus sp.	L	B	C		C	C	B	C
1097	Ficus killipii	M		B					
1098	Fusaea longifolia	H	C					B	C
1099	Geissospermum sericeum	H					C	B	C
1100	Genipa americana var.carub	U	A	C	A	A	B	B	B
1101	Guarea guara	M	A	B	A	B	A	B	B
1102	Guatteria sp.	M	A	B	A	A	C	A	B
1103	Guazuma ulmifolia	M	A	B	A	A	C	B	C
1104	Hernandia sp.								
1105	Hieronyma alchorneoides	U	B	C	A	A	A	A	B
1106	Hieronyma laxiflora	H		C		A	A	A	
1107	Himatanthus sucuuba	U	A	C	A		C	A	
1108	Holopysidium jarana								
1109	Holopyxidium latifolium	H	A		A		A	A	B
1110	Humiriastrum colombianum	H	B	C		A	A	A	B
1111	Humiriastrum excelsum	H		C					
1112	Hymenaea sp.								
1113	Hymenaea palustris	U		B					
1114	Hymenolobium heterocarpum	U		B		B	B	A	
1115	Inga alba	M	A	B	A	B	C	B	B
1116	Inga edulis							B	
1117	Inga floribunda	U	A	B		A	D	B	
1118	Inga ingoides	M		B		A	C	B	
1119	Inga marginata								
1120	Iryanthera spp.								

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
1121	Iryanthera juruensis	L	A	B	A	B	C	A	B
1122	Lecythis sp.	H	B	C		A	B	A	B
1123	Lecythis ampla	H	B		A			A	
1124	Lecythis davisii	H	A	C		A	A	B	
1125	Lecythis usitata var.paraens.	H	C		A		B	B	B
1126	Licania spp.	H	C	B	A	A	B	B	B
1127	Licaria spp.								
1128	Licaria cayennensis	H	C	B	A	A	A	B	C
1129	Licaria guianensis	H	A		A	A	B	A	B
1130	Licaria limbosa							A	
1131	Luetzelburgia trialata	H	C			A	A		
1132	Machaerium millei								
1133	Macrolobium acaciaefolium	U	B	B	A		A	A	B
1134	Macrolobium stenosiphon							B	
1135	Manilkara sp.								
1136	Manilkara bidentata	H	B	B	A	A	A	A	B
1137	Manilkara surinamensis	H	B		A		A	A	A
1138	Mezilaurus sp.								
1139	Micropholis sp.								
1140	Micropholis guianensis	H	B	B	A	A	B	A	A
1141	Micropholis venulosa								
1142	Minquartia guianensis	H	B	B	A	A	A	A	B
1143	Mora gonggrijpii	H	B	B	A	A	A	A	B
1144	Moronobea pulchra	H	A		A			B	C
1145	Myrocarpus sp.	H	B		A	A	A	B	C
1146	Myroxylon balsamum	H	B	B	A	A	A	A	C
1147	Nectandra grandis	L	A	B	A	C	C	A	B
1148	Nectandra mollis								
1149	Ocotea canaliculati								
1150	Ocotea floribunda	U	A	A	A	B		A	
1151	Ocotea tomentella								
1152	Olmedioperebea sclerophylla	H	B		A	A	B	A	B
1153	Ormosia coccinea	U	B	C	A	A	B	B	B
1154	Ormosia coutinhai								
1155	Ormosia lignivalvis	U		B			B	A	
1156	Ormosia micrantha								
1157	Osteophloem sp.	M						A	
1158	Panopsis rubescens	M	A		A		A	B	B
1159	Parahancornia peruviana	M		B					
1160	Parinarium spp.	H	B	B	A	A	B	A	B
1161	Parkia sp.								
1162	Parkia oppositifolia	L	A	B		B	C	A	A
1163	Peltogyne paniculata	U	A	A		B	A	B	B
1164	Persea sp.	M	A	B			B	B	A
1165	Piptadenia sp.	U	A	B		A	B	B	
1166	Pithecolobium sp.								
1167	Pithecolobium corymbosum								
1168	Pithecolobium jupunba	M	A	B		A	B	B	
1169	Pithecolobium latifolium	U		B					
1170	Pithecolobium pedicellaris	M	B	B		B	B	B	
1171	Podocarpus glomeratus	U		B					
1172	Pourouma sp.	L	A	C	A	B	C	B	B
1173	Pourouma aspera								
1174	Pourouma chocoana	L	A			C		A	C
1175	Pouroma lawrancei	L					C	B	B
1176	Pouteria egregia	H	A	B		A	B	A	
1177	Pouteria eugenifolia	H		B		A	A	A	
1178	Pouteria pomifera	H		C		A	B	B	
1179	Pouteria speciosa								
1180	Protium colombianum	M		B		B		A	

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
1181	Protium decandrum	U	A	B	A	A	C	A	B
1182	Protium heptaphyllum	M	A	B	A	B	C	B	B
1183	Protium hostmannii	M	A		A	B	C	B	C
1184	Protium neglectum	U	A	B		A	B	A	
1185	Protium puncticulatum	M	B					B	
1186	Protium sagotianum	M	A	B	A	B	C	B	B
1187	Protium schomburgkianum	M	A	B	A	B	C	A	C
1188	Pseudobombax millei	L						A	
1189	Pseudobombax munguba	L						B	B
1190	Pterocarpus officinalis	L	A	B	A	C	C	A	B
1191	Pterocarpus rohrii	L	A	B	A	C	C	B	B
1192	Pterocarpus vernalis								
1193	Qualea sp.								
1194	Rheedia sp.								
1195	Rheedia benthamiana	H	A	C	A	A	A	A	C
1196	Rheedia kappleri	H	A	C	A	A	A	A	C
1197	Rheedia macrophylla	H	A	C	A	A	A	A	C
1198	Rheedia madruno								
1199	Rhizophora mangle	H	B	C	A	A	A	A	A
1200	Rollinia sp.								
1201	Rollinia exsucca	L		B		B	C	B	
1202	Rollinia insignis var.pallida	L	A					B	
1203	Sacoglottis amazonica								
1204	Sacoglottis cydonicides	H	A	B			B	B	
1205	Sapium jenmannii	L	A	B		B	C	A	B
1206	Sapium marmieri	M		B					
1207	Schefflera paraensis	L	A		A	C	C	A	C
1208	Schinopsis balansae	H	C	C		A	A	B	B
1209	Schinus sp.	M	A				A	B	C
1210	Schizolobium amazonicum	M	A		A		C	A	C
1211	Sclerolobium albiflorum	M	A	B	A	B	C	A	B
1212	Sclerolobium guianense	U	B	B	A	B	C	A	B
1213	Sclerolobium melionii	U	A	B	A	B	C	A	B
1214	Sclerolobium micranthum	H		C					
1215	Sclerolobium paniculatum	L	B	B		B	C	B	
1216	Sclerolobium setiferum	L		B					
1217	Scleronema micranthum	U	A		A		B	A	B
1218	Scleronema praecox	U	A		A			A	B
1219	Sickingia standleyi	U	A		A		B	B	
1220	Sickingia tinctora	H	A	C	A	A	B	B	B
1221	Sickingia williamsii	U		C					
1222	Simaruba versicolor	M	A			B	C		
1223	Sloanea sp.	H	B	C		A	B	B	B
1224	Spondias mombin	L	A	A	A	B	C	A	B
1225	Spondias purpurea	L		B					
1226	Sterculia pruriens	M	A	C	A	B	C	A	B
1227	Swartzia sp.								
1228	Swartzia jenmanii	U	A		A		B	B	B
1229	Swartzia leiocalycina	H	B		A	A	A	A	B
1230	Swartzia polyphylla	U	A	C	A		B	B	B
1231	Swartzia schomburgkii	U	A		A		B	B	B
1232	Tabebuia guayacan	H	B		A	A	A	B	
1233	Tabebuia insignis var.mono.	U	A	B	A	A	C	B	B
1234	Tabebuia ipe								
1235	Tabebuia pentaphylla	M	A	B	A	B	B	B	B
1236	Tabebuia serratifolia	H	B	B	A	A	A	A	B
1237	Tabebuia stenocalyx	U	A	B	A	A	B	B	B
1238	Tapirira guianensis	M	A		A		C		
1239	Tapirira marchandii								
1240	Terminalia sp.								

Note: For explanations of symbols and abbreviations see Appendix VI.

REF.No.	SCIENTIFIC NAME	DENS	WORK	SHRI	FINI	STRE	DURA	LOGF	OCCU
1241	Terminalia catappa	U			A		B	B	
1242	Terminalia guianensis	H	A	B		A	A	B	
1243	Tetragastris sp.								
1244	Tetragastris altissima	U	A	B	A	A	A	B	B
1245	Tetragastris balsamifera	H		B					
1246	Trattinickia sp.								
1247	Trattinickia demerarae	L	A	B	A	C	C	A	C
1248	Trattinickia rhoifolia	L	A	B	A	C	C	A	C
1249	Trichilia sp.	U	A				C	A	
1250	Trichilia japurensis	H		C				B	A
1251	Trichilia propingua	U		B		A	B	B	
1252	Triplaris surinamensis	M	A	B	A	B	B	B	B
1253	Vantanea sp.								
1254	Vantanea micrantha	H	A					A	B
1255	Vatairea guianensis	U	B	B	A		A	A	B
1256	Vatairea paraensis	H	B		A		A	A	C
1257	Vismia guianensis	M	A	B	A	B		B	C
1258	Vitex sp.	M	A	B	A		B	A	B
1259	Vitex stahelii	U	A	C		A	A	A	
1260	Vochysia lehmannii	M		C		B	B	A	
1261	Vochysia macrophylla	L	A	B	A	C		A	
1262	Vouacapoua macropetala	H	B	B	A	A	A	B	B
1263	Xylopia aromatica	U	B	C	A	A		B	

Note: For explanations of symbols and abbreviations see Appendix VI.

PILOT NAME	REF.No. APPENDIX I.	BRA 1972	BOL 1973	PER 1973	ECU 1973	COL 1971	VEN 1972	GUY 1973	SUR 1973	GUF 1971	PERCENTAGE OF TOTAL	WOOD VALUE S	P	V
VIROLA	192-198	1105	3	0.8	5	510	-	3	35	0.4F	24.0	1	2	-
CAOBA	175	204	150	34	-	-	23	-	-	-	6.0	1/2	2	3
CEDRO	48, 49	107	0.7	130	13	12	-	-	0.3	2	3.8	2	2	3
BALSA	122	-	-	-	246	-	-	-	-	-	3.5	2	2	2
ANDIROBA	36, 37	151	-	-	13	34	-	5	16	0.4F	3.2	1	1	-
SAJO (L)	35	-	-	-	-	182	-	-	-	-	2.6	1	1	-
LOURO INHAMUY	125	149	-	-	-	-	-	-	-	-	2.2	1	-	-
SAQUI-SAQUI	24	-	-	-	-	1	124	-	-	-	1.8	1	1	-
EUCALIPTO	88	-	-	115	-	4	-	-	-	-	1.7	1	-	-
GREENHEART	131	-	-	-	-	-	-	117	-	-	1.7	1	-	2
MIJAO	8	-	-	-	6	8	92	-	-	-	1.5	1	1	-
ANDIROBA JAREUA	9	99	-	-	-	-	-	-	-	-	1.5	1	-	2
MUIRATINGA	134	95	-	-	-	-	-	-	-	-	1.4	-	1	-
ASSACU	98	43	25	0.01	-	-	22	-	0.4	-	1.3	1	1	2
CUANGARE	66-68	-	-	-	87	-	-	-	-	-	1.2	2	3	-
CATIVO	161	-	-	-	-	80	-	-	-	-	1.2	1	1	2
LAUREL	59	-	-	-	56	-	19	-	-	-	1.1	2	2	2
CEIBA	51	42	-	-	-	31	-	-	-	-	1.0	1	1	-
SAMAN	147	-	-	-	-	-	73	-	-	-	1.0	1	1	-
CUPIUBA	92	27	-	-	-	-	-	24	16	3	1.0	1	-	2
LOURO	123	67	-	-	-	-	-	-	-	-	1.0	1	-	-
ROBLE CORRIENTE	123	-	-	64	-	-	-	-	-	-	0.9	1	-	-
TORNILLO	50	4F	-	57	-	-	-	-	-	-	0.9	1	-	-
MAPARANJUBA	111, 112	61	-	-	-	-	-	-	-	-	0.9	2	-	-
APAMATE	178	-	-	-	-	29	30	-	-	-	0.9	1/2	-	2
JACAREUBA	31-34	33	0.1	10	4	8	-	-	-	-	0.8	1	1	2
SUCUPIRA MATA	26	48	-	-	-	-	-	-	-	-	0.7	2	-	3
ABARCO	38	-	-	-	-	46	-	-	-	-	0.7	1	-	2
LUPUNA	54	-	-	46	-	-	-	-	-	-	0.7	1	1	-
SANDE	30	-	-	-	22	24	-	-	-	-	0.7	1	1	-
PAU AMARELO	89	43	-	-	-	-	-	-	-	-	0.6	2	-	-
MORFILLO	80	-	-	-	-	-	41	-	-	-	0.6	1	1	-
CARAÑO	63, 162	4F	29	-	-	7	-	-	-	-	0.5	1	1	-
QUARUBA	200-208	28	-	-	-	-	-	-	-	12	0.5	1	1	-
WALLABA	76-79	-	-	-	-	-	-	20	15	-	0.5	1	-	-
GUAYABO	181, 182, 184	-	-	10	6	15	-	-	-	-	0.5	1	-	3
COURBARIL	99	19	-	0.5	-	-	8	2	-	-	0.4	1	-	2
CARRETTO	17-20	-	-	-	-	29	-	-	-	-	0.4	1	-	-
ANGELIM	101-103	28F	-	-	-	-	-	-	-	-	0.4	1/2	-	-
MARUPA	172	22	-	0.2	-	-	-	4	1	0.4F	0.4	1	1	-
PIQUIA	41	27	-	-	-	-	-	-	-	-	0.4	1	-	-
CHARO	27, 28	4F	-	-	-	8	14	-	-	-	0.4	1	1	-
COPAIBA	55-58	14F	-	11	-	-	-	-	-	-	0.4	1	-	2
PURPLEHEART	140-145	14F	-	-	-	-	-	11	-	-	0.4	2	-	3
FREIJO VERMELHO	60	25	-	-	-	-	-	-	-	-	0.4	2	3	3

Note: For explanations of symbols and abbreviations see Appendix VI.

PILOT NAME	REF.No. APPENDIX I.	BRA 1972	BOL 1973	PER 1973	ECU 1973	COL 1971	VEN 1972	GUY 1973	SUR 1973	GUF 1971	PERCENTAGE OF TOTAL	WOOD VALUE S	P	V
ACAPU	209	19	-	-	-	-	-	-	6	-	0.4	2	-	-
SUCUPIRA	72, 73	19F	-	-	-	-	-	4	1	-	0.3	2	-	3
PEINEMONO	12-14	-	-	-	-	24	-	-	-	-	0.3	1	-	-
PAU D'ARCO	177	23	0.1	-	-	-	-	-	-	-	0.3	1	-	-
FERNAN SANCHEZ	188	-	-	-	23	-	-	-	-	-	0.3	1	-	-
MORNA	124, 128-130	-	-	22	-	-	-	-	-	-	0.3	1	-	-
CHANUL	97	-	-	-	20	-	-	-	-	-	0.3	1	-	-
CEDRO ROJO	47	-	-	-	-	-	20	-	-	-	0.3	2	2	-
MACACAUBA	150-153	19F	-	-	1	-	-	-	-	-	0.3	3	-	3
CEREJEIRA	7,110	16	-	-	-	-	-	-	-	-	0.2	1	1	-
MATO	116, 117	-	-	-	-	16	-	-	-	-	0.2	1	-	2
WANA	132	4F	-	-	-	-	-	-	5	6	0.2	1	-	-
MORA	115	-	-	-	-	-	-	14	-	-	0.2	1	-	2
BASHALOKUS	69	-	-	-	-	-	-	-	12	0.4F	0.2	1	-	2
DUKALI	136	4F	-	-	-	-	-	8	-	-	0.2	1	-	-
VARA PIEDRA	42-44	-	-	-	-	10	-	-	-	-	0.2	1	-	-
JIGUA	120, 121	-	-	-	9	-	-	-	-	-	0.1	1	-	-
KERETI	127, 130	-	-	-	-	-	-	9	-	-	0.1	1	-	-
ULCUMANO	156	-	-	9	-	-	-	-	-	-	0.1	1	1	-
ENCENILLO	210	-	-	-	-	8	-	-	-	-	0.1	1	-	-
PARICARANA (L)	148	8	-	-	-	-	-	-	-	-	0.1	1	2	-
PERILLO BLANCO	94	-	-	-	-	8	-	-	-	-	0.1	1	-	-
CAMORUCO	173	-	-	-	-	-	8	-	-	-	0.1	1	-	-
SERINGA	93	7F	-	-	-	-	-	-	-	-	0.1	1	1	-
ANIME	64, 65, 163	-	-	-	7	-	-	-	-	-	0.1	1	1	-
SANGRE DE GALLINA	199	-	-	-	7	-	-	-	-	-	0.1	1	1	-
SEBO	135	-	-	-	-	7	-	-	-	-	0.1	1	-	-
MANDIOQUEIRA	164-170	4F	-	-	-	-	-	-	2	0.4F	0.1	1	1	-
ARARACANGA	15, 16	4F	-	-	-	-	-	-	2	-	0.1	1	-	-
MOROTOTO	70	4F	-	-	-	-	-	-	2	-	0.1	1	1	1
AMARILLO	119	-	-	-	6	-	-	-	-	-	0.1	1	-	-
CHAQUIRO	155	-	-	-	-	6	-	-	-	-	0.1	1	-	-
CHAGUACA	191	-	-	-	-	6	-	-	-	-	0.1	1	-	-
ANANI	176	4F	-	-	-	-	-	1	-	0.4F	0.1	1	1	-
MORADILLO	109	-	5	-	-	-	-	-	-	-	0.1	1	-	-
HIGUERON	90, 91	-	-	-	-	5	-	-	-	-	0.1	1	-	-
CONGONA	29	-	-	5	-	-	-	-	-	-	0.1	1	-	-
SAJO (N)	52	-	-	-	5	-	-	-	-	-	0.1	1	-	-
DIABLO FUERTE	154	-	-	4	-	-	-	-	-	-		1	1	-
MOMDEY	82	-	-	-	-	4	-	-	-	-		1	-	-
PAU MARFIM	1	4F	-	-	-	-	-	-	-	-		1	-	2
LOURO AMARELO	10	4F	-	-	-	-	-	-	-	-		1	-	-
MUIRACATIARA	21	4F	-	-	-	-	-	-	-	-		2/3	-	3
TATAJUBA	22	4F	-	-	-	-	-	-	-	-		1	1	-
CASTANHA PARA	23	4F	-	-	-	-	-	-	-	-		2	-	3

PILOT NAME	REF.No. APPENDIX I.	BRA 1972	BOL 1973	PER 1973	ECU 1973	COL 1971	VEN 1972	GUY 1973	SUR 1973	GUF 1971	PERCENTAGE OF TOTAL	WOOD VALUE S	P	V
PARICARANA (H)	25	4F	-	-	-	-	-	-	-	-		2	-	3
PIQUIARANA	39, 40	4F	-	-	-	-	-	-	-	-		1	-	-
AMOEIRA	53	4F	-	-	-	-	-	-	-	-		1	-	-
ANGELIM PEDRA	71	4F	-	-	-	-	-	-	-	-		2	-	-
CUMARU	74	4F	-	-	-	-	-	-	-	-		1	-	-
SUCUPIRA AMARELA	75	4F	-	-	-	-	-	-	-	-		2	-	3
CATAUBA	81	4F	-	-	-	-	-	-	-	-		1	-	-
UNIRI	96	4F	-	-	-	-	-	-	-	-		1	-	-
JUTAI	100	4F	-	-	-	-	-	-	-	-		2	-	2
CAROBA	104	4F	-	-	-	-	-	-	-	-		1	1	-
ITAUBA	113	4F	-	-	-	-	-	-	-	-		1	1	-
ANGELIM RAJADO	146	4F	-	-	-	-	-	-	-	-		2	-	-
ABIURANA	114, 157-160	4F	-	-	-	-	-	-	-	-		1	-	-
ITAUBARANA	174	4F	-	-	-	-	-	-	-	-		1	-	-
TACHI PRETO	179	4F	-	-	-	-	-	-	-	-		1	1	-
TANIBOUCA	183	4F	-	-	-	-	-	-	-	-		1	-	-
FAVEIRA	137-139, 190	4F	-	-	-	-	-	-	-	-		1	-	-
TAURONIRO	95	-	-	-	-	-	-	4	-	-		1	-	-
PISI	126-130, 133	-	-	-	-	-	-	-	4	-		1	-	-
MANBARKLAK	83-87	0.5F	-	-	-	-	-	0.4	3	-		1	-	-
COPAL	187	-	-	3	-	-	-	-	-	-		1	-	-
ISHPINGO	6, 7	-	0.7	2	-	-	-	-	-	-		1	1	-
MOGAL	105, 106	-	0.4	2	-	-	-	-	-	-		1	2	2
ALMENDRILLO	180	-	2	-	-	-	-	-	-	-		1	-	-
BAROMALLI	45, 46	-	-	-	-	-	-	2	-	-		1	1	-
PERILLO NEGRO	61	-	-	-	-	2	-	-	-	-		1	-	-
MANNIBALLI	118	-	-	-	-	-	-	2	-	-		1	-	-
DUKURIA	171	0.5F	-	-	-	-	-	1	-	-		1	-	-
HUBUBALLI	108	-	-	-	-	-	-	1	0.3	-		1	-	-
PARCOURI	149	0.5F	-	-	-	-	-	-	0.3	0.4F		2	-	-
SALI	185, 186	-	-	-	-	-	-	-	1	-		1	-	-
HAIARI	3-5	-	-	-	-	-	-	1	-	-		1	1	-
DRAGO	62	-	-	-	-	1	-	-	-	-		1	-	-
SILVERBALLI	11, 107	-	-	-	-	-	-	1	-	-		1	-	-
ANGELIM AMARGOSO	189	1F	-	-	-	-	-	-	-	-		1	-	-
unspecified		611.5	5	118.5	24	125	86	0.6	0.7	1.2	14.1			
TOTAL		3300	221	644	560	1250	560	235	123	27	100.0			

Note: For explanations of symbols and abbreviations see Appendix VI.

PILOT NAME	REF.No. APPENDIX I.	BRA 1973	BOL 1973	PER 1973	ECU 1973	COL 1973	VEN 1973	GUY 1973	SUR 1973	GUF 1973	PERCENTAGE OF TOTAL
WALLABA	76-77	-	-	-	-	-	-	12	-	-	2.6
VIROLA	122-126	-	-	-	-	-	-	1	-	5	1.3
CUPIUBA	92	-	-	-	-	-	-	5	-	-	1.1
DUKALI	136	-	-	-	-	-	-	4	-	-	0.9
CUANGARE	66-68	-	-	-	3	-	-	-	-	-	0.6
GREENHEART	131	-	-	-	-	-	-	3	-	-	0.6
SILVERBALLI	11, 107	-	-	-	-	-	-	2	-	-	0.4
MORA	115	-	-	-	-	-	-	2	-	-	0.4
BAROMALLI	45, 46	-	-	-	-	-	-	1	-	-	0.2
unspecified		376	-	-	-	37F	-	1	7	2	91.9
TOTAL		376	-	-	3	37F	-	31	7	7	100.0

Note: For explanations of symbols and abbreviations see Appendix VI.

PILOT NAME	REF.No. APPENDIX I.	BRA 1972	BOL 1973	PER 1973	ECU 1973	COL 1973	VEN 1973	GUY 1973	SUR 1973	GUF 1973	PERCENTAGE OF TOTAL
VIROLA	132-138	233	2	-	-	-	-	-	0.02	-	37.3
CAOBA	175	98	47	-	-	-	-	-	-	-	17.3
ANDIROBA	36, 37	52	-	-	-	-	-	0.01	-	-	6.4
BALSA	122	-	-	-	23	-	-	-	-	-	3.6
ANDIROBA JAREUA	9	20	-	-	-	-	-	-	-	-	2.5
CEDRO	48, 49	18	0.1	-	-	-	-	0.01	-	-	2.2
GREENHEART	131	-	-	-	-	-	-	11	-	-	1.4
COURBARIL	99	9	-	-	-	-	-	-	-	-	1.1
MAPARANJUBA	111, 112	7	-	-	-	-	-	-	-	-	0.9
BASRALOKUS	69	-	-	-	-	-	-	-	5	-	0.7
WANA	132	-	-	-	-	-	-	-	5	-	0.7
ARARACANGA	15, 16	1F	0.08	-	-	-	-	-	-	-	0.1
CUPIUBA	92	1F	-	-	-	-	-	0.02	-	-	0.1
SUCUPIRA	72, 73	1F	-	-	-	-	-	0.01	-	-	0.1
ABIURANA	114, 157-160	1F	-	-	0.01	-	-	-	-	-	0.1
DUKALI	136	1F	-	-	-	-	-	-	-	-	0.1
PIQUIA	41	1F	-	-	-	-	-	-	-	-	0.1
CEIBA	51	1F	-	-	-	-	-	-	-	-	0.1
FREIJO VERMELHO	60	1F	-	-	-	-	-	-	-	-	0.1
PAU AMARELO	89	1F	-	-	-	-	-	-	-	-	0.1
ANGELIM PEDRA	71	1F	-	-	-	-	-	-	-	-	0.1
CEREJEIRA	7, 110	1F	-	-	-	-	-	-	-	-	0.1
LOURO	123	1F	-	-	-	-	-	-	-	-	0.1
PURPLEHEART	140-145	1F	-	-	-	-	-	-	-	-	0.1
MACACAUBA	150-153	1F	-	-	-	-	-	-	-	-	0.1
MANDIOQUEIRA	164-170	1F	-	-	-	-	-	-	-	-	0.1
MARUPA	172	1F	-	-	-	-	-	-	-	-	0.1
PAU D'ARCO	177	1F	-	-	-	-	-	-	-	-	0.1
QUARUBA	200-208	1F	-	-	-	-	-	-	-	-	0.1
CUANGARE	66-68	-	-	-	1	-	-	-	-	-	0.1
ASSACU	98	-	0.7	-	-	-	-	-	-	-	0.1
unspecified		44	1.12	15	0.99	122	-	0.95	-	2	23.3
TOTAL		565	51	15	31	122	-	12	10	2	100.0

Note: For explanations of symbols and abbreviations see Appendix VI.

EXPLANATIONS OF SYMBOLS, ABBREVIATIONS AND METHODS USED

Appendix I: Occurrence and denomination of South American tropical wood species

The occurrence of wood species in a particular country is indicated by the vernacular name used in the country. If more than one vernacular name is used, additional numbers are indicated in brackets.

Part A: Commercial species

All vernacular names typed in capital letters are pilot names as referred to in Appendixes III, IV and V.

The commercial importance of individual or groups of species, i.e. annual forest production of industrial roundwood is indicated as follows:

* - 1000 to 10000 m3
** - above 10000 m3
} in solid measure of roundwood

Part B: Lesser used species

All individual or groups of species of which figures on the annual forest production of industrial roundwood were available are indicated by:

* - up to 1000 m3 - in solid measure of roundwood

Appendix II: Use properties of South American tropical wood species

Symbols and abbreviations used:

DENS - Density:	L - low
	M - medium
	U - upper
	H - high
WORK - Workability:	
SHRI - Shrinkage:	A - good
FINI - Finishing:	
STRE - Strength:	B - medium
DURA - Durability:	
LOGF - Log form:	C - bad
OCCU - Occurrence:	

Basis for evaluation of use properties

DENS - density Wood density - weight divided by volume of 12 to 15 per cent moisture content. Average densities of wood species are grouped as follows:

	g/cm3
(L) light	up to 0.50
(M) medium	0.50 to 0.65
(U) upper	0.65 to 0.80
(H) high	0.80 and up

WORK - workability Summarizes suitability for sawing, peeling, slicing, planing, drilling, nailing, nailholding, screwing, gluing, moulding, mortizing and other properties related to cutting, combining and shaping wood.

SHRI - shrinkage The shrinkage coefficient used for classification is based on the relation between tangential and radial shrinkage, multiplied by volume shrinkage from green to oven-dry, as follows:

- tangential to radial shrinkage = a:

A - up to 1.4
B - 1.4 to 1.8
C - 1.8 and up

- volume shrinkage = b:

A - up to 10 per cent
B - 10 to 15 per cent
C - 15 per cent and up

- shrinkage coefficient (a x b):

A - up to 14 per cent
B - 14 to 27 per cent
C - 27 per cent and up

Indications on dimensional stability as well as on behaviour during seasoning or kiln drying were taken into account whenever they deviated notably from the above shrinkage classification.

FINI - finishing Properties are related to surface quality and appearance after wood-working and comprise items such as filling and printing, staining, painting, transparent coating and printability.

STRE - strength Summarizes properties such as bending, static and impact strength, stiffness, compression parallel and perpendicular to grain, shearing strength, cleavage, and resistance to wear. Many of the above strength properties are correlated and often show relationship with density. If data are available the strength classification is based on the values of bending strength at 12 to 15 per cent moisture content, as follows:

A - 100 N/mm2 and up
B - 50 to 100 N/mm2
C - up to 50 N/mm2

(N - Newton = 1 kg. m/sec2)

DURA - durability Comprises the whole complex of natural durability and resistance to decay and insect attack including termites and marine borers.

The durability classification is particularly based on the estimated service life of the wood under different conditions and its resistance to insect and fungi attack as follows:

Durability Class:	A	B	C
a) In continuous contact with moist ground:	5 years and up	3 to 5 years	very short
b) Exposed only to weather but kept from getting soaked in water and properly ventilated:	10 years and up	several years	very short
c) Under the roof, not in contact with moist ground and properly ventilated:	indefinitely	very long	several years
d) As above but properly maintained and regularly painted:	indefinitely	indefinitely	20 years
e) Attack by subterranean termites	rare	rapid	very rapid
f) Attack by powder post beetles:	none	not serious	very rapid

LOGF - Log form: Comprises size, appearance and frequency of natural defects, impeding full utilization as follows:

A - large well-formed unarmed trees, diameter at breast height above 60 cm, usable length 15 m and up, buttresses and natural defects which are not impeding full utilization.

B - medium sized well-formed unarmed trees, diameter at breast height between 30 and 60 cm, usable length up to 15 m or large trees not well formed with buttresses and natural defects impeding full utilization.

C - small trees, diameter at breast height under 30 cm which are of no commercial value with regard to the production of sawnwood and veneer.

OCCU - Occurience refers to the frequency of the tree in the South American Amazon region as described in the literature mentioned in Appendix VIII.

A - generally frequent
B - locally frequent
C - occasional to rare

Appendix III: Saw and veneer log production of South American tropical wood species

Wood value classification: The above classification does not contain indications on colour, texture, lustre and other wood characteristics relative to decorative aspects and to factors involving a certain measure of subjective judgement which may change over time because of changing consumer attitude. For these important aspects common denominators were established in the form of a broad value/use classification system which is based on estimates of averages 1972/3 at the point of shipping and/or at mill site. The estimates aim at bringing out the "solid wood" values for the commercial species and are based on established uses for sawing (S), peeling (P) and slicing (V). Conversion costs are excluded from these estimates as they would divert from the actual value of solid wood. The following value classes are applied:

		US$/m3
(1)	Low	up to 30
(2)	Medium	30 - 60
(3)	Intermediate	60 - 90
(4)	High	90 - 130
(5)	Special	130 - 180
(6)	Premium	180 - 260
(7)	Top	260 and up

Appendice III, IV and V.

P = Estimates

ABBREVIATIONS

South America	West and Central Africa	Southeast Asia
BRA - Brazilian Amazon	LIB - Liberia	THAI - Thailand
BOL - Bolivia	IVC - Ivory Coast	MAL - West Malaysia
PER - Peru	GHA - Ghana	SAR - Sarawak
ECU - Ecuador	NIG - Nigeria	SAB - Sabah
COL - Colombia	CAM - Cameroon	IDO - Indonesia
VEN - Venezuela	GAB - Gabon	PHIL - Philippines
GUY - Guyana	CGO - Congo	
SUR - Surinam	ZAI - Zaire	
GUF - French Guiana		

CHECKLIST ON PROPERTIES AND CHARACTERISTICS FOR EVALUATION OF LESSER-USED WOOD SPECIES

The following description of wood properties and characteristics is the result of [illegible] screening described in Chapter 4. The terms used in the literature were systematically [illegible] under the heading also used in this chapter, but indications on "Aspect and Structure" were added.

There are 44 items in the list below and the following comments seem appropriate:

- detailed studies are needed to define correlations between items, aimed at reducing the total number;
- add new items as may be necessary to improve description of properties and characteristics;
- results of tests on properties need to be expressed in terms understandable to all interested in working and using tropical timber;
- results of tests should be easily comparable when different test methods are used.

1. Workability

Properties related to cutting, combining and shaping wood:

(a) sawing
(b) peeling
(c) slicing
(d) planing
(e) drilling
(f) nailing
(g) nail holding
(h) screwing
(i) gluing
(j) moulding
(k) mortizing
(l) sanding

2. Finishing

Properties related to surfact quality and finishing:

(a) filling
(b) staining
(c) painting
(d) printing
(e) transparent coating

3. Shrinkage

Properties and criteria related to behaviour during seasoning and kiln drying [illegible] dimensional stability:

(a) volume shrinkage and swelling
(b) tangential and radial shrinkage
(c) T/R ratio
(d) tendency to split
(e) tendency to cell collapse
(f) tendency to other specific seasoning defects
(g) dimensional stability

4. Strength

Properties and criteria related to mechanical strength:

(a) static bending
(b) impact bending, toughness
(c) compression parallel to grain
(d) compression perpendicular to grain
(e) shear parallel to grain
(f) tension parallel to grain
(g) tension perpendicular to grain, cleavage
(h) hardness, resistance to wear

5. Durability

Properties related to natural durability, resistance and treatability:

(a) resistance against fungi
(b) resistance against wood borers
(c) resistance against marine borers
(d) resistance to acids, etc.
(e) treatability - type of preservative

6. Aspect and structure

Characteristics related to the natural aspect and wood structure:

(a) colour
(b) grain and texture
(c) heartwood - sapwood
(d) ageing - change in colour

7. Characteristics of logs

Description of type and frequency of natural defects, impeding full utilization:

(a) defects visible outside of tree trunk
(b) defects visible in transverse section
(c) deviation from cylindrical form
(d) occurrence of butt ends and other deformation in tree trunks causing difficulties in harvesting and utilization

Selected Bibliography for Reference:

A. Country Reference:

BRAZIL

1. "Amazonian Forestry" (1975)
   Ministério da Agricultura
   Instituto Brasileiro de Desenvolvimento Florestal
   Rio de Janeiro, Brazil

2. FAO/IBDF/BRA-45 (1974)
   "Production and Distribution of Amazon Timber Products"
   Bruce, R.W.
   Rio de Janeiro, Brazil

3. Loureiro, A.A., Freitas da Silva, M. (1968)
   "Catálogo das Madeiras da Amazônia"
   Belém, Brazil

4. FAO - No. 2080 (1965)
   "Forest Inventories in the Amazon"
   Report to the Government of Brazil
   Rome, Italy

5. "Relação Botânica de 704 Espécies Florestais Amazônicas"
   SUDAM
   Santarém, Brazil

6. Seminario FAO/Finlandia (1974)
   "Recursos para el Desarrollo de las Industrias Forestales Mecánicas del Amazonas"
   Belém, Brazil

BOLIVIA

7. FAO - No. AT 2323 (1967)
   "Estudio Preliminar de los Bosques"
   Informe al Gobierno de Bolivia
   Rome, Italy

COLOMBIA

8. Del Valle A., J.I. (1972)
   "Introducción a la Dendrología de Colombia"
   Medellín, Colombia

9. PROEXPO: Fondo de Promoción de Exportaciones
   "Maderas Colombianas"
   Bogotá, Colombia

10. INDERENA-UNDP/SF-FAO COL-16 (1972)
    Investigación: "Aserrio en Colombia"
    Bogotá, Colombia

ECUADOR

11. ECU/FOR/58/2/982 No.748 (1958)
    "Informe al Gobierno del Ecuador sobre un Estudio Forestal"
    Rome, Italy

12. FO:SF/ECU 13
"Estudio de Preinversión para al Desarrollo Forestal de la Región del Noroeste de Ecuador"
Rome, Italy

GUYANA

13. Agriculture Handbook No.207 (1962)
"Commercial Timbers of the Caribbean"
U.S. Department of Agriculture

14. "The Guyana Grading Rules for Hardwood Timber"
Forest Department
Georgetown, Guyana (1974)

GUYANE FR.

15. "Bois de Guyane"
Centre Technique Forestier Tropical
Nogent-sur-Marne, France:
Office National des Forêts, Paris, France:
Cayenne, Guyane française:
Ministère des Departements et Territoires D'Outre-Mer et la Prefecture de la Guyane

PERU

16. FO-UNDP/PER/119/21 - Part V. (1970)
"Wood Investigations"
Rome, Italy

17. Lebacq, L. (1973)
"Classification de Bois de l'Amazonie Peruvienne"
Tervuren, Belgium

SURINAM

18. Vink, A.T. (1965)
"Surinam Timbers"
Ministry of Development, Surinam Forest Service
Paramaribo, Surinam

VENEZUELA

19. "Anuario Estadístico Forestal 1972"
Ministerio de Agricultura y Cria
Caracas, Venezuela (1974)

20. UNDP-FAO (1970)
Estudio de Preinversión para el Desarrollo Forestal de la Guayana Venezuelana: Informe Final - Tomo III:
"Las Maderas del Area del Proyecto"
Rome, Italy

B. General Reference:

21. Association Technique Internationale des Bois Tropicaux (ATIBT) (1975)
"Nomenclature Générale des Bois Tropicaux"
Nogent-sur-Marne, France

22. Lebacq, L. and Staner, P. (1964)
"Anatomie Comparée des Bois d'Amérique Latine et d'Afrique Centrale"
Tervuren, Belgium

23. Gottwald, H. (1958)
"Handelshölzer"
Hamburg, Germany

24. Record, S.J., Hess, R.W. (2nd ed. 1972)
"Timbers of the New World"
New York, U.S.A.

25. "Veneer Species of the World" (1973)
by IUFRO Working Party on
Slicing and Veneer Cutting

26. Begemann, H.F. (1962)
"Lexikon der Nutzhölzer"
Mering, Germany

27. Dahms, K.G. (1956)
"Forst und Holz in Mittel-und Südamerika"
Stuttgart, Germany

28. Kukachka, B.F. (1970)
"Properties of Imported Tropical Woods"
Paper F.P.4. 125
Forest Products Laboratory
Madison, U.S.A.

29. Woods, R.P. (1953)
"Timbers of South America"
Timber Development Association
London, England

30. Chudnoff, M. (1973)
"Physical, Mechanical and other Properties of Selected Secondary Species in Surinam, Peru, Colombia, Nigeria, Gabon, Philippines and Malaysia"
Agency of International Development
Washington, D.C., U.S.A.

FAO TECHNICAL PAPERS

FAO FORESTRY PAPERS:

1. Forest utilization contracts on public land, 1977 (E* F* S*)
2. Planning forest roads and harvesting systems, 1977 (E* F* S*)
3. World list of forestry schools, 1977 (E/F/S*)

3 Rev. 1. - World list of forestry schools, 1981 (E/F/S*)

4. World pulp and paper demand, supply and trade - Vol. 1, 1977 (E* F* S*)
   Vol. 2, 1978 (E* F* S*)
5. The marketing of tropical wood in South America, 1978 (E* S*)
6. National parks planning, 1978 (E* F* S***)
7. Forestry for local community development, 1978 (E* F* S*)
8. Establishment techniques for forest plantations, 1978 (Ar*** C* E** F* S*)
9. Wood chips, 1978 (C* E* S*)
10. Assessment of logging costs from forest inventories in the tropics, 1978
    1. Principles and methodology (E* F* S*)
    2. Data collection and calculations (E* F* S*)
11. Savanna afforestation in Africa, 1978 (E* F*)
12. China: forestry support for agriculture, 1978 (E*)
13. Forest products prices, 1979 (E/F/S*)
14. Mountain forest roads and harvesting, 1979 (E*)
15. AGRIS forestry wood catalogue of information and documentation services, 1979 (E/F/S*)
16. China: integrated wood processing industries, 1979 (E* F* S***)
17. Economic analysis of forestry projects, 1979 (E* F* S*)

17 Sup. 1. - Economic analysis of forestry projects: case studies, 1979 (E* S*)

17 Sup. 2 - Economic analysis of forestry projects: readings, 1980 (E*)

18. Forest products prices 1960-1978, 1980 (E/F/S*)
19. Pulping and paper-making properties of fast-growing plantation wood species - Vol. 1, 1980 (E*)
19. Pulping and paper-making properties of fast-growing plantation wood species - Vol. 2, 1980 (E*)
20. Mejora genética de árboles forestales, 1980 (S*)
21. Impact on soils of fast-growing species in lowland humid tropics, 1980 (E* F*)

22/1. Forest volume estimation and yield prediction - Vol. 1, Volume estimation, 1980 (E* F* S*)

22/2. Forest volume estimation and yield prediction - Vol. 2, Yield prediction, 1980 (E* F* S*)

23. Forest products prices 1961-1980, 1981 (E/F/S*)
24 Cable logging systems, 1981 (E*)
25. Public forestry administration in Latin America, 1981 (E*)
26. Forestry and rural development, 1981 (E* F* S*)
27. Manual of forest inventory, 1981 (E* F*)
28. Small and medium sawmills in developing countries, 1981 (E* S*)
29. World forest products, demand and supply 1990 and 2000, 1982 (E* F* S*)
30. Tropical forest resources, 1982 (E/F/S*)
31. Appropriate technology in forestry, 1982 (E*)
32. Classification and definitions of forest products, 1982 (Ar/E/F/S*)
33. Logging of mountain forests, 1982 (E*)
34 Fruit-bearing forest trees, 1982 (E* F* S*)
35. Forestry in China, 1982 (E*)
36. Basic technology in forest operations, 1982 (E* F* S*)
37. Conservation and development of tropical forest resources, 1982 (E* F* S*)
38. Forest products prices 1962-1981, 1982 (E/F/S*)
39. Frame saw manual, 1982 (E*)
40. Circular saw manual, 1983 (E*)
41. Simple technologies for charcoal making, 1983 (E* F* S*)
42. Fuelwood supplies in the developing countries, 1983 (Ar* E* F* S*)
43. Forest revenue systems in developing countries, 1983 (E*)

44/1. Food and fruit-bearing forest species, 1983 (E* F*)

44/2 Food and fruit-bearing forest species, 1984 (E*)

45. Establishing pulp and paper mills, 1983 (E*)
46. Forest products prices 1963-1982, 1983 (E/F/S*)
47. Technical forestry education - design and implementation, 1984 (E*)
48. Land evaluation for forestry, 1984 (E*)
49. Extracción de trozas mediante bueyes y tractores agrícolas, 1984 (S*)
50. Changes in shifting cultivation in Africa, 1984 (E* F*)
51/1 Etudes sur les volumes et la productivité des peuplements forestiers tropicaux
    1: FormaTions forestières sèches, 1984 (F*)

52/1. Cost estimating in sawmilling industries: guidelines, 1984 (E*)

53. Intensive multiple-use forest management in Kerala (India), 1984 (E*)

Availability: December 1984

Ar	–	Arabic	*	Available
C	–	Chinese	**	Out of print
E	–	English	***	In preparation
F	–	French		
S	–	Spanish		

The FAO Technical Papers can be purchased locally through FAO sales agents or directly from Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

AE225E