

**A SHORT GUIDE
TO
SUBSTITUTE SELLING
OF
PAPUA NEW GUINEA TIMBER**

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PORT MORESBY
PAPUA NEW GUINEA**

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(G.E. GRESHAM)

INTRODUCTION

This paper is not intended to be a comprehensive treatise on selling nor on species. There are any number of excellent books on these subjects and a whole mass of statistics and data of all kinds on world timbers and timber trading which will repay study when entering new, or extending existing, sales coverage.

It is hoped to show in a simple way some of the steps to be taken when venturing into European markets, and how some Papua New Guinean species compare with the Top Ten selling species from Africa.

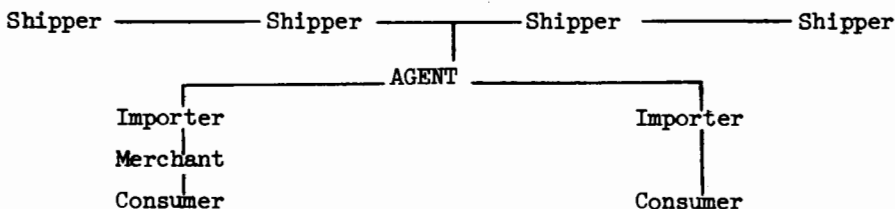
Much of the information is based on first hand experience of buying and selling timber and, it is stressed, views are the writers personal opinions. Acknowledgement is made for use of extracts and information from the various papers and publications listed in the bibliography in appendix III.

SELLING

In almost every country the business of importing timber and timber products is carried on through Agency Companies. It is not usual for business to be fixed directly between shippers and consumers though some large producers pursue a policy of integration by setting up their own agencies in consuming countries and becoming partners in existing or newly formed distributors of their products. Even in these latter cases care is taken to maintain the structure and trading pattern, recognising that each link in the distributive chain has a part to play and that attempts to short circuit the pattern almost inevitably have led to greater problems and less even distribution of available specifications.

There are many larger consumers who feel there is gain to be made by direct purchase from the overseas shipper. It is unlikely that direct arrangements of this kind would benefit a shipper. True there is the agent's commission on the f.o.b. price and the mark up of the importer which theoretically are available to be shared between the consumer-buyer and the shipper, however the agent does have work to do for his commission and an importer handling substantial contracts for one consumer will have to be so competitive that his mark up may be only 1½ to 2½% and even then he may be taking in some less saleable part of the total specification to his stock for later sale to other users. Thus, the actual saving in monetary terms of a direct shipper to consumer sale would be very small and far outweighed from the shipper's point of view by the risk of some hitch in shipping, port working, forwarding or documentation which, without the help of the agent and importer who are on the spot, could face him with immense costs, no customer, and his product lying uncared for in some far away land.

Usual European trade channels are:-



This chart is very much simplified and timber products may pass through several hands before final sale to the ultimate user.

An agency company generally prefers to be the sole representative of a shipper in a country and for his 5% or more commission will provide the services of his salesmen, often in many different ports and cities, will make out the contract, monitor the shipping, documentation and forwarding of shipments and above all will guarantee the good standing of buyers.

There are one or two exceptions but it is unusual in Europe for a buyer to renege on a contract properly enacted through a reputable agency, no matter how the price alters or how full the log ponds and timber yards.

Many agency houses are able to assist with finance. They may usually be relied upon to obtain the highest current market price, but it must be made clear that an agent exists on the goodwill of his buyers and he expects the shippers he represents to maintain goodwill by shipping exactly according to contract in grade, specification and time.

Whether a shipper is a producer of consistently high or consistently low quality, the agent will represent him fairly and help to find buyers in whichever category the production falls.

It is never wise to underestimate buyers, many of whom do not particularly care where their supply comes from nor its botanical name or structure as long as it serves their particular purpose and is the right competitive price and above all is reliable. Buyers are normally very loyal and if they find a reliable, consistent shipper, no matter whether it is in the highest grade or the lowest category, they will favour regular continuing business.

In this business there is no question of 'caveat emptor', let the buyer beware: quite the reverse, it is the seller who must beware for if he makes a mistake or sends a bad shipment he may never ever receive another order from that buyer and news of his lapse will quickly spread amongst other buyers.

Unless already having an existing sales organisation in the overseas target market it would appear advantageous for a shipper to select a good reliable agent to carry out the sales. If he does not perform the arrangement should be terminated and another agent appointed. It should be clearly appreciated that a European agent is, unlike some Japanese agents and trading houses, a shippers (sellers) agent and not a buyers agent. He is therefore intent on getting the best deal for the seller, with consequent higher return from his commission percentage; he is not under normal circumstances involved in buying on his own account to sell for a higher price and pocketing the difference. The contract will be between company 'X' as seller and company 'Y' as buyer "through the agency of" . Whatever price the buyer pays, all goes to the seller less agents commission.

PAPUA NEW GUINEA SALES

It is most unlikely that direct sales from PNG to consumers in Europe would be successful or satisfactory. It is essential to have someone (the agent) on the spot to arrange the paper work, shipping and transportation details and to be there in case of dispute. In due course an agent may agree to act 'del credere' for a shipper which basically means that letters of credit will be unnecessary as the agent will ensure payment to the shipper and may handle the payment in cash or by Bill of exchange from the buyer. So much for the structure of marketing.

The sales and production directors must decide where best their particular species would have the greatest chance of sales success. First to be overcome is the perennial argument as to whether production should be for the optimum in sizes and species and the sales department be forced to sell whatever was produced, or whether the sales department should sell and then force the production of what has been sold.

There is no straight answer. This must be a compromise; Companies must pay attention to the vital day-to-day liaison between the production and sales departments as neither one can be effective without the other, and export specifications are very strict, usually with a minimum requirement of Thickness x 150mm (6 inch) and wider x 2.4m (8ft) and longer.

Some countries still trade in the inch/foot system. There is a significant percentage loss if timber produced in inch/foot is sold as metric size.

NEW SUBSTITUTES FOR OLD

In opening new, or increasing existing markets for PNG timber it has to be accepted that, unless a completely new use timber has been found, we are attempting to substitute PNG timber for some other already in use.

Before anyone will change, assurance of continuity must be given. If it is not possible to absolutely guarantee continuity of supply it is scarcely worth wasting a buyers time. Given the continuity of species supply in the right grade and sizes with adequate shipping arrangements to the chosen market the next consideration is to discover which of the competitive timbers from other country's mills can best be substituted by PNG timbers. Obviously there are specialist uses for specialist timbers - ebony and rosewood for example - however the best chance is in the biggest volume market where the choice of potential customers and potential end use is greatest.

If Europe is the target market it is necessary to study first the African species which have been the main source of hardwood supply for more than 200 years. S.E. Asian timbers have been introduced as substitutes, with great success, in the main during only the past 30 years, though most of them are now sold on their own merits. We are beginning to see a form of role reversal; as the best known species become increasingly scarce, African countries are now looking to market their many lesser known ones - some of which inevitably can only compete with the S.E. Asian 'newcomers' such as Keruing, Meranti and the other dipterocarps, so in effect Africa and PNG are now having to face the same substitute marketing problems as S.E. Asia faced 25-30 years ago.

PNG is part of S.E. Asia yet, perhaps unexpectedly, PNG timber species appear much more comparable to African timber than to those of Malaysia and Indonesia and should, therefore, in the context of marketing into Europe, be compared and substituted for these rather than S.E. Asian species.

TOP SELLING AFRICAN SPECIES

From Courier No. 40 Nov/Dec 1976, the 10 best selling African species are listed below:-

<i>West and Central African saw and veneer log production of principal commercial woods - 1000m3 (1973)</i>									
	Log Production	Liberia	Ivory Coast	Ghana	Nigeria	Came- roon	Gabon	Congo	Zaire
OBECHE	1960	21	1109	520	229	69	-	5	7
OKOUME	1782	-	-	-	-	-	1571	211	-
SIPO	661	49	430	107	2	26	9	7	31
ACAJOU-MAHOGANY	586	3	195	161	136	18	19	28	26
SAPELLI	552	7	172	190	7	84	-	61	31
LIMBA	462	-	51	1	265	16	39	65	24
IROKO	349	9	184	95	17	18	-	6	20
TIAMA	308	2	179	83	6	4	5	3	26
AZOBE	284	16	5	1	1	261	-	-	-
MAKORE-DOUKA	274	20	166	56	-	2	15	15	-

From 'The Marketing of Tropical Wood':-

SAWNWOOD EXPORTS, BY WOOD SPECIES - SIX WEST AFRICAN COUNTRIES. Ivory Coast, Ghana, Nigeria, Cameroon, Gabon, Congo.

	1000m3	1951	1961	1970	1973
OBECHE		29	75	76	96
OKOUME		8	4	2	55
SIPO		1	48	94	93
ACAJOU-MAHOGANY		32	47	57	34
SAPELLI		18	47	45	60
LIMBA		0.3	4	0.2	1
TIAMA		1	4	18	21
MAKORE-DOUKA		1	5	12	14

As Courier says: "these are the top 10 species because they have the right qualities, they are available and, above all, they are known to the trade. Another 200 species are waiting to challenge them. Years of laboratory work have gone into investigating their properties, but timber dealers are not going to read through years of laboratory work!"

Most PNG producers will be suprised that the top seller is OBECHE which is a light density 23-25 lb cu.ft (370-410 kg m3), relatively weak and light coloured cream or yellowy timber, and even the next best seller, OKOUME, although a pink-red colour is still a relative lightweight 25-32 lb cu.ft. (400-500 kg m3). Far from PNG lightweight species being unmarketable they ought to have the best chance of success in a huge volume market, granted that this is the lower end of the price scale. Well up in the top ten is LIMBA which is one of the many familiar Terminalia species - not the same as in PNG but very similar and certainly near enough to satisfy the same end uses.

It is very important to avoid the term softwood when referring to soft hardwoods. In most parts of the world softwood means botanical softwood, Pine, Fir, Spruce etc. and is not at all used to describe the relative hardness and softness (i.e. density) of the wood.

On the following pages are descriptions of these 10 competitors and some notes on which PNG species might make substitutes. The densities are all defined as lbs per ft³ at 12% moisture content. The strength, shrinkage and durability factors are defined in appendices I and II. See also tables 2-0.

OBECHE *Triplochiton sceroxylon*West Africa

	<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
(also known as SAMBA-WAWA - AYOUS)	23-25lb.ft3	7	1-2	4 low (non durable)

Description: Timber is a pale straw or yellow-brown colour, weathering to light brown with little or no difference between heartwood and sapwood. The latter, however, may be up to 6 inches (150mm) wide. Texture is medium to coarse, but even, grain is usually interlocked giving typical striped figure on the quartersawn face. Growth rings indistinct. Lustrous surface. When first felled, timber has a disagreeable odour which disappears on seasoning. Tree has high buttresses which may rise up to 20 feet (6m) above the ground. Bole is clean and cylindrical and up to 80 feet (24m) in length. Common in tropical West Africa. Old trees may be hollow.

Characteristics: Logs must be extracted from the forest and converted rapidly to avoid deterioration by fungi or insects. Clean timber of exceptional length is obtainable. Air and kiln dries readily and rapidly with little tendency to degrade. Stock must be carefully piled to permit good air circulation. Works easily with hand or machine tools with a slight abrasive effect. Sharp edges necessary for smooth finish. Veneers, glues and stains well. Rather soft for hand-turning. Very resilient for its density. Liable to attack by pinhole borers, longhorn beetles and termites, as well as sap stain fungi. A die-back fungus *Botryodiplodia theobromae*, which reduces most mechanical properties is sometimes found in this species. Sapwood permeable, heartwood resistant to preservative impregnation. Steam bending properties moderate. Nail holding power is medium. Dust may cause asthma attack.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTES.

<u>AMBEROI:</u>	<i>almost identical - probably averaging slightly lighter in density (23) and colour. Advantage that Amberoi is more permeable to pressure treatment.</i>
<u>LABULA:</u>	<i>Almost identical - averaging slightly heavier in density (29) and stronger, strength groups 6. Advantages: Labula is more permeable to pressure treatment and its slightly better strength may be an added selling point.</i>
<u>BASSWOOD:</u>	<i>Almost identical.</i>
<u>WHITE CHEESEWOOD:</u>	<i>Almost identical</i>
<u>LIGHT EVODIA:</u>	<i>Almost identical.</i>
<u>LITSEA:</u>	<i>Almost identical: probably average slightly heavier (29) and stronger (6). Darker in colour.</i>
<u>QUANDONG:</u>	<i>Almost identical. Colour normally slightly less yellow and more brown than Obeche.</i>
<u>HEAVY EVODIA:</u>	<i>Rather heavier but probably acceptable if colour is right.</i>
<u>CHRYSOPHYLLUM:</u>	<i>Almost identical: probably slightly too light coloured.</i>
<u>TERMINALIA:</u>	<i>Some of the lighter density pale yellow terminalias such as Terminalia complanta and Terminalia longespicata may be acceptable if not too heavy or too distinctively grained. (see also Idigbo)</i>

OKOUME Aucoumea klaineana

West Africa

Density

Strength

Shrinkage

Durability

(also known as GABOON U.K.) 28-32

6

3

3-4

Description: Sapwood almost white or pale grey, 1-3 inches (25-75mm) wide. Heartwood salmon pink to light brown. Grain may be straight or interlocked with little figure although there is a slight, often irregular, stripe on the quarter. Texture is moderately fine and even. No odour or taste. Sometimes lustrous. Growth rings distinct. Bole 70-100 feet (21-30m) long, cylindrical but not always straight. Occurs in equatorial Africa and Guinea in well demarcated localities.

Characteristics: Logs liable to sap-stain in the forest. Although fairly soft the timber is rather difficult to saw and may blunt saw teeth due to gritty content. Easy to work with hand tools but interlocked grain may cause roughening. Sanding or scraping necessary for good finish. Slices and peels well but veneer quality variable. Glues well. Filler needed for good finish. Strength varies with origin. Seasons easily with little degrade but when air-drying some cover necessary to prevent decay. Takes nails and screws well with good holding power. Refractory to impregnation. Prone to termite attack.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTES

ERIMA:

Lighter in density (22) and not as strong. (7) Colour is not brown or red enough but even grain will allow staining to required shade. Suitable for the joinery uses but probably not as acceptable for peeling. Okoume/Gaboon is widely accepted as a "Mahogany type, even grain, red plywood and blockboard face".

CRYPTOCARYA:

Similar properties, a little more dense and stronger, colour rather too brown.

CAMPNOSPERMA:

Lighter in density (26) and not as strong (7) Colour rather pale pink.

CALOPHYLLUM:

Rather heavy (37+) and much stronger but the right colour and peeling properties. Calophyllum is a rather better and more valuable timber than OKOUME and better compared to SIPO (UTILE 'MAHOGANY') or the KHAYA MAHOGANIES OR SAPELE

CANARIUM: (GALIP)

Rather heavy (41) but good even grain makes this possibly (with Red Planchonella) the best Papua New Guinea substitute for Okoume as the colour also is about right.

RED PLANCHONELLA:

Just a little heavier in density, (37), colour about right but on the pale side.

SCHIZOMERIA:

Heavy (40) but probably about the right colour and even grain.

RED BROWN TERMINALIA:

(BROWN TERMINALIA)

Some of these species are very similar in density and performance though their colours are not right, being brownish rather than pink or red. Colour selection would be needed in order to make these a substitute for any of the similar African species.

SIPO Entandophragma utileUTILE (UK)

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
40-45	5-6	3-4	3

Description: Sapwood up to 2 inches (50 mm) wide, light brown, and well demarcated from the fairly uniform red or purple-brown heartwood. Texture medium, and somewhat finer than Khaya spp. Grain broadly interlocked, producing wide, often irregular quartersawn stripe. Timber has a faint, cedar-like scent. Bole is straight, cylindrical, and up to 100 feet (30m) in length, occasionally fluted. Tree may be free of buttressing in some areas, while thick, high buttresses may occur in other places. Species occurs in moist-dry and dry sub-types of closed forest, in transitional formations and in moist, deciduous high forest. Often found in groups.

Characteristics: There are conflicting reports regarding the seasoning qualities of this species. Apparently it air-dries slowly with a slight marked tendency to splitting and distortion. However, the severity of degrade may vary considerably from log to log. Kiln-dries satisfactorily with only slight degrade, except in material with severe interlocked grain. Timber works fairly easily with all tools with relatively little blunting effect. Interlocked grain may cause tearing in planing and moulding. Fifteen degree cutting angle will give good results. Finishes and polishes well, although a filler is needed. Takes nails easily. Heartwood moderately resistant to termites and marine borers. Very resistant to impregnation. A poor steam-bending timber. In drilling, some charring may be expected. Peels and slices well, and can be glued satisfactorily. Timber is corrosive to metals.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTES

KAMARERE:

Just the right density (43) and Colour. Quarter sawn surfaces look very similar to 'Mahogany'. Its performance should be equal in all respects to all except the Finest Prime, mild, even textured Khaya Mahogany.

CALOPHYLLUM:

The heavier density (40-45) is just right as is the colour and grain. Flat (back) sawn looks very much like most of the African Mahoganies.

TAUN:

Some taun looks like some Mahogany types - and some doesn't - probably Taun is better marketed in its own right but in all respects its end uses can be the same as for the Mahoganies.

DVSOX:

A little heavier in density (49) but probably seasons better than some of the heavy mahogany types (see also Makore). It is the right colour.

CANARIUM:

(GALIP)

The better Canarium could compete for density and colour, however shrinkage and seasoning factors are little known.

RED PLANCHONELLA:

Almost identical to some of the milder Mahoganies though not always showing a Mahogany type grain. Colour is about right.

ACAJOU/MAHOGANY Khaya ivorensis (and other Khaya spp)

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
35-45	5-6	2-3	3

Description: Sapwood $\frac{1}{2}$ -2 inches (12-50mm) wide, creamy white, distinct from the uniform pale pink or pale red heartwood which darkens to a deep brown with a golden lustre. Texture medium to coarse. Grain straight but may be often interlocked. Growth rings usually indistinct. A very large tree. Sapwood is often removed soon after felling to prevent ambrosia beetle attack. Quality of logs is variable. Common defects found are thunder-shakes, cross-breaks and "punk" heart. Species is distributed through coastal West Africa, mainly in the rain forest areas, but also extending into the drier forest zone. Some planting has been carried out successfully within the natural habitat of the species.

Characteristics: Timber air and kiln dries well with little tendency to split, though some warping may occur due to interlocked grain. Rather variable in working properties, and the surface quality depends on the degree of interlocking which can result in pick-up on the quartered surfaces, unless the cutting angle is reduced to 15°. Timber sometimes tends to "woolliness" in machine finishing, and the use of sharp, thin edge-cutters is then essential. Dust may cause dermatitis occasionally. Nailing, screwing and gluing properties are very good. An excellent finish is readily obtainable. Timber has a good reputation as a plywood and veneer species. Moderately susceptible to fungi, but timber is seldom used where this is a hazard. Prone to pinhole borer, longhorn beetle, teredo and termite attack. Extremely resistant to impregnation. Steam-bending properties very poor. Black iron stains may occur.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTESKAMARERE:

Just the right density (43) and Colour. Quarter sawn surfaces look very similar to 'Mahogany'. Its performance should be equal in all respects to all except the Finest Prime, mild, even textured Khaya Mahogany.

CALOPHYLLUM:

The heavier density (40-45) is just right as is the colour and grain. Flat (back) sawn looks very much like most of the African Mahoganies.

TAUN:

Some taun looks like some Mahogany types - and some doesn't - probably Taun is better marketed in its own right but in all respects its end uses can be the same as for the Mahoganies.

DYSOX:

A little heavier in density (49) but probably seasons better than some of the heavy mahogany types (see also Makore). It is the right colour.

CANARIUM:
(GALIP)

The better Canarium could compete for density and colour, however shrinkage and seasoning factors are little known.

RED PLANCHONELLA:

Almost identical to some of the milder Mahoganies though not always showing a Mahogany type grain. Colour is about right.

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
40-45	4	2-4	2-3

Description: Sapwood grey-pink or cream coloured, 3-4 inches (75-100mm) wide, heartwood pink when freshly cut, darkening to red-brown or purple-brown, lustrous. The most striking feature of wood is its regular stripe or roe figure on quarter cut face. This type of figure is better developed in this species than in any other member of the mahogany family. Texture rather fine, grain interlocked or wavy. Timber liable to ring or cup shakes, but is generally free from the cross-breaks which occur in African mahogany. Distinct cedar-like scent remains even after long exposure. Gum canals may be present. Growth rings distinct. Bole 65-110 feet (19.5-33m) long, straight, high, and cylindrical, with a swollen base and low, thick buttresses rarely extending over 12 feet (3.6m) up the stem. Occasionally unbuttressed. Species occurs in semi-evergreen and evergreen forests, on rocky ground, in lake-shore forests, deciduous forests, semi-deciduous and almost dry zones and transitional formations.

Characteristics: Timber seasons fairly rapidly with a marked tendency to distort. Careful stacking and slower drying, as well as quarter-sawing, will reduce warping and other losses. Considerable variations in the species seasoning properties have been reported. Timber is generally harder than either African or American mahogany, but some strength properties, such as impact, may drop by up to 70% from green to dry. Timber works fairly well by hand machine tools with a relatively minute dulling effect on cutting edges. It has a tendency to pick up in planing due to its interlocked grain. Finishes well in all other operations, takes and holds nails and screws well, polishes excellently and stains readily. Glues well. May be peeled and sliced satisfactorily. Liable to pinhole borer attack, and not resistant to termites and marine borers. Sapwood moderately resistant and heartwood resistant to preservative treatment. Timber is resilient and has a good resistance to wear. Steam bending characteristics poor. Timber has a corrosive effect on iron.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTES

KAMARERE: *Just the right density (43) and Colour. Quarter sawn surfaces look very similar to 'Mahogany'. Its performance should be equal in all respects to all except the Finest Prime, mild, even textured Khaya Mahogany.*

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RED PLANCHONELLA: *Almost identical to some of the milder Mahoganies though not always showing a Mahogany type grain. Colour is about right.*

LIMBA Terminalia superba
(White Afara)

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
30-35	5-6	3-4	4

Description: Sapwood 5 to 6 inches (125-150mm), not distinct from heartwood. Colour varies from a grey or pink-white when freshly cut, darkening to a light red-brown. Depending on locality, some stems contain an irregular almost black heart which may be brittle. Grain varies from straight to slightly interlocked, texture moderately coarse. Growth rings often wide and well defined. If dark coloured wood makes up a large proportion of the log, it is sold separately. Ray cells are filled with a yellow gum. Larger trees may have straight clear boles up to 90 feet (27m) in length. Buttresses may extend to 8 feet (2.4m) up the tree. Tree occurs in small dense forests, rain forests and in savanna forests. Plantations are successful in West Africa.

Characteristics: Logs should be debarked and treated in the forest with fungicides and insecticides to prevent decay and borer attack. Saws easily. Seasons rapidly with little degrade. Very stable, Variable in density but works easily with hand and machine tools. Veneering properties are good. Finishes and glues well if filler used. Holds nails and screws firmly, but with some tendency to split. Sapwood is moderately resistant to preservative penetration, heartwood extremely so. In large logs, brittle heart should be boxed out. Splinters may cause bad inflammation of the skin. Bending properties poor. Susceptible to Anobium, termite, marine borer and longhorn beetle attack.

This is Terminalia superba, a species not found in PNG but most similar to PNG Red-Brown and Brown Terminalias which are of similar density, strength group and colour; almost identical in every respect and suitable for the same end uses.

In Africa, too, there are many terminalia species and the next in importance is Idigbo.

It is probable that both the Limba (and the Idigbo) being marketed from Africa contain more than one species.

PAPUA NEW GUINEA SUBSTITUTES: Papua New Guinea Terminalias, if colour graded, should in all respects pass as equal to the African species of Limba, Afara and Idigbo.

Limba (Afara) should be substituted by such species as Terminalia calamansanai, Terminalia brassii, Terminalia micro carpa, Terminalia solomonensis etc - the Brown or Red brown colours.

IDIGBO Terminalia ivorensis(Emeri-Black Afara)

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
32-40	5	3	2

Description: Sapwood up to 2 inches (50mm) thick, not clearly demarcated from the yellow-brown or light pink-brown heartwood. An irregular brown stripe occasionally present. Texture medium to fairly coarse. Grain usually straight. Growth rings distinct. Bole usually clear to a height of 70 feet (21m). Base slightly buttressed. The heart of large stems may be rotten or brittle. Species is successful in plantations. Tree grows in rain forest at altitudes up to 4000 feet (1200m), also in transition formations.

Characteristics: Timber seasons readily and well, with little or no distortion or degrade. Good air circulation around drying stacks is necessary. Stock works well with most hand and machine tools. Quarter-sawn stock may tear a little when planed under standard conditions. Finishes, turns, stains and polishes well, with little preparation necessary. Good nailing and screwing properties. Takes glue well. Veneers satisfactorily. Steam-bending properties poor. Damage by pinhole borers and longhorn beetles sometimes present. Reports of termite resistance variable. Sapwood moderately resistant, heartwood highly resistant to preservative treatment. Yellow dye in the timber makes it unsuitable for laundry equipment. Tanning causes timber to become stained in contact with iron. Slight acidic properties may corrode metals. Good moulding timber. Dust may cause irritation of skin or respiratory tracts.

This Terminalia ivorensis and PNG Yellow Terminalias are very similar in all respects even to colour, density and end uses.

The 'other names' Black and White (agara) refer to the colour of the bark and not to the colour of the timber which in the case of Limba is light yellowish brown occasionally with irregular greyish marking; Idigbo timber is yellow, the same as the yellow terminalias of PNG.

It is probable that both the Idigbo (and the Limba) being marketed from Africa contain more than one species.

PAPUA NEW GUINEA SUBSTITUTES: Papua New Guinea Terminalias, if colour graded, should in all respects pass as equal to the African species of Limba, (Afara) and Idigbo.

Idigbo should be substituted by species Terminalia complanta, Terminalia longespicata etc. - the yellow to pale straw colours.

IROKO *Chlorophora excelsa*

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
40-45	4	1-3	1-2

Description: Sapwood clearly defined yellow-white, up to 2 inches (50mm) wide in mature trees but 4 inches (100mm) or more in small logs. Heartwood light yellow, rich brown or greenish brown, darkening on exposure. Texture medium to coarse, grain typically interlocked, figure mottled. Wood is slightly greasy with no odour. Logs from closed forest are generally sound, straight and cylindrical. Trees growing in the savanna are often damaged by fire and the butt log affected by eccentric growth, ingrown bark or "stone" (a calcium carbonate plus). Depending on location the bole may vary from 30 to 80 feet (9-24m). Species is widespread at altitudes below 4000 feet (1200m) and grows under a variety of conditions.

Characteristics: Timber dries rapidly with very little degrade. It has good but variable working properties. Interlocking grain may pick up during sawing or planing. Wood is rather abrasive due to mineral deposits. Wet sawdust may cause dermatitis. Good nailing, screwing and gluing properties; polishes and stains well but requires filler. With case in glue a black line is produced along the glue line. Moderate steam bending properties. Resistant to marine organisms, termites and fire. Heartwood impermeable to preservative impregnation. Stable with good weathering properties. Chemically active with iron.

*This is a well known and sought after timber originally marketed, along with Afrormosia (*Afrormosia angolensis*) and Muninga (*Pterocarpus angolensis*) and others, as a substitute for Teak. Both Afrormosia and Muninga are now very expensive and difficult to obtain leaving Iroko, which is not quite as good a timber, a clear field as a Teak substitute for joinery etc. and particularly for boat building.*

PAPUA NEW GUINEA SUBSTITUTES.

- KWILA:** *Is a little heavier in density (52) on average but is about the right colour and texture. With its 'oily' feel and good working properties may be a better substitute for Teak than is Iroko.*
- VITEX:** *Is about the right density [44] and colour, could probably be developed as a competitor of Iroko given more data and experience of working properties.*

TIAMA Entandophragma angolensealso known as
GEDU NOHOR (UK)

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
35	5	5	3

Description: Sapwood is creamy white or pale pink up to 4 inches (100mm) wide. Heartwood may be pale pink, pink-brown or a dull uniform red which usually darkens on exposure to a deep red-brown, the sapwood remaining pale. Texture fairly uniform and medium. Grain interlocked, producing a rather wide, often irregular stripe on the quartercut face. Darker wood has cells heavily infiltrated with gum. Bole is straight to moderately straight, cylindrical and 60-80 feet (18-24m) long. Buttresses are thick and may be up to 20 feet (6m) high, with wide-spreading root-ridges. Species occurs in rain forest, semi-evergreen forest, deciduous forest and transitional formations. Coppices freely at the pole stage, and can be regenerated from stumps.

Characteristics: Timber saws easily with circular and wide bank-saws. Air seasons slowly with a marked tendency to distort and warp. Kiln-dries with little or no checking if a mild schedule is used. Warping is not excessive in thicker dimensions. Timber must be fully seasoned before use. Works fairly easily with machine and hand tools. Due to interlocked grain, stock may pick up quite considerably on the quarter-sawn face. Backsawn faces plane readily and finish smoothly. In planing and moulding, a 15° cutting angle will show good results. A good finish is obtainable in most operations if sharp cutters are used. Timber drills and mortises cleanly and turns readily. Finishes well. Takes nails and screws well without splitting, and has good holding characteristics. Glues well. Liable to pinhole borer and marine borer attack. Termite resistance variable. Heartwood extremely resistant and sapwood resistant to preservative treatment. Poor steam bending properties. Because of large, defect-free logs, species is suitable for peeling and slicing. Darker wood is appreciably denser, has better working qualities, and takes longer to season than the light coloured wood which may be woolly and more difficult to saw. Low fibre saturation point.

This is another Entandophragma like Sapele and SIPO (Utile) and though mentioned seperately it seems likely that many of these species, which are variable in density, are marketed rather mixed.

PAPUA NEW GUINEA SUBSTITUTES.

Same as for SIPO - SAPELE and MAHOGANY with the possible addition of:

DILLENIA: About the same or slightly heavier density, and shares the high shrinkage and air seasoning distortion and warping problems of Gedu Nohor.

TAUN:)
KAMARERE:)
CALOPHYLLUM:)
DYSOX:)
CANARIUM)
(Galip))
RED PLANCHONELLA:)

As previously described and compared.

AZOBE *Lophira alata*

(EKKI)

DensityStrengthShrinkageDurability

63-71

1

5

1

Description: Sapwood is a pale pink colour up to 2 inches (50mm) wide, well defined from the heartwood which is a purple-brown or deep chocolate brown. Texture is variable, grain interlocked. Occasional figure and gum veins. Tree may occur as one of small stature and twisted bole but in areas of Ghana, Nigeria and Cameroon it may reach large heights with boles up to 100 feet (30m). Species occurs in evergreen and deciduous forests, in freshwater swamp forests and close to river-banks.

Characteristics: Very difficult to season without excessive degrade particularly surface checking and end splitting. However some reports have been favourable. Because of its hardness and high density the timber is very difficult to work with hand tools and has a severe blunting effect on cutting edges. Hard to screw or nail. Saws comparatively well. Very strong and resilient. Resistant to, but not immune from termites and pinhole borers. Resistant to teredo marine borers. Heartwood impermeable, sapwood resistant to impregnation. Gluing properties variable but usually good. Good wearing and weathering properties. Fairly stable. Resistant to damage by acids. Steam bending properties poor.

This timber is better known as EKKI. It is a very difficult timber to do much with as it is so hard and dense. If the logs, some of which are very large, are allowed to dry out it is virtually impossible to saw up commercially. It is reputed to be the most durable wood in West Africa.

PAPUA NEW GUINEA SUBSTITUTES

Almost all the heavier Papua New Guinea Species would be easier to deal with than EKKI. Malas, Water Gum, Yellow Hardwood are all softer and more workable, however they are not as durable though Malas is probably unique in its permeability to pressure impregnation and would certainly be far easier to work than EKKI and at least as durable when so treated.

MAKORE-DOUKA *Tieglemella africana* and *Tieglemella heckelii*

<u>Density</u>	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
40-45	4-5	4-5	1

Description: Sapwood is 2-3 inches (50-75mm) wide, pale pink, differentiated from the heartwood which may vary from pink to a rich mottled figure with occasional darker streaks is produced. Texture is fine to very fine. Lustrous. Tree bole may be massive and cylindrical up to 100 feet (30m) in length. Logs may shatter on falling. Species is widely distributed in high forest and rain forest.

Characteristics: Timber has a high silica content which causes rapid blunting of saws. Tungsten carbide tipped teeth give good results. Species seasons slowly with moderate amount of degrade. Works reasonably well with machine and hand tools apart from blunting effect. Finishes and glues well. Pre-boring is recommended as timber is liable to split on nailing or screwing. In planing, a 20° cutting angle is necessary to avoid tearing of quartersawn stock. Fine dust may irritate nose and throat or cause dermatitis. Produces high grade veneers. Heartwood is suitable but sapwood unsuitable for steam bending. Resistant to termites and Anobium borer, durable in the ground. Occasionally attacked by stain, pinhole and longhorn borers. Sapwood is moderately resistant and heartwood extremely resistant to preservative treatment. May develop stains in contact with iron. Stable.

These two separate species are actually in the same family, (Sapotaceae,) as PNG Pencil Cedar but the resemblance ends there as these are dense and very dark red timbers, full of silica which blunts saws and planer knives and whose dust is an irritant necessitating wearing of protective masks and clothing. They are used mainly for high grade veneers, specialist joinery and flooring though suitable for the same end uses as the 'Mahoganics'.

PAPUA NEW GUINEA POSSIBLE SUBSTITUTES

KAMARERE: As previously described.

DILLENIA: As previously described.

CALOPHYLLUM:

DYSOX:

CANARIUM:

TAUN:

All the PNG substitutes would probably have easier working properties as they are without Makore's high silica content.

SPECIFICATIONS

A vital step is to discover the size specifications and grades most desired by buyers. The agents will know this, and examination of other shippers and the importers stock lists will quickly provide information. From this can be calculated the approximate conversion percentage, reject rate for each grade and so the cost evaluations relating to size and grade offered for sale. Upon consultation with the agent the best compromise specification between production and sales considerations can be drawn up, and priced, to be offered to potential customers, and production planning can begin.

To quote from Dossier: 'The question of specifications is an important aspect of marketing. Standardisation, dimensional accuracy, moisture content, tolerances, quality control and packaging are so many anxieties for importers. Tropical forest products usually take several months in transit from producer to consumer, during which time they can be affected by handling, moisture and temperature. The timing of deliveries in these conditions also needs special attention. All these are aspects of industrialisation, a complex subject. Timber processing mills producing for export will continue to face rather rigid market requirements for some time to come, and will have to find an economically viable and technically appropriate mixture of wood species from what is often a limited choice in any particular locality. The choice of species will also depend on thorough market studies.

Local Markets.

"Although export markets will continue to play a key role, local markets offer the advantages of different and possible integrated industrial operations through which it would be possible to use a wider range of species and also to use wood, including residues, more efficiently. It will require considerable technical and managerial pioneering but developing local markets could offer outlet for lesser-used species, particularly for their utility qualities, and for a wider range of processed products - quite apart from socio-economic considerations. Another aspect of local markets is that the building and construction industries could very well use the tropical woods that are generally considered too heavy for general utility purpose in the industrial countries, which are used to temperate forest species. More than 90% of the trade in the temperate countries is in low density species. Heavy species are usually bigger and stronger, after all. Nonetheless, since there is a high demand for light and medium-weight hardwoods, increasing attention should be given to these in planning the regeneration of forest resources and when evaluating the use potential of lesser-use species for general utility purposes, it would be uneconomic and impractical to market species individually. While there is a high degree of flexibility in the use of most commercial species, specialisation for specific uses has marked economic advantages. Marketing should aim at selling the right wood for the right job".

SEASONING

It is essential that production is begun in good time to provide air dried sawn lumber to be available soon after the sales offers are made. A buyer with many excellent sources of supply is not going to change to some unknown shipper half way round the world who can't give delivery for six months. The timber market is volatile and buyers have to take risks. on price movements, the longer ahead the shipment date the greater the risk, and, as a corollary, the quicker the goods are shipped the less chance is there of contract cancellation.

Most sawn timber is shipped after air seasoning and should not be packaged completely encased in plastic sheeting. It is sufficient to cover only the top with a short overhang each side and perhaps the ends of the package. Sides and bottom should be left open to avoid the timber sweating and thus causing discolouration. It is better to leave entirely unsheeted than to cover completely.

The only exception to this is for timber kiln dried to a low moisture content 9-11% which may be packaged completely in plastic to inhibit moisture movement during transportation and even so it may be wise not to completely cover. The Singapore Timber Trade mission to Australia July 31 - August 14, 1976 made the following recommendations:-

"Packing. For kiln-dried timber, the moisture content should be maintained at below 14% at time of packing and the bundles should not be completely wrapped in polythene or kraft paper as this would induce sweating within the bundle. Preference was expressed by importers for kiln-dried parcels to be wrapped in polythene on both ends and on the top and bottom leaving the sides open for air circulation.

In case of strips, there must be sufficient stickers spaced in between a bundle to prevent the bundle from collapsing or "balling" during handling and in transit. The collapse of a bundle results not only in loose pieces of the bundle being lost, it will also mean that additional labour will be required at the wharf to gather the pieces for delivery to the buyer's yards.

Small bundles of 1.5-3 cubic metres also lead to wasteful labour in handling and larger bundles in units of between 15-30 cubic metres were preferred by the importers".

Importers have their own air seasoning yards and sheds for intermediate storage of timber awaiting sale or delivery. Much of the timber will be used in an air dried condition at an approximate equilibrium moisture content of about 14-16%, maybe a little drier in the summer or more moist in the winter.

Stored, kiln dried timber will in time revert to this equilibrium moisture content, and in this case the kiln drying will have been only a means of quicker seasoning, which may be a financial benefit to the producer or importer in lower stockholding times/costs etc., but which does not render the timber any more suitable at point of sale for such specific uses as, say, furniture manufacture.

For specialist uses the timber will have to be kiln dried to an exact moisture content, specified by the end-user, and virtually the only way of guaranteeing the timber to be delivered in this condition is to kiln dry in the country of import and deliver direct ex-kiln to the users premises. For this reason many specialist kilning companies exist, though major furniture and joinery manufacturers now buy their timbers air dried (shipping dry) and have their own large kiln installations in order to retain complete control over quality and condition. The question of whether or not to kiln dry in the producing country is largely a matter of the economics of fuel and capital costs in relationship to possible savings in stock financing and possible value added to the product. It is much less a question of demand by end users.

It is far more important to produce consistently well sawn, well graded air seasoned (shipping dry) timbers than to rush too soon into the relatively small specialised market for kiln dried sawn timber. Without further processing, the added value of kiln dried timber is unlikely to be economically rewarding unless fuel and capital costs are very low and the material remains closely under control until it is safely in the ships hold.

In a recent typical month, Singapore exported more than 106,000 cubic metres of timber. Less than 3,000 m³ was kiln dried, but included, was almost 4000 m³ of mouldings.

It is quite plain that kiln drying is not yet essential in either market or economic terms for the bulk trade in sawn hardwood.

There is an increasing trend towards kiln drying but this is an expensive and technically demanding process. In the case of PNG timbers it is likely that the most economic return will be for kiln dried and then further processed timbers such as moulding, and furniture components rather than as merely kiln dried sawn lumber. Further processing has a significant advantage, that of selling a component rather than a particular timber. For example a quadrant, architrave or D mould from well graded kiln dried labula, spondias, erima, buchanania or any one or more of many similar species would be equally acceptable to the same moulding made in Baltic red wood or obeche or ramin, so that in such cases the product is being sold and not the timber species; appearance, colour consistency and accurate smooth machining are more important than botanical names.

MARKETS

The study of competitors exports statistics and importing countries trade figures is a continuing aspect of sales departments' work. Much useful price information can be obtained from agent and importers stock and offer lists and, once again, from export statistics which will show average FOB prices to various markets. Careful analysis of prices, species, freight opportunities and cost will quickly give leads to the optimum target markets, and also point to those markets likely to prove unworkable.

In the case of mouldings previously mentioned, a study of the Singapore export figures reveals the U.S.A. buys from Singapore more than twice the volume of mouldings sold to all the other countries put together and as PNG has a good, cheap, reliable shipping service to U.S.A. it would be logical to make any major moulding sales effort towards the U.S.A.

A promising looking market is the Middle East where statistics show large volumes of timber imports; however, closer studies will reveal that usually buyers want the very cheapest bulk volume, there are very many sources of supply from Europe, Malaysia and Indonesia all of which countries can offer the required volumes of single bulk species and shipping arrangements with regular sailings of bulk carriers. PNG shippers cannot offer either the volume to fill a large and therefore economical ship or smaller volume liner parcels as there are no regular ships and demurrage problems in most Middle East Countries are horrific; further than that, PNG just cannot compete in the cheap end of the market because of high costs of conversion and transport. Presently, therefore, and probably medium to long term the Middle East is likely to prove unrewarding, if tempting, for PNG shippers.

A brief round up of the major European Markets may interest.

All countries buy large volumes of Red coloured hardwoods. The marketing question is; in which areas do PNG species compete?

Main species areas are in descending order of price:-

- (a) Mahogany - Types, heavy (weight and colour)
- (b) Mahogany - Types, light (weight and colour)
- (c) Meranti - Dark Red
- (d) Meranti - Light Red and other lights (weight and colour) suitable for general joinery or peeling.
- (e) Keruing - Types; constructional heavy timbers.

All the countries buy large volumes of white/brown coloured hardwoods, the same marketing question is posed. Main species, in descending order price:-

- (f) Teak Substitutes (Afrorosia, Iroko, Muninga, Kwila etc)
- (g) Oak (true oak)
- (h) Ramin
- (i) Limba and other Terminalias, Agba, Serayah and other good lighter coloured species.
- (j) Other good brown species eg. Dahoma, Avodire etc.
- (k) Obeche, yellow Meranti and other good malayan species
- (l) Mersawa (Anisoptera) other yellows, constructional medium heavy and then the light whites, ceiba, celtis etc.

These are generalisations but give a guide to where PNG substitutes may fit in.

SUMMING UP

To sum up, the main factors involved in selling timber - any timber - are:-

1. Continuity of supply and regular, reliable delivery.
2. Availability of the right colour and performance of the timber.
3. Reliability of sawing and quality tolerances.
4. Accurate assessment of demand in the selected market.
5. Correct sales procedures - including publication of stock, forward sales and price indication information sheets.
6. Persistence in the chosen markets.
7. Performance - strictly according to contract.
8. Presentation.

Somewhere, somebody is using timber which PNG shippers could supply in equal or better species at an attractive price; it requires only a modicum of sales analysis, a little product knowledge and a lot of salesmanship and persistence to place firm, lasting, long term business. This salesmanship must be backed by production and delivery performance, not once but always.

NAMES

Many species have different names in different countries e.g. Okoume in France is Gaboon in UK and many of the more recently marketed timbers began commercial life with such names as 'African Teak' 'African Yellow Oak' etc., Makore used to be called 'Cherry Mahogany' and so on.

Most of these 'new' timbers have been introduced into Europe only in the last 25-30 years and now have a very major share of the market.

Where there is a common name it would be sensible to use this for PNG species; for example PNG anisoptera is the same as Malaysian anisoptera. Use should be made of the common commercial name Mersawa.

There is no reason why PNG Terminalias should not be marketed under the names PNG or Papuan or New Guinea Afara or 'PNG Limba' and for the yellow species to be called 'PNG Idigbo' or just Idigbo.

As a commercial proposition it would probably be possible to put together, say:-

Amberol
 Labula
 Basswood
 Light Evodia
 White Cheesewood
 Chrysophyllum
 Sterculia

and sell them grouped as 'PNG Obeche'. The minor variations in these species would be likely to be only the same as the normal density and colour variations in true Obeche from the several African producing countries.

On the other hand, ERIMA is probably best marketed under its own name but as a substitute for OBEICHE and OKOUME. Though it is not the right colour for either, Erima is a good timber in its own right and entirely suitable for the same uses as Obeche and Okoume.

MALAS too, should sell best under its own name but with considerable sales emphasis on substitution for Malayan, African and Australian species being used for sleepers, ground contact and marine work where its natural good durability (class 2-3) and unique permeability to pressure preservative treatments make it superior in many respects to its competitors.

SPONDIAS could be marketed as substitute for CEIBA which is a very light density (Obeche type) timber and used at the cheapest end of the hardwood trade. SPONDIAS (slightly denser) would normally be a much better working timber in texture and grain than Ceiba.

These are examples of market approach, the same can be applied to all PNG species, or combinations of species; detail sales method and direction of effort can only be worked out by the individual company sales organisations in conjunction with the overseas selling agent and is of course very dependent on the mixture of species available at the sawmills. If it is intended seriously to engage in marketing in Europe or USA it is essential for a sales/technical representative to visit the target market, set up agency arrangements and, above all, to visit potential buyers yards and mills to carefully weigh up competitors products.

To be informed on what sales and production problems will be faced is more than half the sales battle.

PNG TIMBERS vs. THE REST.

PNG has very many excellent timbers, some have almost unique properties, many are very similar or identical to African or other countries' species. PNG OAK, for example is a true Quercus oak like the much sought after and very valuable European species. TAUN is as good a timber in its own right as "Mahogany": PNG Terminalias are equal to the African ones; similar favourable comparisons can be made for very many PNG timbers and there need be no fear that Papua New Guinea timbers are inferior to their counterpart species from other producing countries.

Much research and technical work has been carried out on properties and end uses and there is every reason to suppose that PNG timbers are no more difficult to saw, season and sell than their longer established competitors.

The fact that there is as large variety of species available can be a positive advantage in that PNG can offer timbers closely suitable for an exceptionally wide range of end uses.

AVERAGE STRENGTH GROUPS

The same values are used in the African and PNG systems and are also currently in use in Australia (CSIRO). Values are for defect-free timber.

Strength Group	Density @ 12% Moisture content	
	lb/ft ³	Kg/m ³
1.	56	900
2.	47	750
3.	40	640
4.	33	530
5.	28	450
6.	23	370
7.	20	320

It is stressed these are only averages as other factors apart from density also influence the strength group placings.

TABLE 2

SHRINKAGE CLASSIFICATION

The groupings used are those established by CSIRO; the PNG table is almost identical, however not all PNG timbers have been fully classified and it is simpler to use figures 1-5 for the classes.

Shrinkage from Green to Oven Dry

Group		Tangential		Radial	
CSIRO	PNG	CSIRO	PNG	CSIRO	PNG
1	V. low	0-3.5%	0-3.5%	0-2%	0-2%
2	Low	3.6-5.0	3.5-5.0	2.1-3.0	2-3
3	Medium	5.1-6.5	5.0-6.5	3.1-4.0	3-4
4	High	6.6-8.0	6.5-8.0	4.1-5.0	4-5
5	V. high	over 8.1	over 8.0	over 5.1	over 5%

DURABILITY CLASSES

For conditions significantly different from that of moderately high decay hazard as represented by ground contact, the life expectancies of the classes would, of course, depart markedly from those given in the definitions. However the relative durabilities might be expected to be maintained.

Although the wording in A and B is different it is apparent the classes are virtually identical.

A. "African Timbers": from "Properties, Uses and Characteristics of 700 Species".

The timbers have been assigned to one or other of four durability classes. Whilst it is not possible to be precise in this area, the following definitions were adopted as being applicable when describing the resistance to decay of the heartwood in ground contact under average conditions:-

Class 1: Timber of the highest natural durability which may be expected to have a life of at least 25 years and sometimes up to 50 years.

Class 2: Timber of high natural durability which may be expected to have a life of about 15-20 years.

Class 3: Timber of only moderate durability which may be expected to have a life of about 8-15 years.

Class 4: Timber of low durability which may last from 1 to 8 years. These timbers have about the same durability as untreated sapwood which is generally regarded as Class 4 irrespective of species.

B. For PNG Timbers, from the "Properties and Uses" booklet:

A general classification based on the resistance of untreated heartwood to attack by wood destroying fungi, termites and other insects is used. The Australian system has been used as a model, however, it should be realised that these classes are relative. Any species in a particular class would be expected to have a shorter life in hazardous Territory conditions than it would under milder Australian conditions.

The following grouping is used:-

Class 1: Very durable, suitable for long term use in contact with the ground.

Class 2: Durable, suitable for use in the ground and for unprotected exterior use.

Class 3: Moderately durable, suitable for protected exterior work and for interior use.

Class 4: Non-durable, not suitable for exterior use unless treated.

COMMENT

It should be noted that these durability classes are formulated relative to the country and conditions under which tests were made and may not relate to the country of final destination where the timber may be intended to be used i.e. A timber classed in PNG or Australia as being non-durable may be classed as durable or moderately durable in Europe. Care should be taken when quoting durability of timber that the values relative to receiving countries are noted

TABLE 3

<u>AFRICAN</u>	<u>Density</u> lb/ft ³	(Kg/M ³)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>OBECHE</u>	23-25	370-400	7	1-2	4
<u>PNG.</u>					
AMBEROI	23	370	S7-	-	4
LABULA	29	464	S6	-	4
BASSWOOD	24	384	S7	1-2	4
CHEESEWOOD	24	384	S7	2	4
LIGHT EUODIA	24	384	S7-	2	4
LITSEA	29	464	S6	2	4
QUANDONG	24	384	S7	2	4
HEAVY EUODIA	30	480	S7	-	4
CHRYSOPHYLLUM	28	450	S6	2	4
TERMINALIA	29	464	S6	2	3-4

TABLE 4

<u>AFRICAN</u>	<u>Density</u> lb/ft ³	(Kg/M ³)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>OKOUME</u>	28-32	410-450	6	3	3-4
<u>PNG.</u>					
ERIMA	22	352	S7	2	4
CRYPTOCARYA	34	544	S5	2	4
CAMPNOS-					
PERMA	26	416	S7	2	4
CALOPHYLLUM	37	592	S4	-	3
CANARIUM					
(Galip)	41	656	S3	-	4
PLANCHONELLA					
(red)	37	592	S5	-	3-4
SCHIZOMERIA	40	640	S4	-	4
TERMINALIA					
(red brown)					
(brown)	29	464	S5	-	4

	<u>Density</u> lb/ft ³	(Kg/M ³)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>AFRICAN</u> <u>UTILE</u> (UK) SIPO	40-45	640-720	5-6	3-4	3
<u>ACAJOU/</u> <u>MAHOAGANY</u>	35-45	560-720	5-6	2-3	3
<u>AFRICAN</u> <u>SAPELE</u>	40-45	640-720	4	2-4	2-3
<u>PNG</u> KAMARERE	43	690	S4	-	3
CALOPHYLLUM	40-45	640-720	S4	-	3
TAUN	43	690	S4	3	3
DYSOX	49	784	S3	3	2-3
CANARIUM (Galip)	41	656	S3	-	4
PLANCHONELLA (Red)	37	592	S5	-	3-4

TABLE 6

	<u>Density</u> lb/ft ³	(Kg/M ³)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>AFRICAN</u> <u>LIMBA</u> (White) Afara) Terminalia Superba etc.	30-35	480-600	5-6	3-4	4
<u>AFRICAN</u> <u>IDIGBO</u> (Emeri - Black Afara) Terminalia Ivorensis etc.	32-40	512-640	5	3	2
<u>PNG.</u> Terminalia: Red to Red-Brown	35	560	S5	-	4
Yellow Terminalias	29	480	S6	-	3-4
Yellow-brown Terminalias		600	S5		4

<u>AFRICAN</u>	<u>Density</u> lb/ft 3	(Kg/M3)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>IROKO</u>	40-45	640-720	4	1-3	1-2
<u>PNG.</u>					
KWILA	52	800	S2	2	1-2
VITEX	44	750	S3	LOW	2

TABLE 8 *

<u>AFRICAN</u>	<u>Density</u> lb/ft 3	(Kg/M3)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>TIAMA</u>	35	560	5	5	3
<u>PNG.</u>					
DILLENIA	35-45	560-720	S5	-	4
KAMARERE	43	690	4	-	3
CALOPHYLLUM	40-45	640-720	4	-	3
DYSOX	49	784	3	3	2-3
CANARIUM (Galip)	41	656	4	-	4
RED PLAN- CHONELLA	37	592	5	-	3-4

TABLE 9

<u>AFRICAN</u>	<u>Density</u> lb/ft 3	(Kg/M3)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>AZOBE</u>	63-71	1008-1136	1	5	1
<u>PNG.</u>					
MALAS	56	800	S1-S2	2	2-3
WATER GUM	48	770	S4	3	2-3
YELLOW HARDWOOD	50	800	S2	2	2-3

TABLE 10 *

<u>AFRICAN</u>	<u>Density</u> lb/ft 3	(Kg/M3)	<u>Strength</u>	<u>Shrinkage</u>	<u>Durability</u>
<u>MAKORE</u> <u>DOUKA</u>	40-45	640-720	4-5	4-5	1
<u>PNG.</u>					
KAMARERE	43	690	4	-	3
DILLENIA	35-45	560-720	7	-	4
CALOPHYLLUM	40-45	640-720	4	-	3
DYSOX	49	784	3	3	2-3
CANARIUM	41	656	4	-	4

TABLE 5

AFRICAN
UTILE (UK)
SIPO

ACAJOU/MAHOGANY

AFRICAN
SAPELE

* TABLE 8

AFRICAN
TIAMA

* TABLE 10

AFRICAN
MAKORE
DOUKA

These African species are the famous and popular "Mahogany" Timbers, all of the same family, Meliaceae, but SAPELE, renowned for its striped (interlocked) grain and UTILE which is normally heavier and denser are Entandophragma species, and strictly speaking only the ACAJOU and MAHOGANY are true mahogany (Khaya) species though Sapele is often called Sapele Mahogany and Utile similarly as Utile Mahogany. Utile used to be thought inferior but in the last few years has commanded a premium price over most other 'Mahogany'. Some of these timbers are quite difficult to season and this is variable from log to log.

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SEALPA Indonesia
SEALPA Indonesia

PNG Office of Forests
PNG Office of Forests

UK
D of E UK
BRE UK
UNASYLVA FAO

FAO Rome

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