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# Utilization and Prospect of Sawmilling Products in Bangladesh - An Exploratory Study

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***Abstract:*** *A survey was conducted in 2007 to assess the total employment opportunity, swan timber and the so-called waste products of the sawmills under Chattogram City Corporation area considered as the study area. The findings show that around 619 workers/staffs (permanent and temporary) work in 65 sawmills of the city whose salary ranges from Tk. 2,500.00 to Tk. 6,000.00. A total volume of 28,494 cu.m round logs with 15,461 tonnes of weight was found to be swan annually in the sawmills while the total sawn timber was 19,366 cu.m with 10,513 tonnes of weight. If an average price of sawn timber is considered to be Tk 20,000.00 per cu.m, the total value of the sawn timber in city area stands at Tk. 38.73 crore. The most common sawn timbers found in the City area are raintree (Samaneasaman) (75%) and mango (Mangiferaindica) (15%) and the remaining (10%) are teak (Tectonagrandis), jarul (Lagerstroemia speciasa), jam (Syzgiumcumini), gamar (Gmelinaarborea), acacia (Acacia auriculiformis), shilkoroi (Albiziaprocera), garjon (Dipterocarpusturbinatus), pitraj (Aphanamixispolystachya) and dewa (Artacarpuscacucha). The recovery rates of the sawn timber, sawdust, off-cuts and trimmings were found to be 67%, 14%, 6% and 13% respectively. The values of by-products in the present market have been calculated. The commercial use and the prospect of the by-products in local as well as in international markets are also determined and discussed in the paper.*

***Key Words:*** Sawn timber, Trimmings, Sawdust, Residue

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## I. Introduction

Bangladesh is a densely populated country having 900 people per square kilometer.[1] The per capita natural resource of its forest is alarmingly declining with the increase of the country's population. As trees grow slowly compared to the increase of population, there is a danger that the demand for wood is exceeding the supply. To meet up this increased demand, over exploitation of the existing forest has taken place creating heavy pressure on our natural resources. As a result, the forest resources are terribly depleting both in the public forest and in the homesteads. According to a general thumb rule, for a balanced environment, around 25% forest of the total land area of any country should be covered with trees. Unfortunately, about 17% of the total land area of Bangladesh is designated as forest land, though the actual tree cover is less than 9%[2]. So, the fact is, Bangladesh is a country of limited forest resource to meet up its increasing demand.

Sawmilling industries play a vital role in the development of wood-based industries of Bangladesh. A sample survey of rural sawmills was conducted[3]. Later on another sample survey on urban swamills was completed[4]. A total of 1032 rural sawmills and of 3470 urban sawmills were estimated in 1992. The contribution of this sector in Gross National Product (GNP) of the country has been estimated as 2% [5]. It is evident that timbers processed in sawmills are directly used for making furniture and many other housing materials which are extracted from the forest and also from the homesteads. The wastage of round wood are produced as sawdust, off-cuts, trimmings (portions of logs with bark, shavings etc). It is observed that sawdust is used in poultry farms, ice factories in small scale and mostly as fuel for cooking. Moreover, residue of crude oil mixed with sawdust is used in some brickfields to increase calorie of heat if sawdust are available nearby. But in present days, poultry farms in the country are severely affected by bird flu for which a substantial amount of sawdust are remaining unutilized every year. As a result, it is becoming a burden to the sawmill owners. The unutilized saw-dusts are either burnt as fuel or used in some other ways which are also creating hazard to the community and the environment. Off-cuts of the servicing sawmills are mostly used for making the cheaper items of furniture. These furniture are generally sold in the footpath. Some of these are used in building-construction sites as centering material. Off-cuts of the servicing-cum-business sawmills are also used for making meat-shelfs and a minor portion are used in the inner side of show cases, almirah, etc. On the other hand, trimmings are directly used for cooking of the urban poor and the villagers. Under the circumstances, only

efficient use of forest products can make the resource economically sustainable. Diversified but inefficient use of the resource, some way or other, has an immediate negative impact on the forest stock. Since the forest stock of the country is diminishing in an alarming rate, it is therefore, the high time to find out ways and means to improve effective and economic utilization of the existing forest and forest products. A large volume of round wood is converted to timber every day in the wood-based industries of the country. Different wood residues including saw-dusts are produced as by-product in the sawmills during conversion of logs to timbers which are not properly utilized. Therefore, these by-products need to be properly utilized in efficient and economic ways by using as raw materials for many secondary products, such as briquette, tabletops, knobs, handles particleboard, pulp and paper, fiberboard, core board, plywood, flush door etc.[6]

The briquetting industries in Bangladesh are still using only rice husk to produce briquettes. It is examined that the mixture of rice husk and sawdust with 1:1 ratio produce good quality briquettes (5879.67 Cal/gm) and shows a higher caloric value than briquette (4011 Cal/gm) from only rice husk. So briquette from the mixture of rice husk and sawdust is one of the effective fuels in present situation. The manufacturing of sawdust board can be used as tabletops, knobs, handles, etc.[7]

Sawdust are now being used in USA as raw materials for wood floor. About 4 (four) tons of green sawdust are required for preparing per ton kraft pulp in the pulp mills of North American States.[8]Now-a-days, the waste products are being used in many countries in making very lucrative, fancy and valuable furniture and showpieces. This has already attracted the attention of the furniture dealers and buyers of the country. But, no attempt has so far been undertaken in the country to assess the wood wastage produced from the sawmills, the timber recovery rate and also the status of the work force in the sawmilling industries. The present study is, therefore, an attempt in this context. The survey was conducted on 65 sawmills of Chittagong City Corporation area. The principle objective of the survey was to assess the total sawn timber, waste products, total working force engaged in the sector and their wages. In order to focus overall situation in sawmilling sector in Bangladesh. Expectation is that the results of the study will serve the purpose of the sawmill owners, researchers, forest managers, planners, furniture dealers and traders and the related entrepreneurs all over the country. Economic utilization of the residues with higher value added products will thereby generate employment opportunities for the growing rural and urban poor of the country.

## II. Material And Methods

A list of 77 registered sawmills of Chattogram City Corporation area was collected from the office of Divisional Forest Office (Chattogram North). But 65 sawmills were found in existence and the other were closed during last few years for various reasons. So, the findings of the survey was based on the sampled data collected from the 65 sawmills.

Study Design: Cross Sectional Study.

Study Location: Chattogram City Corporation has been considered as the study area.

Study Duration:July, 2007 to June 2008.

Sample size: 65 Sawmills.

Data Collection Methodology:Data were collected in two phases. In the first phase, 65 sawmills were visited and data on present workforce and their salary/wages, annual working days, machine capacity, etc. were collected.In the 2nd phase of data collection, based on the primary information, 65 sawmills were stratified into two groups considering the number of workers in the sawmills. Stratum-I included the sawmills where there were a maximum of 6 workers and stratum-II for more than 6 workers. Thus, the former group had 35 and the later had 30 sawmills. Then 15% sample sawmills were randomly selected from both the strata with 6 and 4 sawmills respectively for the data collection.Thus stratified random sampling design was applied for the purpose.Data on input and output items of the sawmills that is, types and quality of round wood including the main products and by-products were recorded within the working period of a day. As such, data on 10 sample sawmills were collected in 10 working days with one sawmill per day. Finally, these were compiled to estimate the average round wood sawn per sawmill, recovery rate of timber, quantity of off-cuts and fuel wood, amount of sawdust and its market price and annual income of a sawmill. The totality of each parameter was calculated based on the average estimate per sawmill.

Data Analysis: Raw Data was firstlystored in excel form and after that it was converted in SPSS 17 and analysis. Ethical considerations: The study protocol was developed and approved by Bangladesh forest research institute ethical committee and a consent form was filled by the sawmillsauthority/owner.

## III. Result

It is found from the findings of the survey that there are three types of workers viz., permanent, temporary and daily basis or mobile found to work in the sawmills of Chittagong City Corporation area. The permanent and temporary/mobile working force engaged in 65 sawmills has been estimated in percentage to be 68 and 32 (Table-1).

**Table -1.** Some key statistics of the sawmills of Chittagong City Corporation area.

| Items/Statistics | Values |
|---|---|
| No. of sawmills under Chittagong City Corporation area | 65 |
| Permanent workers/staffs (%) in the mills | 68 |
| Temporary/mobile workers (%) | 32 |
| Average salary range of the workers (Tk) | 2500/- to 6000/- |
| Annual working days | 250 |
| No. of sawing machine (range) | 1-8 |
| Average capacity range of the sawing machines (HP) | 10-25 |
| No. of labourers per sawmill (permanent & temporary) | 7 |
| Recovery rate of timber (%) from the round logs | 67 |
| Trimming (%) from the round logs | 13 |
| Sawdust (%) from the round logs | 14 |
| Off-cuts (%) from the round logs | 6 |
| Labor productivity/year (cu.m) | 63 |

The monthly salary/wage per worker/staff varies from Tk. 2500.00 to Tk 6000.00. The total working days were found to be about 250 days per year excluding Govt. holidays, load shedding and other unexpected situations. The number of sawing machines per mill was found to vary from 1 to 8 while the capacities of the machines varied from 10-25 HP. Table-1 also describes the labour productivity which was found to be 63 cu.m/year. The recovery rate of the sawn timber was found to be about 67% while for trimmings, sawdust and off-cuts were 13%, 14% and 6% respectively. Round tree log processed in sawmills' out put have been estimated in both volume and weight.

**Table-2.** Stratum-wise estimated total volume (cu.m) of round logs, sawn timbers, trimmings, off-cuts and saw dusts in the sawmills per year.

| Indicators | Mean (cu.m) | | | Estimated Total (cu.m) | SE of Total | % SE |
|---|---|---|---|---|---|---|
| | Stratum-I | Stratum -II | Stratified | | | |
| Number of sawmills | 35 | 30 | 65 | - | - | - |
| Sample sawmills | 6 | 4 | 10 | - | - | - |
| Round log sawn | 230 | 681 | 438 | 28,494 | 3,313 | 11% |
| Sawn timber | 159 | 460 | 298 | 19,366 | 2,387 | 12% |
| Trimmings | 29 | 82 | 54 | 3,502 | 522 | 14% |
| Off-cuts | 12 | 40 | 25 | 1,626 | 226 | 13% |
| Saw-dusts | 77 | 257 | 160 | 10,416 | 1,652 | 15% |

Table-2 shows the over all mean volume of round log, swan timber, trimmings and off-cuts of stratum-I and stratum-II which are 438 cu.m, 298 cu.m, 54 cu.m and 25 cu.m. respectively. On the other hands, the estimated total volumes of the same per year have been calculated to be 28494 cu.m, 19366 cu.m, 3502 cu.m, and 1626 cu.m respectively with corresponding percentage under standard error (%SE) of 11, 12, 14, 13 respectively. The estimated mean and total volume of sawdust (in loose form) have been calculated to be 160 cu.m and 10,416 cu.m with % SE 15. The % SE show bit high because of all samples sawmills. A higher sample sawmills. A higher sample size sometime provides representative sample resulting small standard error. Since it is an exploratory study the estimates may be accepted.

**Table-3.** Stratum-wise estimated total weight (cu.m) of round logs, sawn timbers, Trimmings, off-cuts and saw dusts in the sawmills per year.

| Indicators | Mean (cu.m) | | | Estimated Total (cu.m) |
|---|---|---|---|---|
| | Stratum-I | Stratum -II | Stratified | |
| Round log sawn | 118 | 377 | 238 | 15461 |
| Sawn timber | 81 | 256 | 162 | 10513 |
| Trimmings | 16 | 46 | 30 | 1923 |
| Off-cuts | 7 | 22 | 14 | 906 |
| Saw-dusts | 15 | 56 | 34 | 2200 |

Table-3 shows the over all mean weight of round log, swan timber, trimmings, off-cuts and sawdust of stratum-I and II which are 238, 162, 30, 14 and 34 tons respectively. The estimated total weights per year are accordingly determined to be 15461, 10513, 1923, 906 and 2200 tons. The weight estimates do not require % SE as the estimates are more conversion of volume estimate.

**Table-4.** Mean and estimated total value of the sawn timber, saw dusts, trimmings, off-cuts, income of sawing and income per sawmill and of total 65 sawmills.

| Items/year | Unit price | Mean/ sawmill (Tk.) | Estmed. total value from 65 sawmills (Tk.) |
|---|---|---|---|
| Value of sawn timber | Tk. 20000/$m^3$ | 59,60,000 | 38,73,20,000 |
| Saw dust value | Tk.78/Bag* | 57,000 | 37,13,000 |
| Trimming | Tk.90/40 kg | 67,000 | 43,27,000 |
| Off-cuts value | Tk.160/40 kg | 56,000 | 36,25,000 |
| Sawing income | Tk.1236/$m^3$ | 3,68,000 | 2,39,37,000 |
| Total income | - | 4,55,000 | 2,95,97,000 |

(*1 bag = 8 cu.m loose sawdust where1 cu.m sawdust= 5.8 kg)

Table-4 shows the total values of swan timber and different wood wastes viz., sawdust, trimmings and off-cuts produced in the sawmills per year based on the present market price. These are respectively Tk. 38,73,20,000/- Tk., 37,13,000/- Tk., 43,27000/- and Tk. 36,25,000/- On the other hand, the annual income from sawing and the total income are accordingly Tk. 2,39,37,000/- and Tk. 2,95, 97,000/-.

## IV. Discussion

A huge amount of wood conversion is done every day in 4,800 numbers of sawmills and in wood based industries in Bangladesh. During conversion of wood, 10% of wood or sometimes more than 10% of wood come out as sawdust. A small amount of which is used as fuel for cooking, while the remainders have no practical use and is wasted.[9] It was observed that about 75% of the logs sawn in the sawmills were rain tree while 15% were mango and the rest 10% were of other forest tree species like teak ( *Tecnonagrandis*), jarul (*Lagerstroemia speciosa*), jam (*Syzygiumcumini*), gamar (*Gemlinaarborea),* acacia (*Acacia auriculiformis*), shilkoroi (*Albiziaprocera*), garjon (*Dipterocarpusturvinatus*), pitraj (*Aphanamixispolystachya*) etc.

Previously we found in a study that Sawmilling residue are estimated about 40.5% of the total consumption of logs in the sawmills in which sawdust, edging/trimming, slab and others constituted about 12%, 20.73%, 4.22% and 3.55% respectively. In the study we have considered that The recovery rate of the sawn timber was found to be about 67% while for trimmings, sawdust and off-cuts were 13%, 14% and 6% respectively. So, sawdust and other wood residues produced in the sawmills during conversion of timber should be utilized in more efficient and economic way and keeps it out from waste. We have also observed that in the utilization of saw mills, 68% mills have permanent workere and only 32% of the mills have temporary workers. Overall labour productivity per year is also 63 cubic meter. It rationalizes the harmony of a industry that consistenly produce a good utilizations. We have also focused their wages where they only receive average 2500 Tk to 6500 Tk. We observed in Table-4 that the total values of swan timber and different wood wastes viz., sawdust, trimmings and off-cuts produced in the sawmills per year based on the present market price. These are respectively Tk. 38,73,20,000/- Tk., 37,13,000/- Tk., 43,27000/- and Tk. 36,25,000/- On the other hand, the annual income from sawing and the total income are accordingly Tk. 2,39,37,000/- and Tk. 2,95, 97,000/-. The profit from the sawmills are enormous but wages rate was very minimum.

## V. Conclusion

It has become evident from the literatures reviewed and the findings of the survey that the by-products (wastes) of the sawmills industries have a greater scope of economic value and opportunity. The result of the sawmills in Chittagong City Corporation in fact give an overall situation of sawmills products in Bangladesh. During sample surveys of rural sawmills in 1992 and urban sawmills in 1994, it was found that all sawmills were of same type and same homestead and forest trees were sawn. So, the study area reflects the present situation of sawmills production in Bangladesh. The waste products have respect both in local and international markets, if these can be utilized in making higher value-added products, using the latest technologies, machineries and equipment. The income of the sawmills are also substantial and quite good which is encouraging for the sawmill owners. The industrialists and other concerned entrepreneurs are, therefore, needed to pay proper attention to the materials for proper utilization and prospects for the cause of their own benefit and also the country in general.

Conflict of interest: The author has no specific conflict of interest.

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