Selecting alternatives in place of naturally grown timber species - Local timbers for future?

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Traditionally building contractors and furniture manufacturers select naturally grown timber for most of their timber requirements. These include high rated rare hardwood timber species such as Mee, Wewarana, Milla, Palu, Halmilla, Hulanhik, Etathimbiri, Dun, Alubo, Liyan and Suriyamara. These species are mostly grown in natural forests and their supplies have now become very limited. Fellings from natural forests and transport of these rare valuable species are now banned by Forestry Legislation. However government building specifications continue to specify the use of these endangered species. It is apparent that either contractors use these illicitly felled timber they obtain, or they are actually using other low quality readily available species instead of these natural species.

The natural forest cover of Sri Lanka has been depleted and timber supplies from these sources are becoming limited. Nevertheless, sawnwood demand is projected to grow from 0.544 million m^3 in 1993 to 0.885 million m^3 in 2020, i.e. by about 12,600 m^3/year. This corresponds to an average annual growth rate of 2%. If you are not in a position to get this required amount of timber from natural forests, alternative sources have to be sought to meet this increasing timber demand. Most contractors close to major cities today use imported timbers such as Kempus and Balau. But it is unwise to rely solely on imported timber because unsustainable utilization of tropical natural timber species cannot be continued at the present rate. The availability of these species will continue to decrease because pressure on these species is becoming severe in these tropical timber producing countries such as Malaysia. Hence the price of these species is likely to increase at a rapid rate. Timber importers in Sri Lanka found it expensive to import heavy hardwoods such as Balau and now they import medium hardwoods such as Kempus and low quality ungraded mixed hardwoods. Hence, while our short term timber requirements are satisfied by these imported species, it is essential to plan for the local fast growing tree species to supply the required timber essential for the construction and furniture industries.

CURRENT SUPPLY TRENDS

Recent statistics show that more than 70% of the local commercially acceptable timbers are now potentially available from sources other than natural forests such as forest plantations, home gardens, Rubber and Coconut lands (Table 1). Major plantation species available in forest department plantations are Teak, Pine, Eucalyptus and Mahogany. These timbers, which are originating from sources other than natural forests, can be produced in a sustainable manner by planting more and more trees. These species can be used as alternatives to the natural timber species, and it seems essential to identify such species and popularize them in this country to meet the national timber demand. If our future timber requirements can be met by these species, then the remaining natural forests can be conserved for protection of soil, water and bio-diversity.

Table 1: Supply sources of timber in 1993 (from FSMP, 1995)

Source of supply	Availability in cubic meters	Percentage
Homestead gardens	500 000 m3	39.2%
Rubber plantations	230 000 m3	18.0%
Natural forests (unrecorded)	286 000 m3	22.4%
Natural forests (supplied by STC)	5 000 m3	0.5%
Palms	150 000 m3	11.8%
Tea estates	50 000 m3	3.9%
Plantations	47 000 m3	3.7%
Imports	7 000 m3	0.5%
TOTAL	1275 000 m3	100.0%

NEW CHALLENGE FOR CONSTRUCTION INDUSTRY

Contractors, timber specifiers and furniture manufactures will have to use these alternative timber species in future in addition to the utilization of imported timber. Major alternative timber species to natural timbers are listed in Table 2. With the rapid growth and expansion of wood products and construction sector, it is essential to utilize these **alternative species** in place of natural rare species to satisfy the market demand on the one hand and to protect natural ecosystems on the other.

Table 2: Some of the major local commercial alternative timber species that are available in Sri Lanka.

Common Name	Scientific Name
Albizia	*Paraserianthes falcataria*
Coconut	*Cocos nucifera*
Cypress	*Cupressus macrocarpa*
Eucalyptus species	*Eucaluptus grandis, Eucalyptus pilularis, Eucalyptus robusta, Eucalyptus microcorys, Eucalyptus citradora, Eucalyptus globulus*
Gansooriya	*Thespesia populnea*
Ginisapu	*Michelia champaca*
Havarinuga	*Alstonia macrophylla*
Jak	*Artocarpus heterophyllus*
Kadju	*Anacardium occidentale*
Lunumidella	*Melia dubia*
Mahogany	*Swietenia macrophylla*
Mango	*Mangifera indica*
Pinus species	*Pinus caribaea, Pinus pilularis* and *Pinus insularis*
Rubber	*Hevea brasiliensis*
Sabukku	*Gravillea robusta*
Teak	*Tectona grandis*
Toona	*Cedrella toona*

Construction and furniture industries have to face a new challenge in utilizing these alternative timber species, because some of these species are relatively new and knowledge on their properties

and service qualities are limited. To assess the potential utilization of these species it is essential to get a sound knowledge on their properties. Limited studies are available on the properties of Sri Lankan timber species (Amarasekera and Denuwara, 1995; Denuwara, 1992; Navaranjan 1985; Chandrakeerthi, 1985; Seneviratne, 1981; Soyza, 1973; Tisseverasinghe, 1971).

MAJOR TIMBER PROPERTIES

In general terms, the use of a particular species and quality of timber for an end use is a function of the technical and commercial properties of that timber. The technical properties include tree form, sawing and machining properties, colour, durability, shrinkage and movement, figure and texture, density and strength. The key commercial properties include availability of sizes and quality required, regularity of deliveries and price competitiveness. In Sri Lanka, as timber transport is heavily controlled, legal and procedural difficulties in obtaining the stocks are also important commercial propertues.

DENSITY

The widely used Timber classification system in Sri Lanka is adopted from STC timber categories. This system is based largely on demand and supply and not on strength or durability of timbers. Most authors have shown that density can be used as a major determinant of the timber quality especially concerning most of the strength properties. Hence, in order to obtain knowledge on the quality of alternative timbers in Sri Lanka these are classified according to density and are presented in Table 3. The density data (based on green volume and oven dry weight) were obtained from two previous studies conducted by Denuwara (1992) in University of Sri Jayewardenepura and Navaranjan (1985) in University of Moratuwa.

Based on density values it is possible to classify timbers into three density ranges: Light (less than 500 kg/m^3), moderately heavy (500-650 kg/m^3) and heavy (more than 650 kg/m^3). All *Eucalyptus* species (except *Eucalyptus grandis*), Alstonia, Teak and Gansooriya fall in the category of Heavy, indicating their suitability for medium to heavy construction. Most timbers that fall in the Moderately Heavy category (Grandis, Mahogany, Jak, Mango, Ginisapu and Sabukku) are used for construction. Timbers such as Albizia, Lunumidella, Pine, Toona and Cypress which fall in the category of Light can be used as furniture and paneling timber.

OTHER TIMBER PROPERTIES

Other timber properties which are important in introducing a lesser known timber into the market include the following

- strength properties
- shrinkage of wood on drying
- durability
- workability, which include the suitability for sawing, planing, drilling, nailing, nail holding, screwing, gluing, moulding and other properties related to cutting combining and shaping of wood.

- Finishing characteristics which refers to the surface quality and appearance after wood working.
- preservative permeability
- commercial properties such as availability, price levels and any procedural and legal requirements in obtaining these timbers

Table 3: Classification of timbers according to density

Species	**Common Name**	**Density in Kg per cubic meter**
Light (<500 kg/m^3**)**		
Paraserianthes falcataria	Albizia	189
Melia dubia	Lunumidella	305
Pinus caribaea	Pine, Rata amba	413
Anacardium occidentale	Kadju	421
Cedrella toona	Toona	424
Cupressus macrocarpa	Cypress	441
Pinus patula	Pine	495
Moderately Heavy (500- 650 kg/m^3**)**		
Hevea brasiliensis	Rubber	513
Pinus insularis	Pine	513
Swietenia macrophylla	Mahogany	559
Eucaluptus grandis	Grandis	575
Artocarpus heterophyllus	Jak	591
Mangifera indica	Mango, Amba	598
Michelia champaca	Ginisapu	613
Gravillea robusta	Sabukku, Silky oak	622
Heavy (> 650 kg/m^3**)**		
Alstonia macrophylla	Alstonia,	659
Thespesia populnea	Gansooriya	684
Tectona grandis	Teak	745
Eucalyptus robusta	Red gum	755
Eucalyptus microcorys	Tallow wood	781
Eucalyptus globulus	Blue gum	809
Eucalyptus pilularis	Black butt	849
Eucalyptus citradora	Lemon-scented	869

With the wide range of density values, these species appear to have potential to meet the wood quality requirements for construction and furniture. Among the species listed in table 3, some species such as Jak, Mahogany and Teak, have been extensively used for construction and/ or furniture industry and there properties are well known. Rubber is also widely used in furniture and

wooden crafts industries after being treated with boron compunds. However some other species are lesser known or secondary species.

The most important secondary species are Eucalyptus and Pinus. The Forest Department has planted substantial amount of Pinus and Eucalyptus in forest plantations. However these are still less known to the market due to marketing strategy as well as due to the lack of knowledge on the properties and uses of these species. Most Eucalyptus species can be used in both heavy and medium construction, especially *Eucalyptus microcorys* which is a good timber for heavy construction such as roof work and also has high durability. Commonly available *Eucalyptus grandis* can be recommended for medium construction and but is not very durable. Pinus species are not durable but after proper treatment they can be used in furniture, paneling and also in some construction applications.

Ginisapu is another promising species for medium construction which is also durable. Alstonia and Sabukku are also other important secondary species which can be used both in medium construction and in furniture. However, these two are not durable species. Lunimidella and Cypress are widly used alternative species for panelling purposes.

Most of these species are fast growing, and have rotations of about 20-30 years, hence it is recommended to select suitable species from this list in future afforestation and reforestation programmes (forest plantations, tree growing on private and other agro-forestry lands) to meet the timber demand. Some of these alternative species may not possess the exact desirable properties that the contractor would like to have such as high natural durability and strength. Hence, to popularize the usage of these alternative timbers it is essential to establish scientific timber grading and standards for selecting timber species and sizes for the building industry. Timbers should be classified according to their mechanical properties and durability.

Also, it is essential to revise the present building specifications, which lisits valuable, rare natural forest species which are near extinction- alternative timbers should be specified. Use of endangered natural timbers should be discouraged by removing these species from the specification list used by the building industry.

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