

# PLANTED TIMBER- PROPERTIES, TECHNOLOGY AND OPPORTUNITIES

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## ▶ FOREST PLANTATION PROGRAMME IN THE EARLY 80'S

Forest plantations have long been recognized as an essential part of the strategic development plan for the suitable management of forest resources in Malaysia. This strategy dates back to the beginning of the century when efforts were made to test out both indigenous and exotic species in the country. In early 80's, the Forestry Department of Peninsular Malaysia (JPSM) had embarked on planting general utility timbers under the 'Compensatory Plantation Project' covering 188,200 ha based on a 15-year rotation. Due to difficulty in procuring planting material, the majority of the areas were planted with mainly *Acacia mangium*. Unfortunately, its growth has remained below expectations, and many of the trees appeared to be susceptible to heart rot damage in some sites (Hashim et al. 1990), along with marginal performance for sawlog production (Weinland and Zuhaidi 1990).

## ▶ ESTABLISHMENT OF INDUSTRIAL-DRIVEN FOREST PLANTATION

In 2005 the Ministry of Plantation Industries and Commodities (MPIC) established a large-scale forest plantations programme to alleviate the pressure on the country's natural forests. The target is to plant 25,000 ha of forest plantations per year for 15 years, or a total of 375,000 ha of forest plantations by 2020. Out of the nine selected species, two major species related are Rubberwood (Timber Latex Clone) and *Acacia* spp. (*mangium* /hybrid). Other additional fast growing timber species recommended are *Tectona grandis* (Teak); *Azadirachta excelsa* (Sentang); *Khaya* spp. (*Khaya ivorensis*/*Khaya senegalensis*), *Neolamarckia cadamba* (Kelempayan/Laran); *Paraserianthes falcataria* (Batai), *Octomeles sumatrana* (Binuang) and Bamboo (five selected commercial bamboo species). Figure 1 presents the description of these species.

## ▶ PROPERTIES OF PLANTED TIMBERS

Generally, planted forests yield relatively more wood at lower cost than natural forest, the natural forest provides more valuable environmental services such as climate moderation and biodiversity. Nevertheless, the high growth rate and yield of planted forests were also offset by low

wood quality and price, while manpower constraint was caused by high dependence on imported labour. While solid timbers from natural forests can be used for specialty products due to its special appearance, decorative value or technical specifications, planted timbers can be converted into laminated products, plywood or other engineered products such as laminated veneer lumber (LVL), cross laminated lumber (CLT) where appearance is of less importance. The choice of the products depends on the available technology, capital investment, logistics and the properties of the timbers. Table 1 compares some properties of planted timbers with other commercial timber species.

	<p><b>Acacia mangium</b></p> <p>This species is originated from North Australia, Papua New Guinea and East Indonesia (Maluku and Irian Jaya). It usually occurs in lowland areas below 100m above sea level. This species can grow up to 30m in height. Among its common usage are for furniture manufacturing and cabinet, door framework, moulding wood, light construction and pulp &amp; paper.</p>		<p><b>Azadirachta Excelsa</b></p> <p>Sentang is a native plantation of Malaysia as the atmosphere or climate is suitable for its plantation. Sentang wood is medium hard or light, which the tree is widely planted in Thailand, Malaysia, and Indonesia. This species can be used in small construction.</p>
	<p><b>Hevea brasiliensis</b></p> <p>This species is grown for timber production as its major produce and latex as the byproduct. Rubber species possess rapid growth rate and high quality latex production. It can be used in the manufacture of furniture, fibreboard and medium density fibreboard (MDF).</p>		<p><b>Khaya Spp.</b></p> <p>Khaya tree is a hardwood and fast growing species. This species can reach up to a height of 26m. Wood from Khaya tree can be used in carpentry, furniture manufacturing, cabinet work, shipbuilding and decorative veneer production.</p>
	<p><b>Neolamarckia Cadamba</b></p> <p>This is a fast growing species and is suitable for replantation of forests. It is found in an area below 1000m above sea level. This species is light wood and can be used for pulp and small construction.</p>		<p><b>Octomeles Sumatrana</b></p> <p>This species can be found throughout Indonesia and Malaysia (Sabah and Sarawak). It grows in lowland areas up to 1000 m and is suitable for planting in alluvial, clay or sandy soils. It can be used for small construction and pulp production as this species is a light wood species.</p>
	<p><b>Paraserianthes Falcataria</b></p> <p>This species originated from Maluku, Irian Jaya and Papua New Guinea. This is a fast growing species and can reach up to a height of 46m. This species can be used in the production of plywood, matchstick, board, carving, pulp and paper.</p>		<p><b>Tectona Grandis</b></p> <p>This species is also categorized as a fast-growing species and can reach up to a maximum height of 80m. Teak is one of the most valuable timber in Southeast Asia. Its durable wood and attractive natural colors made it suitable for the production of high quality furniture.</p>

Figure 1. List of species and general information under the Forest Plantation Programme, MTIB. (extracted from JPSM, 2017).

Table 1. Comparative strength properties of planted timber

Species	Air-dry Density (kg/m <sup>3</sup> )	Static bending (MPa)		Compression // to grain (MPa)	Shear strength // to grain (MPa)
		MOE	MOR		
<i>Amangium</i> <sup>1,4</sup>	200-580	12310	78.1	34.0	9.7
Rubberwood	400-700	9240	60	32.3	9.5
Sentang <sup>2</sup>	482-648	6770	60	31	-
Khaya <sup>3</sup>	580-650	8700-10800	71-128	37-48	8-12
Teak <sup>3</sup>	610-760	8900-13400	85-109	43-72	8-16
Batai <sup>3</sup>	220-430	6890	48	26.6	6.5
Kelampayan/ Laran <sup>1</sup>	370-465	7700	50	37	15
Binuang <sup>1</sup>	270-465	6700	49	32	5.4
COMMERCIAL TIMBERS					
<i>Pinus radiata</i> <sup>4,6</sup>	500	10000	81	37	12
Yellow Poplar <sup>7</sup>	380	8340	38.6	38	5.5
<i>C. pelita</i> <sup>2</sup>	715	13000	63.2	-	-
Sesendok <sup>1,3</sup>	305-655	8500	39	20.8	5.4
Kadondong <sup>1</sup>	460-760	12100-12900	81	43.1-43.7	10.9-11.8

Source: <sup>1</sup>S.C. Lim et al. (2016); <sup>2</sup>NurDahli et al. (2014); <sup>3</sup>NurDahli et al. (2013); <sup>4</sup>Matub (2019); <sup>5</sup>Ballester et al. (2008); <sup>6</sup>Wang & F. Nuzar (2010); <sup>7</sup>Com (1992)

## ► PROCESS TECHNOLOGY

Traditional processing approaches have not been either to accommodate small diameter logs or to create profitable production due to low product recovery. Hence alternative processing approaches are necessary to enable the efficient recovery of wood from this source in the form that is usable for high-value product manufacturing. For instance, the use of spindleless veneering technology was able to produce good quality and high yield veneers from small diameter logs compared to the traditional rotary peeled veneers. To ensure efficient use of planted timbers, the right technology to produce suitable and new products with acceptable global quality should be used (Figure 2). Technology can also shift the industry from labour-intensive sector to automated manufacturing. The industry players must align themselves to the external changes and must be ready to adopt new ways of doing business. The beneficiaries of timber from plantation forests will not only be the obvious downstream woodworking mills that produce indoor and outdoor furniture, but also mills that manufacture mouldings, doors and flooring, as well as, engineered wood products.



Figure 2. Product-Technological pathways for planted timbers

## ► OPPORTUNITIES

According to MTIB, Malaysia has over 4,000 mills comprising furniture, sawmills, mouldings, plywood, veneer, wood chip, kiln drying, builder's joinery carpentry and medium density fibreboard. About 83% of these mills are located in Peninsular Malaysia and 17% in both Sabah and Sarawak (MTIB, 2018) mainly using timbers from natural forest except for rubberwood, which is the major wood raw material for furniture, particleboard and medium density fibreboard. Conversely, the use of *A.mangium* in furniture is declining whilst both *Eucalyptus spp.* and batai are gaining interest from the local manufacturers particularly those of plywood and lamination sectors.

Investments on R&D in developing methods to use juvenile hardwood timbers, specifically for the eight plantation species under the Malaysian Forest Plantation programme is crucial to ensure maximum value can be benefited from the investment. Fundamental studies such as wood quality, strength, dimensional stability, sawing, drying, gluing and finishing of these timbers are of prime importance in providing guidelines for the industries when making decisions on the end product. Concurrently, investment should be made in identification of marketable opportunities for such products. At the same time, efforts towards 'zero waste' should be encouraged by converting the wood wastes into biorefinery and power generation.

## ► REFERENCES

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