FPRDI

ITTO

# MANUAL ON THE PROPERTIES AND USES OF LESSER-USED SPECIES OF PHILIPPINE TIMBERS

## FPRDI-ITTO Project PD 47/88 Rev. 3(I) Utilization of Lesser-Used Species as Alternative Raw Materials for Forest-Based Industries


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College, Los Baños, Laguna
Philippines
1997

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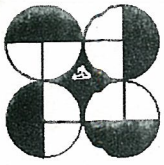

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Utilization of Lesser-Used Species as Alternative Raw Materials for Forest-Based Industries


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# FOREWORD

One of the greatest challenges we are facing today is ascertaining which tropical timber species should be promoted in ways which allow the forestry sectors of developing economies to become more sustainable. Those who make policy for forest products companies, timber investment organizations, environmental non-governmental organizations or governments face a daunting array of uncertainties when it comes to consideration of new species. The interaction between ecologic and economic systems, each of which by itself merits careful attention, define both a complex investment environment and a complex policy setting.

At a time when more and more people are realizing the crucial importance of sustainability, ITTO continues to support the increased use of lesser-used species (LUS) as a means to increase the value of the forest. To accomplish this, we need reliable information, as well as viable alternatives to current patterns of deforestation. The future of the tropical forests and their people depend on the skillful advocacy of these alternatives. This *Manual on the Properties and Uses of Lesser-Used Species in the Philippines* has an important part to play in the process because all of these efforts must start from the same sound basis: up-to-date knowledge of tree characteristics and their technological properties. This manual presents the distribution of the species, the tree characteristics and wood descriptions, the physical and mechanical properties, strength group, the working properties and uses of some LUS species. This information is particularly important to both processors and users of tropical timber in order to widen their raw material base.

In a world of dynamic timber markets, predicting and marketing a successful LUS is difficult at best. This publication was prepared to serve as a reference in promoting the wider use of these Philippine species and serve as an aid on the current knowledge of species that can possibly play an important commercial role in sustainable forest management. Against this background, the publication of this new manual by the Forest Products Research and Development Institute (FPRDI) is of utmost importance. We sincerely hope that this manual will provide a useful tool for education, research, extension and industry, and also for policy-makers committed to the sustainable use of timbers and forest in the Philippines. This publication provides a comprehensive manual on the diversity and utility of LUS species in the Philippines and will be a valuable reference material for future work in the sector. I sincerely hope that this manual triggers your interest in learning more about these Philippine tree species and leads to a renewed commitment in favour of tropical forests and thereby contribute to local communities who depend on these forests for their livelihood.

Finally, I wish to express my appreciation of the efforts of all the authors, editors and FPRDI personnel for making this important publication a reality.

**B. C. Y. Freezailah**
Executive Director

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# INTRODUCTION

One of the primary challenges we are facing today is identifying and ascertaining which tropical timber species should be promoted to allow the forestry sectors of developing economies be more sustainable. Policy makers of forest products industries both in government and non-governmental organizations are faced with some uncertainties with regard to consideration of new timber species. The ecologic and economic influences in this aspect merit careful attention and consideration.

At the present scenario, when majority of world population are openly aware of the crucial importance of sustainability, the International Troipical Timber Organization (ITTO) continuously support the increased use of Lesser-Used Species (LUS) as a means to increase the value of the forest. In 1990, the Philippines has an estimated total volume of 0.413 million cubic meters of LUS with 70 cm and up diameter at breast height (dbh), 0.771 million cubic meters, for 60 cm and up dbh, and 1.183 million cubic meters for 50 cm and up dbh. It is apparent that the rational utilization of LUS will substantially increase the round wood supply in the country.

Subsequently, during the Eleventh Session of the International Tropical Timber Council in 1991, the ITTO approved and funded a project proposal of the Forest Products Research and Development Institute of the Philippines (FPRDI) on the "Utilization of Lesser-Used Species as Alternative Raw Materials for Forest-Based Industries." The specific objectives of the project are: (1) to collect, identify and authenticate LUS that are promising from the point of view of their occurence, silvicultural features and technical properties; (2) to test and evaluate their basic and working properties; and (3) identify LUS or group of LUS for specific end-uses and to prepare a manual on the properties and uses of LUS in the Philippines.

The manual as prepared presents the distribution of the species, the tree characteristics and wood descriptions, the physical and mechanical properties, strength group and the working properties and uses of important LUS. The information generated is particularly important to both processors and users of tropical timber to widen their raw material base. It will also provide a useful tool for education, research, extension and industry, and also for policy makers committed to sustainable use of timbers and forest in the Philippines.

This publication will also serve as a reference in promoting the wider use of Philippine LUS and as an aid on the current knowledge of species that can play an important commercial role in sustainable forest management. It will likewise serve as a valuable reference material for future work in the forestry sector.

# CHARACTERISTICS/PROPERTIES, CLASSIFICATION AND DESCRIPTION OF LESSER-USED SPECIES

## EXPLANATORY NOTES

### 1. NAMES AND FAMILY

Official Common Name : Refers to the accepted official or standard name of a species adopted by the Department of Environment and Natural Resources (DENR) and the Forest Products Research and Development Institute (FPRDI)

Scientific Name : Refers to the universally accepted botanical name of species presented binomially. It consists of a generic name (genus) and specific name (epithet) followed by the abbreviated name of the person who first applied the specific name.

Local Names : Refers to the different names used for a species in various localities in the Philippines. They have been derived from various local dialects and languages. Local names cannot be depended upon in distinguishing one species from another throughout the country considering that the name applies to one species in one locality is often used for different species in other localities.

Family Name : Refers to the botanical family which one or several species belong.

### 2. DISTRIBUTION

Refers to the dispersion of a species in various island provinces of the Philippine archipelago.

### 3. TREE CHARACTERISTICS

Refers to the physical description of a tree species in terms of diameter, height, and bole form. As a practical rule, trees are classified into 3 groups as to their diameter and height at maturity, namely: (1) small tree (st)-diameter 3 to 30 cm., height 2 to 5 m.; (2) medium-sized tree (mt)-diameter 30 to 40 cm., height 5 to 15 m.; and (3) large tree (lt)-diameter over 40 cm., height over 15 m. this grouping was formulated based on the actual field observation of the tree species by FPRDI botanists and from original published descriptions.

## 4. WOOD DESCRIPTION

Color : Refers to the natural color of the wood which serves as basis in the selection of a species for a particular purpose. Color is developed in the heartwood due to the accumulation of extractives during heartwood formation. It is one of the properties that make it superior to other construction materials and maybe used to indicate chemical comsumption in pulping and bleaching in the paper industry and to certain extent the durability of construction lumber. Light colored woods are usually more perishable than dark colored ones.

Grain : Refers to the arrangement and direction of alignment of wood when considered en masse. Straight grained woods find their uses for furniture and cabinets, chopsticks, popsicle sticks, toothpicks, pencil slats, tool handles, toys, flooring and sporting goods, while interlocked grained woods are suitable for decoration purposes due to figure produced.

Texture : Refers to the size and proportional amount of woody elements. Texture can be described in relation to pore sizes as: very fine, when pores are visible only with hand lens; fine: pores are barely visible to the naked eye; moderate coarse: pores readily visible to the naked eye; and coarse texture: very distinct to the naked eye.
Fine texture species are preferred for wood carvings, novelty items, toys, panels, flooring, and other installation.

Figure : Refers to the general pattern or design produced in a smooth longitudinal surface of the wood as a result of arrangement of the structural features like rays, growth rings, knots, nature of grains, changes in texture and variations in color.

## 5. TECHNOLOGICAL PROPERTIES

Relative Density : Refers to the oven-dry mass weight of wood to the mass weight of an equal volume of water measured at a certain temperature. It is an important parameter in determining a good approximation of the latent strength of a particular species in the absence of actual strength test results. It is also useful in estimating charcoal and pulp yields, gluing, nail holding and shrinkage characteristics of a given wood species. For practical purposes, tree species are classified into 5 relative density classess namely: Class I - High RD (0.701 and above), Class II - Moderately high RD (0.601-0.700), Class III - Medium RD (0.501-0.600), Class IV - Moderately low RD (0.401-0.500), and Class V - Low RD (0.400 and below)

Volumetric shrinkage : Refers to the reduction in total dimension of wood after removal of bound water below fiber saturation point. In the longitudinal direction, i.e. along the grain, shrinkage is usually insignificant. Shrinkage on the tangential direction (parellel to growth rings) for most species is about twice as great as in the radial directions (right angles to growth rings). Grouping to shrinkage values aids the user proper use and avoidance of defects. Tree species are classified into 5 volumetric shrinkage (VS) values: Class I - Low VS (7.8% and below); Class II - Moderately low VS (7.9% to 10.5%); Class III - Medium VS (10.6% to 13.2%); Class IV - Moderately high VS (13.3% to 16%); and Class V (16.1% and above)

Strength Properties : Refers to the qualities of wood that indicate its ability to resist applied external forces. They are important criteria in determining the relative suitabilities of different wood species for various uses. They provide the best index for its use for structural purposes.

LUS are classified into five (5) strength groups or classes set forth by Forest Products Research and Development Institute (FPRDI) System of Strength Grouping Philippine Timber Species. These are: High strength (Class I), moderately-high strength (Class II), medium strength (Class III), moderately low strength (Class IV), and low strength (Class V). Strict adherence to the strength class limits is maintained in assigning species to a certain class. The minimum strength class limits in the green condition is presented in the following Table:

Table 1. Minimum Strength Limits for the Five Strength Groups/Classes of Philippine Woods

| Property | Unit | Class I | Class II | Class III | Class IV | Class V |
|---|---|---|---|---|---|---|
| Static bending | | | | | | |
| Modulus of rupture | MPa | 78.43 | 61.76 | 49.02 | 39.22 | 30.88 |
| Modulus of elasticity | GPa | 12.74 | 9.80 | 7.55 | 5.88 | 4.51 |
| Compression parallel to grain | MPa | 39.22 | 29.90 | 23.03 | 18.14 | 13.72 |
| Maximum crushing strength | | | | | | |
| Compression perpendicular to grain | MPa | 8.82 | 5.49 | 3.48 | 2.21 | 1.37 |
| Stress at proportional limit | MPa | 9.80 | 7.84 | 6.18 | 4.90 | 3.92 |
| Shear parallel to grain | Joule | 49.02 | 39.21 | 29.41 | 19.61 | 9.80 |
| Toughness | | | | | | |

| | | |
|---|---|---|
| Sawmilling | : | Refers to the ease of sawing or operation of sawmill equipment and scheduling of materials to produce optimum quantity and quality of sawn timber. Incidence of sawmilling defects reduces the quantity and impairs the quality of sawn timber product. LUS are grouped into 3 sawing classification namely: 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 sawn); Class II - Moderate to saw (average feed rate of 14 square meter per minute with saw blade performance of 70 to 100 square meters surface area sawn); Class III - Hard to saw (feed rate is less than 14 meters per minute with saw blade performance of not more than 70 meters surface area sawn. |
| Drying | : | Refers to the process of removing moisture in wood to a desired level through application of Kiln Drying schedule to improve its serviceability. Drying characteristics is influenced by density and anatomical structures. In general, high density and fine textured species are more difficult to dry than those with low density. Coarse textured woods are preferred for flooring panels, and other builders woodworks. LUS are grouped into 4 drying classifications, namely: Class I - Easy to dry (with no difficulty of drying or 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 | : | Refers to the process of cutting wood into desired shapes and dimension using very simple or complex woodworking equipment such as moulder, routers, lathes and sanders. Machining improves surface quality and aesthetic value of wood. |

Species with good machining property or surface quality are preferred for products requiring smooth surfaces such as flooring, furniture, novelty items, toys, sporting goods and tool handles. LUS are grouped into the following machining characteristics, namely: Class I - Very good (95-100% defect-free surface; very good surface quality); Class II - Good (85-94% defect-free surface; good surface quality); Fair (75-84% defect-free surface; fair surface quality); Poor (65-74% defect-free surface; poor surface quality).

Finishing : Refers to operations involved in the application of transparent or opaque liquid coatings on the wood to protect and enhance its durability and appearance. LUS are classified into the following groupings based on finishing characteristics, namely: Class I - Good to very good (sands and takes stains and varnish very well); Class II - Fair (sands and takes stains well); Class III - Poor (poor sanding)

Natural Durability : Refers to its ability to resist the attacks of deteriorating organisms. Although wood is not completely immune to such attacks, a number possesses superior resistance. LUS are grouped according to the following natural durability classes, namely: Class I - Durable (more than 7 years); Class II - Moderately durable (4-7 years); Class III - Slightly durable (2.5-4 years); Class IV Non-durable (1-2.5 years); Class V Perishable (less than 1 year).

Treatability : Refers to the ease with which species of wood takes in preservatives using vacuum or pressure process. This serves as a guide for the wood preserving industry in formulating treatment schedules for different species. LUS are grouped according to the following durability classes, namely: Class I - Easy to treat (practically complete penetration of chemical preservatives); Class II - Moderately difficult to treat (limited side penetration of chemical preservatives); Class III - Very difficult to treat (practically no side penetration of chemical preservatives).

## 6. END-USES

Refers to the listing of current and potential industrial end-uses of each LUS based on R & D results conducted by the Forest Products Research and Development Institute and from available industry market information.

## 7. ILLUSTRATION

Refers to the photographed LUS wood samples taken in either quarter-sawn or flat-sawn surface. The wood samples were properly identified and carefully selected to ensure that it will be true presentation of its original source.

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Alupag-amo |
| Scientific Name | : | ***Litchi chinensis* Sonn. *ssp. philippinensis* (Radlk.) Leenh.** |
| Local Names | : | Kagsakan, sim-moka (Cagayan), aninguai, (Pangasinan); alupai, kumingi, kaninge, taningi (Bataan); alupag-amo (Tagalog); bankig (tayabas); alupag, bulala, kagaskason, mailusong (Camarines); kagsakan (Albay); kagaskas (Sorsogon); kadangisol (Masbate); kagasakan (P. Bisaya); ipanga (Palawan); dalupaga (Leyte); baet, baliok, bugna (Davao); balangas (Manobo); balit or balik (P. Bisaya, Sibuyan, Zamboanga); bugna (Sulu). |
| Family Name | : | Sapindaceae |

## 2. *DISTRIBUTION*

Luzon (Cagayan, Isabela, Pangasinan, Zambales, Bataan, Tayabas, Camarines and Albay), Sibuyan, Samar and Mindanao (Surigao, Agusan and Davao), in secondary and primary forests from about sea level to an altitude of 500 m.

## 3. *TREE CHARACTERISTICS*

A large tree reaching a diameter up to 90 cm. Trunk often irregular, straight, 8 to 12 m long. Buttress large but low.

## 4. *WOOD DESCRIPTION*

Sapwood thin and distinct from the heartwood, which is reddish brown; grain straight, often slightly wavy, very hard, very strong, tough. Growth rings due to alternating bands of dense late wood and relatively light early woods, delimited by narrow but distinct terminal parenchyma. Vessels variable in grouping, from mostly isolated sides and with moderately few; vessel elements 2 to 3 per mm; perforation simple; perforation plates almost horizontal; white or light yellow deposits in most vessels visible to the naked eye. Fibers dense. Wood parenchyma not conspicuous; between growth layers exceedingly narrow; light colored terminal parenchyma are occassionally present; vasicentric parenchyma distinct.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density | Class I | High relative density (0.89) |
| * * Volumetric shrinkage | Class V | High volumetric shrinkage (16.7%) |
| * * Mechanical/Strength Properties | Class I | High strength (Bending strength - 100 MPa; Compressive strength- 52.4; MPa; Shear strength - 15.6 MPa; Hardness 1.39 KN; Toughness - (Joule/Specimen) |
| * * Sawing | Class II | Moderately difficult to saw |
| Drying | No available data | No available data |
| * * Machining | Class III | Fair machining property |
| Finishing | No available data | No available data |
| * * Natural Durability | Class I | Durable |
| * * Treatability | Class III | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For posts and sills, beams, joists, rafters, flooring, teeth of native sugar mills, presses, bearings, wooden anchor, combs, tree nails, harrow teeth and other parts of agricultural elements, salt water piles, keelsons of ships and other purposes for which a very hard and very heavy wood is required.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

Official Common Name : Amugis

Scientific Name : ***Koordersiodendron pinnatum*** **(Blco.) Merr.**

Local Names : Tirong, oris, uris-urisan (Cagayan, Ilocos Norte); taligaan (Ilocos Norte); salga, sarga (Ilocos Sur, Abra); molato (Abra); bankasi, bankalari (Ilocano); malabanais, marabanias, palapias (Pangasinan); orisen (Tarlac); dangila (Tagalog); ambugis, amugis, mugis (Bulacan, Bataan, Rizal, Laguna, Tayabas, Samarines, Albay, Marinduque, Palawan, Negros, Zamboanga); barok, pamalatangan (Sorsogon); karogkog (Bicolano); hamoges, hamogis, karo (Catanduanes); kalumanog, lakolako, sambalagan, (Bisaya); sambulauan (Masbate, Samar, Leyte, Capiz, Cebu, Surigao); kiakia (Cebu); maguyabud, simbauanan (Agusan); kalantas-colorado (Cotabato); samba-uauan (Manobo); bugis, maguabod (Davao); gagil, magalibas, magulibas (Zamboanga, Davao, Sulu).

Family Name : Anacardiaceae

## 2. *DISTRIBUTION*

Widely distributed in the Provinces of Cagayan, Isabela, Aurora, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Davao del Norte, Agusan del Sur, Davao del Norte, Lanao del Sur.

## 3. *TREE CHARACTERISTICS*

A medium to large tree attaining a diameter of 120 cm. though usually 60 to 80 cm. Trunk fairly straight, cylindrical, 12 to 18 m. long. Buttress not pronounced.

## 4. *WOOD DESCRIPTION*

Sapwood 3 to 5 cm. thick, light pinkish, sharply marked off from the heartwood, which is reddish when fresh, turning reddish brown to russet, with age; grain crossed, often wavy or curly; texture and moderately fine; glossy; taste and odor not perceptible; comparatively heavy. Growth rings absent or indistinct.

Vessels almost all isolated, evenly distributed; surrounded by narrow vasicentric parenchyma; come in contact with rays on both sides; small to moderately small; mostly circular, rarely oblong, moderately few; perforation plates slightly inclined, tyloses entirely occlude the vessels of the heartwood. Fibers moderately dense. Wood parenchyma vasicentric, indistinct consisting of a very narrow ring around the vessel. Resin ducts,very small, very few, seen on the tangential sections as occlusions in some rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class II | Moderately high relative density (0.69) |
| * * Volumetric shrinkage | Class IV | Moderately high volumetric shrinkage (13.6%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 65.9 MPa; Compressive strength - 19.5; MPa; Shear strength - 10.0 MPa; Hardness 5.24 KN; Toughness - 65.1 (Joule/Specimen) |
| * * Sawing | Class I | Easy to saw |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class II | Good machining property |
| * * Finishing | Class I | Very good finishing property |
| * * Natural Durability | Class I | Durable |
| * * Treatability | Class III | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

The wood makes excellent flooring owing to its uniform dark-red color. It is also used for house construction and furniture and cabinet making. Wall panels, room dividers, louvre doors, balusters, pictures frames, ash trays, trophy, bowls, coaster set, pencil holders and table name blocks.

## 7. *ILLUSTRATION*

Radial Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Anabiong |
| Scientific Name | : | ***Trema orientalis* (L.) Blume.** |
| Local Names | : | Anardung (Mountain Province); anadong (Pangasinan); lalaong, maladurong, malasikong-durong (Pampanga); anabiong (Laguna, Tayabas); anagdong (Camarines, Albay); indalugong (Lanao); mandaragon (Davao). |
| Family Name | : | Ulmaceae |

## 2. *DISTRIBUTION*

Very widely distributed throughout the Philippines at low and medium altitudes, sometimes found at an altitude of 2000 meters. Common and abundant. It is one of the pioneering species that take possession of abandoned clearings, thickets and second-growth forests.

## 3. *TREE CHARACTERISTICS*

Large tree; height to 15 meters or more, DBH up to 60 cm., bole cylindrical, short, forking and producing several, rounded, medium-sized branches upwardly oriented; bark quite smooth, grayish brown; inner bark reddish without distinct odor; buttress nil to almost absent; leaves simple alternate, elliptic, acuminate, serrate; crown sparse, irregular in shape.

## 4. *WOOD DESCRIPTION*

Sapwood is not distinct from the heartwood, which is buff; grain is straight; texture is fine to moderately coarse; light and soft (easily indented by finger nail). Pores are barely to readily visible to the naked eye solitary and in radial multiples of 2-4; occasionally with chalky white deposits and tyloses present in some pores. Parenchyma is indistinct under a hand lens. Rays are indistinct to the naked eye. Fibers are loose.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class V<br><br>Class II | <br>Low relative density (0.306)<br>Moderately low volumetric shrinkage (10.2%) |
| Mechanical/Strength Properties | Class V | Low strength (Bending strength - 35.8 MPa; Compressive strength - 13.9 MPa; Hardness - 21.8 KN; Shear strength - 5.28 MPa; Toughness - 27.0 (Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class II | Moderately difficult to dry |
| Machining | Class I | Very good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class V | Perishable |
| Treatability | No available data | No available data |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3 (1).

## 6. *END-USES*

For manufacture of wooden shoes, fish net floats, pulp and paper making, particleboard, boxes and crates, and other stringed instruments.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Anang |
| Scientific Name | : | ***Diospyros pyrrhocarpa* Miq.** |
| Local Names | : | Kabag (Isabela); balubagto (Nueva Vizcaya); kugao pugao (Quezon); talang gubat (Rizal); anang, pugauing-itim (Laguna); anang, malamabolo (Camarines Norte); ata-ata, lupaoan, kanalum, konalum (Negros Occidental) |
| Family Name | : | Ebenaceae |

## 2. *DISTRIBUTION*

Reported from Cagayan, Isabela, Nueva Vizcaya, Rizal, Laguna, Quezon, Palawan, in the island of Luzon. In Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Sur and Davao Oriental.

## 3. *TREE CHARACTERISTICS*

Medium sized tree; height up to 15 m or more, DBH to 40 cm; bole cylindrical, somewhat fluted near the base with inconspicuous, small low, rounded buttresses; branches many, oriented at an angle with an axis, somewhat slender, rounded; bark surface dark-colored, almost black, finely grid-cracked; inner bark bright yellow without distinct odor; leaves simple alternate, elliptic-oblong, thick, glabrous, slightly glaucous underneath, entire; crown irregular, quite dense, small.

## 4. *WOOD DESCRIPTION*

Sapwood is very thick not distinguishable from the heartwood. Grain straight; texture is fine to moderately fine; glossy; very hard and very heavy. Growth rings are sometimes present marked by darker bands of wood tissues. Pores are slightly visible to the naked eye, solitary and in radial multiples of 2-4. Arranged in slightly oblique and in radial pattern, often with dark coloration associated with the vessels. Parenchyma is continuous and sometimes, interrupted to give rise to diffuse parenchyma or short tangential lines.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class III<br><br>Class IV | <br>Medium relative density (0.598)<br>Moderately high volumetric shrinkage (15.2%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 68.6 MPa; Compressive strength - 32.4 MPa; Shear strength - 8.50 MPa; Hardness - 4.84 KN; Toughness - 36.1 (Joule/Specimen) |
| Sawing | Class II | Moderate to saw |
| Drying | Class III | Difficult to dry |
| Machining | Class I | Very good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class II | Moderately durable |
| Treatability | No available data | No available data |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3 (1).

## 6. *END-USES*

The wood is used for scaling sticks, golf heads, bowling balls, furniture and cabinets, trophy, table nameblocks, paper weights, coaster set, pencil holders, powder case and letter opener.

## 7. *ILLUSTRATION*

Radial Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Anang-gulod |
| Scientific Name | : | ***Diospyros inclusa* Merr.** |
| Local Names | : | Same as Anang |
| Family Name | : | Ebenaceae |

## 2. *DISTRIBUTION*

Same as Anang.

## 3. *TREE CHARACTERISTICS*

A medium-sized tree growing to a height of 20 m. or more and attaining dbh of 60 cm. or longer. Bole long, fluted somewhat near the base, erect, distinctly tapering. Buttress very low, simple, rounded. Bark surface smooth from a distance, black-colored; grid-cracked on close observation or very finely cracked or fissured longitudinally and transversely, producing minute, appressed scales. Branches are quite slender, short and inclined, black-colored. Crown sympodial, irregular in shape, dark green, dense but small.

## 4. *WOOD DESCRIPTION*

Heartwood is jet black, small and often defective that is seldom put to any use; grain is straight; texture is fine; glossy very hard and very heavy. Growth rings are sometimes present marked by darker bands of wood tissues. Pores are slightly radial multiples of 2-4, arranged in slightly oblique and radial pattern, often with discoloration associated with vessels. Parenchyma is wavy, continuous and sometimes interrupted to give rise to diffuse parenchyma on short tangential lines.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class II | Moderately high relative density (0.679) |
| * * Volumetric shrinkage | Class III | Medium volumetric shrinkage (12.0%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 77.1 MPa; Compressive strength - 36.0 MPa; Shear strength - 10.3 MPa; Hardness - 5.14 KN; Toughness - 29.3 (Joule/Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class IV | Very difficult to dry |
| * * Machining | Class I | Very good machining property |
| * * Finishing | Class II | Fair finishing property |
| * * Natural Durability | Class IV | Non-durable |
| * * Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI

## 6. *END-USES*

Suitable for house framing and musical instruments, for golf heads, scaling sticks, rulers and bowling pins.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Antipolo |
| Scientific Name | : | ***Artocarpus blancoi* (Elm.) Merr.** |
| Local Names | : | Pakak (Batanes Islands, Cagayan and Pangasinan); ubien (Mountain Province); pakak-bakia, tuyop (Zambales); antipuo (Tayabas); kamansi (Bataan, Iloilo); tipolo, antipolo, dulungian, agob (Camarines, Albay); razara (Palawan); togog, tugop (Samar, Leyte); antipolo (Surigao). |
| Family Name | : | Moraceae |

## 2. *DISTRIBUTION*

Very widely distributed throughout the archipelago; common at low and medium altitudes.

## 3. *TREE CHARACTERISTICS*

A medium sized to a large tree up to 90 cm. in diameter and 30 m. in height with cylindrical bole and prominent buttress.

## 4. *WOOD DESCRIPTION*

Sapwood light buff, distinct from the heartwood which is bright yellow when fresh, turning russet upon exposure; grain crossed; texture moderately coarse to coarse; glossy; odor and taste not characteristic; comparatively light to comparatively heavy. Growth rings entirely absent; wood very homogenous. Vessels isolated in groups, those in groups mostly in pairs and seldom in threes; diffuse; majority touch the rays on only one side, some on both sides; separated from fibers by a narrow ring of parenchyma. Occasional tyloses present. Fibers moderately dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class II | Moderately high relative density (0.61) |
| * * Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (8.4%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 69.8 MPa; Compressive strength - 21.0 MPa; Shear strength - 3.96 MPa; Hardness - 4.82 KN; Toughness - 7.10 Joule/Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class III | Fair machining property |
| * * Finishing | Class II | Good to very good finishing property |
| * * Natural Durability | Class I | Durable |
| * * Treatability | Class I | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI

## 6. *END-USES*

For house posts and other uses requiring durability; for paneling, furniture and cabinet works of all kinds, and for musical instruments as a substitute for nangka (*Artocarpus heterophylla Lam.*) The wood is highly prized for making dugout canoes.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Antsoan |
| Scientific Name | : | ***Cassia javanica* L.** |
| Local Names | : | Bagayong, fugayong, tualing bakulao (Cagayan); caña fistula (Cagayan, Ilocos Sur, Pangasinan, Nueva Ecija, Pampanga, Batanes, Rizal, Sorsogon); narandaoel, pangoasen (Ilocos Sur); apostala (Pangasinan); dulauen, kapistula (Isabela); maratayong (Nueva Ecija); duyong (Laguna); anchoan (Camarines Norte); dangkalang, matang-ulang, malatagum (Camarines); baru-baru (Albay); bagiroro (Masbate, Capiz); balayong (Iloilo); fistula (Negros Oriental); candela-candela, apodapod (Palawan); pistol (Lanao); kil-kil (Zamboanga). |
| Family Name | : | Leguminosae |

## 2. *DISTRIBUTION*

Reported from Northern Luzon to Mindanao and Palawan in open forests at low and medium altitudes.

## 3. *TREE CHARACTERISTICS*

A medium-sized tree a diameter up to 70 cm. Bole straight, cylindrical, usually 5 to 8 m. in length.

## 4. *WOOD DESCRIPTION*

Sapwood is white or creamy white, turning light brown on drying, and distinctly marked off from the heartwood, which is light yellow when fresh turning to brick red with age; grain crossed; texture moderately fine; hard and heavy; Pores are slightly visible to the naked eye, generally solitary with reddish deposits. Parenchyma is fairly distinct to the naked eye, usually aliform and confluent, and scarcely in bands of fine lines. Rays are not visible to the naked eye.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density | Class I | Moderately high (0.70) |
| * * Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (8.2%) |
| * * Mechanical/Strength Properties | Class I | High strength (Bending strength - 95.6 MPa; Compressive strength - 47.8 MPa; Shear strength - 12.4 MPa; Toughness - 53.8 Joule/Specimen) |
| * * Sawing | Class II | Moderately difficult to saw |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class II | Good machining property |
| * * Finishing | Class I | Very good finishing property |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class III | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For heavy construction such as bridges, posts, piles, railway sleepers, stairs and highway railguards. Balusters, railings in building, tool handles, paper weights, pencil holders, door and window frames, beams and joists.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Balakat |
| Scientific Name | : | ***Ziziphus talanai* (Blco.) Merr.** |
| Local Names | : | Aggok, aggub, dinan (Cagayan); aligamen, apatuten (Ilocos Norte); dinaan, dir-an, duplok (Pangasinan); duldap (Pangasinan, Zambales); balakat (Zambales, Nueva Ecija, Bataan, Laguna, Camarines, Palawan, Butuan); bia-a (Zambales); lanutan (Nueva Ecija); biga-a, diga-a (Bataan, Rizal, Tayabas, Leyte, Samar, Davao); dugaa (Sorsogon); bariango, dogaa (Palawan); dagao (Surigao, Agusan); duguo (Davao) |
| Family Name | : | Rhamnaceae |

## 2. *DISTRIBUTION*

Balakat can be found in Cagayan, Isabela, Aurora, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Sur, Davao del Norte and Lanao del Sur Provinces.

## 3. *TREE CHARACTERISTICS*

Large tree; height to 30 m, DBH to 100 cm; bole cylindrical, long, producing several rounded branches, branchet slender, rounded, arranged almost horizontally, appearing crooked; crown widespread, large, almost oval in shape, quite dense; bark surface ridged, the ridges sloughing at times with maturity and flaking, grayish brown; inner bark reddish to purple, without distinct odor and sap.

## 4. *WOOD DESCRIPTION*

Sapwood not sharply defined from heartwood, which is light red or reddish-brown; grain straight; occasionally wavy; texture moderately fine; heavy. Pores barely visible to the naked eye, solitary and in radial multiples of 2-5, usually 2-3. Parenchyma visible with a hand lens, distinctly aliform to confluent. Rays not visible to the naked eye, with whitish streaks on cross-section, slightly conspicuous on radial surface due to color of ray flecks.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density | Class III | Medium relative density (0.527) |
| Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (10.3%) |
| Mechanical/Strength Properties | Class II | High strength (Bending strength - 72.1 MPa; Compressive strength - 34.6 MPa; Shear strength - 10.1 MPa; Hardness - 5.12 KN; Toughness - 49.0 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| * * Drying | Class I | Easy to dry |
| * * Machining | Class II | Good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class IV | Non-durable |
| Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3 (1).

## 6. *END-USES*

For general construction, furniture and cabinet works; veneer and plywood; bowling pins and baseball bats; rotary cut veneer for chopsticks, popsicle sticks, medical sticks, toothpicks, ice cream spoons, pulpwood, pallets.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Balete |
| Scientific Name | : | ***Ficus balete* L.** |
| Local Names | : | Universally known as balete, which means to bind or entrap |
| Family Name | : | Moraceae |

## 2. *DISTRIBUTION*

It occurs from Cagayan, Isabela, Quirino, Aurora, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Norte, Davao del Norte, Davao Oriental and Lanao del Sur Provinces.

## 3. *TREE CHARACTERISTICS*

The tree species has epiphytic habits; it usually starts as seedling upon another tree and eventually entraps it. Air roots are sent to the ground as support and develop into fair sized trunks reaching 60 to 80 cm. in diameter.

## 4. *WOOD DESCRIPTION*

Color is light buff to light yellow; grain straight; texture moderately coarse, not lustrous, taste and odor not distinct. Pores are visible to the naked eye, solitary and in radial multiples of mostly 2; whitish deposits and tyloses are present in some pores. Parenchyma is distinct to the naked eye. Fibers are moderately loose. Ripple marks are visible to the naked eye on tangenial surface due to the storied arrangement of the rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density | Class IV | Moderately low relative density (0.47) |
| Volumetric shrinkage | No available data | No available data |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 73.4 MPa; Compressive strength - 33.1 MPa; Shear strength - 7.49 MPa; Hardness - 5.05 KN; Toughness - 59.8 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class I | Easy to dry |
| Machining | Class II | Good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class IV | Non-durable |
| Treatability | Class I | Easy to treat with chemical preservatives |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3 (1).

## 6. *END-USES*

Suitable for interior framing, wooden shoes, floats, louvre doors, frames, veneer, moulding, newspaper stand, table and cabinet drawers.

## 7. *ILLUSTRATION*

Radial Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Balobo |
| Scientific Name | : | ***Diplodiscus paniculatus* Turcz.** |
| Local Names | : | Barubu (Cagayan); bagobo (Ilocos Norte); apipangol-lokilloten (La Union); manaring (Isabela); balogo (Pangasinan); burusang (Bulacan); bolato (Quezon); barko (Camarines Sur); baroto (Albay); marbo (Catanduanes); barubo (Samar, Albay, Mindoro, Leyte, Bukidnon); maobo (Cebu); balugug (Zamboanga, Cotabato); basobo (Davao); balobo (Laguna, Rizal, Quezon, Camarines Sur, Samar, Agusan, Cotabato, Davao, Basilan). |
| Family Name | : | Tiliaceae |

## 2. *DISTRIBUTION*

The species has been reported to be found in Cagayan, Isabela, Aurora, Palawan, Catanduanes, Mindoro, Masbate, Samar, Leyte and Panay and all provinces of Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Norte, Davao del Norte, Davao Oriental and Lanao del Sur. Found in old growth and secondary forests at low and medium altitudes often on flat level land, and seldom on slopes.

## 3. *TREE CHARACTERISTICS*

Medium sized tree; height to 20 m, DBH to 60 cm; bole short, cylindrical, at times angular, crooked, tapering; branches somewhat slender, twisted so are the branchlet; crown irregular in shape, quite dense; buttresses high, symmetrical, plank type, spreading to 4 m; bark rough, dirty-brown,flaky-scaly, flaking and sloughing in time into small, irregular-shaped sheets, leaving conspicuous flat scars on the bole of the surface; leaves oblong or linearly-oblong, glaucous beneath, simple alternate, entire.

## 4. *WOOD DESCRIPTION*

Sapwood is not sharply marked off from heartwood, which is grayish or pale reddish-brown; grain straight; texture moderately fine; hard; and heavy. Growth rings indistinct to fairly distinct. Pores barely visible to the naked eye, solitary and in radial multiples usually 2-3, the multiples predominating; perforation plates simple. Parenchyma visible with a hand lens, abundant, diffuse as short tangential lines between rays forming a mesh-like pattern. Rays not visible to the naked eye on cross section. Ripple marks due to storied arrangement of the rays on tangential surface are distinct with a hand lens.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class II<br><br>Class III | <br>Moderately high relative density (0.632)<br>Medium volumetric shrinkage (12.6%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 81.2 MPa; Compressive strength - 36.1 MPa; Shear strength - 9.27 MPa; Hardness - 6.16 KN; Toughness - 61.8 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class IV | Very difficult to dry |
| Machining | Class I | Very good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class IV | Non-durable |
| Treatability | Class I | Easy to treat with chemical preservatives |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3 (1).

## 6. *END-USES*

For venetian blinds, bowling pins, bobbins, spindles and shuttles, house posts, agricultural implements, general construction work, toothpicks, chopsticks, matches, tool handles (cant hooks, peavies), packing boxes and crates, pulp and paper, furniture and cabinets, mouldings, balusters, louvre doors, frames, bowls, cups, ash trays, candy trays, chopping boards, pencil holders, and paper weights.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Banaba |
| Scientific Name | : | ***Lagerstroemia speciosa* (L.) Pers.** |
| Local Names | : | Nabulong, tabangau (Cagayan); banaba (Ilocos Norte, Ilocos Sur, Abra, La Union, Pangasinan, Bulacan, Bataan, Mindoro, Palawan, Antique, Negros, Davao); aropag, makabolo (Pangasinan); mitla (Tarlac); banang-pulo (Tayabas); pantahaun (Camarines); agupanga (Marinduque); pamalasagon (Leyte); pamalauagon, pamaraugon (Samar, Leyte); kauilan (Iloilo); manaba (Capiz) parasabakong (Misamis); batiladhan (Lanao); abak (Agusan, Zamboanga). |
| Family Name | : | Lythraceae |

## *2. DISTRIBUTION*

Scattered along streams in open places and second growth forests. Reported from almost all provinces. Often cultivated as ornamental plant on account of its showy purplish flowers.

## *3. TREE CHARACTERISTICS*

A medium-sized tree reaching a height of 25 or more and a diameter of 120 cm. Bole usually short, irregular, not strongly buttressed.

## *4. WOOD DESCRIPTION*

Sapwood 4 to 6 cm. thick not well marked off from the heartwood, which is reddish brown; grain generally straight, sometimes wavy; texture moderately fine to moderately coarse; glossy; no distinct taste and odor. Tyloses completely clog the vessels. Fibers dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class III | Medium relative density (7.6) |
| * * Volumetric shrinkage | Class III | Medium volumetric shrinkage (12.4%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 63.7 MPa; Compressive strength - 18.5 MPa; Hardness - 4.85 KN; Shear strength - 9.37 MPa; Kn; Toughness - 40.9 Joule/Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class III | Fair |
| * * Finishing | Class I | Very good |
| * * Natural Durability | Class II | Moderately-durable |
| * * Treatability | Class III | Very difficult to treat |

** - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For ship building, flooring, interior finish, furniture, and cabinet work and house posts. Louvre doors, balusters, frames, ash trays, bowls, paperweights, pencil holders, and table name blocks.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Banai-banai |
| Scientific Name | : | ***Redermachera pinnata* (Blco.) Seem.** |
| Local Name | : | Lanunisi (Cagayan); ati-atip; pagalayan (Mountain Province); baranggaoan (Ilocos Sur); banaibahayan, pata del monte (Pangasinan); balinghasai, katurai (Zambales); banai-banai (Bulacan, Bataan, Laguna, Cavite, Batangas, Mindoro, Samar); tuing hulo, yabang-yabang (Bataan); kalapuing, pingkapinkahan (Laguna); palinguak (Camarines Sur); badlan, sali (Tayabas); milansilan (Camiguin). |
| Family Name | : | Bignoniaceae |

## 2. *DISTRIBUTION*

Reported in Luzon (Cagayan to Bicol), Visayas (Samar, Biliran, Negros) and Mindanao (Misamis). Found scattered in second-growth and virgin forests at low and medium altitudes.

## 3. *TREE CHARACTERISTICS*

A large tree up to 80 cm. in diameter. Bole generally straight, regular 8 to 12 m. long. Buttress pronounced.

## 4. *WOOD DESCRIPTION*

Sapwood not distinct from the heartwood, which in light reddish yellow, turning to cinnamon buff upon exposure; grain crossed; texture moderately fine; glossy; no taste or scent. Growth rings present, but not distinct, delimited by dense wood bands, often accompanied by a narrow line of terminal parenchyma. Vessels isolated and in groups, those in groups 2 to 4 in multiples, evenly distributed, inclined to arrangement in tangential rows, come in contact with the rays mostly on one side. Also with aliform parenchyma, perforation plates simple, slanting and empty. Fibers comparatively dense. Pith-ray flecks occasionally present as in margapali (*Dehaasia triandra*).

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class III | Medium relative density (0.52) |
| * * Volumetric shrinkage | Class II | Moderately low (9.6%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 63.8 MPa; Compressive strength - 21.9 MPa; Hardness - 4.14 KN; Shear strength - 8.34 MPa; KN; Toughness - 27.0 Joule/Specimen) |
| * * Sawing | Class I | Easy to saw |
| * * Drying | Class I | Easy to dry |
| * * Machining | Class II | Good |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class III | Slightly durable |
| * * Treatability | Class III | Very difficult to treat |

** - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For cabinet and furniture, sculpture and carving. Wallings, balusters, louvre doors, mouldings, door and window frames, bowls, fruit and candy trays, handle, newspaper and magazine stand.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Banilad |
| Scientific Name | : | ***Sterculia philippinensis*** **Merr.** |
| Local Name | : | Hantak (Batanes); lapnit (Babuyan, Cagayan); sinaligan (Ilocos Sur, Mt. Province); malabanilad (Rizal, Bicol, Mindoro); malabuho (Bataan, Laguna); bonga, malabonga (Quezon); uos (Camarines, Albay); saripongpong (Sorsogon); bakan (Mindoro); malabanilad (Samar); taroi (Negros Occidental). |
| Family Name | : | Sterculiaceae |

## *2. DISTRIBUTION*

Reported from Luzon (Cagayan to Sorsogon, Mindoro), Visayas (Busuanga, Samar, Leyte, Negros) and Mindanao (Lanao).

## *3. TREE CHARACTERISTICS*

A large tree attaining a diameter of 70 cm. Bole generally straight, regular short, seldom reaching 10 m.

## *4. WOOD DESCRIPTION*

Sapwood indistinguishable from heartwood which is buff-colored; straight grained; comparatively coarse textured; not glossy, without taste or odor; very soft and very weak. Growth rings indistinct. Vessels mostly in groups, evenly distributed; surrounded by vasicentric parenchyma, come in contact with the rays on one or two sides, small to moderately large; few; vessel elements distinct, 2.3/mm. perforations simple; perforation plates horizontal; with occasional tyloses. Fibers loose; sheath cells present.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class V<br><br>No available data | <br>Low relative density (0.315)<br>No available data |
| Mechanical/Strength Properties | Class V | Low strength (Bending strength - 27.6 MPa; Compressive strength - 11.4 MPa; Shear strength - 3.34 MPa; Hardness - 1.36 KN; Toughness - 9.71 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class II | Moderately difficult to dry |
| Machining | Class II | Good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class II | Moderately durable |
| Treatability | Class I | Easy to treat with chemical preservatives |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For general house construction particularly sidings ceilings and partitions. Louvre doors, balusters, frames, moulding, knife blocks, cups, bowls, coaster set, toys, candy tray, table tops, pencil holders, and trophy.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Batino |
| Scientific Name | : | ***Alstonia macrophylla* Wall.** |
| Local Name | : | Busisi, pangolaksien (Cagayan); basikal, basikarang, batisalag, batikalang (Cagayan, Ilocos Sur, Isabela, Pangasinan); mangga-mangga, maramangga (Cagayan, La Union); banakao, panglanutien, pangalunadsin (Ilocos Norte); dalakan, darakan (Ilocos Sur); kalatuche, pangalisokloen (Pangasinan); batino (Rizal, Laguna, Cavite, Batangas, Tayabas, Camarines, Mindoro); itang-itang (Tayabas, Guimaras); buyao-yao, kuyao-yao (Camarines Sur, Catanduanes, Capiz); dita-dita (Albay); pugayan, tugayan (Mindoro); malabato (Marinduque); lasona (Samar); opon-opong (Leyte); tangitang, ughayan (Capiz); dinog (Bohol), kurayan, rigayan, sulusihigan (Palawan); guala (Bukidnon); tulingan (Sibutu); saakias, tambaltungon (Sulu). |
| Family Name | : | Apocynaceae |

## *2. DISTRIBUTION*

Found in Cagayan, Isabela, Aurora, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Davao del Norte, Davao Oriental, and Lanao del Sur Provinces.

## *3. TREE CHARACTERISTICS*

Attains a diameter of 65 cm. Bole straight, regular, about 10 m. long.

## *4. WOOD DESCRIPTION*

Sapwood not distinct from the heartwood, which is pale yellowish brown (warm buff to cinnamon buff of Ridgway); grain crossed, often wavy; moderate fine texture; with distinct bitter taste, particularly when fresh; without odor. Growth rings absent; wood very homogenous. Vessels almost all in groups, 2 to 14 in multiples; diffuse; come in contact with the rays generally on two sides; small, oblong; numerous; vessel elements distinct, variable in length; perforation simple; perforation plates slightly inclined; empty. Fibers dense. Wood parenchyma diffuse, consisting of small isolated dots between rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class II | Moderately high relative density (0.64) |
| * * Volumetric shrinkage | Class V | High volumetric shrinkage (14.5%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 84.0 MPa; Compressive strength - 20.2 MPa; Shear strength - 10.6 MPa; Hardness - 5.7 KN; Toughness - 43.1 Joule/Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class II | Good |
| * * Finishing | Class II | Good |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class I | Easy to treat |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For beams, joists, rafters, flooring and household implements, for high grade furniture and cabinet making, bobbins, floor parquet, louvre doors, balusters, frames, toys, coaster set, cups, bowls, candy tray, fruit tray, trophy, chess pieces, pencil holders, table tops and moulding.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Binuang |
| Scientific Name | : | ***Octomeles sumatrana* Miq.** |
| Local Name | : | Sanew (Cagayan); barong (Cagayan, Ilocos Norte); barasing (Nueva Ecija); binuang (Bulacan, Laguna, Quezon, Palawan, Agusan, Davao, Zamboanga); samak (Tarlac); binua (Zambales); kobal (Bataan); barousan (Rizal); biluang (Camarines); barobalobo (Albay); banuang (Zamboanga) |
| Family Name | : | Datiscaceae |

## *2. DISTRIBUTION*

Reported from Cagayan, Mt. Province, Zambales, Bataan, Laguna, Quezon, Camarines, Sorsogon, Mindoro, Palawan and Mindanao. Grows along streams and often gregarious in second-growth forests.

## *3. TREE CHARACTERISTICS*

Large tree; height 35 to 60 m., DBH 100 cm. or more, bole long, cylindrical, tapering, the major branches stout, branchlet quite slender; crown small, ovoid or circular, sparse; buttresses high, plank type, symmetrical, spreading to 4 m; bark surface creamish-yellow, scaly, the somewhat rounded scars deep and prominent; leaves large, heart shaped often with many punctures; petiole long, slender.

## *4. WOOD DESCRIPTION*

Sapwood is not distinguishable from the heartwood which is buff to pale orange yellow; grain straight; texture comparatively coarse not glossy; taste and odor not perceptible. Fiber loose. Rays on one kind multiseriate, very narrow; few distinctly heterogenous with 2 or more upright cells.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class V | Low relative density (0.265) |
| * * Volumetric shrinkage | Class II | Moderate volumetric shrinkage (10.0%) |
| * * Mechanical/Strength Properties | Class V | Low strength (Bending strength - 31.9 MPa; Compressive strength - 16.0 MPa; Shear strength - 3.64 MPa; Hardness - 1.50 KN; Toughness - 16.9 Joule/Specimen) |
| * * Sawing | Class I | Easy to saw |
| Drying | Class I | Easy to dry |
| Machining | Class II | Good machining property |
| * * Finishing | Class II | Good finishing property |
| Natural Durability | Class V | Perishable |
| Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For veneer and plywood, match boxes, fishnet floats, dugouts, pulpwood, veneers and wooden clogs.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Bayok-bayokan |
| Scientific Name | : | ***Pterospermum niveum* Vid.** |
| Local Name | : | Bayok-bayokan |
| Family Name | : | Sterculiaceae |

## *2. DISTRIBUTION*

Supply limited.

## *3. TREE CHARACTERISTICS*

A small tree attaining about 50 cm. in diameter. Trunk usually straight, cylindrical of moderate length. Buttress small.

## *4. WOOD DESCRIPTION*

Sapwood is lighter-colored gradually merging with heartwood which is light drab to reddish; grain is straight or slightly crossed; texture is moderately fine to moderately coarse; moderately heavy and moderately hard. Pores are fairly visible to the naked eye, solitary and in radial multiples of 2-4, mostly 2-3; occasional tyloses present. Rays are not visible to the naked eye. Ripple marks are present on the longitudinal surface due to the tier arrangement of the rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br>* * Volumetric shrinkage | <br>Class III<br>Class III | <br>Medium relative density (0.53)<br>Medium volumetric shrinkage (12.60%) |
| * * Mechanical/Strength Properties | Class IV | Moderately low strength (Bending strength - 54.9 MPa; Compressive strength - 21.1 MPa; Toughness - 35.2 Joule/Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class III | Fair |
| Finishing | No available data | No available data |
| * * Natural Durability | Class III | Slightly durable |
| * * Treatability | Class II | Moderately difficult to treat |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For posts (above stumps) beams, joists, rafters, floorings, sheathing, ceilings, furniture and cabinet works, combs, baseball bats, tool handles, carriage and wagon shaft and household and agricultural implements.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

Official Common Name : Bitaog

Scientific Name :. ***Calophyllum inophyllum* L.**

Local Name : Batargo, pamitaogen, vitang, vutalao (Batanes, Cagayan); bitaog (Babuyanes, Cagayan, Isabela, Ilocos Norte, Abra, La Union, Zambales, Batman, Batangas, Lanao, Agusan, Camiguin); dankalan or dangkalan (Batanes Isabela, Polilio, Tayabas, Camarines, Catanduanes, Mindoro, Burias, Masbate, Samar, Capiz, Negros Oriental, Palawan, Agusan, Lanao, Cotabato, Davao, Zamboanga, Basilan); bitaoi, pamitaogen (Cagayan, Pangasinan, Tarlac); palomaria (Cagayan, Nueva Ecija, Tayabas, Zambales, Bataan, Mindoro, Cebu); palomaria de playa (Pangasinan, Laguna, Camarines Sur, Masbate, Mindoro, Agusan, Zamboanga, Basilan); bilasi (Zambales); bitong (Bataan); tamayuan (Batangas); bitaog (Camarines); dangkaian (Catanduanes); bitanghol (Leyte); dangkaan (Davao); makabanakan (Zamboanga); tambo (Sulu).

Family Name : Guttiferae

## *2. DISTRIBUTION*

Widely distributed throughout the Philippines along seashores and bank of streams of low and medium altitudes particularly in the provinces of Cagayan, Isabela, Quirino, Aurora, Palawan, Zamboanga, Agusan, Surigao del Sur, Davao and Lanao del Sur. A fair amount is obtainable in Bataan, Zambales and Mindoro.

## *3. TREE CHARACTERISTICS*

A large tree attaining a diameter of 130 cm. Bole short, seldom reaching 5 m. with big sprading branches, the part of the tree most commonly used.

## *4. WOOD DESCRIPTION*

Sapwood 2 to 5 cm. thick, light colored, well marked-off from the heartwood, which is light reddish brown; grain decidedly crowded; texture moderately fine; very glossy; no odor or taste; heavy. Growth rings marked by terminal parenchyma spaced from a fraction from a mm to 1.5 mm, occasionally more. Vessels mostly isolated; diffuse but arranged in oblique or radial chains of 2 to 4 in a row; vessel elements difficult to distinguish. Tyloses and gummy deposits present. Fibers dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density | Class III | Medium relative density (0.56) |
| * * Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (10.3%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 65.6 MPa; Compressive strength -18.0 MPa; Hardness - 5.60 KN; Shear strength - 11.0 MPa; Toughness - 62.9 Joule/ Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class III | Fair machining property |
| * * Finishing | Class I | Good to very good finishing property |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class II | Moderately difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For general construction, doors, flooring, sheathing and ceilings; ship sterns, knees and ribs; vehicle wheel hubs; fine furniture and cabinet work; gunstocks and musical instruments. Louvre doors, axe and hammer handles, balusters, door and window frames, moulding, agricultural implements.

## 7. *ILLUSTRATION*

Radial Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Bitanghol |
| Scientific Name | : | ***Calophyllum blancoi* Planchon & Triana** |
| Local Name | : | Tadak (Cagayan); basangol (Ilocos Norte); pamitangan (Ilocos Sur, La Union); bitaol (Abra); tikleg (Mt. Province); bitaog-bukid (Pangasinan); bitanghol (Nueva Ecija, Bataan, Laguna, Camarines, Albay, Sorsogon, Masbate, Leyte, Capiz, Lanao); marabiklat (Tarlac); palomaria (Quezon, Nueva Ecija, Zambales, Pampanga, Bataan, Laguna, Palawan, Surigao); bagomanban (Samar); sililihan (Surigao). |
| Family Name | : | Guttiferae |

## *2. DISTRIBUTION*

Bitanghol is usually distributed in Cagayan, Isabela, Palawan, Aurora, Leyte, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Sur, Davao del Norte, Davao Oriental and Lanao del Sur Provinces.

## *3. TREE CHARACTERISTICS*

A medium sized tree attaining a diameter of 60 cm. and a stem of 12 to 18 meters clear of branch. Without buttress.

## *4. WOOD DESCRIPTION*

Sapwood is light colored, distinct from the heartwood, which is reddish brown; grain is slightly crossed or wavy; texture is fine or moderately fine; moderately heavy. Pores are barely visible to the naked eye, almost solitary, unevenly distributed in oblique or radial pattern; tyloses are sparse or absent. Parenchyma is distinct to the naked eye, typically in apotracheal bands, continuous or sometimes interrupted. Rays are fine, visible only with a hand lens.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class III<br><br>Class V | <br>Medium relative density (0.51)<br>High volumetric shrinkage (16.9%) |
| Mechanical/Strength Properties | Class III | Mdium strength (Bending strength - 49.9 MPa; Compressive strength - 11.3 MPa; Shear strength - 6.51 MPa; Hardness - 3.10 KN; Toughness - 37.4 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class III | Fair machining property |
| * * Finishing | Class I | Very good finishing property |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class III | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

The wood is used for posts and spars; bridge and boat building; beams, joists, rafters, floorings, furniture and cabinet works. It is suitable for poles and piles, pulpwood, truck bodies, exterior siding and flooring, boxes and crates, tool handles. Mouldings balusters, louvre doors, frames, chopping boards, bowls, paper weights and toys.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Bok-bok |
| Scientific Name | : | ***Xantophyllum excelsum* (Blume) Miq.** |
| Local Name | : | Barokbok (Cagayan); pagpagan (Ilocano); kabol (Bataan); anono, malagitinggiting (Rizal); bagaluan, banig, butugan (Tagalog); bagarilao, bokbok (Mindoro); managbak, balobo (Palawan); magbok (Bisaya); kangkangum (Davao). |
| Family Name | : | Polygalaceae |

## *2. DISTRIBUTION*

Distributed in the provinces of Cagayan, Isabela, Aurora, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Surigao del Sur, Davao del Norte, Davao Oriental and Lanao del Sur.

## *3. TREE CHARACTERISTICS*

A medium sized tree attaining a diameter of about 80 cm. Trunk generally straight, regular 7 to 12 meters long. Buttress small.

## *4. WOOD DESCRIPTION*

Sapwood almost identical in color with heartwood, which is light yellow; grain straight; texture moderately coarse; not particularly lustrous; taste and odor not perceptible; comparatively hard, heavy and strong; fiber length medium sized.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br><br>* * Volumetric shrinkage | <br>Class I<br><br>Class IV | <br>High relative density (0.64)<br>Moderately high volumetric shrinkage (15.7%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 68.8 MPa; Compressive strength - 35.3 MPa; Shear strength - 9.01 MPa; Hardness - 5.09 KN; Toughness - 33.8 Joule/Specimen) |
| Sawing | Class II | Moderately difficult to saw |
| Drying | Class III | Difficult to dry |
| Machining | Class I | Very good machining property |
| Finishing | No available data | No available data |
| * * Natural Durability | Class IV | Non-durable |
| * * Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For interior work and temporary constructions; paving blocks or ties, poles and piles and picker sticks. Floor parquet, moulding, balusters, louvre doors, chopping boards, balusters, frames, knife blocks, toys, bowls, cups, coaster set, ash tray, candy tray, paper weights and pencil holders.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Dita |
| Scientific Name | : | ***Alstonia scholaris* (L.) R. Br.** |
| Local Name | : | Andaragan (Cagayan, Isabela); andauyar (Isabela); dalipanan (Cagayan, Ilocos, Nueva Ecija, Pangasinan, Bataan); bita, dita (Pangasinan, Zambales, Bulacan, Bataan, Rizal, Laguna, Palawan); dirita (Bataan); manakat, takno (Quezon); linog (Cebu); kamaglit (Palawan). |
| Family Name | : | Apocynaceae |

## 2. *DISTRIBUTION*

Scattered from Northern Luzon to Mindanao and Palawan, in most provinces and islands, in primary and secondary forests at low and medium altitudes.

## 3. *TREE CHARACTERISTICS*

A large tree attaining a diameter of about 90 cm. or more. Bole straight, generally fluted, 10 to 15 m. long. Buttress small.

## 4. *WOOD DESCRIPTION*

Sapwood is not distinct from heartwood, which is yellowish-brown; grain straight sometimes interlocked; texture moderately fine to moderately coarse; has a bitter taste; soft and light. Pores somewhat readily visible to the naked eye, unevenly distributed, typically in radial multiples of 2-5 or more cells, few solitary and in clusters. Parenchyma visible to the naked eye in narrow bands irregularly spaced and slightly wavy. Rays on cross-section indistinct to the naked eye. Fibers somewhat loose. Latex traces observable in longitudinal surfaces.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class V<br><br>Class IV | <br>Low relative density (0.34)<br>Moderately low volumetric shrinkage (9.3%) |
| Mechanical/Strength Properties | Class V | Low strength (Bending strength - 35.7 MPa; Compressive strength - 12.0 MPa; Shear strength - 3.57 MPa; Hardness - 1.90 KN; Toughness - 17.2 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class I | Easy to dry |
| Machining | Class I | Very good machining property |
| Finishing | No available data | No available data |
| * * Natural Durability | Class V | Perishable |
| Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For matchwood, wooden shoes, household implements, ceiling, partition, boxes and crates, interior finish, mouldings, pattern making, turnery bouys and floats, veneer and plywood (core), wooden bowls (buttress), roof shingles and for pulp and paper.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Duguan |
| Scientific Name | : | ***Myristica philippinensis* Lam.** |
| Local Name | : | Talihagan (Cagayan); mundura (Ilocos Norte); mabolo palong (Ilocos Sur); kutu, palong, pau (Abra); bagir, malamabolo (Pangasinan). |
| Family Name | : | Myristicaceae |

## *2. DISTRIBUTION*

The species has been reported to abound in Cagayan, Camarines and Mindoro. It is a component of primary and old secondary forest at low to medium altitudes. It is fairly common on slopes and near creeks and streams in Mt. Banahaw, Quezon, Isabela, Aurora, Quirino, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Sur, Agusan del Norte, Surigao del Norte, Davao del Norte, Davao Oriental and Lanao del Sur.

## *3. TREE CHARACTERISTICS*

Medium-sized tree up to 80 cm. in diameter; bole long; straight, cylindrical, tapering; branches arranged horizontally, teretes or rounded, quite slender, short, forming a sparse almost pyramidical to oblong shape crown; buttresses low, inconspicuous; bark surface dark brown to blackish, smooth with minute, inconspicuously sloughing flakes; inner bark red, profusely exuding red, blood-like watery sap.

## *4. WOOD DESCRIPTION*

Sapwood is lighter colored and not sharply marked off from heartwood, which is reddish brown; grain straight; texture fine or moderately fine; soft to moderately hard; light to moderately heavy. Growth rings somewhat distinct, marked by terminal parenchyma. Pore barely to readily visible to the naked eye, solitary and in radial multiples of 2-3 or more, the multiples more frequent. Parenchyma indistinct to the naked eye, usually in terminal bands. Rays not or hardly visible to the naked eye on cross section, often with whitish streaks in certain specimens; conspicuous in radial surface due to color of rays flecks.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class IV<br><br>Class II | <br>Moderately low relative density (0.421)<br>Moderately low volumetric shrinkage (9.5%) |
| Mechanical/Strength Properties | Class IV | Moderately low strength (Bending strength - 43.30 MPa; Compressive strength - 23.8 MPa; Shear strength - 5.70 MPa; Hardness - 1.96 KN; Toughness - 7.54 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| * * Drying | Class II | Moderately difficult to dry |
| Machining | Class II | Good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class V | Perishable |
| Treatability | Class I | Easy to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For temporary construction, boxes and crates, mouldings and interior finish, concrete shuttering, temporary cladding, floors of temporary camp buildings and plywood cores. Furniture components, louvre doors, balusters, knife blocks, paper weights, pencil holders, name blocks, chopping boards and picture frames.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Ipil |
| Scientific Name | : | ***Intsia bijuga* (Colebr.) Kuntze** |
| Local Name | : | The name "ipil" is used throughout the islands for all species of the genus Intsia. Other names reported for ipil are labrig (Tayabas); ipil-ilog, ipil-talao (Mindoro); tagal-tugas (Palawan); molato (Surigao); itil (Cotabato); balayong (Lanao); ipil-nangka (Sulu). |
| Family Name | : | Leguminosae |

## 2. *DISTRIBUTION*

The tree is found in Babuyan Islands and Northern Luzon to Palawan and Mindanao. Scattered along seashores, back of swamps and sometimes in inland forests. Obtained in fairly large quantities especially from Mindoro and Palawan.

## 3. *TREE CHARACTERISTICS*

A large tree, usually slightly crooked; attains a diameter up to 1.2 m and a height up to 35 m. Trunk often forks a short distance from the ground but sometimes it is clearly cylindrical and straight, unbuttressed but sometimes fluted and irregular cross section.

## 4. *WOOD DESCRIPTION*

Sapwood 4 to 8 cm. light buff, distinctly marked-off from the heartwood, which is bright yellow when fresh, turning dark brown with age; grain slightly crossed; texture moderately coarse; moderately glossy; with characteristic odor when fleshly cut, resembling that raw of beans.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br>* * Volumetric shrinkage | <br>Class II<br>Class III | <br>Moderately high relative density (0.68)<br>Medium volumetric shrinkage (12.1%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 90.4 MPa; Hardness - 5.90 KN; Toughness - 30.0 Joule/Specimen) |
| * * Sawing | Class III | Hard to saw |
| * * Drying | Class III | Very difficult to dry |
| * * Machining | Class III | Fair |
| * * Finishing | Class I | Good to very good |
| * * Natural Durability | Class I | Durable |
| * * Treatability | Class III | Very difficult to treat |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For high grade construction, furniture and cabinet making, for house posts, door and window jambs and frames. Balusters, floor parquet, coffee table, ash tray, tool handles, agricultural implements, paper weights, truck bodies, stairs, and rails, boat components, wharf and pier.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Kalumpit |
| Scientific Name | : | ***Terminalia microcarpa*** **Decne** |
| Local Name | : | Alupi, kalupi, kalusit, lauang (Cagayan); anagep (Cagayan, Mountain Province, Ilocos Sur); kalauitit (Cagayan, Mountain Province, Nueva Vizcaya); ambobok, ambobonat (Isabela); sakat (Pampanga, Laguna); galamayen, gayumayem (Zambales), dalinsi (Tayabas, Bataan); bisal, kalosit (Bulacan); kalamansanai (Rizal); balisayin, dilasa, dumasil, malagabi (Mindoro); tina (Camarines Norte); dalinson, kalamagon, tangal (Camarines Sur); kalimangog, kalumangog (Sorsogon, Masbate, Samar); magtalisai (Sorsogon, Masbate); lumangog (Leyte, Iloilo) taya-taya (Iloilo); kalomagon (Samar); balisayon (Negros Occidental); kamaris (Palawan); bogo (Butuan); bulao (Zamboanga). |
| Family Name | : | Combretaceae |

## 2. *DISTRIBUTION*

Widely distributed from Northern Luzon to Mindanao and Palawan, in most Provinces and islands in the more open portions of the diptrocarp forests at low and medium altitudes.

## 3. *TREE CHARACTERISTICS*

A large tree that attains a diameter of 100 cm. Bole straight, regular 10 to 12 m. long. Buttress small.

## 4. *WOOD DESCRIPTION*

Sapwood large, yellowish, merging gradually into the heartwood, which is light brown to dark reddish brown; grain slightly crossed; sometimes curly or wavy; texture moderately coarse; fairly glossy; taste and scent not perceptible. Growth rings indistinct; marked by alternating rings of porous and less porous wood. Sometimes marked by very narrow yet distinct terminal parenchyma. Vessels mostly isolated; rather irregularly distributed; several rows of relatively large vessels in concentric alignment and those in the rays on both sides, partly with the vasicentric-aliform parenchyma, and when free abut upon the fibers. Perforation plates horizontally or slightly inclined; some with scanty tyloses. Fibers comparatively dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class IV | Moderately low relative density (0.48) |
| * * Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (9.80%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 65.8 MPa; Compressive strength - 19.1 MPa; Hardness - 2.5 KN; Toughness - 61.5 Joule/Specimen) |
| Sawing | No available data | No available data |
| * * Drying | Class I | Easy to dry |
| * * Machining | Class I | Very good |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class I | Durable |
| * * Treatability | Class I | Easy to treat |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For general construction, furniture and cabinet making; a good wood for a ship planking. Louvre doors, balusters, picture frames, room dividers, bowls, coaster set and tool handles.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Kamatog |
| Scientific Name | : | ***Erythrophloeum densiflorum*** **(Elm.) Merr.** |
| Local Name | : | Abbinal, kadir, malena, pali, ngirik-ngirik, salsal (Cagayan); bulilising, kihaulit (Isabela); balayong-aso, kalumatan, kamatog, mallabunao (Camarines); bangati (Albay); malasantol (Masbate); isao (Leyte); balakbakan (Lanao). |
| Family Name | : | Caesalpiniaceae |

## 2. *DISTRIBUTION*

Found in the forests at low and medium altitudes, from Northern Luzon to Mindanao and Palawan, scattered in dipterocarp forests.

## 3. *TREE CHARACTERISTICS*

A large tree attaining a diameter of 150 cm. with a clear, cylindrical or irregular bole of 10 to 15 m. Buttress prominent.

## 4. *WOOD DESCRIPTION*

Sapwood up to 7 cm. thick; light-colored, turning reddish brown upon drying, sometimes distinctly marked off from the heartwood, which is reddish and sometimes merging gradually into the heartwood; grain crossed; texture comparatively fine to moderately coarse; taste and odor not characteristics.

Growth rings irregular, being delimited by concentric bands about 15 times those in groups; diffuse with a tendency to be more numerous in the early part of the growth rings and less numerous in the late wood; come in contact mostly with the vasicentric parenchyma that surrounds the vessels and also with rays on both sides as the diameter of vessels is once or twice the distance between the two adjoining rays; moderately small to moderately large; circular; occasionally oblong; vessel elements 3 to 4.5 per mm; distinct, perforations simple; perforation plates slightly inclined; reddish gummy deposits in most vessels. Wood from Mindanao have slightly larger vessels than those from Luzon. Fibers dense.

Wood parenchyma vasicentric and terminal; the vasicentric parenchyma broad surrounding entirely one to two three vessels, aliform or confluent, in a good many instances connecting neighboring vessels and appearing to the naked eye as wavy or oblique lines of soft tissues; the terminal parenchyma occurs a distinct, fine, concentric lines, more or less interrupted.

Rays of two kinds; one to two fine rays between two large ones; but occasionally none at all; large rays moderately narrow to moderately broad; small rays narrow and not distinctly visible to the naked eye; few to moderately few; extremely low to very low.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br><br>* * Volumetric shrinkage | <br>Class II<br><br>Class IV | <br>Moderately high relative density (0.67)<br>Moderately high volumetric shrinkage (15.5%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 72.2 MPa; Compressive strength - 34.9 MPa; Shear strength - 9. 72 MPa; Hardness - 5.37 KN; Toughness - 38.2 Joule/ Specimen) |
| * * Sawing | Class I | Easy to saw |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class II | Good |
| * * Finishing | Class I | Very good |
| * * Natural Durability | Class II | Moderately durable |
| Treatability | No data available | No data available |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For house posts, beams, joists, floors, sheathing, ceilings and furniture and cabinet work of all kinds. Balusters, frames, louvre, knife blocks, and coaster sets.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Kato |
| Scientific Name | : | ***Amoora aherniana* Merr.** |
| Local Name | : | Kato (Bataan); malatumbaga (Bataan, Laguna); malakamote (Quezon). |
| Family Name | : | Meliaceae |

## *2. DISTRIBUTION*

Kato has been reported from Zambales, Bataan, Laguna, Quezon, Camarines Norte, Lanao and Zamboanga in Mindanao.

## *3. TREE CHARACTERISTICS*

A medium sized tree attaining a diameter of 100 centimeters and a stem of 6 to 8 meters to the first branch.

## *4. WOOD DESCRIPTION*

Sapwood is lighter-colored, distinctly marked-off from the reddish brown heartwood; grain is straight or slightly crossed; texture is moderately coarse; hard and heavy. Pores are readily visible to the naked eye, comparatively more of solitary than in radial multiples of 2-3; yellowish white deposits present occluding the vessels in the same samples. Parenchyma is indistinct even with a hand lens. Rays are fine, not visible to the naked eye.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class II<br><br>Class IV | <br>Moderately high relative density (0.647)<br>Moderately high volumetric shrinkage (16.0%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 71.4 MPa; Compressive strength - 36.9 MPa; Shear strength - 8.58 MPa; Hardness - 5.87 KN; Toughness - 34.9 Joule/ Specimen) |
| Sawing | Class II | Moderately difficult to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class II | Good machining property |
| * * Finishing | Class I | Good to very good finishing property |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class III | Very difficult to treat with chemical preservatives |

* * - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

The wood is used for posts, beams, rafters, floorings, door, windows, interior trims, furniture and cabinet work, bridges, wharves and other heavy construction. It is suitable for rotary-cut veneer for plywood and related products, mine and truck bodies.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Lamog |
| Scientific Name | : | ***Planchonia spectabilis* Merr.** |
| Local Name | : | Puragot (Cagayan); matonbaton (Mountain Province); poronot (Ilocos Norte); apalang (Zambales, Bataan); malaputat (Bataan, Rizal); lamog (Laguna, Tayabas, Masbate); malauban, mauban (Laguna, Tayabas); bagobangas (Tayabas); malaputat (Tagalog); batongbatong, boroboro, matonbaton (Albay, Catanduanes); balatuson, balituson (Camiguin); bohokan (P. Bisaya, Masbate); uya-oi (Iloilo); himbabalod (Capiz); amog (Palawan); tagumata (Negros Oriental); tawi (Bohol); sumuandud (Davao). |
| Family Name | : | Lecythidaceae |

## 2. *DISTRIBUTION*

Common in primary forests at low and medium altitudes. Reported from Luzon (Cagayan, Ilocos Norte, Bataan, Rizal, Laguna, Batangas, Tayabas, Camarines and Albay), Masbate, Panay, Negros, Bohol and Mindanao (Davao).

## 3. *TREE CHARACTERISTICS*

A large tree up to 100 cm. or more in diameter. Bole straight, regular, 16 to 20 m. in length, strongly buttressed.

## 4. *WOOD DESCRIPTION*

Sapwood 4 to 8 cm. thick sharply marked off from heartwood, which is russet to dark reddish brown; grain crossed; sometimes curly; texture moderately fine; glossy; no distinct taste or scent; heavy; strong and tough.

Growth rings present, plainly visible to the naked eye, being delimited by relatively dense concentric bands of woody tissues. Vessels isolated and in groups 2 to 3 in multiples, diffuse; come in contact with the rays mostly moderately few; vessel elements hard to distinguish, perforation simple; perforation plates horizontal tyloses occlude the vessels. Fibers dense. Wood parenchyma diffuse, numerous, starting from one ray and extending to the adjacent ray.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density | Class II | Moderately high relative density (0.62) |
| * * Volumetric shrinkage | Class IV | Moderately high volumetric shrinkage (15.4%) |
| * * Mechanical/Strength Properties | Class III | Medium strength (Bending strength - 56.8 MPa; Compressive strength - 17.6 MPa; Shear strength - 8.65 MPa; Hardness - 5.34 KN; Toughness - 26.8 Joule/Specimen) |
| Sawing | No available data | No available data |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class III | Fair machining property |
| * * Finishing | Class I | Very good finishing property |
| * * Natural Durability | Class I | Durable |
| Treatability | No available data | No available data |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For posts, beams, joists, rafters, flooring, sheathing, paneling, furniture and cabinet work, bentwood work, ship framing and vehicle shafts.

## 7. *ILLUSTRATION*

Tangential Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Loktob |
| Scientific Name | : | ***Duabanga moluccana* Blume** |
| Local Name | : | Arek (Cagayan, Pangasinan); bukag, kadig (Cagayan, Ilocos, Mountain Province); loktob (Cagayan, Quezon, Laguna, Mindoro, Albay, Zamboanga); bayrekan (Nueva Vizcaya); malailang-ilang (Nueva Ecija); malapalikpik (Rizal); anaang (Catanduanes); karauan (Camarines); ilo-ilo (Capiz); dahi (Negros Occidental, Misamis, Davao); tikatan (Cotabato); laton (Zamboanga). |
| Family Name | : | Sonneratiaceae |

## 2. *DISTRIBUTION*

It can be found in forests along streams at low and medium altitudes, ascending to 1200 meters. Reported from Cagayan, Isabela, Mountain Province, Ilocos Norte and Sur, Abra, Nueva Vizcaya, Bulacan, Rizal, Bataan, Laguna, Quezon, Palawan, Leyte, Panay, Negros, Zamboanga del Norte, Agusan del Sur, Agusan del Norte, Surigao del Sur, Surigao del Norte, Davao del Norte, Davao Oriental and Lanao del Sur.

## 3. *TREE CHARACTERISTICS*

A large tree attaining a diameter of 90 cm. and a height of 50 meters. Bole regular, usually straight, short, seldom reaching 15 meters. Buttress high to more than 1 m. plank, symmetrical, spreading to 3 m. Branches ascending, few, short, rounded. Bark surface greenish brown with yellowish and purplish tinge, hard, brittle, pimpled with diffusely arranged purplish and black lenticels that are rounded with purplish horizontal slits, flaking and shredding irregularly into thin flakes whose underside is blackish or shiny leaving greenish and yellowish brown scars on the bole; give stain when chopped with bolo, middle bark purplish brown; inner bark pale or dull brown, woody with fine fibers, exuding watery sap sparingly.

## 4. *WOOD DESCRIPTION*

Sapwood 6 to 8 cm. thick, not sharply marked off from the heartwood, which is light reddish brown; grain crossed; texture coarse; glossy when cut in tangential section; no distict taste or odor. Fibers loose. Occasional tyloses present.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class I<br><br>Class III | <br>Low relative density (0.341)<br>Medium volumetric shrinkage (11.1%) |
| Mechanical/Strength Properties | Class IV | Moderately low strength (Bending strength - 43.0 MPa; Compressive strength - 19.6 MPa; Shear strength - 5.74 MPa; Hardness - 3.98 KN; Toughness - 21.6 Joule/ Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class I | Easy to dry |
| Machining | Class II | Good machining property |
| Finishing | Class II | Fair finishing property |
| Natural Durability | Class V | Perishable |
| Treatability | Class I | Easy to treat with chemical preservatives |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For floaters, for rafting heavy logs, fishnet floats, dugout canoes and light and temporary construction. It is recommended for core veneer for plywood.

## 7. *ILLUSTRATION*

Partly Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Magabuyo |
| Scientific Name | : | ***Celtis luzonica* Warb.** |
| Local Name | : | Magabuyo (Bikol, P. Bisaya) |
| Family Name | : | Ulmaceae |

## *2. DISTRIBUTION*

Widely distributed from Northern Luzon to Mindanao in thickets and medium altitudes.

## *3. TREE CHARACTERISTICS*

Large tree; height to 25 m, DBH to 60 cm. or more; bole long, cylindrical, erect, at times bent or crooked, tapering; branches rounded, stout; branchlet slender, somewhat twisted complemented with somewhat oval or rounded, dense crown; bark surface grayish black, pimpled with conspicuously minute, rounded, black lenticels crowded over bole surface; middle bark green; inner bark yellow brown, streaked with brownish black, dot like longitudinal bands; buttresses high, plank or boars type, spreading to 6 m; leaves simple, alternate, entire, shiny above, dull green below, tri nerved.

## *4. WOOD DESCRIPTION*

Wood is straw colored or pale white; grain crossed or wavy; texture is moderately fine to moderately coarse; moderately heavy and moderately hard. Pores are barely to readily visible to the naked eye, solitary and in radial multiples of 2-5 of less frequent occurrence; with occasional whitish deposits in some pores. Parenchyma is not visible to the naked eye, aliform and confluent. Rays are indistinct to the naked eye.

## 5. *TECHNOLOGICAL PROPERTIES*

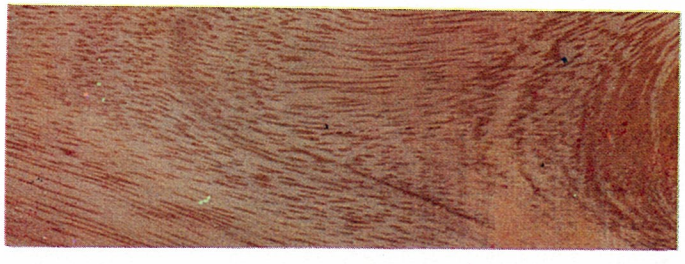
| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class IV<br><br>Class II | <br>Moderately low relative density (0.488)<br>Moderately low volumetric shrinkage (8.9%) |
| Mechanical/Strength Properties | Class III | Mediumh strength (Bending strength - 55.7 MPa; Compressive strength - 25.2 MPa; Shear strength - 8.70 MPa; Hardness - 3.67 KN; Toughness - 40.8 Joule/ Specimen) |
| Sawing | Class II | Moderate to saw |
| Drying | Class III | Moderately difficult to dry |
| Machining | Class III | Fair |
| Finishing | Class I | Good |
| Natural Durability | Class IV | Non-durable |
| Treatability | Class I | Easy to treat |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

Suitable for poles and piles, pulpwood, house frames, boxes and crates, rackets, bowling pins and musical instruments.

## 7. *ILLUSTRATION*



Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Malak-malak |
| Scientific Name | : | ***Palaquium philippense*** **(Perr.) C.B. Rob.** |
| Local Name | : | Arako (Cagayan); afakopaka (Pangasinan); tagogong (Zambales); malak-malak (Bataan, Laguna); baniti (Bataan); alakaak (Pampanga, Bulacan, Rizal, Tayabas, Laguna, Batangas, Mindoro); malasaputi (Pampanga); dulitan (Laguna, Quezon); takloban, palak-palak (Pangasinan, Zambales, Nueva Ecija, Tarlac, Pampanga, Bulacan, Camarines); gendang (Catanduanes). |
| Family Name | : | Sapotaceae |

## *2. DISTRIBUTION*

Reported in Cagayan, Isabela, Aurora, Palawan, Bicol, Mindoro, Panay, Negros, Zamboanga del Norte, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Davao del Norte and Lanao del Sur. Common in primary forests at low and medium altitudes.

## *3. TREE CHARACTERISTICS*

Attains a diameter of 120 cm. Bole cylindrical, straight, 10 to 12 m. long; buttress small.

## *4. WOOD DESCRIPTION*

Sapwood 2 to 4 cm. thick, not so sharply distinguished from the heartwood, which is reddish brown; grain straight; texture moderately fine; fairly glossy. Tyloses present in some vessels. Fibers comparatively dense; the uniseriate rays largely composed of upright cells.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class IV<br><br>Class II | <br>Moderately low relative density (0.407)<br>Moderately low volumetric shrinkage (9.9%) |
| Mechanical/Strength Properties | Class III | Mediumh strength (Bending strength - 58.9 MPa; Compressive strength - 27.6 MPa; Shear strength - 8.31 MPa; Hardness - 4.14 KN; Toughness - 30.7 Joule/ Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class III | Difficult to dry |
| Machining | Class III | Fair |
| Finishing | Class I | Good to very good |
| Natural Durability | Class IV | Non-durable |
| Treatability | Class III | Very difficult to treat |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

Suitable for rotary cut veneer for plywood and related products, house framing, furniture and cabinets, wallings, flooring, louvre doors, balusters, moulding, picture frames, tool handles, pencil holders, boxes and crates.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Malakauayan |
| Scientific Name | : | ***Podocarpus rumphii* Blume** |
| Local Name | : | Malakauayan |
| Family Name | : | Podocarpaceae |

## *2. DISTRIBUTION*

Reported from Luzon (Ilocos Sur, Bataan, Pampanga) and Mindoro in forests at medium altitudes.

## *3. TREE CHARACTERISTICS*

Medium to large tree.

## *4. WOOD DESCRIPTION*

Wood is yellowish-pinkish buff with brownish streaks; grain is straight; texture is fine; moderately light to moderately heavy and moderately hard. Growth rings are variable, sometimes indistinct or fairly distinct darker-colored latewood.

Parenchyma is diffuse visible only with a hand lens and usually filled with dark contents. Rays are not visible to the naked eye. Resin canals are absent.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br><br>* * Volumetric shrinkage | <br>Class IV<br><br>Class III | <br>Moderately low relative density (0.50)<br>Medium volumetric shrinkage (12.10%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 71.0 MPa; Compressive strength - 20.0 MPa; Shear strength - 8.86 MPa; Hardness - 3.84 KN; Toughness - 18.4 Joule/ Specimen) |
| * * Sawing | Class II | Moderate to saw |
| * * Drying | Class II | Moderately difficult to dry |
| * * Machining | Class II | Good |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class V | Perishable |
| * * Treatability | Class I | Easy to treat |

* * - Data obtained from previous studies on LUS of FPRDI

## 6. *END-USES*

The wood is used for high grade construction, carving and household utensils. Walls, room dividers, louvres, picture frames, toys, coaster set, bowls, trays, trophy, chess pices, and boards.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Malasantol |
| Scientific Name | : | ***Sandoricum vidallii* Merr.** |
| Local Name | : | Malasantol |
| Family Name | : | Meliaceae |

## *2. DISTRIBUTION*

It is widely distributed throughout the Philippine islands at low and medium altitudes.

## *3. TREE CHARACTERISTICS*

It is a medium sized tree with wood very similar to santol ***(S. koetjape)***

## *4. WOOD DESCRIPTION*

Sapwood is lighter-colored and not sharply marked off from the heartwood, which is light brown to pinkish brown; grain is straight to slightly crossed; texture is moderately fine. Pores are slightly visible to the naked eye. Parenchyma is visible only with a hand lens as indistinct sheath to the pores, narrow aliform and terminal irregular occurrence. Rays are not visible to the naked eye.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density | Class IV | Moderately low relative density (0.43) |
| * * Volumetric shrinkage | Class I | Low volumetric shrinkage (4.3%) |
| * * Mechanical/Strength Properties | Class IV | Moderately low strength (Bending strength - 44.5 MPa; Compressive strength - 10.4 MPa; Shear strength - 5.28 MPa; Hardness - 2.20 KN; Toughness - 21.9 Joule/ Specimen) |
| * * Sawing | Class I | Easy to saw |
| * * Drying | Class I | Easy to dry |
| * * Machining | Class III | Fair |
| Finishing | No available data | No available data |
| * * Natural Durability | Class IV | Non-durable |
| * * Treatability | Class III | Very difficult to treat |

* * - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

The wood is often used as a substitute material in wood carving, household implements, butchers block and for general construction. It is occasionally cut for timber and sold as "red miscellaneous" lumber.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Malugai |
| Scientific Name | : | ***Pometia pinnata* Forst.** |
| Local Name | : | Chai (Batanes); laui, madalo, madlau (Cagayan); malakobe (Isabela); suket (Ilocos); doko (La Union); kirone, malatagum (Bulacan); aklan (Tagalog); bangked (Bataan, Batangas); kayani (Quezon, Laguna); malugai (Laguna, Quezon, Albay, Mindoro, Cebu); bontog, malaguas, kuglik, tugaui, tigaui, bayod, kayaua (Bicol); balolanga, kia-kia (Leyte, Masbate, Samar, Cebu, Bohol); tipanga agupanga (Iloilo); bankalan (Surigao); alipanga, tipanga (Palawan, Zamboanga); bantagali (Agusan); gasuli (Lanao). |
| Family Name | : | Sapindaceae |

## *2. DISTRIBUTION*

Malugai is obtainable in fair quantities and has been reported to abound in Cagayan, Isabela, Quirino, Aurora, Palawan, Zamboanga del Sur, Agusan del Norte, Agusan del Sur, Cotabato, Davao del Norte, Laguna and Zamboanga del Norte. Can be found in old growth and secondary forests at low and medium altitudes often near creeks and waterways.

## *3. TREE CHARACTERISTICS*

A tree attaining a diameter up to 60 to 100 cm. Trunk is 18 to 25 meters in length, cylindrical and straight. Buttress conspicuous; bole long, somewhat fluted, tapering, erect, at times crooked or bent; branches stout, rounded, the branchlet quite slender, somewhat twisted and rounded; crown wide spreading, irregular in shape; dense; bark surface yellow-brown or "khaki" brown, flaking and sloughing into more or less circular sheets, leaving deep, crowded, scary marks on the bole; buttresses high, symmetrical, plank type spreading to 6 m; middle bark tinged with green, thin, inner reddish-brown with narrow, fine, concentric bands or streaks of light and dark colors.

## *4. WOOD DESCRIPTION*

Sapwood is lighter in color but not sharply defined from the heartwood which is light red to dark red brown; grain straight or sometimes interlocked; texture moderately fine to moderately coarse; hard and heavy. Growth rings marked by fine terminal parenchyma; pores barely or readily visible to the naked eye, solitary and in radial multiples up to 4 or more; solitary pores round to oval in shape; white yellow brown deposits present. Parenchyma of indistinct sheath to the pores, visible to the naked eye or cross-section, with dots or streaks of white deposits; rather conspicuous on radial surface due to color.

## 5. *TECHNOLOGICAL PROPERTIES*

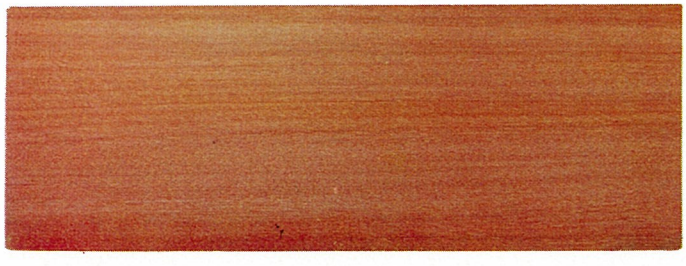
| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class II<br><br>Class V | <br>Moderately high relative density (0.581)<br>High volumetric shrinkage (16.1%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 58.1 MPa; Compressive strength - 30.8 MPa; Shear strength - 9.16 MPa; Hardness - 5.42 KN; Toughness - 43.6 Joule/ Specimen) |
| Sawing | Class II | Moderate to saw |
| Drying | Class III | Difficult to dry |
| Machining | Class I | Very good |
| Finishing | Class I | Good to very good |
| Natural Durability | Class II | Moderately durable |
| Treatability | Class III | Very difficult to treat |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For beams, girders, rafters, chords and purlins, flooring, sheathing, bentwood articles, boat and car framing, mast and spars, tool handles. It is also ideal for furniture and cabinet making, baseball bats, rim of tennis racket, pole and golf clubs, airplane construction (substitute for white ash), bobbins, spindles and shuttles, cooperage, tripods, T-squares, shipbuilding (stern and hull of ships and small launch), frames, spokes and truck bodies, house framing.

## 7. *ILLUSTRATION*



Radial Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Nato |
| Scientific Name | : | ***Palaquium luzoniense* (F.-Vill.) Vid.** |
| Local Name | : | Arako (Cagayan); niket (Ilocos Norte); gatasan (Ilocos Sur); tarakan (Pangasinan); pateleo (Nueva Ecija); palak-palak (Bataan); nato (Bataan, Quezon, Laguna, Mindoro); tingkayad (Rizal). |
| Family Name | : | Sapotaceae |

## *2. DISTRIBUTION*

Nato is common in primary forests at low and medium altitudes. It has been reported in Cagayan, Abra, Mt. Province, Isabela, Quirino, Aurora, Ilocos Sur and Norte, Pangasinan, Zambales, Rizal, Bataan, Laguna and Quezon, Mindoro, Masbate, Palawan, Zamboanga del Sur, Agusan del Sur, Surigao del Sur, Davao del Norte, Davao Oriental, and Lanao del Sur.

## *3. TREE CHARACTERISTICS*

It reaches a diameter of 120 cm generally with a straight regular trunk of 10 to 12 meters long.

## *4. 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; occasionally wavy; texture comparatively fine; fairly glossy; without taste or smell. Fibers comparatively dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class IV<br><br>Class II | <br>Moderately low relative density (0.482)<br>Moderately low volumetric shrinkage (10.2%) |
| Mechanical/Strength Properties | Class III | Mediumh strength (Bending strength - 58.2 MPa; Compressive strength - 26.7 MPa; Shear strength - 7.70 MPa; Hardness - 3.53 KN; Toughness - 20.4 Joule/ Specimen) |
| Sawing | Class II | Moderately difficult to saw |
| Drying | Class II | Moderately difficult to dry |
| Machining | Class I | Very good |
| Finishing | Class I | Good to very good |
| Natural Durability | Class III | Slíghtly durable |
| Treatability | Class II | Moderately difficult to treat |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

All uses of red lauan and for interior case of cigar boxes; rotary cut veneer for plywood and related products; house framing; exterior siding and flooring; furniture and cabinet work; for sides and neck of guitars. Louvre doors, balusters, stairs, railings, solid and panel doors, moulding, bowls, candy and fruit trays, chopping boards.

## 7. *ILLUSTRATION*

Radial Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Pahutan |
| Scientific Name | : | ***Mangifera altissima* Blco.** |
| Local Names | : | Apan,bunutan (Cagayan, Negros); pang-manggaen(Ilocos Sur, Abra); pahong damulag (Tarlac); paho (Nueva Ecija, Zambales, Batman, Camarines Sur, Mindoro, Sibuyan, Leyte); malaputat, pahutan (Bulacan, Rizal, Bataan, Tayabas, Mindoro); panghutan, malamangga, kaburoan (Samar); bitanghol (Capiz); malapaho (Sibuyan, Negros Occidental); mangian (Lanao); manggapole (Zamboanga) |
| Family Name | : | Anacardiaceae |

## *2. DISTRIBUTION*

Widely distributed in Cagayan, Isabela, Quirino, Aurora, Palawan, Zamboanga, Agusan del Sur, Surigao del Sur, Davao del Norte, Lanao del Sur, Mindoro and Quezon.

## *3. TREE CHARACTERISTICS*

Generally straight and tall, attaining a diameter up to 90 cm. Trunk cylindrical, 15 to 20 m. long. Buttress small.

## *4. WOOD DESCRIPTION*

Sapwood very thick 8 to 10 cm; light colored with a yellowish tinge, distinctly marked off from the heartwood, which is dark brown with a narrow, almost black longitudinal bands; grain generally straight, occasionally wavy or curly, texture moderately fine; no taste or odor. Tyloses occlude the vessels. Fibers dense. Wood parenchyma vasicentric and terminal; the vasicentric parenchyma narrow, completely surrounding each vessel, aliform,often confluent crossing 1 to 3 rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class III | Medium relative density (0.55) |
| * * Volumetric shrinkage | Class II | Moderately low volumetric shrinkage (10.4%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 64.8 MPa; Compressive strength - 20.9 MPa; Shear strength - 9.37 MPa; Hardness - 4.4 KN; Toughness - 33.7 Joule/ Specimen) |
| * * Sawing | Class I | Easy to saw |
| * * Drying | Class II | Moderately difficult |
| * * Machining | Class II | Good |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class III | Slightly durable |
| * * Treatability | Class III | Very difficult to treat |

** - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For general construction for interior work, sheathing, ceiling, door panels, flooring, furniture and cabinet work, veneer and plywood.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Rarang |
| Scientific Name | : | ***Erythrina subumbrans* (Hassk.) Merr.** |
| Local Names | : | Rarang |
| Family Name | : | Leguminosae |

## *2. DISTRIBUTION AND SUPPLY*

A tree of primary and second growth forests occurring usually on level land at low and medium altitudes. In Mt. Banahaw, Quezon, Cagayan, Aurora, Palawan, Agusan del Sur, Davao del Norte, Davao Oriental, and Lanao del Sur, growing abundantly in old coconut plantation regenerating into forest.

## *3. TREE CHARACTERISTICS*

Large tree; height to 30 m. or more, DBH to 80 cm; bole cylindrical, erect, tapering, very long; branches slender, complemented with small, compact more or less rounded crown; bark surface yellowish to blackish spines, distinctly protruding from rounded and swollen base, arranged in almost longitudinal rows; lenticellate; wide, boat-shaped fissures at times developing from rows or columns of abscised spines; buttresses low, symmetrical, rounded, branched and spreading to 3 m.

## *4. WOOD DESCRIPTION*

Sapwood is buff, not clearly defined from the color of the heartwood; grain is wavy or slightly crossed; texture is coarse; soft and very light. Pores are distinct to the naked eye, solitary and in radial multiples of 2. Parenchyma is distinct to the naked eye, in broad and slightly wavy bands; ripple marks are observed in longitudinal surfaces. Rays are broad distinct to the naked eye. Fibers are loose, visible with a hand lens.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class V<br><br>Class I | <br>Low relative density (0.236)<br>Low volumetric shrinkage (5.7%) |
| Mechanical/Strength Properties | Class V | Low strength (Bending strength - 24.6 MPa; Compressive strength - 11.9 MPa; Shear strength - 3.65 MPa; Hardness - 1.12 KN; Toughness - 11.5 Joule/Specimen) |
| Sawing | Class I | Easy to saw |
| Drying | Class II | Moderately difficult to dry |
| Machining | Class II | Good machining property |
| Finishing | No available data | No available data |
| Natural Durability | Class III | Slightly durable |
| Treatability | Class I | Easy to treat |

Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For fishnet floats; helmets; insulator boards; rotary cut veneer; for chopsticks, popsicle sticks, medical sticks, ice cream spoons, toothpicks, matches; pulpwood and boxes and crates.

## 7. *ILLUSTRATION*

Radial Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Sakat |
| Scientific Name | : | ***Terminalia nitens* Presl.** |
| Local Names | : | Kalampa, kalumpe (Cagayan); anagep, kalautit (Ilocos Norte, Ilocos Sur); porngued (Nueva Vizcaya); aritongtong (Nueva Ecija); arimbokal, arinbukal, saket (Pangasinan, Tarlac; sakat (Tarlac, Bulacan, Cavite, Laguna, Rizal, Batangas); hakut, sakut, sulu-sulu- (Zambales); kalumpit, malabunga (Bulacan); dalinsi (Tayabas); malagabi (Mindoro); dalinson (Camarines) samando, tagit (Palawan); magatalisai, magtalisai, manggatalisai, matalisai (Masbate,Sorsogon, Negros Occidental, Agusan, Cotabato, Zamboanga). |
| Family Name | : | Combretaceae |

## 2. *DISTRIBUTION*

From Northern Luzon to Mindanao and Palawan. Common in the more open portions of the dipterocarp forests at low and medium altitudes.

## 3. *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.

## 4. *WOOD DESCRIPTION*

Sapwood 5 cm. or more not sharply marked-off from the heartwood, which ranges from light yellow to yellowish brown or dark yellowish brown when exposed; grain crossed; texture moderately fine; glossy taste and odor not characteristic; comparatively heavy to heavy. Growth rings fairly distinct, marked by alternating belts and in groups; diffuse with a tendency for the early wood to be more porous than the late wood; perforation plates horizontal and slightly inclined; most vessels contain tyloses. Fibers dense.

Wood parenchyma vasicentric and diffuse; the vasicentric parenchyma narrow, aliform, sometimes confluent the latter irregular in occurrence and interrupted; the diffuse parenchyma conspicuous, maybe in very fine tangential lines, extending from ray to ray or maybe isolated cells containing aggregate white crystals.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties | | |
| * * Relative density | Class II | Moderately high relative density (0.66) |
| * * Volumetric shrinkage | Class III | Medium volumetric shrinkage (11.4%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 71.4 MPa; Compressive strength - 18.3 MPa; Hardness - 4.88 KN; Toughness - 28.5 Joule/ Specimen) |
| * * Sawing | Class I | Easy |
| * * Drying | Class I | Easy |
| * * Machining | Class II | Good |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class III | Slightly durable |
| * * Treatability | Class I | Easy to treat |

** - Data obtained from previous studies on LUS of FPRDI.

## 6. *END-USES*

For general construction, furniture and cabinets. Balusters, louvre doors, frames, flooring, knife blocks, paper weights, bowls, cups, trays, pencil holders, boxes, crating, materials and some handles of agricultural implements.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Talisai gubat |
| Scientific Name | : | ***Terminalia foetidissima* Griff.** |
| Local Names | : | Talisai-gubat |
| Family Name | : | Combretaceae |

## *2. DISTRIBUTION*

Distributed in primary forests at low and medium altitudes in limited quantities in Cagayan, Isabela, Bataan, Quezon, Laguna, Palawan, Camarines, Sorsogon, Mindoro, Panay, Surigao, Zamboanga, Davao and Lanao.

## *3. TREE CHARACTERISTICS*

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

## *4. WOOD DESCRIPTION*

Sapwood yellowish; not sharply marked off from the heartwood, which ranges from yellowish brown to dark yellowish brown or dark reddish brown; grain crossed; texture moderately coarse; fairly glossy. Growth rings indistinct; visible to the unaided eye as narrow belts of relatively dense wood with few vessels. Fibers moderately dense. Rays of two kinds, uniseriate and multiseriate, 1 to 4 cells narrow; not distinctly visible to the naked eye; moderately numerous; uniseriate rays built largely of upright cells; multiseriate rays almost homogenous; apical cells practically the same in height as the procumbent cells.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br><br>* * Volumetric shrinkage | <br>Class III<br><br>Class II | <br>Medium relative density (0.547)<br>Moderately low volumetric shrinkage (10.1%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 78.3 MPa; Compressive strength - 36.1 MPa; Shear strength - 8.50 MPa; Hardness - 4.75 KN; Toughness - 48.7 Joule/ Specimen) |
| Sawing | Class I | Easy to saw |
| * * Drying | Class II | Moderately difficult to dry |
| Machining | Class II | Good |
| Finishing | Class I | Good to very good |
| Natural Durability | Class III | Slightly durable |
| Treatability | Class I | Easy to treat |

** - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

For furniture and cabinet making, wallings, poles and piles, rotary-cut veneer, musical instruments, louvre doors, balusters, mouldings, tool handles, window and door frames, bowls, pencil holders, newspaper and magazine stands.

## 7. *ILLUSTRATION*

Tangential Cut

## *1. NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Ulaian |
| Scientific Name | : | ***Lithocarpus llanosii* (A.DC.) Rehd.** |
| Local Names | : | Ulaian (Cagayan); manaring (Isabela); masaring (Nueva Vizcaya); uhip (Zambales); barusang (Bulacan); bayukan, kakana (Rizal); katabang (Bataan and Laguna); lisikan, olayan (Laguna); babaysakan, basakan (Tayabas); tilakod (Albay); umayam (Surigao); ulan (Misamis); uayan (Agusan). |
| Family Name | : | Fagaceae |

## *2. DISTRIBUTION*

Of wide distribution in forests at medium altitudes from Luzon to Mindanao. In the provinces of Cagayan, Isabela, Aurora, Palawan, Zamboanga del Norte, Zamboanga del Sur, Agusan del Sur, Surigao del Sur, Davao del Norte, Davao Oriental and Lanao del Sur.

## *3. TREE CHARACTERISTICS*

A large tree growing to a height of 20 cm. or more and attaining DBH of 50 cm. or over. Bole slightly bent and twisted, slightly fluted. Buttress low insconspicuous. Branches steeply ascending. Crown far spreading open. Bark grayish-brown, smooth with fine, inconspicuous; inner bark reddish-brown, immediately turning dark brown on exposure, brittle. Leaves alternate, oblong-oval, 11-16 cm. long. 5.5-7 cm. wide apex acuminate, base rounded, textures leathery, both leaf surface glabrous, the underneath with ochre gray bloom or glaucous.

## *4. WOOD DESCRIPTION*

Sapwood not distinct from the heartwood, which is fawn colored, grain slightly crossed; texture moderately coarse owing to the presence of large rays; not glossy taste and odor indistinct; very heavy; hard, strong and somewhat hard to split owing to toughness. Fibers dense.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>Relative density<br><br>Volumetric shrinkage | <br>Class III<br><br>Class V | <br>Medium relative density (0.561)<br>High volumetric shrinkage (18.0%) |
| Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 63.6 MPa; Compressive strength - 34.5 MPa; Shear strength - 9.67 MPa; Hardness - 4.76 KN; Toughness - 34.4 Joule/ Specimen) |
| Sawing | Class III | Hard to saw |
| * * Drying | Class III | Difficult to dry |
| * * Machining | Class II | Good |
| Finishing | No available data | No available data |
| * * Natural Durability | Class II | Moderately durable |
| * * Treatability | Class III | Very difficult to treat |

** - Data obtained from previous studies on LUS of FPRDI.
Data obtained from Phase I of ITTO Project PD 47/88 Rev. 3(1).

## 6. *END-USES*

Suitable for sliced veneer, pulpwood and picker sticks. For general house construction; for furniture and cabinets.

## 7. *ILLUSTRATION*

Radial Cut

## 1. *NAMES AND FAMILY*

| | | |
|---|---|---|
| Official Common Name | : | Vidal's lanutan |
| Scientific Name | : | ***Hibiscus campylosiphon* Turcz. *var. glabrescens* (Warb. ex Perk.) Borss.** |
| Local Names | : | Losoban, nusuban, tokulao-blanco (Ilocos Norte, Ilocos Sur, Abra, Mountain Province); bitnong (Mountain Province); lanutan (Northern Luzon to Bataan); barioan (Pangasinan, Nueva Ecija); binatalan (Palawan). |
| Family Name | : | Malvaceae |

## 2. *DISTRIBUTION*

Widely distributed from Northern to Southern Luzon, southward to Mindoro, and Palawan. Common in forested ravines and in secondary forests at low and medium altitudes ascending to 1,200 m.

## 3. *TREE CHARACTERISTICS*

A small tree up to 60 cm. in diameter. Trunk generally crooked and short.

## 4. *WOOD DESCRIPTION*

Sapwood narrow (1.5 to 5 cm. thick), light colored sharply marked off from heartwood, which is brownish drab or purplish, including intermediate colors; grain crossed; texture moderately fine; fairly glossy; no taste or odor; comparatively light. Growth rings distinct to the naked eye; arise from dark bands formed during late growth, where the vessels are smaller and the woody tissue denser in contrast with the relatively soft, more porous bands of the early woods. Vessels mostly in groups of 2 to 3 in chains, evenly distributed; come in contact with the rays mostly on two sides; perforation plates inclined or horizontal; some vessels have iridescent tyloses. Fibers dense. Ripple marks present, owing to the storied arrangement of the rays.

## 5. *TECHNOLOGICAL PROPERTIES*

| Technological Properties | Property Classification | Description/Remarks |
|---|---|---|
| Physical Properties<br>* * Relative density<br><br>* * Volumetric shrinkage | <br>Class II<br><br>Class II | <br>Moderately high relative density (0.69)<br>Moderately low volumetric shrinkage (9.70%) |
| * * Mechanical/Strength Properties | Class II | Moderately high strength (Bending strength - 65.9 MPa; Compressive strength - 21.2 MPa; Shear strength - 12.2 MPa; Hardness - 3.8 KN; Toughness - 28.5 Joule/ Specimen) |
| Sawing | No available data | No available data |
| * * Drying | Class I | Easy |
| * * Machining | Class III | Fair |
| * * Finishing | Class II | Fair |
| * * Natural Durability | Class II | Moderately durable |
| Treatability | No available data | No available data |

** - Data obtained from previous studies of FPRDI.

## 6. *END-USES*

For posts, beams, joists and rafters of small houses; tool handles, vehicle shafts, singletrees, gunstocks, backs and sides of musical instruments (guitars, mandolins, etc.), furniture and cabinet works.

## 7. *ILLUSTRATION*

Tangential Cut