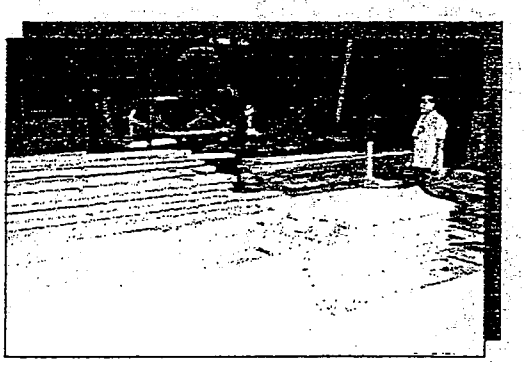
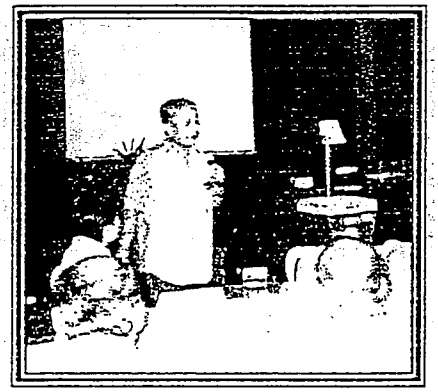
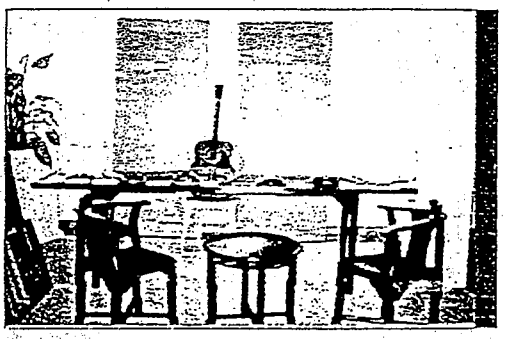
FPRDI-ITTO PROJECT PD 47/88 Rev. 3(I)

PROCEEDINGS

SEMINAR ON THE UTILIZATION OF LESSER-USED SPECIES (LUS) AS ALTERNATIVE RAW MATERIALS FOR THE FOREST-BASED INDUSTRIES

April 30, 1998 Anest Tower, College, Los Baños, Laguna, Philippines

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SEMINAR ON THE UTILIZATION OF LESSER-USED SPECIES (LUS) AS ALTERNATIVE RAW MATERIALS FOR THE FOREST-BASED INDUSTRIES

ANEST Tower
College, Laguna, Philippines
30 April 1998

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and

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Yokohama, Japan

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TABLE OF CONTENTS

PROGRAM OF ACTIVITIES

PROGRAM OF ACTIVITIES

A.M.		
8:00 - 9:00	Registration	FPRDI Secretariat
9:01 - 9:30	Opening Ceremonies Invocation/Singing of the National Anthem	
	Welcome/Opening Remarks	**Dr. Emmanuel D. Bello** Director, FPRDI
	Introduction of Participants	**For. Felix B. Tamolang** Chief, Technology Promotion and Documentation Section, FPRDI
9:30 - 9:45	Overview of FPRDI-ITTO Project on the Utilization of LUS as Alternative Raw Materials for the Forest Based Industries PD 47/88 Rev. 3 (I)	**Dr. Emmanuel D. Bello** Project Leader, FPRDI-ITTO
9:45 - 10:00	Snacks	
10:00 - 10:30	Identification of Important Philippine LUS (Botanical and Wood)	**Dr. Justo P. Rojo** Scientist 2, FPRDI-DOST
10:31 - 11:00	Properties, Characteristics and Uses of Important Philippine LUS	**Engr. Arnaldo P. Mosteiro** Asst. Project Leader FPRDI-ITTO Project PD 47/88 Rev. 3 (I)
11:01 - 11:30	LUS Processing Technologies	**For. Robert A. Natividad** Supervising Science Research Specialist FPRDI
11:30 - 12:00	Lunch/Technofeature on LUS Processing	
P.M.		
1:00 - 1:30	Value-Added Products from LUS (Viewing of Exhibits)	**Engr. Arnaldo P. Mosteiro** Asst. Project Leader, PD 47/88 Rev. 3 (I)
1:31 - 2:00	Strategic Frameworks for Marketing Philippine LUS	**Ms. Emelyne C. Cortiguerra** Science Research Specialist, FPRDI-DOST
2:01 - 2:30	Resource Availability of LUS (RP-German NFIP)	**Atty. Antonio C. Manila** Project Director,CPPAP, PAWB, DENR
2:31 - 3:00	DENR Policies and Programs on LUS Utilization	**For. Eriberto C. Argete** Director, Policy & Planning Office, DENR
3:01 - 4:30	Open Forum	**For. Felix B. Tamolang**
4:31 - 5:00	Awarding of Certificates	**Dr. Emmanuel D. Bello** **For. Dominador S. Alonzo** Deputy Director
	Closing Remarks	**For. Dominador S. Alonzo** Deputy Director, FPRDI

Master of Ceremonies **For. Felix B. Tamolang**

PAPERS PRESENTED

PRACTICAL BOTANICAL AND WOOD IDENTIFICATION OF IMPORTANT LESSER-USED SPECIES

JUSTO P. ROJO, DPhil (Oxon)
Scientist II, FPRDI

Introduction

The paper which I will present to you this morning is about the identification of trees. For businessmen engaged in forestry, both in production and forest products utilization, identification of trees is not a problem. The identification of trees or other plants in the forest falls on the laps of foresters, especially the timber cruisers who survey how much volume of timbers are contained in a certain area by species and by diameter classes. In the olden days, i.e. during our heyday of log exportation, from the 1950's to early 1970's, timber inventory crews had easy time identifying standing timbers because then, they were only interested in "Philippine mahogany" species which were composed of only 7 moderately low to medium density dipterocarps and one or two species of heavy dipterocarps such as guijo and yakal. Other important timbers they could not identify were lumped into the so-called "miscellaneous" species. The task of timber cruisers and their assistants was made simpler by the demands of the time. Then, Japan and the United States demanded "Philippine mahogany" logs. It so happened that nature endowed the Philippines with timbers 80% by volume of which were dipterocarps comprising only about 45 species. The rest of the volume was represented by over 2,000 species.

Because of the unabated exploitation of our commercial forests up to the late 1970's, we are now faced with dwindling forest areas resulting in log-deficit of timbers. A logging ban was imposed on our old-growth forests. Log and lumber exports were also banned so that we are faced with logging from second-growth forest with low timber volume and utilization of plantation-grown timbers.

The plantation - grown species of trees are quite easy to identify. We know them when we planted them. But how about those timber species left in the logged-over forests which we are forced to utilize by necessity? If we could hardly identify the dipterocarp species which are common in our forests, how could we manage to identify the more than 2,000 species composing other commercial timbers and the "lesser utilized" or "lesser-known" or, to use the currently appropriate name, "commercially less acceptable species (CLAS)?"

Definition of Identification

Identification - is the process of naming, i.e. the giving of a correct name to organisms. It is different from classification or nomenclature. Taken together, they form the basic definition of systematic botany or plant taxonomy which is the classification, nomenclature (naming) and identification of plants.

Obviously our trees standing in the forest have been classified and named, i.e., given the correct nomenclature by taxonomists or botanists. The purpose of classifying and giving names to plants in general and trees in particular is for identification purposes because without names, it would be impossible to acquire and disseminate knowledge and the business of the world could not go on.

Identification is simply the determination of the similarities or differences between two elements, whether the two elements are different or the same.
In the process of identification, however, we need classification (i.e. determination of what species, genus or family, etc., the unknown species belongs). Both processes, identification and classification, involve comparison and judgment and require a definition of criteria of similarities (Radford, *et. al* 1974). However, the provision of nomenclature to the identified and classified element is essential in the retrieval of information and as a means of communication. The practical aspect of identification, i.e. by direct comparison or the use of keys and other means does not necessarily involve classification and nomenclature because in the forest or in the laboratory, we are only after the name of the species. Later on, we may need a more detailed knowledge of the species which will include description of standing trees and anatomical, physical, chemical and mechanical properties of the wood. In other words, aside from identification we need classification and nomenclature
which in totality is systematic botany or plant taxonomy.

Means of Identification

The traditional methods of identification include (1) expert determination, (2) recognition, (3) comparison, and (4) the use of keys and other similar devices.

Expert determination - In terms of reliability or accuracy the best method of identification is expert determination. The experts have already prepared monographs, revisions or synopses of the group of plants in question. For example, this author (1972 & 1982) had prepared a revision of the genera *Pterocarpus* (Papilionoideae) and *Dialium* (Caesalpinioideae) for the world.

Obviously, if one sends to me materials for identification of these groups of the Leguminosae, I can identify them more accurately than other botanists.

However, this method takes so much time of experts, money for sending the materials for identification to the experts as well as creates delays in identification.

Recognition - Recognition is next to experts' determination in accuracy/reliability. Through constant association, some people become adept at recognizing plants. Examples are professors of their assistant who, in their teaching of dendrology (study of trees) to students, become proficient in recognizing trees, e.g. the likes of Professor Quimbo, Mr. Ignacio panot and others. However, if they die, the knowledge in identification goes with them in their graves because they have not published what they have imparted to their students.

Comparison - This involves comparing an unknown and a known specimen. Obviously, this method cannot be done in the forest because there are no known or a named specimens available in the field. The unknown specimens should be brought to the Herbarium where named specimens are available for comparison. The only more or less complete herbarium in the country is the Philippine National Herbarium where unidentified specimens can be compared. The unknown specimen can also be compared with photographs, illustrations and description in published works. This is time consuming.

The use of keys and similar devices (synopses, outline, etc.) - Keys in the traditional sense are a type of taxonomic literature. They are devices consisting of a series of contrasting or contradictory statements or proposition requiring the identifier to make comparisons and decisions based on statements in the keys as related to the material to be identified. The contrasting statements usually begin with broad lead statements such as "Plants composed of herbs" and "plants composed of trees". The last contrasting statements which are usually detailed or specific will lead one to the identification of species such as 'flowers white" and "flowers red". If the identifier holds the unknown specimen with a "red flower," then he has arrived at its identification stated in the lead. In the taxonomic literature, the key portion of the work precedes the descriptions of the species.

Of all the methods mentioned above, **recognition** by trained specialists both in the field and in the herbarium is the fastest and most reliable. However, it should be checked against taxonomic literature on the group in question, if these are available.

Number of commercial and lesser-used timbers

The question we have to ask is: Do we have the capability to identify lesser-used species of timbers? My answer is: it depends. If it concerns a few species- then maybe we can accurately identify them. Another question is, who are capable of identifying lesser-used species? People who teach dendrology in the colleges of forestry in state colleges and universities may be able to identify lesser-used species. Maybe the most capable to do identification jobs are dendrology professors of the University of the Philippines College of Forestry.

They have the advantage because they have a university forest as their laboratory.

From the above, we can see that if lesser -used species of timber are few and that there are available expertise to do the identification, then we may be able to get accurate identification results.

In 1990 (Rojo 1990), I was confronted with the question of how many species of lesser-used timbers we have in the country. To find out the number of LUS, I first determined how many Philippine species are commercial timbers. I found from various published reports that we have at least 130 commercial timber species. If the total of 3,500 tree species listed down by Salvosa (1963) is our basis of number of Philippine trees, then we shall have 3,370 species which we call lesser-used species of timber. The Forest Products Research & Development Institute In its more than 40 years of existence has to date completed information on end-use properties and current and potential uses of 116 LUS (Tesoro & Aday 1990). These species can be elevated to commercial timber status. But there is still an enormous number of species left for us to study both on their potential end-use properties and identification in the field and herbarium.

Practical botanical and wood identification

The prospect of identifying with accuracy the more than 3,000 trees is daunting, to say the least. It is not only discouraging but also impossible. How the should we go about doing practical identification of LUS or commercial species, for that matter?

A. Identification by recognition

As stated above, identification by recognition not only is next in accuracy to identification by the experts but also relatively fast. It has, however, an advantage over identification by the experts because an individual who does identification by recognition knows a varied groups of trees than the expert who knows only the trees of a group he specializes in. More often than not, some so-called experts identify plants based on herbarium or dried specimens only and may have not seen the standing individuals of species they know in the herbarium.

B. Procedure on practical identification by recognition

1. Obviously, persons who can identify trees by recognition are few. Logging /timber licensees interested in the utilization of LUS or any timber species that cannot be identified by them should start to make it a point to immediately start a crash program for a few of their personnel to train in actual standing tree identification. An example of this kind of training was the one availed of by the RP-German Timber Inventory Project. At the beginning of this project, members of the timber cruising crews got intensive field identification of trees on site. Whether or not the crews learned how to identify trees cannot be assessed.

But the result of the project seemed incredible enough and the criticism lies on the delayed results, not on the results themselves. The consultants for the course were Professor L. Quimbo and Dr. J.P. Rojo. Other persons trained in tree identification can conduct crash course in standing tree identification.

The material for identification of standing trees are those gross features that can easily be seen by the naked eye. The use of magnifying lenses, i.e. up to 20X, is useful but not absolutely necessary. Some obvious features such as color and geography of outside portion of barks, bark exudation, color and feature of slash, color and thickness of the sapwood, shape, thickness and color of fallen leaves, etc. are helpful in the identification of species. If possible, of course, it is wise to collect fresh herbarium material from the standing tree not only for identification outright in the field but also in the herbarium at the office. However, most of the time, collection is expensive.

2. For a company engaged in the logging and wood processing business with a lease of 35 years and renewable for another 35 years, it may be wise to put up in the headquarters a herbarium and wood collection which can be named accurately by experts and become references for future identification by the company's trained personnel. This has not been done by previous big time logging concessions such as PICOP and NASIPIT before. Their identification problems were attended to by FPRDI when they concerned wood material and UPLB and FPRDI when they concerned herbarium material identification.

3. We do not know of anybody in the Philippines who knows how to identify wood taken fresh from standing tree. Some of us at FPRDI can identify wood already dried and taken from a dried log or from a piece of lumber. To aid in identifying the wood of LUS or even commercial timbers, a logging company with sawmills, plywood plants and other log conversion facilities should collect specimens and maintain a xylarium (or wood collection) correctly identified for future reference. Samples can be taken from standing trees during timber cruising, from logs in the log pond and from lumber produced by the sawmills. Initially, personnel who would specialized on wood identification can be trained at FPRDI. FPRDI has a sizable collection of both Philippine and foreign woods. These samples can be used as references during the wood identification training course.

4. Identification of local LUS wood is already a problem, how much more of LUS imported to the country by our sawmills and plywood mills?

Recent information revealed that a shipment of imported logs from our neighbors in the south, New Guinea, Africa and South America is usually composed of 30-70 different species with widely varying densities. This condition creates problems utilization, especially in plywood-making and construction. A conglomeration of many species of different densities indicates that these logs are LUS in their countries of origin.

This is either because the countries of origin could not identify their logs, or if they can, the recipient country does not require them to provide identification of shipped logs. This is because if the importing country insists on properly identified logs, they will cost more the importer. Since the Philippines cannot afford named logs, it has to accept unidentified logs of various species and densities. The suggested solution for this predicament is to get wood samples from the imported logs and store them for the future identification. In the meantime, we write to our ambassadors to the exporting countries then let the commercial attaches there acquire information on the logs. Then, we can have some references accumulated at home for identification purposes in the future. In the interim, we can classify the logs/woods according to their specific gravity/ density. The specific gravity/density of wood should be determined because the most important property of the wood for certain use is its specific gravity/density.

Conclusion

The paper discusses identification but does not provide a specific method for identifying a botanical or wood specimen at hand. There are many methods on how to identify unnamed or unknown trees/wood. These can only be learned through a formal course or crash identification program conducted by experts in botanical and wood specimen identification.

Philippine LUS are many and it is impossible to know all of them. It is suggested that a selection of the species be made according to their availability or occurrence in the forest and then identification studies should concentrate on them.

The practical way of identifying botanical and wood specimen is by recognition method. Experts in field identification of trees should be harnessed to train foresters, botanists or interested laymen how to identify botanical or wood specimens.

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PROPERTIES, CHARACTERISTICS AND USES OF SOME LESSER-USED PHILIPPINE TIMBERS

ARNALDO P. MOSTEIRO
Scientist I, FPRDI

Introduction

Wood possesses some properties and characteristics which serve as important indicators of wood quality and its suitability for a particular end-use or product. These indicators, together with the end-use requirements, should be given priority attention and consideration when choosing wood species for a specific end-use particularly when there are indications that they could affect the quality and service performance of the end product.

Of course, there are some ways of improving wood quality and serviceability but one rational approach is to ascertain that the species would be suitable for the intended product. To accomplish this, one should properly and carefully match the particular end-use requirements with the wood species possessing the best combination of properties for the specific end product. Such end product could be in the form of furniture, woodcarvings, toys, mouldings, doors, window and window frames, musical instruments and other high value-added products.

Recommended Wood Property Requirements

The Forest Products Research and Development Institute, through a financial grant from the Food and Agriculture Organization of the United Nations, has established property requirements for various wood products. These wood property requirements are presented as follows:

Color

Color is one of the properties of wood that makes it superior to other competing materials. The natural color of wood serves as one of the bases in the selection of materials for a particular purpose. It significantly affects the final shade of finishes of wood products.

Grain

Grain refers to the arrangement and direction of alignment of wood elements when considered en masse. Direction of grain is an important criterion in the selection of materials for a particular purpose. Straight-grained wood are suitable for picker sticks, chop sticks, toothpicks, ice cream spoons and pencil slats. Interlocked grain woods are good for decorative purposes due to the figure produced.

Texture

Texture refers to the size and proportional amounts of different cell types. Texture is used as a basis in selecting materials for wood products that require finishing such as furniture, woodcarving, novelty items, toys and other related items. Fine and uniform texture are generally preferred for high grade furniture.

Odor and Taste

These are influenced by the presence of deposits in the wood cells such as resins, gums, tannins, oils and other volatile substances. Freedom from odor and taste is an essential requirement for wood products such as food containers, kitchen utensils, toothpicks, spoons, chopsticks and spatula.

Relative Density

It is the measure of solid wood substance and is useful index of the suitability of wood for various uses. It is a reliable indicator of strength properties, pulp yield, dimensional stability, thermal and electrical properties of wood. It is also an indicator of the drying, machining finishing, gluability and other working properties.

Volumetric shrinkage

It is the resultant decrease in dimension as wood is dried to a specified moisture content level. The heterogeneous and hygroscopic nature of wood helps bring about major physical changes when wood is exposed to varying climatic conditions. Information on shrinkage values aids in proper use and avoidance of defects in wood.

Strength

Mechanical or strength properties of wood provide the best index for its use for structural purposes and serve as a basis for deriving the working stresses of structural species for promoting lesser-used species for commercial exploitation and as substitutes for commercial species and other economic uses where strength is an important factor.

Sawing

The sawing properties and grouping of species according to ease of sawing help in the operation of sawmilling equipment, scheduling of materials, and use of saw for each group of species in order to produce optimum quantity and quality of sawn timber.

Machining

Machining is the process of cutting wood with the use of knives or cutters mounted on rotating cutter heads or spindles. Cutting of wood could also be done by passing the wood installed in a rotating chick to the knives installed in a stationary block. Machining aims to process wood to the desired shape and dimension with requisite accuracy and surface quality in the most economical way.

Drying or Seasoning

Drying of wood to the desired moisture content is essential to assure minimal defects of wood which could occur during drying, processing or transport, or even during the actual use of the finished products. Improperly dried wood products will result to significant losses due too rejection of the product when exported to temperate countries where prevailing conditions is quite different from tropical countries like the Philippines.

Finishing

Finishing operation includes sanding, staining, varnishing and painting. Performance of finishes is affected by wood moisture content, specific gravity, type and amount of extractives, surface texture, surface preparation, type and quality of finishing materials. It is guarded by its adhesion to the substrate, appearance, integrity and protective ability and resistance to liquids.

Natural Durability

This is the natural resistance of wood against the attack of wood destroying organisms such as termites and fungi. Grouping species based on the natural durability of their heartwood guides wood users and the construction industry in specifying species to suit their specific purpose. This grouping would also indicate what species require chemical preservative treatment to improve their durability and lengthen their service life.

Treatability

Treatability is the measure of the ability of the species (heartwood portion) to absorb chemical preservatives when subjected to pressure impregnation in retort or treating cylinder. The treatability of wood varies considerably from one species to another. Some species are easy to treat with chemical preservatives, some moderately difficult and others are difficult to treat.

Explanatory Notes on the Characteristics/Properties Classification of Lesser-Used Species (LUS)

Item	Classification	Description
Species Classification*	LUS	Lesser-used species
	PS	Premium species
	FCW	Furniture and construction wood
	PMW	Pulp and matchwood
Tree Size **	Small tree	3 to 30 cm. Diameter; 2 to 5 m height
	Medium tree	30 to 40 cm diameter; 5 to 15 m height
	Large tree	over 40 cm diameter; over 15 m height
Relative Density (RD) ***	Class I	High RD (0.701 and above)
	Class II	Moderately high RD (0.61-0.700)
	Class III	Medium RD (0.501-0.600)
	Class IV	Moderately low RD (0.401-0.500)
	Class V	Low RD (0.400 and below)
Volumetric Shrinkage (VS) ***	Class I	Low VS (7.8% and below)
	Class II	Moderately low VS (7.9%-10.5%)
	Class III	Medium VS (10.6%-13.2%)
	Class IV	Moderately high VS (13.3%-16.0%)
	Class V	High VS (16.1% and above)
Strength Properties***	Class I	High strength
	Class II	Moderately high strength
	Class III	Medium strength
	Class IV	Moderately low strength
	Class V	Low strength

Item	Classification	Description
Sawing***	Class I	Easy to saw (Average feed rate of 18 meters per minute with saw blade performance of 100 square meters and above surface area)
	Class II	Moderately difficult to saw (Average feed rate of 14 meters per minute with saw blade performance of 70 to 100 square meters and above surface area)
	Class III	Difficult to saw (Feed rate is less than 14 meters per minute with saw blade performance of not more than 70 meter surface area sawn)
Drying ***	Class I	Easy to dry (with no difficulty of drying, no drying degrades if reasonable care is taken; Kiln Drying Schedule I)
	Class II	Moderately difficult to dry (with slight tendency to check, warp or collapse; Kiln Drying Schedule II)
	Class III	Difficult to dry (susceptible to check and warp; Kiln Drying Schedule III)
	Class IV	Very difficult to dry (very slow to dry and easily checks; Kiln Drying Schedule IV)
Machining	Class I	Very good (95-100% defect -free surface; very good surface quality)
	Class II	Good (85 to 94% defect-free surface; good surface quality)
	Class III	Fair (75 to 84% defect - free surface; fair surface quality)
	Class IV	Poor (65 to 74 % defect-free surface; poor surface quality)

Item	Classification	Description
Finishing***	Class I	Good to very good (sands and takes stain and varnish and very well)
	Class II	Fair (sands and takes stains very well)
	Class III	Poor (poor sanding)
Natural Durability***	Class I	Durable (more than 7 years)
	Class II	Moderately-durable (4 to 7 years)
	Class III	Slightly durable (2.6 to 4 years
	Class IV	Non-durable (1 to 2.5 years)
	Class V	Perishable (less than 1 year)
Treatability ***	Class I	Easy to treat (practically complete penetration)
	Class II	Moderately difficult to treat (limited side penetration)
	Class III	Very difficult to treat (practically no side penetration)

* Species Classification based on DENR Administrative Order No. 19 dated July 16, 1995.

** FPRDI Classification based on "Lexicon of Philippine Trees" by F. Salvosa. FPRDI Bulletin No. 1 1963.

*** FPRDI End-use/Property Classification as per "Guidelines for the Improved Utilization and Marketing of Tropical Wood Species." FAO.

Official Common Name	:	ALUPAG-AMO
Scientific Name	:	*Litchi chinensis* Sonn. Spp. Philippinensis (Radk.) Leench.
Family	:	Sapindaceae
Tree Characteristics	:	Large tree reaching a diameter of 90 cm. Trunk often irregular, 8 to 12 m. long.
Wood Description	:	Sapwood thin, distinct from the heartwood, which is reddish brown grain straight, often slightly wavy.

Technological Properties :

Relative density	---	0.890 High RD, Class I
Volumetric shrinkage	---	16.7% High VS, Class V
Bending strength	---	100 Mpa
Compressive strength	---	52.4 Mpa
Shear strength	---	15.6 Mpa
Hardness	---	1.39 kN
Sawing	---	Moderate to saw
Machining	---	Fair machining property
Natural Durability	---	Durable, more than 7 years
Treatability	---	Very difficult to treat with chemical preservatives

Uses: Posts, beams, joist, rafters, flooring, wooden anchors, salt water piles, agricultural implements, and other purposes requiring hard and heavy wood.

Official Common Name : ANABIONG

Scientific Name : *Trema orientalis* (Linn.) Blume

Family Name : Ulmaceae

Tree Characteristics : Large tree; height 15 m or more, DBH up to 60 cm; bole cylindrical, bark smooth and grayish brown; buttress nil to almost absent.

Wood Description : Sapwood is not distinct with heartwood which is buff; straight grain and texture fine to moderately coarse. Light and soft, easily indented by finger nail. Fibers are loose.

Technological Properties :

Relative Density	---	0.36 low RD, Class V
Volumetric shrinkage	---	10.20% Moderately low VS, Class II
Bending Strength	---	35.8 Mpa, Low strength, Class V
Compressive Strength	---	13.9 Mpa
Shear Strength	---	5.28 Mpa
Hardness	---	21.80 kN
Toughness	---	27.00 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Very good machining property Class II
Finishing	---	Fair, Class II
Natural Durability	---	Perishable, less than 1 year, Class V

USES: Pulp and paper, particle board, wooden shoes, fish net floats, boxes and crates, toys and stringed musical instruments.

Official Common Name	:	AMUGIS
Scientific name	:	*Koordersiodendron pinnatum* (Blco.) Merr.
Family Name	:	Anacardiacea
Tree Characteristics	:	A medium to large tree attaining a diameter of 120 cm, though usually 60 to 80 cm. Trunk fairly straight, 12 to 18 m long. Buttress not pronounced.
Wood Description	:	Sapwood 3 to 5 cm thick, light pinkish sharpl;y marked from the heartwood which is reddish when fresh, turning reddish brown with age; grain crossed; texture moderately fine; glossy.

Technological Properties :

Relative Density	---	0.690 Moderately high RD, Class II
Volumetric shrinkage	---	13.6% Moderately high VS, Class IV
Bending Strength	---	65.9 Mpa, Moderately high strength
Compressive Strength	---	19.5 Mpa
Shear Strength	---	10.0 Mpa
Hardness	---	5.24 kN
Toughness	---	65.1 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Difficult to dry, Class III
Machining	---	Good machining property, Class II
Finishing	---	Very good
Natural Durability	---	Durable, more than 7 years
Treatability	---	Very difficult to treat

USES: Flooring, furniture and cabinets, walls, room dividers, louvres, balusters, bowls, trophy, coaster set, pencil holders, table name blocks and house construction.

Official Common Name : BALETE

Scientific Name : *Ficus balete* Linn.

Family Name : Moraceae

Tree Characteristics : The tree has epiphytic habits; it usually starts as a seedling upon another tree and eventually entraps it. Air roots are sent to the ground as support and develop into a fair size trunk reaching 60 to 80 cm in diameter.

Wood Description : Color is light buff to light yellow, grain straight; texture moderately coarse, taste and odor not distinct. Pores visible to the naked eye. Ripple marks is likewise visible.

Technological Properties :

Relative Density	---	0.470 Moderately low RD, Class IV
Bending Strength	---	73.40% Moderately high, Class II
Compressive Strength	---	33.10 Mpa
Shear Strength	---	7.94 Mpa
Hardness	---	5.05 kN
Toughness	---	59.80 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Good machining property, Class II
Finishing	---	Fair, Class II
Natural durability	---	Non- durable 1 to 2.5 years, Class IV
Treatability	---	Easy to treat, Class I

USES: Interior framing, louvre doors, frames, veneer, moulding, drawers, table, newspaper stands.

Official Common Name : BALOBO

Scientific Name : *Diplodiscus paniculatus* Turcz.

Family Name : Tiliacea

Tree Characteristics : Medium size tree; height up to 20 m, DBH up to 60 cm; bole short, cylindrical, crooked, tapering; crown irregular in shape, buttress high.

Wood Description : Sapwood is not marked off from heartwood , which is grayish or pale reddish brown; grain straight; texture moderately fine, hard and heavy.

Technological Properties :

Relative Density	---	0.632 Moderately high RD, Class II
Volumetric shrinkage	---	12.6% Medium VS, Class III
Bending Strength	---	81.20 MPa Moderately high, Class II
Compressive Strength	---	3.10 MPa
Shear Strength	---	9.27 MPa
Hardness	---	6.16 kN
Toughness	---	61.8 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Very difficult to dry, Class IV
Machining	---	Very good machining property, Class I
Finishing	---	Fair, Class II
Natural durability	---	Non- durable 1 to 2.5 years, Class IV
Treatability	---	Easy to treat, Class I

USES: Bowling pins, bobbins, shuttles, agricultural implements, general construction works, tool handles, furniture and cabinets, moulding, balusters, louvre doors, frames, bowls, pencil holders, and paper weights.

Official Common Name	:	BANILAD
Scientific Name	:	*Sterculia philippinensis* Merr.
Family Name	:	Sterculiaceae
Tree Characteristics	:	A large tree attaining a diameter of 70 cm. Bole generally straight, regular short, seldom reaching 10 m.
Wood Description	:	Sapwood indistinguishable from heartwood which is buff-colored; straight grained; coarse texture; not glossy, very soft.

Technological Properties :

Relative Density	---	0.315 Low RD, Class V
Volumetric shrinkage	---	No available data
Bending Strength	---	27.6 MPa, Low strength, Class V
Compressive Strength	---	11.4 MPa
Shear Strength	---	3.34 MPa
Hardness	---	1.36 kN
Toughness	---	9.71 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Fair, Class II
Natural durability	---	Slightly durable 2.5 to 4 years, Class III
Treatability	---	Easy to treat, Class I

USES: Sidings, ceilings and partition walls, louvre doors, frames, mouldings, knife blocks, bowls, coaster set, toys, pencil holders and trophy.

Official Common Name	:	BATINO
Scientific Name	:	*Alstonia macrophylla* Wall.
Family Name	:	Apocynaceae
Tree Characteristics	:	Attains a diameter of 65 cm. Bole straight, regular, about 10 m long.
Wood Description	:	Sapwood not distinct from heartwood which is pale yellowish brown; grain crossed, moderately fine texture; with distinct bitter taste, particularly when fresh; without odor. Fibers dense.

Technological Properties :

Relative Density	---	0.640, Moderately high RD, Class II
Volumetric shrinkage	---	14.50% High VS, Class V
Bending Strength	---	84.0 MPa, Class II
Compressive Strength	---	20.2 MPa
Shear Strength	---	10.6 MPa
Hardness	---	5.7 kN
Toughness	---	43.1 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Difficult to dry, Class III
Machining	---	Good machining property, Class II
Finishing	---	Good, Class I
Natural durability	---	Moderately durable 2.5 to 4 years, Class II
Treatability	---	Easy to treat, Class I

USES: Beams, joists, rafters, and household implements, high grade furniture and cabinets, bobbins, floor parquet, louvre doors, balusters frames, toys, coaster set, cups, bowls, fruit and candy trays, chess pieces, pencil holders, table tops and moulding.

Official Common Name : BINUANG

Scientific Name : *Octomeles sumatrana* Miq.

Family Name : Datiscaceae

Tree Characteristics : Large tree, height 35 to 60 m; DBH 100 cm or more; bole long and cylindrical, tapering, crown small, buttreess high.

Wood Description : Sapwood is not distinguishable from heartwood which is buff to pale orange yellow; grain straight; texture coarse, not glossy; taste and odor not perceptible. Fibers loose.

Technological Properties :

Relative Density	---	0.265, Low RD, Class V
Volumetric shrinkage	---	10.0% Moderately low VS, Class II
Bending Strength	---	31.9 MPa, Low strength, Class V
Compressive Strength	---	16.0 MPa
Shear Strength	---	3.64 MPa
Hardness	---	1.50 kN
Toughness	---	16.90 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Good machining property, Class II
Finishing	---	Good, Class I
Natural durability	---	Perishable less than 1 year, Class V
Treatability	---	Easy to treat, Class I

USES: Veneer and plywood, matchboxes, fishnet floats, dugouts, pulpwood and wooden clogs.

Official Common Name	:	BITAOG
Scientific Name	:	*Callophyllum inophyllum* Linn.
Family Name	:	Guttiferae
Tree Characteristics	:	A large tree attaining a diameter of 130 cm. Bole short, seldom reaching 5 cm with large spreading branches.
Wood Description	:	Sapwood 2 to 5 cm thick, light colored, well mark-off from heartwood, which is light reddish brown; grain straight; texture moderately fine; very glossy; no odor or taste. Fibers dense.

Technological Properties :

Relative Density	---	0.56, Medium RD, Class III
Volumetric shrinkage	---	10.30% Moderately low VS, Class II
Bending Strength	---	65.60 MPa, Medium strength Class III
Compressive Strength	---	18.0 MPa
Shear Strength	---	11.00 MPa
Hardness	---	5.60 kN
Toughness	---	62.90 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Fair machining property, Class III
Finishing	---	Good to Very good, Class I
Natural durability	---	Moderately durable, 4 to 7 years, Class II
Treatability	---	Moderately difficult to treat, Class II

USES: Doors, flooring, ship sterns and ribs, vehicle wheel hubs, furniture and cabinets, gun stocks, some musical instruments, louvre doors, ax and hammer handles, balusters, door and window frames, moulding and agricultural implements.

Official Common Name	:	BITANGHOL
Scientific Name	:	*Callophyllum blancoi* Planchon & Triana
Family Name	:	Guttiferae
Tree Characteristics	:	A medium sized tree attaining a diameter of 60 cm and stem of 12 to 18 clear of branch. Without buttress.
Wood Description	:	Sapwood is light colored, distinct from heartwood which is reddish brown; grain is slightly crossed, texture is fine.

Technological Properties :

Relative Density	---	0.51, Medium RD , Class III
Volumetric shrinkage	---	16.90% High VS, Class V
Bending Strength	---	49.9 MPa, Medium strength, Class III
Compressive Strength	---	11.3 MPa
Shear Strength	---	6.51 MPa
Hardness	---	3.10 kN
Toughness	---	37.4 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Fair machining property, Class III
Finishing	---	Very good, Class I
Natural durability	---	Moderately durable, 4 to 7 years, Class II
Treatability	---	Very difficult to treat, Class III

USES: Posts, bridges, boat building, beams, joists, rafters, flooring, furniture and cabinets, poles, piles, truck bodies, exterior sidings and flooring, tool handles, balusters, louvres, frames, chopping boards, bowls and toys.

Official Common Name	:	BOK-BOK
Scientific Name	:	*Xantophyllum excelsum* (Blume) Miq.
Family Name	:	Polygalaceae
Tree Characteristics	:	Medium sized tree attaining a diameter of about 80 cm. Trunk generally straight, 7 to 12 m long. Buttress small.
Wood Description	:	Sapwood almost identical in color with heartwood, which is light yellow, grain straight; texture moderately coarse; taste and color not perceptible.

Technological Properties :

Relative Density	---	0.640, High RD, Class I
Volumetric shrinkage	---	15.70% Moderately high VS, Class IV
Bending Strength	---	68.80 MPa, Moderately high Class II
Compressive Strength	---	35.30 MPa
Shear Strength	---	9.01 MPa
Hardness	---	5.09 kN
Toughness	---	33.80 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Difficult to dry, Class III
Machining	---	Very good machining property, Class I
Finishing	---	No available data
Natural durability	---	Non- durable, 1 to 2.5 years, Class IV
Treatability	---	Easy to treat, Class I

USES: Floor parquet, moulding, baluster, louvre doors, chopping boards, frames, knife blocks, toys, bowls, cups, coaster set, candy and fruit trays, paper weights, pencil holders, poles and piles.

Official Common Name : DITA

Scientific Name : *Alstonia scholaris* (L.) R. Br.

Family Name : Apocynaceae

Tree Characteristics : A large tree attaining a diameter of 90 cm or more. Bole straight, 10 to 15 m long. Buttress small.

Wood Description : Sapwood is not distinct from heartwood which is yellowish-brown; grain straight, texture moderately fine to moderately coarse; has a bitter taste. Fibers loose.

Technological Properties :

Relative Density	---	0.34,Low RD, Class V
Volumetric shrinkage	---	9.30% Moderately low VS, Class IV
Bending Strength	---	35.70 MPa, Low, Class II
Compressive Strength	---	12.00 MPa
Shear Strength	---	3.57 MPa
Hardness	---	1.90 kN
Toughness	---	17.2 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Very good machining property, Class I
Finishing	---	No available data
Natural durability	---	Perishable, less than 1 year, Class V
Treatability	---	Easy to treat, Class I

USES: Match boxes and sticks, wooden shoes, ceiling, partition walls, boxes and crates, moulding, bouys and floats, veneer and plywood (core), pulp and paper.

Official Common Name	:	DUGUAN
Scientific Name	:	*Myristica philippinensis* Lam. (Myrist)
Family Name	:	Myristicaceae
Tree Characteristics	:	Medium sized tree up to 80 cm in diameter; long bole; straight and cylindrical. Buttress low.
Wood Description	:	Sapwood is lighter colored and not sharply marked off from heartwood which is reddish brown; grain straight, texture fine or moderately fine.

Technological Properties :

Relative Density	---	0.421 moderately low RD, Class IV
Volumetric shrinkage	---	9.50% Moderately low VS, Class II
Bending Strength	---	43.30 MPa, moderately low strength, Class IV
Compressive Strength	---	23.80 MPa
Shear Strength	---	5.70 MPa
Hardness	---	1.96 kN
Toughness	---	7.54 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Fair, Class II
Natural durability	---	Perishable, less than 1 year, Class V
Treatability	---	Easy to treat, Class I

USES: Furniture and cabinets. Louvre doors, balusters, knife blocks, frames, moulding, flooring, walling boxes and crates, veneer and plywood, bowls and chopping boards.

Official Common Name	:	KATO
Scientific Name	:	*Amoora aherniana* Merr.
Family Name	:	Meliaceae
Tree Characteristics	:	A medium sized tree attaining a diameter of 100 cm and a stem of 6 to 8 m to the first branch.
Wood Description	:	Sapwood is lighter-colored, distinctly marked-off from the reddish brown heartwood; grain straight or slightly crossed; texture moderately coarse.

Technological Properties :

Relative Density	---	0.647 moderately high RD, Class II
Volumetric shrinkage	---	16.00 % moderately high VS, Class IV
Bending Strength	---	71.40 MPa, moderately high strength Class II
Compressive Strength	---	36.90 MPa
Shear Strength	---	8.58 MPa
Hardness	---	5.87 kN
Toughness	---	34.90 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Good to very good, Class II
Natural durability	---	moderately durable 4 to 7 years, Class II
Treatability	---	Very difficult to treat, Class III

USES: Post beams, rafters, flooring, door, windows, bridges and wharves construction timber, furniture, mine timbers and truck bodies.

Official Common Name	:	LOKTOB
Scientific Name	:	*Duabanga moluccana* Blume (Sonn.)
Family Name	:	Sonneratiaceae
Tree Characteristics	:	A large tree attaining a diameter of 90 cm and a height of 50 m. Bole regular, usually straight up to 15 m high. Buttress high.
Wood Description	:	Sapwood 6 to 8 cm thick not marked off from the heartwood, which islight reddish-brown; grain crossed, texture coarse, no distinct odor or taste. Fiber loose.

Technological Properties :

Relative Density	---	0.341 low RD, Class V
Volumetric shrinkage	---	11.10 % medium VS, Class III
Bending Strength	---	43.00 MPa, moderately low strength, Class IV
Compressive Strength	---	19.60 MPa
Shear Strength	---	5.74 MPa
Hardness	---	3.98 kN
Toughness	---	21.60 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Good machining property, Class II
Finishing	---	Fair, Class II
Natural durability	---	Perishable, less than 1 year, Class V
Treatability	---	Easy to treat, Class I

USES: For core veneers for plywood, fishnet floats, for rafting heavy logs, light and temporary construction, boxes and crates for fish and vegetable.

Official Common Name : MAGABUYO

Scientific Name : *Celtis luzonica* Warb (Ulm.)

Family Name : Ulmaceae

Tree Characteristics : Large tree; height up to 25 m, DBH up to 60 cm or more; long bole, cylindrical, erect and tapering.

Wood Description : Wood is straw colored or pale white grain crossed; texture moderately fine to moderately coarse.

Technological Properties :

Relative Density	---	0.448 moderately low RD, Class IV
Volumetric shrinkage	---	9.90% Moderately low VS, Class II
Bending Strength	---	55.70 MPa, medium strength, Class III
Compressive Strength	---	25.20 MPa
Shear Strength	---	8.70 MPa
Hardness	---	3.67 kN
Toughness	---	40.80 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Fair machining property, Class III
Finishing	---	Good, Class I
Natural durability	---	Non-durable, 1 to 2.5 years, Class IV
Treatability	---	Easy to treat, Class I

USES: Louvre doors, balusters, frames, moulding, bowls, furniture, walling, ceiling, room dividers, house framings, rackets, musical instruments, candy and fruit trays, knife blocks, poles and piles.

Official Common Name	:	MALAK-MALAK
Scientific Name	:	*Palaquium philippense* (Perr.)
Family Name	:	Sapotaceae
Tree Characteristics	:	Attains a diameter of 120 cm. Bole cylindrical, straight, 10 to 12 m long; buttress small.
Wood Description	:	Sapwood 2 to 4 cm thick, not so sharply distinguished from the heartwood which is reddish brown; grain straight; texture moderately fine. Fiber comparatively dense.

Technological Properties :

Relative Density	---	0.407 moderately low RD, Class IV
Volumetric shrinkage	---	9.90% Moderately low, Class II
Bending Strength	---	58.90 MPa, medium strength, Class IIII
Compressive Strength	---	27.60 MPa
Shear Strength	---	8.31 MPa
Hardness	---	4.14 kN
Toughness	---	30.70 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Difficult to dry, Class III
Machining	---	Fair machining property, Class III
Finishing	---	Good to Very Good, Class I
Natural durability	---	Non-durable, Class IV
Treatability	---	Difficult to treat, Class III

USES: Veneer for plywood, house framing, furniture and cabinets, flooring, louvre doors, balusters, moulding, picture frame, tool handles, pencil holders, boxes and crates.

Official Common Name	:	MALAKAUAYAN
Scientific Name	:	*Podocarpus philippinensis* (Foxw.
Family Name	:	Podocarpaceae
Tree Characteristics	:	Medium to large tree.
Wood Description	:	Wood is yellowish-pinkish buff with brownish streaks; grain straight, texture fine, moderately light to moderately heavy. Growth rings are variable.

Technological Properties :

Relative Density	---	0.50 moderately low RD, Class IV
Volumetric shrinkage	---	12.10% , medium VSS
Bending Strength	---	71.00 MPa, moderately high strength, Class II
Compressive Strength	---	20.00 MPa
Shear Strength	---	8.86 MPa
Hardness	---	3.84 kN
Toughness	---	18.40 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good, machining property, Class II
Finishing	---	Fair, Class II
Natural durability	---	Perishable, Class V
Treatability	---	Easy to treat, Class I

USES: Woodcarving, household utensils, walls, room dividers, louvre, picture frames, toys, coaster set, bowls, trays, chess pieces and chess boards.

Official Common Name	:	MALUGAI
Scientific Name	:	*Pometia pinnata* (Fors.)
Family Name	:	Meliosmaceae
Tree Characteristics	:	Diameter up to 60 to 100 cm. Trunk is 18 to 25 m in length, cylindrical and straight. Bole long, tapering, erect. Buttress high.
Wood Description	:	Sapwood lighter in color but not sharply defined from the heartwood. Which is light red to dark brown; grain straight, texture moderately fine, hard and heavy.

Technological Properties :

Relative Density	---	0.581 moderately high RD, Class II
Volumetric shrinkage	---	16.10 %,Moderately low VS, Class II
Bending Strength	---	58.10 MPa, moderately high strength Class II
Compressive Strength	---	30.80 MPa
Shear Strength	---	9.16 MPa
Hardness	---	5.42 kN
Toughness	---	43.60 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Difficult to dry, Class III
Machining	---	Very good machining property, Class III
Finishing	---	Very Good, Class I
Natural durability	---	Moderately-durable, Class II
Treatability	---	Very difficult to treat, Class III

USES: Beams girders, rafters, chords and purlins, flooring, bentwood articles, boat framing, striking tool handles, furniture, baseball bats, rim of tennis racket, bobbins, spindles, cooperage, tripods, T-squares, truck bodies and ship building.

Official Common Name : NARRA

Scientific Name : *Pterocarpus indicus* Willd.

Family Name : Leguminosae

Tree Characteristics : A large tree with an irregular fluted trunk attaining a diameter up to 2 m and a height of 40 m. The common sizes are 70 to 80 cm with a clear height of 12 to 15 m. Buttress prominent.

Wood Description : Sapwood light-colored, 2 to 8 cm thick, very distinct from heartwood which maybe pale yellow to blood red. In some instances the center of the trunk is yellowish, but the outer portion of the heartwood is reddish. Grain crossed, wavy or interlocked; texture moderately not very glossy.

Technological Properties :

Relative Density	---	0.52 moderately low RD, Class IV
Volumetric shrinkage	---	7.80% Low VS, Class I
Bending Strength	---	95.60 MPa, moderately high strength, Class III
Compressive Strength	---	51.50 MPa
Shear Strength	---	10.70 MPa
Hardness	---	3.87 kN
Toughness	---	33.20 Joule/Specimen
Sawing	---	Moderate to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Good, Class I
Natural durability	---	Moderately durable, Class II
Treatability	---	Moderately difficult to treat, Class II

USES: For high grade furniture and cabinets, radio, stereo cabinets, piano cases; interior finish in houses, hotels, other commercial buildings, veneer and plywood. Showcases and similar articles requiring beautiful appearance.

Official Common Name	:	NATO
Scientific Name	:	*Palaquium luzoniense* (Vid.)
Family Name	:	Sapotaceae
Tree Characteristics	:	Diameter up to 120 cm, generally with straight regular trunk of 10 to 12 m long.
Wood Description	:	Sapwood thin, light red or pinkish in color; not sharply marked off from the heartwood which is pale red to reddish brown; grain straight or slightly crossed; texture comparatively fine; fairly glossy, without taste or smell. Fiber comparatively dense.

Technological Properties :

Relative Density	---	0.482 moderately low RD, Class IV
Volumetric shrinkage	---	10.20% Moderately low VS, Class II
Bending Strength	---	58.20 MPa, medium strength, Class IIII
Compressive Strength	---	26.70 MPa
Shear Strength	---	7.70 MPa
Hardness	---	3.53 kN
Toughness	---	20.40 Joule/Specimen
Sawing	---	Moderately difficult to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Very good machining property, Class I
Finishing	---	Very good , Class I
Natural durability	---	Slightly durable, Class III
Treatability	---	Moderately difficult to treat, Class II

USES: Furniture and cabinets, cigar boxes, sides and necks of guitars, louvre doors, moulding, house framing, bowls, fruit trays, chopping boards and veneer for plywood.

Official Common Name	:	PAHUTAN
Scientific Name	:	*Mangifera altissima* (Blanco)
Family Name	:	Anacardiaceae
Tree Characteristics	:	Generally straight and tall, attaining a diameter up to 90 cm. Trunk cylindrical, 15 to 20 m long. Buttress small.
Wood Description	:	Sapwood very thick 8 to 10 cm; light colored with yellowish tinge, distinctly marked off from the heartwood which is dark brown with a narrow almost black longitudinal bands. Grain generally straight; texture moderately fine. Fiber dense.

Technological Properties :

Relative Density	---	0.55 medium RD, Class III
Volumetric shrinkage	---	10.40%, Moderately low VS, Class II
Bending Strength	---	64.8 MPa, moderately high strength, Class III
Compressive Strength	---	20.9 MPa
Shear Strength	---	9.37 MPa
Hardness	---	4.40 kN
Toughness	---	33.7 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class III
Finishing	---	Very good , Class I
Natural durability	---	Slightly durable, Class III
Treatability	---	Very difficult to treat, Class III

USES: For general construction, walls, ceiling, room dividers, flooring, furniture and cabinets, louvre doors, frames, solid and panel doors, balusters, bowls, coaster set, side and back of guitars, veneer for plywood.

Official Common Name	:	RARANG
Scientific Name	:	*Erythrina subumbrans* (Hassk.)Merr.
Family Name	:	Leguminosae
Tree Characteristics	:	Large tree; height up to 30 m diameter at breast height up to 80 cm; bole cylindrical, erect, tapering, Buttress low.
Wood Description	:	Sapwood is buff, not clearly defined from the heartwood. Grain is wavy or slightly crossed; texture is coarse. Wood is soft and very light.

Technological Properties :

Relative Density	---	0.236, low RD, Class V
Volumetric shrinkage	---	5.70%, low VS, Class I
Bending Strength	---	24.60 MPa, low strength, Class V
Compressive Strength	---	11.90 MPa
Shear Strength	---	3.65 MPa
Hardness	---	1.12 kN
Toughness	---	11.50 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	No available data
Natural durability	---	Non-durable, Class IV
Treatability	---	Easy to treat, Class I

USES: Insulator boards, veneer, chopsticks, popsicle sticks, ice cream spoons, toothpicks, matchboxes and sticks, pulp, boxes and crates, and fishnet floats.

Official Common Name : SAKAT

Scientific Name : *Terminalia nitens* Presl.

Family Name : Combretaceae

Tree Characteristics : A large tree, attaining a diameter of 100 cm. Bole fairly straight, regular, short, seldom reaching 12 m in length. Buttress not pronounced.

Wood Description : Sapwood 5 cm or more not sharply marked-off from the heartwood which is light yellow to yellowish brown. Grain crossed; texture moderately fine, glossy, fiber dense.

Technological Properties :

Relative Density	---	0.66 moderately high RD, Class II
Volumetric shrinkage	---	11.40% medium VS, Class III
Bending Strength	---	71.40 MPa, moderately high strength Class II
Compressive Strength	---	18.30 MPa
Shear Strength	---	no available data
Hardness	---	4.88 kN
Toughness	---	28.50 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Good machining property, Class I
Finishing	---	Very good , Class I
Natural durability	---	Slightly durable, Class III
Treatability	---	Easy, Class I

USES: For general construction, furniture and cabinets, balusters, louvre doors, frames, flooring, knife blocks, paper weights, bowls, cups, trays, boxes, crating materials, tool handles and handles for agricultural implements.

Official Common Name : TALISAI-GUBAT

Scientific Name : *Terminalia foetidissima* Griff.

Family Name : Combretaceae

Tree Characteristics : A large tree attaining a diameter of 100 cm and height of 40 m. Bole straight, regular, unbuttressed, 12 to 18 m long.

Wood Description : Sapwood yellowish; not sharply marked off from the heartwood which ranges from yellowish brown to dark yellowish brown. Grain crossed; texture moderately coarse; fairly glossy. Fiber moderately dense.

Technological Properties :

Relative Density	---	0.547 medium RD, Class III
Volumetric shrinkage	---	10.10% Moderately low VS, Class II
Bending Strength	---	78.30 MPa, moderately high, Class II
Compressive Strength	---	36.10 MPa
Shear Strength	---	8.50 MPa
Hardness	---	4.75 kN
Toughness	---	48.70 Joule/Specimen
Sawing	---	Easy to saw, Class II
Drying	---	Moderately difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Very good , Class I
Natural durability	---	Slightly durable; Class III
Treatability	---	Easy to treat, Class I

USES: Furniture and cabinets, walls, musical instruments, louvre doors, balusters, moulding, tool handles, door and window frames, bowls, veneer, poles and piles.

Official Common Name : ULAIAN

Scientific Name : *Lithocarpus llanosii* (A.DC.) Rehd.

Family Name : Fagaceae

Tree Characteristics : A large tree growing to a height of 20 m or more and attaining DBH of 50 cm or over. Bole slightly bent and twisted, slightly fluted. Buttress low inconspicuous.

Wood Description : Sapwood not distinct from the heartwood which is fawn-colored; grain slightly crossed; texture moderately coarse; not glossy, taste and odor indistinct; hard and tough. Fiber dense.

Technological Properties :

Relative Density	---	0.620 (green), medium RD, Class III
Volumetric shrinkage	---	18% High VS, Class V
Bending Strength	---	66.90 MPa (green), moderately high strength, Class II
Compressive Strength	---	35.70 MPa
Shear Strength	---	10.30 MPa
Hardness	---	6.04 kN
Toughness	---	33.30 Joule/Specimen
Sawing	---	Hard to saw, Class III
Drying	---	Difficult to dry, Class II
Machining	---	Good machining property, Class II
Finishing	---	Good , Class I
Natural durability	---	Moderately durable, Class II
Treatability	---	Very difficult to treat, Class III

USES: Picker sticks in textile mills, furniture, floor parquet, striking tool handles, agricultural implements, barrel, door and window frames, stairs, railings, beams, and other building components requiring strength.

Official Common Name	:	WHITE LAUAN
Scientific Name	:	*Shorea contorta* Vid.
Family Name	:	Dipterocarpaceae
Tree Characteristics	:	A tall straight tree attaining a diameter of 180 cm and height of 50 m, with a cylindrical bole of 15 to 20 m tall. Strongly buttressed.
Wood Description	:	Sapwood 5 to 7 cm, not distinct from heartwood, which is light gray, turning light pink when dry. In Mindanao the heartwood has a pinkish tint. Grain crossed, texture moderately coarse, glossy. Taste and odor not perceptible.

Technological Properties :

Relative Density	---	0.450 moderately low RD, Class IV
Volumetric shrinkage	---	11.20% Medium VS, Class III
Bending Strength	---	83.20 MPa, medium strength, Class III
Compressive Strength	---	41.90 MPa
Shear Strength	---	7.93 MPa
Hardness	---	2.84 kN
Toughness	---	27.20 Joule/Specimen
Sawing	---	Easy to saw, Class I
Drying	---	Easy to dry, Class I
Machining	---	Very good machining property, Class I
Finishing	---	Good , Class I
Natural durability	---	Non-durable durable, Class IV
Treatability	---	Easy to treat, Class I

USES: For cabinets, flooring, walling, ceiling, boxes, crates, veneer and plywood, mining timbers, boat planking, framing and genera construction, agricultural implements, barrel, door and window frames, stairs, railings, beams, and other building components requiring strength.

LUS PROCESSING AND UTILIZATION TECHNIQUES

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Introduction

In the Philippines and other tropical timber producing countries, one area of deep interest is the utilization of timbers known as Lesser-Used Species (LUS). Since the late 196's much have been said about LUS utilization and their introduction in world market. The call to use LUS to conserve our timber resources and to augment the timber supply or find substitute/alternative species for fading traditionally-known species has become a cliché in the wood industry. Unfortunately, their local utilization is still far from being desirable.

To date, few LUS may be considered to have graduated to the level of commercially-known species. In fact, most of the LUS timbers being processed locally into lumber, plywood and other wooden products comprise mostly of imported logs from West and South Africa, South America and neighboring SEA countries.

This paper presents the major problems associated with LUS and some approaches/techniques to overcome the technical impediments on their processing and utilization.

Major Problems in Harvesting/Utilization

At present, a number of LUS are being processed by the wood manufacturing industries into lumber, plywood, furniture, builders woodworks and other products. However, the intensified utilization in the wood-based industries is affected by some technical, economic and environmental constraints.

Technical Constraints

Policy on DBH limit in harvesting

Thousands of LUS are classified as small to medium-sized trees. They never reach more than 60 cm diameter-at-breast-height (DBH) no matter how long they are left to grow in the forest. In the Philippines, the harvesting of trees with less than 60 cm DBH is prohibited inside TLA's (unless they are found in rights-of-way; along log landings, along skidways and in tree plantations) (FAO 1980). This is one of the reasons why LUS even potentially valuable, are usually left behind during logging operation.

Limited data on stand distribution and volume

The nature of the tropical forest is one of the natural barriers causing the slow progress in utilizing LUS. The tropical forest has high species diversity. Botanical composition and stand density vary widely from one place to another. However, the main commercial interest centers around a number of species which are presently acceptable to the local or export market. Other species or those collectively called LUS are not usually harvested even in accessible areas.

The harvesting of LUS is also affected by the distribution in the forest. In the Philippines where the forest composition is dominated by dipterocarp species, LUS occur sporadically over a wide area. Studies in the country show that LUS comprise around 12 to 20% of the volume of timber in the dipterocarp forest (Sanvictores 1982). In the past no comprehensive inventories were undertaken to ascertain the volume of LUS growing stock per unit area. Previous and current timber inventories were concentrated on the commercial species. Most LUS were lumped as miscellaneous species in the stand stock table due to difficulty in their identification. Because of these, little can be said about the availability of obtaining adequate and regular harvest of LUS for a given period particularly on a species basis.

Inspite of the limited supply of most LUS, they could be more fully utilized for local needs rather than for export. In fact, Loktob (*Duabanga moluccana* Blume) and Binuang (*Octomeles sumatrana* Miq.) have been used since the last decade for veneer core or fuelwood for the local market.

Lately the RP-German Forest Resources Inventory Project generated some information on this aspect (FMB 1988). The number of trees, volume per hectare and regional distibution of 20 LUS is presented in Appendix 1.

Based on the results of the inventory, Ulaian [*Lithocarpus llanosii* A.DC) Rehd.], NATO[(*Palquium luzoniense* (F.-Villa.) Vid.], Loktob (*Duabanga moluccana* Blume), Amugis [*Koordersiodendron pinnatum* (Blanco) Merr.], Pahutan (*Mangifera alstissima* Blanco), Manggis [*Koompassia excelsa* (Becc.) Taub.], Bitanghol (*Callophyllum blancoi* Pl. & Tr.) and Malugia (*Pometia pinnata* Forst.) are among the LUS with around 3 to 5 cu.m/ha harvestable volume per species.

Inferior stem form

Aside from having small diameter and sparse distribution many LUS have poor stem form (i.e. short boled, fluted, highly tapered etc.). From the businessmen's point of view, only high value and quality species are harvested because the extraction of different types/forms of logs may entail processing problems and marginal profit.

Difficulty of species identification and limited information on wood properties and uses

The uncertain commercial value of many LUS is also related to inadequate documentation or technical data on their actual identity (in the field), strength/processing properties and suitable end-uses (as a single species or in group) (Cooper 1990). Many LUS have limited technical characterization to back up effective marketing promotion strategy (PCARRD 1987).

Primary processing and subsequent machining problems

LUS have highly variable wood quality from one species to another. Lestojas (1988) classified the imported LUS being used by their company which composed of 30-70 species into: light to very heavy, soft to extremely hard, perishable to very durable.

One of the important problems in the utilization of LUS particularly the small-diameter species is converting them into conventional products such as lumber and veneer. Most of the present primary processing equipment of the wood industry are designed for large-diameter logs (Rojo 1990). The use of inappropriate equipment for processing entails low mill recovery, low productivity and high processing costs.

Internal defects on the logs cause conversion problems and reluctance to convert some species. Fluting, butressing and high tapering of logs also make milling difficult.

Certain LUS like Dungon [*Terretia decorticata* Merr.) and Antipolo [*Artocarpus blancoi* (Elm.) Merr.] have high abrasive contents in the form of silica or various crystalline deposits while other species have high density. Blunting of saws and other cutters in subsequent machining operations are affected by density and abrasive substances in the wood. Generally the denser the species the greater is the blunting effect.

Grain characteristics also affect also affect other processing operations. Interlocked grain, which characterizes some of the LUS, are often more difficult to machine, finish and kiln dry (prone to warping).

Economic Constraints/ Marketing Problems

Aside from the technical difficulties of use in LUS there is limited markets for lower quality and smaller logs. This is especially true in the log export trade (except for tree plantation species).

The high cost of logging and market promotion implies that the timber industry extracts only better quality and higher value materials from the forest.

The marketing of timber in the local market/export market is typically species oriented. In most cases sales are made in response to the request of the buyers and not as a result of active marketing on the part of the producers (Kalapatis 1985). This practice favors largely the continued production and marketing of familiar species. For this reason, it is difficult to introduce new species in the market although the technical properties are known. Moreover, users/ buyers of especially-used timbers are quite reluctant to buy new untried species.

Aside from limited supporting technical information of LUS promotion in the market, the producers have passive attitude (Natividad 1990). Instead of making the initiative they mainly respond to market changes. Search for alternative species is done only if the availability of in-demand species become scarce or when there is positive inquiry from buyers about new species.

LUS are also introduced in the market not base on their exact qualities but usually as substitute for fading traditionally known species. This tactic creates more long term problem on the part of the producers. It gives a bad name to otherwise usable species if this does not suit the particular requirements of the customer. The wood substitute also degrades the image of a species which may have qualities equal or superior to others in a given application.

Environmental constraints

At present, there is a growing demand from various international/national/local organizations for the conservation of the tropical forest due to ecological reasons. Excessive biomass extraction from the forest eventually results to depletion of essential soil nutrients. This paves way for the invasion of weed trees of grasses in the logged-over areas. The harvesting/removal of more trees in the forest also enhances soil erosion. The growth/regeneration of other associated species in the forest such as rattan, vines and other non-timber forest resources may also be impaired by sudden exposure due to excessive reduction of forest cover. Thus, the harvesting of LUS ultimately contributes to environmental degradation if this is not accompanied by effective forest management.

Approaches/Techniques for More Efficient Use of LUS

To address the technical impediments presented above, the Forest Products Research and Development Institute (FPRDI), through its completed and current R&D projects/studies has been publishing some documents and formulating strategies geared towards the improved utilization and marketing of LUS in the country. Among the important information generated and techniques being promoted to enhance the processing and utilization of LUS are described below.

Preparation of identification manual/guides

The manual/field guide covers 60 LUS belonging to 33 families and 52 genera. The bole form, size, buttress, branching pattern, crown and foliage, bark (external and internal features), leaves and twigs and other striking features of each species were described. Scientific illustration of preserved botanical specimens were prepared (FPRDI 1996).

The anatomical structure and related properties of some LUS were also described/illustrated as a guide for laboratory identification and for the assessment of potential uses.

Establishment of information on basic and woodworking properties and end-use classification

The physico-chemical and mechanical properties of important LUS were tested for categorizing their suitability for specific end-uses e.g. poles/piles, veneer, pulpwood, flooring, furniture and cabinets, millworks and joinery, heavy/light construction, musical instruments, packaging, etc. (FAO 1980).

A sample of the guide for classifying species end-use property requirements for furniture and cabinets is presented in Appendix 2. This guide reflects not only product quality but also ease of fabrication and behavior of the product in service.

Grouping of LUS for specific end-uses

This scheme of utilization is designated to offset the limited timber supply of LUS in a number of applications where color, wood texture and species durability are not critical factors in the end-product. The grouping involves mainly species density and strength properties. Each group of LUS may be used for a number of common end-uses with minor modifications expected to occur on their wood processing and product quality.

Appendix 3 shows the different strength groupings and possible common end-uses of some LUS. Each group also includes reference commercial species which matches or approximates the strength class of the LUS listed.

The idea of grouping LUS for an end-use is applicable for structural purposes e.g. post, studs, trusses, floor joist, etc. The wood is usually hidden and the use of timbers of varying colors and textures may be possible provided other relevant specifications are satisfied e.g. strength and durability.

In the plywood industry, this scheme of utilization is also being done. The Bando Lumber in Pusan, Korea has advanced to the stage of being able to accept mixtures of up to 80 different LUS to produce quality plywood acceptable to all major markets after 2-3 year experimentation on peeling, lathe setting, veneer drying and gluing (Gresham 1983). The same was also reported at ALSON's in Davao City although they are encountering problems on gluing (Lestojas 1998).

The grouping of LUS with almost similar wood properties is also an effective strategy in the exportation of logs from South America "Quaruba" refers to different species in South Brazil and one region in Brazil also use the name "canella" for more than 20 species. (Brazier 1975).

Retooling of equipment

To date, a number of mini-bandmills in the country have been installed particularly in Mindanao to cope with the problems in sawmilling small-diameter logs. In Mindanao, five (5) companies are also using spindleless lathe for the rotary cutting of veneer from veneer log cores. The conventional lathe entails a log core with about 20 to 25 cm diameter after peeling while in the spindleless lathe the diameter of the log core is reduced to about 5 cm. Thus, if the two equipment are used in tandem, veneer recovery per log will be higher. The spindleless lathe can also be used for veneering small-diameter logs but the raw materials should first undergo the rounding process to have a cylindrical form.

The known users of spindleless lathe in the Philippines are PICOP in Bislig, Surigao del Sur; M&S in Recodo, Zamboanga City; UCP in Malungan, El Salvador Misamis Oriental; EverSun Plywood in Cotabato City and C. Alcantara and Sons (ALSONS) in Davao City.

Further processing and adding value to "low value" wood

Traditionally, most developing countries including the Philippines have exported logs and rough sawn lumber to developed countries. This system of marketing forest products is also commonly employed in LUS by South America, Africa, Papaua New Guinea and in SEA.

On approach to generate higher earnings from LUS is the manufacture of finished or semi-finished products for the local and export market (Cooper 1990). While the buyers/sellers are conservative about the technical details of a species, experience shows that the public or end-users are unconcerned about the raw material used in a product as long as it has the proper attributes. This is exemplified by the success of Malaysia in the export of furniture and other products from rubberwood which used to be a "waste" and unknown for this purpose.

Locally, similar ventures on the manufacture of value-added products from LUS have been achieved. One example is Toog [*Combretodendron quadrialatum* (Merr.) Merr.]. This species used to be left in logging areas because it is difficult to saw. It is also susceptible to splitting and warping during seasoning. Through research and technology, this species has been recently utilized for making plywood.
It is sold locally and abroad under the brand name "Philippine Rosewood" due to its beautiful grain and exquisite figure on the surface. However, the logs require heating in water at 82^0 C for 24 hours before peeling or slicing to produce good quality veneers (Eala and Ramos 1983).

In like manner, Mangis is traditionally used for charcoal because it is difficult to dry and tend to warp if not carefully seasoned. Through research done at FPRDI, proper drying schedule was established. The species was also found to have good machining properties. Other studies showed its suitability for sliced veneer for fancy plywood. As a result, this has caught the fancy of furniture and cabinet makers because the color and texture resemble Narra (*Pterocarpus indicus* Willd.); hence the trade name "Palnarra" (Pal refers to Palawan, its native habitat).

There is no doubt that some other LUS have exceptional wood qualities for certain applications e.g. furniture Cuaresma (1982), FAO (1980), PCARDD (1987) and Tesoro and Aday (1990) are the major references which characterized and classified the potential specific products from Philippine LUS.

Recently, FPRDI has also completed two ITTO-funded projects (ITTO-1 and 2) which cover some efficient processing techniques on sawmilling (saw-dry and rip method), preservation, seasoning, machining, finishing, glue-lamination and wood bending, among others. The products developed include furniture, builders woodwok and joineries, CBB pallets, etc.

Complete integrated utilization of resource

The principle of this scheme of utilization is more in the nature of resource driven approach. It involves using all the possible and allowable species to be harvested and all the wood from these trees (Brazier 1979). This is ideal but may be an unrealistic practice.

The theoretical model along these lines is shown in Fig. 1. The main features involve distinction between species currently used and not used. The currently used species can be converted to solid wood products and sold based on existing market demands.

The new development/approach deals with the appraisal of the potential of currently unused timbers in terms of species and quality and abundance.

The relatively abundant species with good qualities may be selected and promoted for some specific end uses while those that are technically unacceptable for any solid timber use are classified as waste products.

For the sparsely available species, the same pattern of utilization may be done. The technically usable species, however, should be grouped and promoted for specific end-uses. Those too difficult to use for solid wood products may be considered as "waste".

The various possible utilization of "waste" and milling residues are the following:

- fuelwood for generating energy for the plant
- fuelwood/charcoal for domestic uses
- fiber based products (boards, pulp and paper)
- chips for export

Except for the export chips and fuelwood/charcoal production, the other "waste" utilization pattern may be unrealistic. This is due to high investment, remoteness from the market and insufficient resources to support large-scale operation.

Development of LUS plantations

Industrial forest plantation development in the country should consider the use of LUS or indigenous and multipurpose trees. Some are known to have similar or even better qualities than the popular plantation species such as Gmelina, Falcata and Mangium.

One excellent example is Bagalunga [*Melia dubia* Cav. (Meliac.)] which is reportedly cultivated in some parts of the country specifically in Leyte. This LUS has the following attributes: fast-growing, good stem form, copping ability, wide site adaptability, prolific seeder and has various economic uses (Arroyo 1990). Information on its wood properties and uses as well as its propagation are already established (Razal *et. al.* 1996 and Nasayao *et.al.* 1992).

The Rose Industries, a PLTP holder in San Francisco, Quezon, has some stands of LUS such as Tangisang-bayawak [*Ficus variegata* Blume (Morac.)] and Balakat [*Ziziphus talanai* (Blanco) Merr.] in their tree plantation project (Bambalan 1996).

Concluding Remarks

The various approaches/techniques presented in this paper for enhancing the utilization of LUS are not novel ideas. These have been part of the plans developed in the past to expand the resource base of the wood industry. However, these have been ignored or finding a gradual response from the parties concerned.

Assuming supportive policies and effective forest management are implemented in the country for the harvesting of LUS below the 60 cm DBH limit, experience from other countries show the following important requirements in the successful utilization and marketing of LUS: a) some technical information i.e. species identity and wood quality; b) resource availability at regular quantity and quality (grades) required; and c) price competitiveness.

If the above criteria are satisfactorily met there is no doubt for a particular LUS (single or grouped species) to find a niche in the wood industry.

The most significant factors, however, are items b and c because practically we have the technologies needed insofar as wood utilization is concerned. Once the timber is converted into finished article with the necessary attributes, in general the end-users are not particular with the raw material or species used. In fact the success of other countries in the local and exportation of LUS is mainly ascribed to their ability to satisfy the commercial requirements rather than the suitability of the species.

In the Philippines the biggest stumbling block in the utilization and marketing of LUS is associated with resources inventory. Lack of data on this aspect entails meaningless R&D efforts uncertain commercial value of LUS resources.

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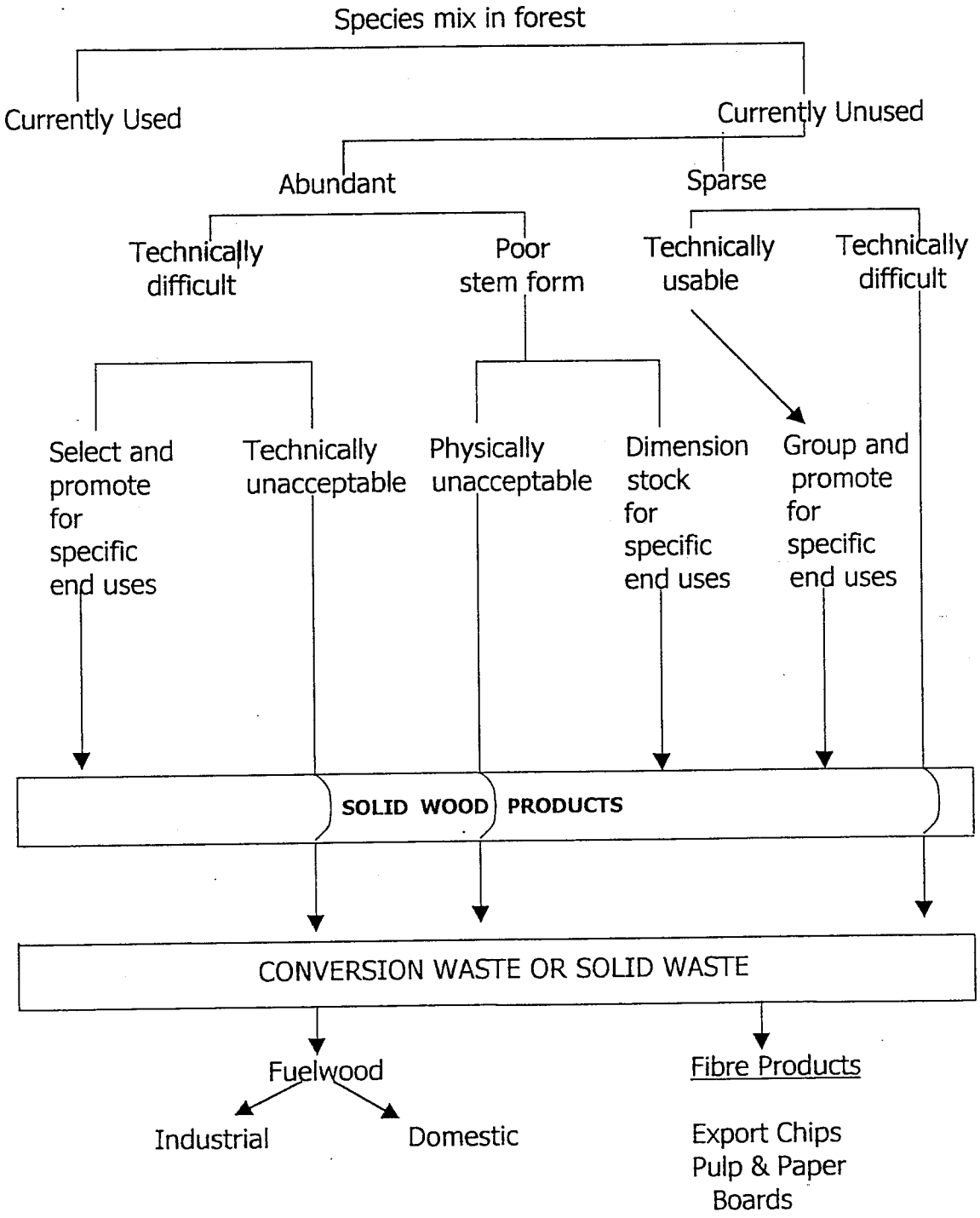
Fig. 1. Complete Integrated Utilization of Tropical Resources



Source: Brazier 1979

Appendix 1. Average volume and number of Trees per hectare of 20 Lesser-Used Species 1/.

LUS	Volume/ha (cu. m.)	Number of Trees/ha	Regional Distribution	Strength Group/Species Classification
Ulaian	4.9	17.5	1-6,8-12	Moderately-High Strength/CFW
Nato*	4.6	8.1	1-6,8-12	Medium Strength/CHS
Loktob*	3.8	4.8	10,12	Moderately-Low Strength/CFW
Amugis*	3.2	4.3	4,6	Moderately -High/CFW
Pahutan*	2.6	4.6	1-5	Moderately -High/CFW
Manggis*	2.5	5.3	4,12	Moderately-High/CFW
Bitanghol*	2.4	10.6	1-6,8-19,12	Medium Strength/CFW
Malugai*	2.4	4.5	2,4-6,8-9,12	Moderately-High Strength/CFW
Kapulasan	2.1	5.4	2	CFW
Bolong-eta*	2.0	5.8	1-3,9-10	Moderately-High Strength/CFW
Rarang	2.0	2.2	1	Low Strength/OS
Duguan	1.7	5.5	2-4,6,8-9	Moderately - Low/OS
Balete	1.8	.8	6,12	Moderately-High/OS
Binuang*	1.6	2.4	1,2,4,6,10,12	Low Strength/OS
Bayok	1.6	3.3	9	CFW
Antipolo	.95	1.2	4,8	Medium Strength/CFW
Igem*	2.8	1.4	4,9,10	Moderately - Low Strength/SS
Binuang*	2.2	1.1	10,12	Low Strength/LHS
Anang	1.6	10.5	5	Moderately-High/OS
Batikuling*	1.5	2.0	6,9	Moderately-High/OS

1/Source: Forest Resources of the Philippines by Regions. 1988. Philippine-German Forest Resources Inventory Project Forest Management Bureau. DENR.

* Promoted to commercial status (Rojo)

Appendix 2. Guidelines for categorizing wood properties in relation to its end-use as furniture material

1. GRN (grain)
   A - Interlocked
   B - Straight
2. TEXT (texture)
   A - Moderately fine to fine
   B - Moderately coarse to coarse
3. SPG (specific gravity, based on oven-dry and green volume)
   A - 0.500 to 0.700
   B - 0.300 to 0.500
   C - Above 0.700
4. WORK (workability)
   A - 95% to 100 % defect-free surface
   B - 10.5% to 16.0%
   C - Greater than 16.0%
5. SHR (shrinkage from green to oven0dry condition)
   A - less than 10.5%
   B - 10.5% to 16.0%
   C - greater than 16.0%
5. SEA (Seasoning)
   A - Easy to dry. (Can be kiln-dried from the saw with little or no degrade.)
   B - Moderately difficult to dry. (Can be kiln-dried from green condition using moderate kiln-drying schedules). Has slight tendency to develop drying defects.
7. FIN (finishing)
   A - Good to very good (Sands and takes stains and varnish very well.)
   B - Fair (Sands and takes stains and varnish well.)
   C - Poor (Poor sanding property.)
8. MOR (modulus of rupture)
   A - above 630 kg/cm^2
   B - 400 to 630 kg/cm^2
   C - 380 to 400 kg/cm^2
9. COL (color)
   A - Dark
   B - Light

Legend:

A - most suitable B - acceptable C - less acceptable

Note: Based on the categories of wood properties and the relative importance of the end-use properties requirements for furniture, a grading of the species as furniture materials can be made. The recommended grades and bases for grading as follows:

a) Premium Grade - Species with A's rating in all properties requirements.
b) Grade - I Species with A's and only 2 B's in any of the properties.
c) Grade II - species with a minimum of 1C in any of the properties requirements.
d) Grade III - Species with a maximum of 2C's in any of the properties requirements.

Appendix 3. Strength grouping of some LUS

Strength Group	Commercial Species	Lesser-Used Species
Class I: High Strength	Guijo Manggachapui Narig Yakal Yakal-Yamban Yakal-Malibato Yakal-Saplungan	Agoho* Anchoan Alupag-amo Arangen Ata-ata Bakauan* Bansilai Katilma Kubi Liusin Malabayabas* Sasalit Satinwood Tindalo*

* Promoted to commercial status (Rojo 1990)

End-Uses of Class I Timbers:

For heavy-duty construction where both strength and durability are required:

- Ship building
- Railway sleepers
- Mine timbers
- bridge & wharf timber
- Salt & fresh water pilings
- Telephone & telegraph poles
- Friction & bearing blocks
- Vehicle spokes & frames
- High-grade beams/girders/rafters/chords/purlins/window sills/balustrades/treads
- Dumb bells, pulley sheaves 7 rollers

Strength Group	Commercial Species	Lesser-used species
Class II: Moderately-high Strength	Kamagong Kamagong, Ponce Dao Malapanau Molave narra Panau Panau,Leaf Tailed Yakal-Kaliot	Akle* Amugis* Anang Anang-gulod Balakat* Balikbikan Balobo Batino Bingga* Bokbok Bolon Bolong-eta* Dangkalan Dungon Gatasan Gisau Ipil* Kalingag Kamatog* Katmon-bayani Kato* Katong-lakihan Langil Lomarau Ludek Makaasim* Malakauayan* Malakatmon Manggis* Maniknik Malaruhat Malasaging Malugai*

Class II: Moderately-high Strength		Miau Pahutan* Palak-palak Patangis Pianga Sakat Salakin Siar Ulaian Talisai-gubat Tamayuan* Toog* Vidal lanutan*

- Promoted to commercial status (Rojo 1990)

End-Uses of Class II Timbers:

For medium heavy-duty construction:

- Heavy-duty furniture & cabinets
- Medium grade beams/girders/rafter/chords/purlins/flooring/door panels/frames
- Parquetry
- Veneer & plywood face
- Paving blocks, boot & shoe last
- Bobbins, spindles & shuttles, picker sticks
- Sporting equipment like bowling pins, baseball bats, checkerboards, golf clubs
- Sailboat parts, gunstocks,tool handles
- Wheel shafts & axles, cant hooks, peavies
- Studs for car & truck bodies
- Airplane construction
- Tri-pods, T-squares
- Kitchen implements like mortars & pestles

Strength Group	Commercial Species	Lesser-Used Species
Class III: Medium Strength	Apitong Apitong, Basilan Basilan & Broad Winged Bagtikan Dagang Giant Ipil-ipil Hagakhak Mahogany, Big leafed Malaanonang White lauan Teak Yemane/Gmelina	Amunat Antipolo Apanit Balukanag Banaba Banai-banai Bitaog* Dalung Gapas-gaps Itangan Java Sala kangko Kalumpit* Katmon Kuling-babui Kuling-manok Lamio Lanipau* Lanutan-bagyo Lingo-lingo Lokinai Lamog* Magabuyo* Malak-malak Mindoro Pine Nangka Nato* Nato, Villamil Pagsahingin Bulog Phil. Chestnut Phil. Maple Piling-liitan Santiki Tan-ag Usuang-saha

* Promoted to commercial status (Rojo 1990)

Strength Group	Commercial Species	Lesser-Used Species
Class V: Low Strength	Kalantas Gubas Ilang-ilang Moluccan sau or Falcata Tiaong	Anabiong* Bagalunga Balsa Binuang* Dita* Ilang-ilang Kaatoan bangkal* Kapok Kaitana Lumbang Malakalumpang Rarang Spanish Cedar Taluto Tulip, African

* Promoted to commercial status (Rojo 1990)

End-Uses of Class V Timbers:

For light construction where strength, hardness and durability are not critical requirements:

- Mouldings, core veneers, fans, wooden shoes
- Sash, door and panel cores
- Ceiling and acoustic panels
- Pulp and paper
- Wall boards and pencil slats/matchsticks/popsicle sticks/ice cream spoons/cigar boxes/bouys and floats

DEVELOPMENT OF STRATEGIC FRAMEWOK FOR MARKETING PHILIPPINE LESSER-USED SPECIES

From the report submitted by DR. IVAN EASTIN, Marketing Consultant, FPRDI-ITTO Project No. PD 47/88 Rev. 3(I)

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Introduction

Environmentalists have long charges that the timber industry is the driving force behind the process of deforestation. There are, however, other factors that have contributed to deforestation. Among these are poverty, rapid population growth and high unemployment rates. Data from the Philippine Forestry Statistics show that the forest estate in the Philippines has declined from approximately 52% of the total land area to less than 20% over the past 50 years. Timber harvests have declined from 11 million m^3 in 1970 to just 865,000 m^3 in 1995. The resulting impact on the forest products industry has been rising prices of lumber, raw, material supply shortages, and a consolidation of the timber processing industry that has resulted in the loss over 25,000 jobs since 1990.

With these problems, manufacturers have found it difficult to price their products at a competitive level and assure buyers of big volume of production because of the unreliability of supply of traditional lumber. However, two recent developments that have tremendous potential for the forest products industry are: 1) the current focus on the establishment of industrial tree plantations and 2) the recognition that lesser-used tropical timber species have the potential to substitute for increasingly scarce traditional species.

While lesser-used species (LUS) and industrial tree plantation species have the potential to substitute for traditional species, it is important to note that local forest product manufacturers are inherently conservative and reluctant to accept substitutes. Reluctance focuses on three concerns: 1) reliability of supply of the new species, 2) performance of the new species in the manufacturing process, and 3) concerns regarding the in-service performance of the new species. Research on new-species introduction conducted by Smith and Eastin (199) showed that raw material preferences within the international timber trade are slow to change. This may be explained by the fact that manufacturers tend to rely on a small portion of species in the forest that have international or domestic markets.

The challenge of marketing LUS focuses on describing a conceptual model of the introduction process and providing a framework to assist in the development of marketing strategies to successfully introduce LUS as new industrial materials. However, the development of an effective marketing strategy requires a thorough understanding of the interrelationships among the factors that influence end-user acceptance of new species in industrial markets.

This report presents the results of a survey of the Philippine wood processing industry conducted by Dr. Ivan Eastin to obtain information related to marketing of lesser-used tropical timber species. The results of a second survey carried in the US are also presented. This report also presents recommendations for the end-use of 23 lesser-used species. Finally, the report presents a strategic framework for effectively introducing and marketing lesser-used tropical species.

Results of the survey of the Philippine Forest Products Industry

The survey was conducted to evaluate the importance of different factors affecting the introduction and acceptance of lesser-used species. Factors that were evaluated were the impact of tropical hardwood boycott, utilization and marketing of lesser-used timber species, and acquisition of market information.

A total of 537 questionnaires were mailed out but only 24 usable questionnaires were returned. The final response rate was 4.6 percent. Size of the firms ranged from a low of five employees to a high of 1,300 employees, with the majority of firms employing between 20 and 200 workers. About half of the respondents were located in Luzon, with remaining firms evenly distributed between the Visayas and Mindanao. Just over two-thirds of the raw material inputs used by the responding firms were from traditional domestic species, while approximately 20% were imported and almost 15% were derived from lesser-used species. Imported timber represented the majority of the raw material mix for 215 of the firms, only one firm utilized imported raw materials exclusively.

Less than half of the respondents exported their products. The main export markets were the US (54.2%), Japan (17.1%), and the UK (7.9%). Almost three-quarters of the exports were furniture (74.4%), followed by joinery/millwork (7.9%), and other products (15.2%). None of the respondents exported primary wood products (i.e., lumber, plywood, or veneer). The vast majority of respondents (75%0 indicated that they used a combination of distribution channels (including export agents, brokers, and direct sales to customers) when exporting their products.

Impact of tropical hardwood boycotts

Tropical hardwood boycotts have been initiated in a number of developed countries by environmental groups in an effort to reduce market demand for tropical hardwoods. While these boycotts have been around for over ten years, one fourth of the respondents indicated that they had not heard of the boycotts.
Respondents were asked to evaluate the impact that tropical hardwood boycotts have had on the demand for their products. Results indicated that boycotts in developed countries have had virtually no impact on producers and exporters of wood products in the Philippines. However, respondents recognized that boycotts could pose a substantial risk to their business activities in the future. Factors impacting raw material availability in the Philippines were perceived to pose more of a risk to long-term operations that tropical hardwood boycotts.

Respondents were next asked to evaluate the effectiveness of a variety of strategies in responding to a boycott of tropical hardwood products. Respondents indicated that the most effective strategies for responding to a boycott were: adopting sustainable forest management practices, using lesser-used tropical timber species. The least effective strategy was to simply ignore the boycott. Respondents perceived that the net impact of boycotts had been to positively influence the strategic development of the industry away from the production of commodity products towards value -added products. They reported that lesser-used species will become a more important component of the raw material mix in the future. This would seem to indicate that, at least from marketing perspective, the challenge is not so much gaining acceptance of lesser-used species, but rather to provide manufacturers with the necessary technical information and promotional material to encourage and support the increased utilization of LUS.

The utilization and marketing of lesser-used species

The results of the survey showed that Philippine manufacturers are already using LUS. Three quarters of the respondents are incorporating lesser-used species into their raw material mix. Of these, almost three-quarters (72.2%) are selling their products in the domestic markets, while one-third are exporting them. This difference appears to support the manufacturers perception that their domestic customers are substantially more willing to accept US products than their foreign customers.

To have a better understanding of how LUS are being utilized in the Philippines, survey respondents were asked to estimate the volume of LUS. Results showed that a total of 2,328m^3 of US were processed by respondents in 1995. While 13 of the 23 US included in the survey had been used by at least one respondent, the primary lesser-used species being utilized were Binuang 938.1%), Nato (22.45%), Malugai (8.8%) and Balete were primarily used for furniture, Magabuyo was principally used for parquet flooring, and Malugai was used for veneer and plywood. Other species were used in wide variety of products.

For example, while the majority of Binuang and Nato (22.4%) were used in the production of lumber, substantial volumes were used to produce furniture, mouldings, veneer, and plywood.

Respondents were asked to evaluate the importance of a variety of factors in promoting the market acceptance of lesser-used, two groups of factors were rated as being very important. The first group consisted of the availability of a reliable long-term resource supply and the availability of technical processing information.
The second group included: providing a low initial price and gaining the acceptance of the lesser-used species by an influential manufacturer or trader. While the second group of factors was rated as being less important than the first group, it was still perceived as very important.

Acquisition of market information

An important component of an effective marketing strategy for introducing and promoting lesser-used species involves establishing an efficient and accurate flow of information between producers, their customers and end-users. Unfortunately, all too often it appears that importers and wholesalers are reluctant to provide foreign manufacturers with detailed information or to identify the end-users of their products for fear that the foreign manufacturer will use this information to bypass the importer or wholesaler and sell their products direct to the end-user. Thus, the establishment of an effective flow of information between the market and the manufacturer requires that a high degree of trust be established.

Survey respondents were asked to evaluate the importance of a variety of factors in acquiring market information. Strategic factors were working with industry associations, discussions with customers, attending industry trade shows, discussions with other manufacturers, conduct of own market research, industry association market intelligence reports, attend industry journals, discussion with importers/agents, Internet 9world wide web) and hire a consultant to conduct market research. Results indicated that almost all the strategies, with the exception of three, were perceived as being effective in acquiring market information. However, two strategies, working with an industry associations and direct discussions with customers (when possible), were perceived to be the most effective. One strategy hiring an outside consultant, was perceived to be the least effective.

Respondents were also asked to rate the importance of different strategies for identifying new customers and market opportunities. Strategic factors were industry trade shows, customer recommendations, direct contact from new customers, industry exhibitions, information from an industry association, information from Department of Trade and Industry, information from importers or agents, company sales staff and information from other manufacturers. The highest rated strategy was attending industry trade shows.

Results of the US Survey on Lesser-Used Tropical Species

A similar survey to that conducted in the Philippines was administered in the US to 100 importers and wholesalers of tropical hardwoods. The high response rate (67%) provides an indication of the interest of US importers and wholesalers in the utilization of lesser-used species.

On average, tropical timber species represented 41.4% of the respondents lumber sales, 12.1% of their plywood sales in 1996. Survey respondents indicated that they imported 25.3% of their tropical hardwood import from Africa, 49.2%
from South America, and 24.5% Southeast Asia.

A high percentage (80.6%) of the US respondents are currently importing US. On average, their customers are reluctant to accept lesser-used species. The survey participants indicted that, on average, their customers are reluctant to accept US although 15% said that their customers accepted quite readily. A similar percentage indicated that their customers were not willing to try lesser-used species at all.

Respondents were asked to indicate how important different strategies were in promoting market acceptance of LUS in the US. By far, the most important factor was the availability of a reliable long-term supply of the species. No other factor was rated as highly as the single factor. Three other factors, the availability of small trial volumes, the availability of technical information and a low trial price, were also rated as important. All other factors were perceived as being of lesser importance.

Respondents were then asked to identify the single most important factor in promoting the acceptance of lesser-used tropical species in the US. The results indicate that single most important factor is low initial price, followed by a reliable long-term resource supply, and the availability of promotional materials. While the ranking of factors in these two questions is somewhat different, considered together they provide a better understanding of the factors that constitute an effective marketing strategy for promoting lesser-used tropical species: the availability of a reliable long-term supply, a low initial price, the availability of promotional materials, and the availability of technical information.

Recommendations

Based on the information derived from the two surveys, a preliminary marketing strategy was developed to facilitate the introduction and acceptance of Philippine lesser-used tropical timber species. The factors that constitute the basis of the marketing strategy include: 1) determination of the technical characteristics of each lesser-used species;

2) development of an effective promotional strategy; 3) identification of appropriated niche markets for each species; 4) acquisition of market information; 5) development of a marketing strategy based on the appropriate mix of marketing variables; 6) establishment of a reliable product supply prior to the initiation of marketing activities, and 7) providing technology transfer and marketing support to the local industry.

Determine the technical characteristics of each lesser-used species

It is crucial that the appropriate technical and processing information be developed to ensure the successful introduction of each lesser-used species. The information that needs to be available to local processors includes the physical and mechanical properties of wood. But the development of technical information needs to extend beyond deriving the basic wood properties. More importantly, information about the basic wood properties needs to provide the basis for developing kiln drying schedules, preservative treatment processes, and providing recommendations on the processing characteristics of each species.

The technical information should also provide the basis for making recommendations about the appropriate end-use applications for each lesser-used species. Similarly, the technical information should provide the basis for identifying higher priced traditional species for which each lesser-used species can be used as substitute. The technical information should be summarized in a series of technical publications that can be provided to manufacturers interested in processing lesser-used species.

Develop an effective promotional strategy

While the technical information developed for each lesser-used species should be a component of the promotional material, the basic function of the promotional material should be to encourage processors to try these species. The promotional material should include attractive photographs of the lesser-used species and the products manufactured for them. They could also include wood specimens of each lesser-used species. The promotional material should also include general information on each lesser-used species including the volume of the available resource, basic wood properties, a summary of the technical information, and a listing of the appropriate end-use application.

Where appropriate, the promotional material should emphasize the ability of the lesser-used species to substitute for traditional species that may be higher priced or in short supply. Finally, the promotional strategy should identify the appropriate outlets and forums or making this information available to manufacturers and exporters and emphasize the role of FPRDI in promoting the transfer of appropriate processing technologies.

Identify appropriate niche markets for each species

Each lesser-used species possesses a unique set of wood properties which, to a large extent, define the range of products that can be manufactured. In addition, within the wood processing industry is a segment of manufacturers who are innovative and therefore would be more willing to try a lesser-used species. In order to maximize the chances of successfully introducing lesser-used species into the marketplace, it is important that each lesser-used species be promoted at least initially, to those manufacturers who would be most likely to try the species. A similar situation exists within the end-use market and accurate market information can provide the basis for identifying these innovative importers and end-users.

Acquire market information

Not only is the acquisition of market information important to help identify appropriate niche markets for each species, but it is equally important for identifying those product/market combinations where a specific lesser-used species would have the greatest chance of gaining market acceptance. This is true for both the domestic market and export markets. The process employed for acquiring market information should include both formal and informal channels, but should be institutionalized so that it can provide the basis for developing effective marketing strategies focused on those market niches where there is the best chance of gaining the acceptance of lesser-used species.

Develop a marketing strategy based on the appropriate mix of marketing variables

Having developed the information described in the previous steps, it is time to synthesize this information into a marketing strategy that will maximize the chances of gaining the acceptance of the lesser-used species in the marketplace. This includes identifying the appropriate product mix and targeting these products to those customers who are most likely to try a lesser-used specie. It means establishing a pricing policy that will encourage end-users to try lesser-used species in preference to the more established species. It means identifying distributors who have the experience selling lesser-used species or who have demonstrated a willingness to invest the required time and effort in promoting these species and their products to their customers. It also means effectively integrating the promotional strategy into the marketing strategy. For example, this may include exhibiting products manufactured from lesser-used species in international exhibitions and trade shows. The net result of this process should be the development of a marketing strategy that effectively promotes lesser-used species to potential end-users.

Develop a reliable product supply prior to the initiation of marketing activities

Nothing is more frustrating to an end-user than investing a substantial amount of time, energy, and capital in evaluating a lesser-used species only to find that, at the end of the process, the product is not available.

It is critical to the successful introduction of lesser-used species that no marketing programs be initiated until a reliable supply of product is available for customers to purchase. The premature development of demand for a lesser-used species prior to the availability of supply can undermine all the previous efforts that have gone into developing a marketing strategy for introducing the lesser-used species.

Provide technology transfer and marketing support to the local industry

Having invested a tremendous amount of resources in developing the information required to effectively market US, FPRDI should be prepared to provide technical assistance to local processors who are interested in incorporating these species into their raw material mix. In particular, FPRDI should have a program in place to provide technical assistance in transferring prototype scale processing technologies to industrial scale manufacturing process. However, given the structure of the wood processing industry in the Philippines, it is equally important that they be able to provide technical assistance to smaller processing companies. FPRDI should also provide assistance to local firms in the marketing of lesser-used species by making available the technical information required to develop effective promotional materials.

Monitoring and Evaluation

To effectively monitor the market acceptance of lesser-used tropical timber species, it is recommended that FPRDI perform an annual survey of the timber industry (this annual survey would be an addition to statistics gathered by FMB as described below). The survey should monitor the utilization of lesser-used species, monitor market developments for products manufactured from lesser-used species and identify problems related to the utilization of marketing of lesser-used species at an early stage. The survey should be supplemented with in-depth personal interviews of managers and companies that are performing primary processing operations (lumber, veneer and plywood production) with lesser-used species as well as with the managers of value-added companies who represent the end-users of the species.

As mentioned earlier, most of the managers in the Philippine industry indicated that they would be willing to try lesser-used species in their manufacturing operations. The primary reason they are not doing this already is because there is no ready supply of these species available. This has been primarily attributed to government policies that prohibit and restrict the harvesting and transportation of US in the Philippines. This report recognizes the need for a policy that explicitly addresses the harvesting and transportation of US in the Philippines. This report recognizes the need for a policy that explicitly addresses the harvesting and transportation of lesser-used species derived from second-growth forests. Not only would such a policy help to promote the more efficient utilization of lesser-used species, but if properly designed it would support the development of a sustainable forest management policy at the national level.

It is also suggested that the FPRDI marketing and promotion group assemble a Marketing of Lesser-Used Species Advisory Board. This advisory board, composed of managers of primary and value-added forest products companies, FPRDI market analysts, and representatives from DENR and FMB, would discuss issues that directly affect the supply and marketing of lesser-used species. In particular, it would provide a forum where value-added manufacturers could discuss their problems and concerns with primary processors and both types of industry managers could open a constructive dialogue with the government officials responsible for developing policies related to the forest products sector.

RESOURCE AVAILABILITY OF LESSER-USED SPECIES

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Introduction

The Philippines is a tropical country with an area of approximately 30 million hectares and a population of about 67 million. It has been endowed with forest resources of enormous beauty and diversity that have contributed to its buoyant economy. For several years, the wood-based industries employed tens of thousands of workers and have been an important source of foreign exchange. For instance, during the late 60's and early 70's the Philippines exported annually some 7 million cubic meters of logs valued at some US$ 200 million (Serna, 1991).

This forestry scenario, however, is short-lived since the destruction and deterioration of the natural forest, particularly the dipterocarp forest, has reached alarming proportions. The country has been rapidly losing its forest resources to agriculture and other land uses. As shown in the Philippine Forestry Statistics (1996), the forest cover has decreased to only 5.49 million hectares or 18.31% of the country's land area. Of this total, only 0.80 million hectares or roughly 2.67% comprise the remaining old-growth (virgin) forest, while 2.81 million hectares or 9.37 % are residual or second-growth forest (Table 2).

With the cessation of commercial logging activities in the virgin forest in January 1, 1992 as prescribed under DENR Administrative Order No.24, Series of 1991, the wood industry sector eventually returned to the residual forest for the next cycling cut. Understandably, the harvest in the secondary forest is much less than that of the virgin stands and therefore should be complemented with government and private tree plantations and steeply priced log imports.

An alternative means of sourcing domestic wood supply in natural and plantation forests which is recommended by the Philippine-German Forest Inventory Project (1988) is the fuller utilization of the so-called lesser-known or lesser-used species (LUS). The Forest Management Bureau (FMB) and the Philippine Wood Producers Association (PWPA) also recommended in 1993, among others, the revision of the annual allowable cut (AAC) formula to include the preponderance of "miscellaneous" or lesser known species (LKS) in logged-over forest that often reach their maturity at an early age, say 40 years, and not 60 years as prescribed in the formula (DAO No. 12, Series of 1992).

Forest Resources Situation

Land Classification/Land-Uses Status

Out of approximately 30 million hectares total land area of the Philippines, 15.88 million hectares or roughly 53% are, by law, considered forest lands, while the remaining 14.12 million hectares or 47% are alienable and disposable (A&D) lands (Table 1).

Table 1. Land Classification Status as of December 1996

	Total Area	
Land Classification	**Hectares (in million)**	**Percent (%)**
Forest lands	15.88	52.94
Classified Forests	15.00	50
Forest reserves	3.27	10.91
Timberland	10.02	33.40
National Parks, GRBS/WA	1.34	4.47
Military Reservation	0.13	0.43
Civil Reservation	0.16	0.53
Fishponds	0.03	0.26
Unclassified Forest	0.88	2.94
Alienable & Disposable Lands	14.12	47.06
Total	**30.00**	**100.00**

Moreover, as of December 1996, it is estimated that only 5.49 million hectares or 18.31% of the country's land area have natural forest cover, of which 0.80 million hectares or roughly 2.67% are old-growth dipterocarp forests (Table 2). The entire old-growth forests have been closed to logging activities since January 1 1992 (DAO No. 24, s. 1991), and placed under the National Integrated Protected Areas System (NIPAS).

Table 2. Land -Use Status as of December 1996

	Total Area	
Land Use/Forest Type	**Hectares (in million)**	**Percent (%)**
Forest	5.49	18.31
Dipterocarp	3.61	12.104
Old Growth	0.80	2.67
Residual	2.81	9.37
Pine	0.23	0.77
Submarginal	0.48	1.60
Mossy	1.05	3.50
Mangrove	0.12	0.40
Brushland	2.26	7.53
Other Land-Use	22.24	74.16
Total	**30.00**	**100.00**

Available Timber Resources

According to the predominant use of their timber, the tree species of the Philippines are commonly classified into five commercial groups: common hardwoods, construction and furniture woods, light hardwoods, softwoods and others.

Common hardwoods encompass mainly Dipterocarpaceae of the genera Shorea (almon, manggasinoro, mayapis, red lauan, bagtikan and tanguile) and nato (Sapotaceae).

Construction and furniture woods include tree species of a variety of botanical families, such as Dipterocarpaceae (apitong, guijo, manggachapui, narig, palosapis, yakal, guisok, etc.), Myrtaceae (makaasim, malaruhat or panglomboyen), Guttiferae (bitanghol), Fagaceae (ulayan), Anacardiaceae (amugis and pahutan0 and Ebenaceae (kamagong and bolong-eta).

Light hardwoods are made up of light-demanding species characterizing the early successional stage after logging operations. They grow fast and regenerate profusely. They are therefore silviculturally very attractive. With increased mechanization, these timbers are preferred since they are lighter are preferred since they are lighter, softer and easier to handle.

Examples are binuang (*Octomeles sumatrana*), loktob (*Duabanga moluccana*), anabiong (*Trema orientalis*) and gubas (*Endospermum peltatum*), including the introduced fast-growing plantation species.

Softwoods are essentially made up of high elevation species, such as Benguet pine (*Pinus kesiya*), almaciga (*Agathis philippinensis*), lokinai (*Dacrydium elatum*), igem (*Podocarpus imbricatus*) and malakauayan (*Podocarpus philippinensis*).

Others are those non-commercial species which could not be identified and hence lumped under the miscellaneous group. With the introduction of new uses for this group, however, there is always a continuing effort toward their utilization considering the shortage of wood raw materials nowadays.

Forest Inventory Results

The dipterocarp forests, which make up almost 12% of the total area covered by vegetation, are also the most important commercial forest type in the Philippines (Table 2). Of this forest type, 9.37% or 2.81 million hectares comprise the logged-over dipterocarp forest, where the LKS (light hardwoods and miscellaneous tree species) predominate in forest successional stages.

Table 3 shows the volume distribution of timber in residual forest by region, including the available LKS (FMB, 1996).

Table 3. Volume of timber, including LKS in residual dipterocarp forest.

Region	Area (has)	Volume 15 cm & up	Miscellaneous 15 cm & up
1	82,300	9,663,000	2,140,000
2	626,679	108,689,000	14,294,000
3	119,600	20,523,000	3,157,000
4	445,471	66,642,000	10,780,000
5	27,800	3,650,000	509,000
6	36,100	4,588,000	859,000
7	4,300	523,000	74,000
8	240,800	25,928,000	5,129,000
9	109,206	20,957,000	2,665,000
10	480,119	47,675,000	5,953,000
11	489,317	44,430,000	8,172,000
12	147,356	28,674,000	4,200,000
Total	**2,812,048**	**391,915,000**	**57,932,000**

Region 2, consisting of Cagayan, Isabela, Nueva Vizcaya and Quirino Provinces, is the most important region with about 22% (629,679 has) of the area still covered with residual dipterocarp forest. The region produces the highest volume of standing timber,including LUS (14.3 million cu.m.) . Large areas of residual forests are also found in Region 4 (445,471 has) particularly in Palawan; Region 11 (489,317 has) and Region 10 (480,119 has).

On the other hand, Regions 1,5,6 and 7 have the lowest forest cover percentage and available LUS volume in the country.

Forestry Researches' Results

The application of timber stand improvement (TSI) treatments through girdling, cutting and/or poisoning of undesirable trees found in designated treated plots, in four study areas across the country had accumulated a substantial quantity of wood raw materials or TSI removals comprising mainly of LKS.

The number of trees girdled or removed during TSI treatments in 13 to 22- year old residual dipterocarp stands averaged 310.2 trees per hectare, or equivalent to 68.5 dipterocarp and 241.7 miscellaneous species (Table 4). The corresponding gross basal area and volume of TSI removals were 8.22 sq. m. and 83.5 cu. m per hectare, respectively (Manila, 1989).

In a similar study by the FMB (1995), a second TSI treatments, i.e. after 10 years in the same study areas, accumulated additional timber volume of 36.4 cu. m. per hectare of miscellaneous tree species group. Unless these timber volumes are properly utilized, they will just left to rot in the forest.

	Dipterocarps			**Non-dipterocarps**			**All Species**		
TSI Sites	Tree No.	B.A. (sq.m.)	Vol. (cu.m.)	Tree No.	B.A. (sq. m.)	Vol. (cu. m.)	Tree No.	B.A. (sq m.)	Vol. (cu. m.)
Taggat	162	4.31	39.7	58	2.60	27.7	220	6.91	67.4
Acoje	25	2.60	50.0	192	2.62	27.2	217	5.22	77.4
Sudecor	54	0.26	2.2	292	10.36	88.0	346	10.62	90.2
GPTDC	33	0.22	1.4	425	9.90	97.9	458	10.12	99.3
Mean	68.5	1.25	23.3	241.7	6.37	60.2	310.2	8.22	83.5

Conclusion/Recommendation

There are still available and accessible residual forest areas throughout the country with substantial standing volume of LUS. The next logical step is to find new uses for this group of tree species. The marketing of these species must be studied including strategic and sound policies that would ensure that more LUS can penetrate the once exclusive territories of the common hardwoods, as well as the construction and furniture woods.

There is no existing government regulation that allows utilization of TSI removals or LUS for large-scale timber operations, except in selected community-based related activities. Moreover, only a very few timber companies are now allowed to operate in residual forest areas after complying with a litany of environment-related prerequisites.

In summary, a sustainable and large supply of LUS would further require the following: a) strong political will or commitment at the highest level for manpower and logistic support, 2) strong institutional linkages and support from other sectors of forestry, such as the NGO's, LGU's and other concerned agencies.

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DENR POLICIES AND PROGRAMS ON LESSER-USED SPECIES (LUS) UTILIZATION

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The Utilization of Lesser-Used Species

When the country's forest resources were seemingly inexhaustible, forest products extraction and utilization were concentrated on the premium and the dipterocarp species as not all tree species were considered commercially useful. Many were relatively unknown and used to a much lesser extent than tree species traditionally harnessed for trade. Now that the resources are about to be depleted, there is conscious effort to expand the forest resource base.

In the light of fast diminishing resources, unutilized or lesser known species must be harnessed for economic use. Their properties, including those of the commercial species in the second-growth forest, are presently being studied. Products processed out of lesser used species are now also being developed.

The Department of Environment and Natural Resources (DENR) supports the optimum utilization of all the resources within a given forestland area, i.e. from extraction to processing of logs into finished products. The use of the lesser-used species (LUS) as substitute to commercial wood is seen as a way to optimize forest resources utilization. This also broadens the resource-base of the forest products industries and consequently reduce the pressure on the overexploited commercial species. Although DENR has no clear-cut policy on US, it encourages the use of LUS.

This paper discusses some programs and policies of the DENR, in general, that deals with the utilization of the LUS.

Present Programs/Policies

The Philippine Constitution

The country's policies regarding the use and disposition of natural resources set forth in the Constitution. Among the relevant provisions of the Constitution are:

"The State shall protect the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature." (Article II, Section 16);

"The goals of the national economy are the common equitable distribution of opportunities, income and wealth; a sustained increase in the goods and services produced by the nation for the benefit of the people; and expanding productivity as the key to raising the equality of life for all, especially the underprivileged."

"The Congress may by law, allow small-scale utilization of natural resources by Filipino citizens..."

These constitutional provisions justify government efforts to correct environmental imbalance and restore degraded ecosystems. In the same manner, it provides that the State may undertake on its own, the development and utilization of natural resources, or enter into co-production, joint venture, or production sharing agreements with qualified persons and entrepreneurs.

Executive Order (EO) No. 192 of 187

By virtue of the EO 192 of 1987, the resources (DENR) was organized as the primary government agency responsible for the sustainable development of the country's natural resources. The operation of the forestry sector is guided by the following policy thrusts of the Department:

a) sustainable development of our forest resources
b) optimal utilization of forest lands
c) social equity and efficiency of forest resource use; and
d) effective forest management.

Supportive of these policies and cognizant of the importance of wood in the national economy, the government has adopted the following strategies:

a) promote the development and utilization of lesser-used species as well as minor forest products as supplemental raw material source for the existing wood and other forest-based industries;
b) determine optimal distribution and location of processing plants relative to raw materials source, transportation network and market outlet; and
c) undertake upgrading of timber extraction equipment considering new mix of available materials as well as improve efficiency and product quality condition.

PD 705 (Revised Forestry Code)

Presidential Decree No. 705, as amended, embodies the regulations on the management, administration, regulation, utilization, protection, and development of forest resources in the country. The Code contains the following related policies:

* Multiple use of forest lands oriented to the development and progress requirements of the country, advancement of science and technology, and public welfare.

* Rationalization of wood processing industry to optimize utilization.

Selective Logging System Implementation (SLSI)

The Selective Logging System is the official silvicultural system adopted for the Philippine dipterocarp forests which although originally intended for the old growth forests, is now being applied to the operable residual forests. Selective logging is defined as the systematic removal of mature, over-mature and defective trees in such a manner as to leave uninjured and adequate number and volume of healthy residual trees of the commercial species and other trees necessary to assure a future crop of timber and forest cover for the protection and conservation of soil and water. An adequate stand is composed of uninjured young trees left as a result of exercising care by using suitable techniques and equipment. The system is composed of three principal phases: a) Tree Marking which involves marking of residual trees to be left in the areas for future crops; b) Residual Inventory to appraise the number and condition of the remaining stock; and c) Timber Stand Improvement which is a form of silvicultural treatment applied during the early growing stages of the stand 5-10 years after logging.

Among the applicable administrative issuances related to the implementation of SLS are:

1. *DENR Administrative Order No. 74 and 78, Series of 1987*-prohibited the cutting of Almaciga trees and the cutting/gathering of narra and other premium species respectively. The purpose of the policy is to prevent the extinction of the said species. This issuance has in effect decreased the number of species which may be extracted during logging operations.

2. *DENR Administrative Order No. 24, Series of 1991*- institutionalized the shift in the operable areas for logging from the old growth (virgin) forests to the second growth (residual) forests. However, there are areas within the second growth (residual) forests where logging is also not permitted: i.e., those with slopes of 50% and greater, areas above 1000 m elevation, within 20-m of either side of a stream bank, wilderness areas, proclaimed watershed reservation, and other areas proclaimed for ecological protection.

3. *DENR Memorandum Order no. 8 of 1991*- provided the guidelines for the implementation of the shift in logging from the old growth to the second growth forest. The guidelines provided for, among others, the delimitation of non-production and production forests in all forest concession areas and the

stratification of the operable second growth forests into the management blocks depending upon the years elapsed after logging (YEAL).

4. *DENR Memorandum Circular No. 9 of August 1992* - required all forest concession holders to submit a Medium Term (10-year) Forest Management Plan as basis for the preparation and submission of their Integrated Annual Operations Plan. Both plans are subject to government approval - without which no logging operation could legally be allowed.

5. *DENR Administrative Order No. 28 of May 1993* - provides the rules and guidelines for the conduct of Residual Forest Inventory to provide data for the modification of the Annual Allowable Cut formula and determine the penalties and fines to be imposed.

6. *DENR Memorandum Circular No. 4, Series of 1996* - imposes compliance of the following requirements before IAOP can be given due course: a) complete aerial photo-coverage of the area under license; b) submission of the required Medium Term Forest Management Plan or Comprehensive Management and Development Plan; c) timber inventory of at least 20% intensity covering the area to be logged; d) satisfactory completion of the reforestation and TSI obligations for the licensee for the preceding years; and e) issuance by DENR of Environmental Compliance Certificate (ECC) based on a duly filed checklist Environmental Impact Assessment (EIA).

Philippine Strategy for Sustainable Development (PSSD)

Consistent with the provision of the Constitution, and as initial step in operationalizing sustainable development, the government as early as 1989, formulated the Philippine Strategy for Sustainable Development (PSSD) to promote economic growth through adequate protection of the country's biological resources and its diversity, vital ecosystem functions and the overall environmental quality.

The PSSD is consistent with the sectoral plans and priority actions in the Medium Term Development Plan. On timber resources, these are:

a) Adoption of proper pricing and natural resource accounting for all forest products and commodities;
b) Encouragement of the use of forest tree species to lessen the demand for traditional commercial ones;
c) Establishment of the community-based forest management and production system and ensuring the participation of indigenous peoples, women and other key actors in the maintenance and development of forest resources.

Master Plan for Forestry Development (MPFD)

To carry out the principles embodied in the PSSD, the DENR prepared the Mater plan for Forest Development with the view of satisfying the needs of the people for wood and other forest products by placing all the country's production forest under sustainable management.

The Philippines' 25-year Master Plan for Forestry Development provides that all of the forest resources will be under efficient and equitable management, conservation and utilization satisfying in appropriate ways and on a sustainable basis needs of the people for forest-based commodities and services. Among the programs addressed by the MPFD is the forest management and products development. The plan also provides programs for lesser-used species.

Community-Based Forest Management Program (CBFMP)

Executive Order No 263 of July, 1995 adopted the CBFMP as the national strategy to ensure the sustainable development of the country's forest resources. It operationalizes pertinent provisions of the Master Plan for Forestry Development and in sync with the government's Social Reform Agenda component of supporting people empowerment as embodied in the Medium Term Philippine Development Plan. It effectively strengthens implementation of people-oriented programs by mandating the active participation of other national government agencies, local government units, and indigenous peoples, among others.

Under the strategy, participating communities are granted access to the forestland resources under long term tenurial agreements, provided they employ environment-friendly, ecologically-sustainable and labor intensive harvesting methods.

Based on DAO No. 96-31 re: IRR for E.O. 263, the implementation of this program is through efficient and sustained management of forest lands that can result from responsible resource utilization by organized and empowered local communities. This program applies to all areas classified as forestlands including allowable zones within protected areas. It integrates and unifies all people-oriented forestry programs including the Integrated Social Forestry Program (ISFP), Upland Development Project (UDP), Forest Land Management Program (FLMP), Community Forestry Program (CFP), Low income Upland Communities Project (LIUCP), Regional Resources Management Project (RRMP), Integrated Rainforest Management Project (IRMP), Forestry Sector Project (FSP), and recognition of Ancestral Domains/Claims.

Integrated Social Forestry Program (ISFP) - was launched in 1982 through Letter of Instruction No. 1260. It consolidated all previous people-oriented programs and its main objective is to promote the economic and social development by democratizing the

use of public forest lands and making equitable the distribution of benefits derived from the forests, at the same time promoting upland environmental stability and resource conservation. It provides security of tenure to participants through the granting of 25-year stewardship contracts (renewable for another 25 years) on economic size holdings. The program's implementation is now the responsibility of Local Government Units (LGU's) although policy formulation was retained by the DENR.

Community Forestry Program (CFP) - Under the Administrative Order No. 22 of April 27, 1993 re: Revised Guidelines for Community Forestry Program, CFP shall be implemented in three phases: pre-implementation that include information dissemination, site selection, census of forest occupants, selection of assisting organizations and orientation training; preparatory phase that includes community organizing, CFMA issuance, on-the-job training in forest management planning and conservation, developing alternative livelihood opportunities, preparation of Community Resources Mangement Plan, and organizational development; and community management phase that includes actual community management of the natural resources and other livelihood projects. The CFMA provides the necessary long term security for utilization of natural resources to motivate participating communities to develop and manage the resources.

Forest Land Management Program (FLMP) - The DENR Administrative Order No. 23 0f 1993 established and promulgated the guidelines for the implementation of the FLMP, and for the issuance of long-term Forest Land Management Agreement (FLMA) with a duration of 25 years and renewable for another 25 years, henceforth replace the former short-term contract reforestation objectives. The program provides financial and tenurial incentives for forest occupants and communities to develop, protect and manage forest resources.

Low Income Upland Communities Project (LIUCP) - A project undertaken by DENR to restore and sustainably manage the country's upland/forest resources, alleviate poverty in the rural areas. This is principally governed by DAO 35, S1992.

Integrated Rainforest Management Project (IRMP) - A community-based forestry project supported by the government of Germany.

Regional Resource Management Project (RRMP) - A community-based rural development project geared towards the protection, development and management of the watershed and upland resources.

Complementary Laws

Republic Act 7161 (Increasing the Forest Charges on Timber and Other Forest Products) - This was enacted by Congress in 1993 which provides, among others, for the increase in forest charges. From the low rate of US$ 1.00/cu.m., the government will now

be able to capture an acceptable economic rent of the forest resource with forest charges now levied at 25% of actual FOB market price for timber.

A feature of the Act is its exemption of plantation timber and other planted forest products from the payment of forest charges. This is an incentive for the private sector to engage in plantation development.

Among the strategic actions implemented by the DENR is the periodic issuance of Administrative Order to address the increase in the rates of forest charges allowed in the premium including the lesser used species and other forest products. The collection of the regular forest charges due on the wood materials scaled and assesses shall be in accordance with the latest issuance, the DAO No. 95-19.

Republic Act 7586 (National Integrated Protected Areas System) - this Act aims to establish a NIPAS which shall encompass remarkable areas and biologically important public lands that are habitats of rare and endangered species of plants and animals, biogeographic zones and related ecosystems. Based of DAO No. 92-25, the effective administration of the NIPAS requires a partnership between the government and other interested parties including the indigenous cultural communities.

Republic Act 7160 (Local Government Code of 1991) - This legislation devolved to the Local Government Units (province, municipality and city) some functions previously exercised by the DENR, most specifically the implementation of the Integrated Social Forestry Program, management and control over communal forests with an area not exceeding 50 square kilometers, establishment of tree parks and greenbelts. It requires the conduct of consultation with the concerned LGU, NGO's and other concerned sectors to explain the goals and objectives of all development projects or programs, its impact on the environment and the measures that will be undertaken to prevent or minimize the adverse effects thereof. Having a stake on the resources, they would begin to value them and take measures to protect them.

The Act also defines the shares of the Local Government Units in the proceeds from the development and utilization of the national wealth where they are located including forest resources. Sixty per cent of the forest charges collected shall accrue to the LGU's to be divided, as follows: for the province - 20% for the municipality - 40%; and for the barangay (village) - 40%. Proceeds from the share of LGU's are used to finance local development and livelihood projects.

Republic Act No. 8371 or Indigenous Peoples Rights Act (IPRA) signed on October 29, 1997 recognizes and promotes all rights of indigenous cultural communities/ indigenous people (ICCs/IPs) through the establishment of mechanisms to enforce and guarantee the realization of these rights, taking into consideration their customs, traditions, values and beliefs. Among these rights provided in the Act are: rights to

ancestral domains which include right to claim ownership of land, right to develop lands and natural resources, right to stay in the territories and right to self-governance and empowerment. The Act created the National Commission on Indigenous People (NCIP) responsible for the formulation and implementation of policies, plans and programs to protect the rights of IPs/ICCs and the recognition of their ancestral domains.

Prior to the IPRA Law, the innovative approach by the DENR helped through the following issuances:

DENR Administrative Order No. 93-02 re: Rules and Regulations for the Identification, Delineation and Recognition of Ancestral Land and Domain Claims. DAO No. 93-02 called for the issuance of the Certificates of Ancestral Land Claims/Certificates of Ancestral Domain Claims (CALCs/CADCs) to protect the tenure of indigenous cultural communities and promote the indigenous ways for the sustainable management of natural resources such as ecologically sound traditional practices. The DENR was able to issue CADCs over more than 1.7 million hectares and was able to create an institutionalization effect.

Department Memorandum Circular No. 02 of February 9, 1996 promulgated the interim guidelines governing the issuance of "Muyong Resources Permit". This is a form of recognition of the significant role of the ICCs of the Cordillera are playing in preserving their "small landholdings" for livelihood, biodiversity conservation and as buffer ones against destructive human intrusions in the uplands.

In the furtherance of the intents and purposes of MC No. 96-01, DENR Memorandum Circular No. 96-10 re: Supplementary Guidelines on the Disposition of Wood Products Derived From Timber Cut from Muyong Areas in the Province of Ifugao was issued.

Proposed Policy Proposal

The proposed code stresses that sustainable development of the multiple uses of forest lands shall be the guiding principles in the management, conservation and development of the forest resources. It adopts the PSSD and the MPFD as the long-term guide in the management, development, protection and use of forest resources. Some of the salient features of the code include the establishment of a permanent forest estate and delineation on the ground of the final limits of the forest land in the country. It emphasizes the institutionalization of the ban in the virgin forest and in areas of the second growth which are more than 50% in slope or higher that 1,000 meters in elevation. It accords highest priority to protecting the existing natural forests while at the same time priority to protecting the existing natural forests while at the same time giving similar attention to the reforestation of degraded forest lands. It also provides that equitable sharing of the

benefits derived from the forest resources shall be promoted by empowering communities to develop and manage forest resources and shall provide sufficient incentives to forest based industries to encourage them to be efficient, competitive and profitable.

Processes that reduce waste or make use of wastes as substitute, if not the principal raw material, should be developed. New products must be developed to take the place of materials with restricted supply, also new designs that require less amount of raw materials or less discrimination in the choice of raw materials.

OPEN FORUM

OPEN FORUM

Q. Leonardo Angeles, Philippine Wood Producers Association (PWPA):

The Problems that industry has in mind regarding Lesser-Used Species (LUS) are the following:

- Where are the LUS?
- How much volume is available? Are we assured of sustained supply?
- How can we harvest them? Won't we be bothered by environmental groups?
- How can we process, manufacture LUS Products?
- How can we market LUS?
- How can we categorize them based on abundance and reproducibility?
- How can we combine/optimize usage of LUS?
  (e.g.- one species for plywood core, another for plywood back)

A. Engr. Arnaldo Mosteiro, Forest Products Research & Development Institute (FPRDI):

A survey done by the RP-German Project during the 1980's generated data on the supply and location of LUS in the country.

Dr. Antonio Manila of DENR whose paper is on resources availability of LUS will share with us his data this afternoon particularly on the volume of LUS available and where they are located. Although I have some transparencies on the volume and location of LUS in the Philippines, I will give Dr. Manila the chance to present his paper first.

It is important that LUS plantations be established to ensure a sustainable supply. Actually this project had an accompanying project proposal on plantation establishment when it was submitted to ITTO for evaluation in 1988. But due to inadequate time, the component was left out. At the November 1997 Session of ITTC, this project component was revived by the College of Forestry of UPLB and approved by the Council. We hope that this will be funded during the ITTC Session in Gabon this May 1998.

We can harvest LUS as long as they are inside an area covered by a Timber License Agreement. As long as harvesting is on a sustained yield basis, there will be no detrimental effect on the environment.

The process of manufacturing various wood products from LUS does not vary much from the processing of traditional species. The main difference is in the size of machines needed. Since LUS are smaller in diameter it is appropriate to use a smaller bandsaw to convert it into lumber and also a smaller lathe machine to convert it into veneer.

Subsequently, if we would like to process LUS lumber to downstream products, the equipment used in processing commercial species can also be used in processing LUS.

Yes we can categorize LUS based on their abundance. The RP-German Resource Inventory Report in 1980 presents the volume of important LUS in the old growth and second growth forest of the Philippines. It is also presented in the report of Ten Percent Timber Inventory conducted by FMB, DENR in 40 TLA's in 1992.

Yes we can combine or optimize the use of LUS, for example for plywood. We have already determined LUS properties so that species with lower density, strength and poor veneering and sanding quality may be used for core veneer.

Dr. Emmanuel Bello (FPRDI):

A pre-project study conducted by the UP College of Forestry identified 25 LUS with potential commercial value. We picked up from this study.

In Ghana they are promoting the use of 5 LUS with potential commercial value.

We need to prioritize the most appropriate species, identify which of these can be propagated so that we can establish tree plantations. We'll talk with ERDB about this.

Q. For. Bernardo Sinues, Surigao Development Corporation (SUDECOR):

- Why was the project limited to 25 species only?
- What were your considerations for including a certain species in the study?
- Did you study the use of small LUS for blockboard manufacture? At SUDECOR, we study the use of these for lumber core manufacture.
- Have you listed LUS which you recommend for particular uses?
- Do you have recommendations for administrative policy reform?

A. Engr. Arnaldo Mosteiro (FPRDI):

The selection of some 24 to 25 species included in the project were based on these considerations:

1. Sufficient supply based on the Pre-Project entitled "Appropriate Supply of Wood Raw Materials in Producing Countries with Dwindling Forest Resources: The Case of Philippines" financed by the ITTO, and implemented by the Forest Development Center of the UPLB College of Forestry.

2. Fast-growing, bigger diameter, other silvicultural aspect.

We are working towards identifying particular end-uses for LUS and we will be publishing our findings soon.

Dr. Justo Rojo (FPRDI):

LUS are site specific. What is available at Nasipit is not necessarily available at SUDECOR. So we need to collaborate. If you have particular species in mind and it is not among the 25, you can tell us so we can study its properties.

Engr. Arnaldo Mosteiro (FPRDI):

The study of LUS for blockboard manufacture is not included in our project proposal. We have not made policy recommendations yet.

Dr. Emmanuel Bello (FPRDI):

We have done gluing studies on LUS. Since gluing is the basic operation for blockboard production, we can use results of our study in assessing LUS for blockboard processing.

DENR representatives can help us draft recommendations. As a group we can have a bigger voice than if only FPRDI makes recommendations.

For. Leonardo Angeles (PWPA):

We need to group species based on their abundance and presence in the second growth forests. Let us check which LUS belong to these 2 groups and concentrate on them.

Also we need to specify which LUS can substitute for our traditional commercial species.

Dr. Emmanuel Bello (FPRDI):

In Ghana, the use of the terms "substitute" or "alternative" is discouraged, as these terms connote inferiority. Perhaps we can use the term "equivalent."

Let us not promote LUS individually, but groups, according to their end-uses.

Let us use catchy names for them to get the interest of buyers.

We are preparing fact sheets highlighting the technological properties of various species. We will give you copies as soon as these are available.

Q. **For. Leonardo Angeles (PWPA):**

The methodology for the marketing survey is impressive, but I am unhappy that 527 companies, only close to 5% responded.

Also respondents are not categorized into industries.

If funds are still available, can we repeat this study to get bigger sample?

The trend now in the US and Europe is DIY or do-it-yourself furniture. Which LUS have potentials for DIY furniture?

A. **Dr. Emmanuel Bello (FPRDI):**

I was in the US in 1995 and we visited big department stores. A lot of the rubberwood furniture that were on display were knocked-down and unfinished.

FPRDI has published the Trade Bulletin Series - we have a publication on Philippine woods for parquet, musical instruments. We're coming out with Philippine Wood for pulp and paper, veneer and plywood. These are all intended for the wood-based industry.

For. Felix Tamolang (FPRDI):

The local furniture industry is exporting in the DIY market in Europe. FPRDI is rendering technical assistance to the furniture industry sector to improve their product quality. The industry takes care of the designs as these are based on design requirements abroad.

Dr. Emmanuel Bello (FPRDI):

It was not possible to stratify respondents of the marketing survey.

We will simplify our questionnaire next time. We used a very thick questionnaire which may have intimidated the respondents.

For. Felix Tamolang (FPRDI):

Perhaps we can request the help of PWPA in following - up the questionnaires.

Q. **For. Bernardo Sinues (SUDECOR):**

- What are the species that are in demand?
- What are the top 10 LUS? What is their available volume in the forest?
- In case DENR increases the forest charges on LUS and bans the cutting of trees below 60 cm dbh, this will be a disincentive for us. We'd rather use the Philippine lauan species. Is there anything available for us to cut?

A. **Dr. Antonio Manila Department of Environment & Natural Resources (DENR):**

(Shows table of most common LUS, enumerates them, then comments. These data are available from the Philippine Forestry Statistics).

Forest charges for LUS would depend on their supply and demand.

For. Nelson Gorospe (DENR):

Forest charges depend on the market.

Only a few LUS reach 60 cm dbh. DENR should review its policies on diameter limits.

Dr. Antonio Manila (DENR):

LUS generally cannot reach the 60 cm diameter limit. We once submitted a policy on the utilization of LUS for approval by the DENR Secretary but unfortunately, environmental groups with the help of Senator Orlando Mercado blocked the approval. Hence, the proposed policy was left in the DENR cabinets. It will now be appropriate to revive the approval of the LUS policy by incorporating whatever recommendations we have made in this seminar.

For. Bernardo Sinues (SUDECOR):

Can we hear recommendations from the study group?

Dr. Emmanuel Bello (FPRDI):

Let's list down our recommendations and we'll make representation with DENR. I agree that there should be a separate policy for LUS on minimum diameter limits.

For. Leonardo Angeles (PWPA):

Here are some of my recommendations:

1. Set diameter limits for common LUS.
2. Allow LUS for use through a guideline: which species can be used, what are the diameter limits?
3. Set a minimal forest charge.
4. Work out with DENR & BOI an incentive program for equipment acquisition and retooling. Give tax rebates for R & D that private sector conducts with FPRDI.
5. Have positive fiscal intervention for small IFMA holders and indigenous people so that they are encouraged to plant LUS. (Government must subsidize plantation establishment).
6. Make sure that government is active in CITIES. Ask that some species be excluded from the list of endangered species.

For. Nelson Gorospe (DENR):

Concerning retooling, BOI is in the best position to answer your question.

We should make a strong representation with the BIR if we want to ask for tax rebates.

For. Robert Natividad (FPRDI):

There are more LUS available in second growth forests because they grow better n disturbed areas. DENR should set limits at 30 cm as trees this size can already be used for electric poles.

Engr. Wivinio Tordilla (FPRDI):

I observed that many LUS have local names that make it difficult for our researchers at FPRDI to identify them.

Q. For. Lucio Quimbo, Jr. (BFI):

Can we encourage R & D on genetically developed LUS? This is crucial for plantation establishment.

A. **For. Dominador Alonzo (FPRDI):**

Ideally, packaging a technology should involve production and utilization. We already have utilization technologies. Perhaps in the next ITTO session, funding would be provided for a project on genetically developed LUS.

Dr. Emmanuel Bello (FPRDI):

Someone from the Philippines (perhaps from the DENR?) must go to Gabon to lobby for funding of the UPLB-CF research proposal on LUS plantation establishment. Maybe PWPA can help finance the trip?

For. Leonardo Angeles (PWPA):

Let's check which regions have available LUS and get samples from there.

Let's package a technology so that upland people can help in plantation development.

The RP-German Model in Leyte grouped species in old and second growth forests by family. This an ideal procedure for resource mapping.

Dr. Emmanuel Bello (FPRDI):

We got our samples from Regions II & IV as it is expensive to get from Mindanao. We have to buy the logs in Mindanao and some got stolen in the pier. We obtain samples from Regions II & IV for free.

For. Bernardo Sinues (SUDECOR):

Can we provide DENR with our seminar proceedings?

For. Leonardo Angeles (PWPA):

How much LUS can we remove without damaging the ecological balance between dipterocarp and non-dipterocarp species?

Dr. Antonio Manila (DENR):

We need to revise BFD Circular No. 32, Series 0f 1981 to suit our needs in the forestry sector.

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