

## **Inventory of Low Grade Wood in East Java, Indonesia**

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### **Abstract**

Excessive exploitation of natural forests in the past and the high demand for high quality wood resulting it supplied fewer, so they were expensive and less affordable by most people. Society would increasingly consider the types of low-quality wood with a more economical price and adequate strength and durability. The purposes of this study were to know the kinds of low-grade timber that was used in East Java and the basic properties of low-grade wood especially strong and durable of timber class. Inventory the types of low-grade woods was done in district Lumajang and Malang, East Java. The surveys were conducted on timber sales centers randomly and represent the two locations. The data were analyzed in the form of the test results of wood density, bending strength, and firmness press and durability of wood in order to obtain strong and durable timber class. Based on survey results to the field and literature study in 45 low-grade timber species in East Java include wood density between 0.21 to 1.02, durability wood is a class II-V, and strength grade range is class I-V. Results of surveys indicate that there are 8 types of low-grade wood favorite of East Java. There is Mahogany, Acacia, Pine, Agathis, Mindi, Gmelina, Sengon, and Coconut. Besides, the types of bamboo that grows in East Java is also good potential to be utilized.

**Key words:** durability, density, strength grade, East Java.

### **Introduction**

Areas of forest in Indonesia, approximately 144 million hectares were covered with no less than 4000 kinds of wood. But only a small fraction that was well known in the market were wood-dipterocarp species such as Meranti, Keruing and other wood types (Teak, Agathis, Bangkirai and Merbau). Excessive exploitation of natural forests in the past and the high demand for high quality wood resulting it supplied fewer, so they were expensive and less affordable by most people.

The present and the future of society would increasingly consider the types of wood with a more economical price and adequate strength and durability. This could be realized with the use of timber species with enhanced low-grade quality, meaning the kinds of low-grade wood as a variable to get a relatively cheap price of timber combined with the technology improving the quality of wood as a variable to get the value of the strength and durability of wood better.

In East Java was expected quite a lot of the kinds of low-grade wood which utilized potential through the implementation of management systems and wood technology. Low-grade wood in question was the kind of mix that were previously little known or of a kind already known but in small amounts like Borneo and type of fast-growing timber species produced by industrial timber plantations or forest people.

The use of low-grade wood as building materials still need to be studied in depth mainly deals with the nature of the strength and durability of wood so it can be done sorting timber for proper use. Also an important factor in the use of low-grade wood is to consider about service life given the wooden buildings can suffer damage or deterioration of quality due to attack wood destroying organisms such as termites, beetles, and fungus.

Low-grade wood from timber species certainly have a diverse range of strength and durability of wood and for different. These conditions will be difficult for users to do even more information on sorting wood basic properties of the wood is still very limited. Based on that idea, we needed research and development of low-grade wood for building materials.

The purpose of this study are to know the kinds of low-grade timber that is used in East Java and to know the basic properties of low-grade wood especially strong and durable timber class.

## **Materials and methods**

### ***Field survey***

Activity field survey aims to inventory the types of low grade wood in the area of East Java (Lumajang and Malang) and laboratory test sampling. The survey was conducted on timber sales centers randomly selected and represent the two locations.

### ***Laboratory testing***

Laboratory testing aims to determine the durability of low-grade wood. Mechanical testing of each variable is as follows:

#### ***Wood density***

Wood density obtained by weighing and measuring the volume of test sample. To find the volume of test sample used gravimetric method by dipping the test sample that has been coated with paraffin to the water, where the amount of water displaced is the volume of wood itself. Once the measured volume, test sample in an oven with a temperature of  $103\pm 2^{\circ}\text{C}$  until constant weight.

#### ***Bending and compressive strength***

Bending strength testing using a defect-free wood samples measured  $(5\times 5\times 76)\text{ cm}^3$  (methods of testing small clear specimens of timber) ASTM D 143-52. Meanwhile, compressive strength testing parallel to grain of maximum stress ( $\text{kg}/\text{cm}^2$ ) is determined by using a test sample  $(5\times 5\times 5)\text{ cm}^3$ . Tests carried out with firmness wood using wood strength testing sorting UTM. The test results are used as a measure of wood strength.

#### ***Durability***

Durability of wood determined by testing the durability of wood against subterranean termites *C. curvignathus* tested in laboratory using a sample size of  $(2\times 1.5\times 1.5)\text{ cm}^3$  based on Sornuwat (1996). Reducing the volume of wood from termite attack after three weeks of feeding is used as a measure of durability of wood.

## **Results and discussion**

### ***Diversity of types of wood***

The results of a survey on the timber trade center in East Java (Lumajang and Malang) showed that low-grade timber species that are relatively heavily traded in East Java about 45 (forty five) species with the endemic area in Bojonegoro, Bondowoso, Blitar, Bangil, Besuki, Banyuwangi,

Jember, Kediri, Lumajang, Madiun, Magetan, Malang, Mojokerto, Ngawi, Nganjuk, Pasuruan, Panarukan, Ponorogo, Probolinggo, Sumenep, and Surabaya. Low-grade timber species and their distribution in East Java presented in Table 1.

Table 1 Kinds of low-grade woods and their distribution in East Java

No	Name of wood	Scientific Names	Distribution Area
1	Afrika	<i>Maeopsis eminii</i>	Kosmopolitan
2	Akasia	<i>Acacia mangium</i> Willd.	Kosmopolitan
3	Bambu	<i>Bamboosa</i> sp.	Kosmopolitan
4	Bayur	<i>Pterospermum javanicum</i> Jungh.	Bjn, Bnd, Bsk, Jbr, Kdr, Njk
5	Benuang laki	<i>Duabanga moluccana</i> Bl.	Jbr, Lmj, Ml, Prb
6	Bintangur	<i>Calophyllum soulattri</i> Burm.	Srb, Snp
7	Bungur	<i>Lagerstroemia calyculata</i> Kurz.	Kosmopolitan
8	Cemara	<i>Casuarina equisetifolia</i> L.	Kdr, Lmj, Mdn, Pas
9	Cempaga	<i>Dysoxylum densiflorum</i> Miq.	Bnd, Bwi, Jbr, Pnk, Snp
10	Cengal	<i>Hopea sangal</i> Korth.	Blt, Bwi, Lmj, Ml
11	Dahu	<i>Dracontomelon mangiferum</i> Bl.	Jbr, Kdr, Bjn, Pnk
12	Damar	<i>Agathis alba</i> Foxw.	Kosmopolitan
13	Durian	<i>Durio zibethinus</i> Murr.	Bjn
14	Gelam	<i>Melaleuca leucadendron</i> L.	Png
15	Gmelina	<i>Gmelina arborea</i>	Kosmopolitan
16	Jabon	<i>Artocarpus cadamba</i> Miq.	Bjn, Bsk, Jbr, Srb
17	Kapuk hutan	<i>Ceiba petandra</i> Gaertn.	Kosmopolitan
18	Kelapa	<i>Cocos nucifera</i> L.	Kosmopolitan
19	Kemiri	<i>Aleurites moluccana</i> Wild.	Bjn, Bsk, Jbr, Kdr, Pnk, Srb
20	Kenanga	<i>Cananga odorata</i> Hook.	Bjn, Pnk, Srb
21	Kenari	<i>Canarium vulgare</i> Leenh.	P. Kangean & P. Paleat
22	Keruing	<i>Dipterocarpus</i> sp.	Bnd, Jbr, Lmj, Ml
23	Kesambi	<i>Schleichera oleosa</i> Merr.	Bjn, Kdr, Ngw, Njk, Pnk, Srb
24	Ketapang	<i>Terminalia catappa</i> L.	Pnk
25	Mahang	<i>Macaranga tanaria</i> Muell.	Bjn, Bnd, Jbr
26	Mahoni	<i>Swietinea mahogani</i> Jacq.	Kosmopolitan
27	Medang	<i>Cinnamomum parthenoxylon</i> Meissn.	Bnd, Bsk, Bwi, Jbr, Png
28	Melur	<i>Dacrydium elatum</i> Wall.	Kosmopolitan
29	Menjalin	<i>Xanthophyllum excelsum</i> Miq.	Bjn, Jbr, Kdr
30	Merambung	<i>Vernonia arborea</i> Ham.	Bnd, Bwi
31	Mindi	<i>Melia azedarach</i> L.	Kosmopolitan
32	Nyatoh	<i>Ternstroemia elongata</i> Kds.	Bwi
33	Nyirih	<i>Xylocarpus moluccensis</i> Roem.	Pnk
34	Pasang	<i>Lithocarpus elegans</i> Bl.	Bnd, Bnl, Bwi, Jbr, Mgt, Mjk,
35	Perepat laut	<i>Sommeratia alba</i> J.E.Sm.	Bwi, Pnk
36	Pinus	<i>Pinus merkusii</i> Jungh.	Kosmopolitan
37	Pulai	<i>Alstonia scholaris</i> R.Br.	Bjn, Bnd, Bsk, Jbr, Kdr
38	Puspa	<i>Schima wallhicii</i> Korth.	Mgt
39	Putat	<i>Barringtonia asiatica</i> Kurz.	Ml
40	Rasamala	<i>Altingia excelsa</i> Noronha	Mgt
41	Sampang	<i>Evodia aromatica</i> Bl.	Bnd
42	Sengon	<i>Paraserianthes falcataria</i> Fosberg.	Kosmopolitan
43	Simpur	<i>Dillenia ovata</i> Wall.	Kosmopolitan
44	Suren	<i>Toona sureni</i> Merr.	Bjn, Bnd, Jbr, Kdr, Pnk, Prb
45	Trembesi	<i>Samanea saman</i> Merr.	Kosmopolitan

Agathis, Mahogany, Pine, and Sengon are four types of low-grade wood most widely distributed in East Java other than teak wood which is a durable high-class. This is possible because the four species are cultivated in bulk timber on government-owned production forests, private, and people. Besides the four types of low-grade timber potential above, there Gmelina, Mindi, Coconut and Bamboo which are relatively high abundance in East Java.

Lumajang and Malang is known as a center of timber trade in East Java had sufficient supply of timber from forests in Lumajang and Malang itself or from another area of forest. Area of production forests and community forests in both locations were significant contribution in supplying the amount of wood in East Java. Especially in a community forest in the two locations was 13% of the total forest in East Java. Forest Service data from East Java in 2000 mentioned that the forest is the largest in Malang in East Java which was 266,624 hectares. Overall, the data area of production forests and community forests in Malang, Lumajang, and East Java.

Inventories are low-grade wood potential to meet the needs of society in general adequate and public interest in using low grade wood is relatively high potential. This is based on facts on the ground that the time required from arrival until the timber sold just one month in each center for trade.

***Low grade wood nature East Java***

There are nine species of woods from 45 species of woods were interested to be discussed base on their demand in the market, namely Mahogany, Acacia, Pine, Agathis, Mindi, Gmelina, Sengon, Coconut, and Bamboo. Table 2 showed the stratification of wood quality based on the wood density, durability and strength grade of nine of low-grade woods species from East Java.

Table 2 Natural characteristic of nine low-grade wood in East Java

No	Wood Names	Wood Density	Wood Durability	Strength Grade
1	Mahogany	0,64	III	II-III
2	Acasia	0,61	III	II-III
3	Pine	0,59	IV	III
4	Mindi	0,53	IV-V	II-III
5	Agathis	0,48	IV	III
6	Gmelina	0,33	IV	IV
7	Sengon	0,33	IV-V	IV-V
8	Coconut	-	-	-
9	Bamboo	-	-	-

Of the nine species, the mahogany has a durable and powerful class, much better than the eight other species. While Sengon is a type of wood that has a durable and strong class lowest among low-grade timber potential. Yet there are opportunities to improve the quality durability and strength of the wood so that the potential of wood for use as building materials more widely will be even greater.

**Conclusions**

Based on survey results to the field and literature study in 45 low-grade timber species in East Java include wood density between 0.21 to 1.02, durability wood is a class II-V, and strength grade range is class I-V. Results of surveys indicate that there are 8 types of low-grade wood favorite of East Java. There is Mahogany, Acacia, Pine, Agathis, Mindi, Gmelina, Sengon, and Coconut. Besides, the types of bamboo that grows in East Java is also good potential to be utilized.

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