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Timber Utilization in Sri Lanka

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Introduction

Timber is one of the oldest building materials used by man. According to the history of Sri Lanka "Lovamahapaya" which was built by King Dutugemunu in the second Century B.C., had a complete timber structure originally comprising nine stories, having a height of over 20 meters,. Timber which is used as a building material consists of several hundred different wood species, some of which are lesser known, but each species possesses different wood properties. People in Sri Lanka, in the past, used popular timber species such as Satin, Palu when this commodity was very widely and freely available. This situation was in existence even before colonization, at a time when Sri Lanka was well known as a forested island. There is no doubt that the natural forest comprising valuable timber species was one of the attractions led this Island to be colonized.

The historical pattern of forest utilization in Sri Lanka could be classified into four stages namely: (a) early exploitation stage upto 1880, (b) forest management based on timber harvesting from 1880 to mid 1950s, (c) peak and decline of timber harvesting from mid 1950s to early 1980s, and finally (d) consolidation from mid-1980s. The new order of managing the Sri Lankan forest resources for sustainable development would be jeopardized unless a judicious attempt is made to utilize timber resources in a sustainable manner. The need becomes even more important in the present scenario where there is a continuous increasing demand for timber resources caused by increasing population, industrialization and underutilization of timber.

This report on timber utilization of Sri Lanka is a review of available historic and current information related to the timber industry and will address on following topics.

1. Timber resources in Sri Lanka
    - 1.1 The forest timber resources
    - 1.2 Man-made forest plantations
    - 1.3. Non-forest timber resources
        - 1.3.1. Contribution of home gardens to timber supply
        - 1.3.2 Contribution of Rubber and Coconut plantations to timber supply
2. Imported and exported timber
3. Supply, consumption, and demand for timber and timber based products
4. Timber industries in Sri Lanka
5. The past and present Sri Lankan timber based enterprises
6. Choices of timber for various purposes
7. Timber seasoning and preservation in Sri Lanka
8. Some suggestions for development of timber industries in Sri Lanka

Timber Resources in Sri Lanka

The timber resources in Sri Lanka consist of forest timber resources and non-forest timber resources. The forest timber resources consist of the timber harvested from natural forests and man-made plantations. The non-forest timber resources consist of timber harvested from rubber and coconut plantations, and home gardens, etc.

Forest Timber Resources

Natural forest cover in 1999 comprised 3099 ha of Montane forest, 65792 ha of sub-montain forest, 124340 ha of lowland rain forest, 221977 ha of Moist monsoon forest, 1027544 ha of dry monsoon forest, 18352 ha of Dry zone riverine forest, 9530 ha of mangrove and 471583 ha of Sparse forest amounting to 1942219 ha. The low land rain forest has an average of 205 stems/ha of at least 10cm diameter at breast height(dbh) containing an average of about 126m^3/ha in trees of more than 30 cm dbh. The dry monsoon forest and the moist monsoon forest have an average of 123 stems/ha and 152 stems/ha; at least 10cm dbh trees containing an average of about 21 m^3/ha and 39 m^3/ha of more than 10 cm dbh respectively. Some of these forests may be managed to obtain timber using suitable harvesting methods after comprehensive study. However in 1989 a moratorium on logging of natural forests was imposed considering the need for conservation. Thereafter the contribution from natural forests towards the country's timber demand was legally stopped though illicit harvesting is still being carried out. With the imposition of bans on timber harvesting from natural forests, projections were made by various parties to the effect that there would be a serious timber scarcity in the coming years. This who made it important during the past 20 years to implement rapid reforestation programs and to change the timber utilization pattern from popular timber species to lesser known timber species or to use exotic timber species and imported timber.

Man-Made Forest Plantations

Forest plantations in Sri Lanka consist of mainly forest plantations belonging to Forest Department and companies under the Ministry of Plantation Industries. According to a five year forestry management plan prepared by the 21 companies have reported that they have total of 16463 ha of forest plantations. Although it is doubtful this forest land is in full stock or managed properly, it will make a significant contribution to cater to national timber demand by providing fuel wood, *Eucalyptus* electrical transmission poles and railway sleepers, sawn timber, etc. From the recent past, several private companies have started Teak and Mahogany reforestation programs attracting the public to invest in their business from an initial stage. The profit from the investments of projects is calculated based on prediction of high growth rate of tree and future timber prices. It is known that short rotation plantations produce low quality timber which cannot be marketed at a good price. Hence, as far as timber utilization is concerned it is very important to produce not only a large volume but also quality timber. However private sector participation in reforestation may have a positive impact on Sri Lanka's forestry sector development.

The total forest plantation under the Forest Department is given in Table 1. The yield of forest plantation varies with site condition, seed stock and management. The expected yield from teak plantations have not been achieved at the end of the rotation according to yield tables. Table 2 shows the volume harvested by the State Timber Corporation (STC) from forest plantations of the Forest Department (FD) in the last 3 years.

Table 1: Total forest plantations under Forest Department in 2007

Name of tree species	**Hectares**	**Name of tree species**	**Hectares**
1.Teak	30,277	8. Kohomba	1,040
2.Upcountry *Eucalyptus*	9,338	9. Alstonia	390
3.Dry zone *Eucalyptus*	15,008	10. Kaya	293
4.Pine	17,240	11.Jak	90
5.Mahogany	5,325	12.Hora	72
6.*Acacia*	8,830	13.Indigenous	7,942
7.*Albizia*	405		
Total			**96,250**

Table 2: Timber harvested by STC from FD plantations

	2005	2006	2007				
Name of species	**Harvested area(ha)**	**Harvested volume (m^3)**	**Harvested area(ha)**	**Harvested volume (m^3)**	**Harvested area(ha)**	**Harvested volume (m^3)**	**Average volume m^3/ha**
Teak	745.8	30396.0	727.0	30219.0	576.5	37257.0	47.7
Pinus spp	110.0	42337.0	129.9	43494.0	194.9	52583.0	318.0
Eucalyptus spp	116.6	27410.0	200.6	30668.0	102.6	22720.0	192.5
Mahogany	296.0	3068.0	189.3	2488.0	169.8	3230.0	13.0

According to Forestry Sector Master Plan (FSMP-1994) a supply 345000 m^3 of industrial timber from forest plantation in 2007 has been protected (Table 8). However, present timber supply from forest plantation is well below the FSMP projected figures. Apart from this, the timber produced from forest plantations is inadequate compared with the country's timber demand for various sizes and uses. Eg: there is a scarcity of long length construction timber in Sri Lanka. At present construction timber produced by up country *Eucalyptus grandis* and *Eucalyptus microcoris* are not adequate because a major portion of volume (10000m^3) is being used to manufacture railway sleepers. Teak and Mahogany are preferably used for furniture, joinery, decorative and parquet industries as super luxury and luxury timber respectively. During the last three years, a large quantity of pine timber has been extracted from the Forest Department plantations which are more susceptible to mould and stain attack. Hence appropriate antisap stain treatments should be included. Use of pine sawn timber has not popular due to drying of this timber and the preservation process needed. Pine poles are now being used after creosote treatment for electrical transmission poles.

Non-Forest Timber Resources

Even though natural forests and forest plantations have the potential to supply the country's total timber demand, most of this is either inaccessible or in protected areas where felling is banned. At present, around 70% of the industrial timber has to be supplied from home gardens, rubber and coconut plantations, and trees planted along farm boundaries, on roadsides and in urban areas.

Contribution of Home Gardens to Timber Supply

The extent of home gardens in Sri Lanka in 1983 was 781000 ha compared to 858500ha in 1993. There are more than 400 woody species planted and naturally regenerated in home gardens. Average tree density of home gardens in the dry zone and wet zones has been recorded at 125 trees per hectare and 260 trees per hectare respectively. Three main multi-purpose tree species namely coconut, jak and mango would produce 38 percent of the total timber volume produced in home gardens. Five exotic timber species namely mahogany, Alstonia, Albizzia, Eucalyptus and Teak contribute 30 percent of the total timber volume produced in home gardens. Home gardens contribute 40 percent of Sri Lankan timber demand but the major portion of timber produced from home gardens is less durable and of low quality which cannot be used for structural purposes in construction industries. Home gardens will produce an average of about 0.95 m^3 of saw logs and 0.5 m^3 of poles per hectares per year.

The most common and valuable timber species grown in home gardens according to a study made by K.P.Ariyadasa (2002), Conservator of Forests, are listed in table 3. Average log price, wood density, uses of timber of most common timber species found in home gardens are also given in Table 3. The log price varies with mid girth of log and log grading.

Table 3: Most common and valuable timber species found in home gardens

Species name		Total no. of trees	Density of timber at 20% m.c.(kg/m^3)	Timber class of STC	Uses of timber (see the notes)	STC Log price: Rs/m^3 in 2008 (mid girth 1 m)
Local	**Botanical**					
Coconut	*Cocos nucifera*	38616649	560-800	Class II	2, 13,	8800.00
Rubber	*Hevea brasiliensis*	17101488	640-720	Class III	9,10,13	4200.00
Jak	*Artocarpus heterophyllus*	10437142	640	Luxury	1,2,3,5,6,7,8,9,13,	29 520.00
Mahogany	*Swietenia macrophylla*	6410248	560-640	Luxury	7,8,9,10,11,13,14	20 250.00
Alstonia	*Alstonia macrophylla*	5968286	640	Class II	4,5,9,15	10 200.00
Mango	*Mangifera indica*	5607688	480-560	Class III	10,16	4 200.00
Albizzia	*Albizia molucana*	5607581	400-500	Class 111 L	16	4000.00
Eucalyptus	*Eucalyptus spp*	4061191	*E.microcoris (800)*	Special class	1,2,3,4,5,7,9,11,15	26000.00
			E.grandis(50)	Class 11	2,3,4,5,13,14,15	11800.00
Teak	*Tectona grandis*	3293609	720	Super luxury	2,3,5,7,8,9,10,11,13,14,15	43000.00
Margosa	*Azadirachta indica*	3044932	720	Special upper	2,3,4,5,7,8,9,13,14, 15	27 500.00
Lunumidella	*Melia dubia*	2349245	400	Class III	10,14(a)	4200.00
Satin	*Chloroxylon swietenia*	1489903	960-1040	Luxury	1,7,8,9,13,14	43000.00
Sabukku	*Grevillea robusta*	1460721	560	Class II	4,5,7,9,13,14,16	4200.00
Halmilla	*Berrya cordifolia*	1185466	800-880	Luxury	1,2,3,4,5,6,7,9,10, 11,13,14	29 500.00
Toona	*Toona sinensis*	1023771	560	Class II	13,14(a),16	8600.00
Hora	*Dipterocarpus zeylanicus*	865437	800-960	Class I	1,2,3,4,5,7,9,	15 100.00
Milla	*Vitex altissima*	774419	880-960	Luxury	1,2,3,4,5,6,7,9,11, 12,14	27 000.00
Kumbuk	*Terminalia arjuna*	686953	720-800	Special class	1,2,3,4,5,6,7,9,11,12 13,14	27600.00
Welang	*Pterospermum canescens*	564431	640	Special upper	4,5,7,8,9,10,12,14	27 500.00
Kolon	*Adina cordifolia*	548464	720	Special upper	2,4,5,7,8,9,13,14	27 500.00

Suriyamara	*Albizzia odoratissima*	509591	800-880	Special upper	1,2,3,5,7,8,9,11,13, 14	27 500.00
Nedun	*Pericopsis mooniana*	473408	800	Super luxury	13,14,	42 400.00
Ginisapu	*Michelia champaca*	415273	560-640	Class 11	4,5,6,7,8,9	14200.00

Notes: *(1)Beams, (2)Rafters, Purling, Ridges, Hips , (3)Ceiling joints, Wall plates , (4) Reapers, (5) Ceiling spacers , (6) Fascia Boards , (7) Door and window frames , (8) Door and window sashes, (9)Partition frames , (10) Ceiling Board (11) Floor Board , (12) Weather Board, (13) Furniture , (14) Paneling (14a) Decorative work, (15) Transmission pole (16) packing cases*

Contribution of Rubber and Coconut Plantations to Timber Supply

There are two sectors in the Sri Lankan rubber wood plantation: the estate rubber plantation sector which represents 66076 ha of more than 20 hectares of plantation and small holding rubber plantations which represent 48655 ha of less than 20 hectares of plantation. There are 16 estates in Sri Lanka representing 58 percent of total (114,713 hectares) of rubber plantations (DCS 2002). Rubber plantations produce an average of about 0.24 m^3 of peeler logs and 65 m^3 of sawn logs for every hectare felled at the end of a 25 year economic lifespan. It can be projected that rubber plantations have supplied approximately 266000 m^3 of sawn logs in 2007. Rubber wood is moderately hard and heavy with a density of 640 to 720 kg/ m^3 at 20% moisture content. Rubber timber has higher shear value. The timber is suitable for furniture being reasonably hard-wearing and attractive in appearance apart from an occasional unsightly black stain.

There are 394800 ha of coconut plantations in Sri Lanka (Census of Agriculture 2002) which produces an average of about 49.4 m^3 of sawn logs for every hectare felled at the age of at least 50 years. It can be projected that coconut plantations have supplied approximately 210000 m^3 of sawn logs in 2007. It is possible to obtain 0.5 to 0.6 m^3/ tree out of which an estimated average sawn timber yield per tree would be 0.2-0.23 m^3. The density of coconut stem varies from 900 kg/ m^3 (outer wood near base) to 150 kg/m^3 (center wood near top). Drying times required are one month for 25 mm thick timber. Treatment with boron by diffusion is possible for coconut wood. High density wood is extremely strong and can be used as structural material like roof rafters and paneling. High density wood will give a good finish but furniture constructed tends to be very heavy.

Imported and Exported Timber

In any discussion on timber utilization in Sri Lanka it is very important to study the import and export of timber and timber based products. The reason is that it gives a good picture of the timber industry in Sri Lanka and the requirements of consumers. In 1993, 29000 m^3 of timber was imported to Sri Lanka and represented 5% of total sawn timber demand at that time. According to international Harmonized Serial (H.S) code under section ix, chapter 44, wood and articles of wood; wood charcoal, Sri Lanka has imported and exported timber or timber based products as mentioned in table 4.

Table 4: Quantity and value of imported and exported wood based products in 2007

	Imported timber product in 2007		**Exported timber product in 2007**	
HS Code and description	**Quantity (kg)**	**CIF value (Rs)**	**Quantity (Kg)**	**FOB value (Rs)**
44.01 Eg: Fuel wood, saw dust, pellets or similar form	4242	94551	3,616,538	101,706,388

4403	Eg: Wood in the rough, strip bark /sap or not, roughly squared	1,391,587	84,996,048	1,038,118	68,732,698
4404	Eg: Hoopwood split poles, tool handle, walking sticks	294	73663	13,100	143,302
4406	Eg: Railway sleeper not impregnated			18,300	886,284
4407	Eg: Wood sawn,	44.071	159,964,642	0	0
	Or chipped lengthwise, Coniferous	10,718,290			
	sliced or peeled, whether Others or not planed or sanded or end-jointed, or a thickness more than 6mm	56,874,011	2,151,394,006	409,764	26,470,508
	Sub total	**67592301**	**2,311,358,648**	**409,764**	**26,470,508**
4409	Eg: Wood including strips and friezes for parquet	425,688	124,694,733	0	*0*
4413	Eg: Densified wood	105,287	35,356,364	52,162	36,433,812
44.18	Eg: Builders' joinery ,door window frames, shuttering	700,613	166,084,149	615,627	162,714,970

Table 4 shows Sri Lanka's imported and exported wood items of various types with their value. Mainly sawn timber has been imported into Sri Lanka, along with other finished products. The quantity of timber imported and exported is expressed in Kg as stated in Customs reports. In 2006, Sri Lanka imported 104,082,012 Kg of sawn timber of Rs. 2,084,454,637 CIF value including a large quantity (15692136 kg) of (Rs. 239838484 CIF value) coniferous timber. This quantity has declined to 67,592,301 kg of Rs. 2,311,358,648 CIF value in 2007 after completion of construction works in Tsunami affected areas. Exports of 409764 kg of Rs: 26470508 FOB value of sawn timber or the same category were made in 2007. Most of the timber imported comes to Sri Lanka under the category of "other" of 44.071 HS code viz but not under their Botanical or commercial names. This has resulted in some importers importing low grade timber which are below the accepted standards and this is being marketed. As the buyers are unaware of the standard quality timber or are not able to identify the timber species, they tend to be easily misled. This prevailing situation can be minimized if standards for regulation of the timber market are introduced. Aif standard. T78h5(e)]T8(st)-6(an)9(dar)-5(d)Sta10(t)-4(ar)-503s mark8(ste)9(rBT131(i)7(of)-3( )-108(8(s

Table 5: Wood consumption per capita in different continents

Country	Consumption per capita/year		
	Industrial round wood (m^3)	**Sawn wood (m^3)**	**Pulp and paper (kg)**
Sri Lanka (2008)	0.0741	0.035	13.6
Africa	0.086	0.015	2.8
Asia	0.073	0.0239	12.0
Europe	0.565	0.1511	66.0
North & central America	1.290	0.3666	153.0
Oceania	1.147	0.2344	64.0
South America	0.375	0.0800	18.0
World	0.254	0.0698	29.0

Table 6: Projection of bio-fuel supply and demand, '000 tonnes based on 1994 data

	1995	2005	2008	2015
Natural forest	664.3	582.8	560.7	557.1
Forest plantation	372.0	192.4	254.1	498.5
Processing residues	341.5	425.9	454.2	557.5
Non forest wood and other biomass resources	8493.1	8733	8812.4	8980.6
National supply	9870.9	9934.1	10081.4	10593.8
National demand	9260	9560	9619.9	9710
National surplus	610.9	374.1	461.6	883.8

STC produced 85000 m^3 of fuel wood from the Forest department plantations in 2007. This production rate does not comply with projected fuel wood supply in FSMP (1994).

Eighty seven percent of the household sector had consumed fuel wood and other bio energy in 1992. According to energy composition in industry, fuel wood represents 49%. Of the tea industry is the main consumer of fuel wood of about 43%, followed by hotels and eating houses (16%), the brick and tile industry (14%) and Bakery (9%). As inefficient utilization of fuel wood can be found elsewhere, these resources are undervalued. We have a surplus of fuel wood supply as a whole but some districts eg: Nuwara Eliya, Gampaha, Badulla and Jaffna are facing fuel wood shortages. The gap between surplus and deficit is difficult to narrow down due to high cost of fuel wood transportation.

Roundwood Consumption by Supply Source

Total consumption of round wood in 2008 was approximately 1.975milion m^3; of which nearly all were industrial logs (1.531 millions m^3) were used for convert log into sawn timber. This conversion of logs into sawn timber should be taken in to consideration when the country's total timber requirement is calculated. The estimated share of wood supply in 2007 can be given as follows:

Estimated demand and supply of industrial wood (logs) in 2007

Supply source	**Volume ('000 m^3/year)**	**% of total demand**
Home gardens	612.4	40.7
Rubber plantation	266	17.7
Coconut Plantation	210	13.99
Forest Plantation (by STC)	122	8.1
Tea Estates	75.9	5
Other sources	70	4.6
Unsustainable supply	43	2.8
Imported sawn wood	101	6.7
Total demand	**1,501.00 m^3**	

Table 7: Projection made by FSMP (1994) of demand, production, and trade in wood products,'000 m^3 or t per year for the year of 2007

Table 8: Projections made by FSMP (1994) of supply of construction and industrial wood '000 cubic meters for the year 2007

Source	**Timber source**	**Volume (m^3)**
Natural Forests	Closed canopy	4.1
	Sparse forest	3.0
	Mangroves	0.7
	Thinning	13.8
Forest Plantations	Conifer plantation	184.0
	Eucalyptus plantation	108.0
	Teak Plantation	34.2
	Other plantation	5.0
	Tea plantation	60.7
	Rubber plantation	274
Non-forest wood sources	Coconut plantation	187.0
	Home gardens	936.2
	Palmyra	22.4

It is time to review the projections made by the Forestry Sector Master Plan (FSMP) in 1994, 14 years ago on timber supply and demand in Sri Lanka. The projected to supply from forest plantations in 2007 was 345000 m^3. However the amount supplied in 2007 from this source was around 122000 m^3, far below the expected FSMP (1994) projection.

Timber Industry in Sri Lanka

The Sri Lankan Forest trees Industry involves the following:

1. Sawmilling
2. Sawnwood processing industries.
   (a) Furniture (b) packaging (c) other wood products (d) timber seasoning and preservation
3. Wood-based panels industries
   (a) Plywood (b) fiber Board (c) particle Board
4. Pulp and Paper Industries
5. Wood and wood based Industries.
   (a) Safety Matches (b) boat building

This paper will discuss only sawmilling and sawn wood processing industries. The Sri Lankan economy and population have increased during the last decade. This has resulted in increase of demand for sawn wood, panels, paper and other industrial products. The biggest challenge faced by the timber industry is that there is no guaranteed continuous supply of wood resources to feed existing industries and to encourage new investment in this industry. In addition the other weaknesses reflected are: lack of a stable policy direction, excessive regulation of transport of wood and finished products, bad image of the industrial, lack of industry information, inadequate management technology and skills. Even under this situation, at present timber industries consume around 1.5 millions m^3 of log annually for different usage.

Past and Present of Sri Lankan Timber Based Enterprises

The increased construction activities in Sri Lanka have created an increased demand for timber. With the conservation of natural forests for environmental reasons this resulted in the reduction of local supply of timber. The increased demand for timber has to be met through other means of imported timber or man-made forests. Statistics published by the authorities do not reveal the real picture of sources of supply as part of the timber still comes from illegal and unreported ways. This scenario is well explained by the following study and its findings.

The Forest Department conducted a timber survey (census) in 1995 covering 19 districts assess the function of all the timber based enterprises at the time. It was disclosed that there were 16,824 units of timber based enterprises comprising 1297 saw mills, 2277 timber depots, 3573 mechanized carpentry sheds, 8706 manual carpentry sheds and 971 fuel wood sheds. However, the administrative Report of the Conservator of Forests reported 4208 timber based enterprises comprising 723 saw mills, 224 furniture shops, 1233 timber depots, 492 mechanized sheds, 1530 carpentry sheds and 6 fuel woods sheds as at 31 December 1994. The census indicated that the majority of (75%) of timber based enterprises was not registered.

The performance report of FD in 2006 on forest offences (court cases-2006) reveal that there are 4322.5 m^3 of timber with up to a value of Rs: 43560268 detected in 2006. According to this report, FD has filed 1751 court cases comprising 926 illegal felling, 337 of illegal transport of timber, and 488 of unauthorized timber depots. These figures also carry emphasis on the magnitude of the unseen side of the timber enterprise.

According to Forest Department report the registered number of timber based enterprises has increased from 4208 in 1994 to 12734 in 2006 (see table 9). During the last decade, the largest number of timber based enterprises remained in the Colombo, Gampaha and Kurunegala districts.

Table 9: Total Number of Registered functioning Timber Based Enterprises as at 31.12.2006

Forest division	Saw mills	Timer Depots	Mechanized carpentry sheds	Carpentry sheds	Furniture shops	Fire wood depots	Total
Colombo	184	643	454	316	187	2	1786
Gampaha	302	483	453	94	159	16	1507
Hambanthota	96	115	315	126	307	19	978
Kalutara	245	359	264	29	95	11	1003
Kurunegala	289	149	685	102	578	35	1838
Other 16 districts	867	997	1672	599	1357	130	5622
Total	**1983**	**2746**	**3843**	**1266**	**2683**	**213**	**12734**

According to the census report, Colombo and Gampaha lead the timber stock over the other districts by 23% and 19% respectively. The census of timber stocks comprise Albizia (17%), Jak (9%), Coconut (8%), Rubber (7%), Ginisapu (6%), Lunumidella (6%), Mango(6%) and Teak, Eucalyptus and Alstonia each by 3%. The greatest majority of available log timber stocks are of class 11(12%) and class 111(63%). The study reveals that out of the available 89000 m^3 of timber stock, 55% and 45% are forms of logs and sawn timber respectively. Thirty two dimensions of sawn wood are used widely for the three most important purposes, namely manufacture of furniture (19%), doors/windows (38%) and roofing materials (42%). Larger portions of total supply of timber come from the wet zone. These need to be treated with preservatives to improve durability. Therefore, it is necessary to develop cost effective treating methods. Other wise added cost of preservation exceeds the cost of durable timber species available.

It is time now to conduct another study of this nature to review available timber resources and patterns of timber utilization which could have changed during the last decade due to popularization of exotic timber species (Teak, Mahogany, Eucalyptus and Alasonia species) and existing demand for rubber wood and other timber raw materials created by medium density fiber-board manufacturing processes.

Choice of Timber for Various Purposes

Timber resources in Sri Lanka will have to be used as efficiently as possible and every species, grade and quality should be used in such a manner that their characteristics and properties are employed in the best possible way. The competent and efficient use of timber to manufacture wood based products or sawn timber for construction depends on the selection of the best timber depending on the task to be performed. Basically there are two aspects to the choice of timber. One aspect is selection of the most appropriate species for the given set of environmental and stress conditions. The second aspect is to obtain the correct grade or selecting the appropriate specification for the wood of any one species. When selecting timber for a particular purpose not only its technical performance but also its cost, size and availability should be considered. The technical performance of a timber lies on its durability, movement, strength, stiffness and toughness, permeability, ease of processing and appearance. The importance of these properties varies with the task the timber has to perform. Table 3: shows the availability of timber species in Sri Lanka, its class, timber density, prices and uses.

Maximum Utilization of Timber

As far as timber utilization is concerned, it is necessary to identify how and where valuable wood is wasted from the time a tree is felled in the forest till it is brought to a processing factory. The wasting of timber due to harvesting operation has to be minimized to get maximum expected yield from a tree. The logging waste varies with harvesting method, harvesting condition and nature of defect in the timber and so many other reasons. In Sri Lanka upcountry eucalyptus has higher logging waste (around 15%) than low land teak plantation (10%). Residues produced by various harvesting activities like cutting branch wood, tops, and trimmed ends at stump site needs to be absorbed for a suitable industries rather than using for fuel wood. Wastage of timber can be minimized by using proper machines and adopting new technology at each and every value addition process eg: saw milling and wood processing industry.

Timber Seasoning and Preservation in Sri Lanka

As discussed earlier, at present the majority of timber supply in Sri Lanka consists of less durable timber which needs to be properly handled to obtain maximum benefit from them. The service life of timber can be prolonged by using proper seasoning techniques and adequate preservative treatment. This longer serviceable life would result in lesser quantity of timber needed to fill the deficit.

Timber Seasoning

Timber is a hygroscopic material. It shrinks or swells with changes in the moisture content of the environment. The process of timber evenly drying under controlled conditions is referred to as seasoning. It could be mentioned that the majority of timber marketed in this country is either unseasoned or partially seasoned. For this reason it is advisable for the user to plan ahead, say 3-4 months to ensure that the timber is seasoned for use and in a well dried state. Under local conditions depending on species and atmospheric conditions the equilibrium moisture content will be from 12-18%. This equilibrium may be attained by easily drying timber for about 2 months for 1" plank. But the period may be very much longer for dense timber such as Satin and Palu.

The State Timber Corporation operates 6 Kiln seasoning plants of 110 m^3 capacity which are used to season the timber used for furniture manufacturing. A few furniture manufacturers and timber dealers also own kilns but these operate mainly for their private use. It is somewhat difficult to prepare seasoning schedules to guide the user due to variation between species. It is quite evident that if the moisture content of the timber is kept below 20%, the timber becomes dimensionally stable, stronger and less prone to insect and fungal attack.

Wood Preservation

The principal causes of deterioration of wood in service are fungal infection, termite and other insect or marine-borer attack, mechanical failure, and fire. The resistance of timber to these agents may be increased by applying suitable chemical preservatives. The selection of the most suitable chemicals and method of treatment is of the utmost importance. When selecting wood preservatives the following properties are useful as a basis for comparison: Highly poisonous to fungi and insect, readily penetrating into wood, chemically stable, easy to apply, cheap and readily available, Non-corrosive to iron, fire retardant. It is a common question asked by people "how is the durability of the timber". Durability of the particular species cannot be expressed meaningfully without knowledge of the situation in which the timber is going to be used. Many species of wood which are not durable when exposed to weather become perfectly durable when kept under shelter.

The popular preservative treatments in current use in Sri Lanka are pressure treatment with creosote, pressure treatment with copper chrome arsenate preservatives(CCA), diffusion treatment with boron or mixtures containing boron and low pressure treatment with light organic solvent preservatives (exposed

building timber and joinery). CCA preservative was used to treat Transmission poles and sawn timber by