

Bamboo Utilization Practices And Challenges Of Cottage Industries: The Case Of Selected Towns In Ethiopia

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Abstract: Large amount of bamboo resource is found in both highland and lowland areas of Ethiopia. Even though the uses of bamboo stems culms are numerous, its utilization in Ethiopia has been limited due to lack of awareness about bamboo resource utilization, scarce technologies, scientific knowledge about the species and its susceptibility to biological and physical deterioration. This study is therefore, intended to describe the current status and constraints of bamboo furniture producing industries. The survey was done by adopting purposive sampling procedure in selected cities/towns. Snowball sampling was used for this study due to absence of registered information on Bamboo industries. Both quantitative and qualitative data were collected mainly from primary sources. Closed and open ended structured questionnaires were used, for collecting both quantitative and qualitative data. Data analysis was done using Statistical Package for Social Sciences (SPSS). Descriptive statistics and inferential statistics were applied to calculate frequency and other tests of significance. The study found that bamboo was one of the most neglected sector and its industries have low capacity and produce low quality of furniture products due to various barriers. Lack of training on improved bamboo technologies for drying and treatment during processing and producing furniture was found by survey result. Moreover, the most common problems confronted were the borer attack on bamboo furniture and raw materials, shortage of production space and lack of capacity with regard to tools/machine and finance. The study implied the need to intervene and train bamboo cottage industries practitioners on improved bamboo technologies and capacity building.

Keywords: Bamboo, cottage industries, challenges, practices

1. Introduction

Ethiopia is known for its large amount of bamboo found in both highland and lowland areas of the country. The high land bamboo is *Yushania alpine* K. Schum (Arundinoideae) and the low land bamboo is *Oxytenanthera abyssinica* (A.Rich.) Munro (Bambusoideae) (Azene, B., 1993; Kassahun E.2003; Getachew, D. and Melaku, A., 2012). Though there are different estimates on bamboo coverage of Ethiopia, latest documents report that it is about one million ha, which is about 67 per cent of African bamboo forest cover and 7 percent of the world's total (Teshome, k 2015). As reported by Luso Consult 1997, out of the total hectares of bamboo; highland and lowland bamboo resources, accounts for about 15 per cent and 85 per cent respectively. The high land bamboo (*Y. alipina*) is found in north western, central, south and southwestern high lands of Ethiopia. The low land bamboo (*O. abyssinica*) grows only in the western of Ethiopia's low lands. Bamboo has numerous benefits in day-to-day uses for the local communities where the species is growing. According to Zhaohua (2001), over 1500 distinct uses of bamboo have been recorded around the world. INBAR (2010), stated that an economy of 2.5 billion people come from bamboo-related activities. In different parts of the world, it is used as a source of raw material for fodder, construction materials, paper production, laminated boards, energy, food, beverage and medicine due to their easy workability, strength, straightness, lightness, range of size, abundance, short period in which they attain maturity (Woldemichael, 1980; Ensermu et al., 2000; Seyoum, 2008). Even though the uses of bamboo Culms are numerous, its utilization in Ethiopia is limited to construction, fences and some rudimentary furniture and household utensils (Arsema, 2008; Tefera et al., 2013). According to literature, some of the major constraints in the sector are lack of awareness about bamboo resource utilization, scarce

technologies/scientific knowledge about the natural properties of the species, its susceptibility to biological and physical deterioration and lack of control measures against bio-deteriorating agent's damage (Kassahun , 2000; Seyoum , 2008; Getachew et al., 2012). According to Seyoum (2008), if there is a good understanding on natural properties of bamboo, it is possible to utilize them successfully and efficiently for multiple uses. Recently, bamboo based small and medium businesses are growing in Ethiopia. However, the level of their utilization is still very limited (Getachew and Melaku, 2012). Further, the authors argued that among the limitations in bamboo utilization its susceptibility to biological and physical deterioration is the most important one. Biological degradation can affect the usage, strength, utility, service life and value of the bamboo/bamboo products (Kassahun et al, 2003). Although various treatments are available to increase its service life, people are unaware of utilizing these technologies. Therefore, bamboo is considered as a perishable material and, hence, useless, which has led to its neglect as a useful renewable resource. Although bamboo has quite high distribution and is widely utilized by large number of local communities in Ethiopia, little information exist on its utilization practices and challenges hindering its utilization practices in bamboo industries. This study is therefore, intended to understand the practices and challenges of bamboo industries producing furniture. Specifically, the base line information is collected to describe the status and constraints on bamboo furniture producing industries.

2. Research Method

2.1. Study area and Sampling method

Survey was done in purposively selected cities and towns taking into account the availability and utilization of bamboo

in the area. These cities were Addis Ababa, Hawassa, Injibara, BahirDar, Hagereselam and Shashamane. Snowball sampling technique was used for this study due to absence of legally registered bamboo firms in selected cities and towns.

2.2 Data source and collection technique

The study is based on mixed research approach using both quantitative and qualitative descriptive methods. Quantitative method was used to apply frequency percentage and mean of respondents' of data collected through questionnaire. Qualitative method was also employed to describe and analyze the information obtained from interviews conducted among the owners and employees of bamboo cottage industries. Closed and open-ended structured questionnaires were used, for data (both quantitative and qualitative) collection from bamboo cottage industries in selected cities and towns. During data collection, the owner or other responsible technical employees were requested to fill the questionnaires. Data from direct observation during bamboo, processing and furniture making from bamboo was taken. In addition, several related relevant textbooks, manuals, journals and reports regarding bamboo were reviewed.

2.3 Data Analysis

Data collected were checked, corrected, coded and entered in Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics were applied to calculate summations, averages and percentages. One sample non-parametric test like chi-square test for goodness of fit for categorical variables, and kolmogorov-Smirnov test to compare mean distribution were applied. The key features and challenges hindering the bamboo processing cottage industries of Ethiopia including their capacities, raw material availability, quality of finished products and their general bamboo utilization practices were analyzed.

3. Results and Discussion

3.1 General Characteristics of Bamboo Industries

As there is no particular attention to the bamboo resource and its industries in Ethiopia, all the bamboo cottage industries are registered under the wood industries categories. According to survey result, most of the industries have been operating for one to five years. With exception of Addis Ababa, the average duration of operation of industries in surveyed towns was four years. It can be concluded that the bamboo cottage industries are largely new start ups as business sector. The survey indicated the male and female staff composition in various categories in administration, technical works and daily wage labourers. Though women seem to be under-represented in the work force, few women in Addis Ababa and Hawassa are business owners. With majority technical workers in industries, the average distribution of employees in industries varies from three to six. There is variation with regard to employee work experience in different surveyed towns. The average work experience of employees in Hawassa, Addis Ababa and BahirDar towns indicated highest experience while, employees in Injibara, Hagereselam and Shashamane showed low experience (Table 1).

Table 1 Mean distribution of industries years of operation, number of employees and experience

Categories	Location of Bamboo Furniture Industries				
	Addis Ababa	Hawasa	Injibara	Bahir Dar	Others
	Mean	Mean	Mean	Mean	Mean
Years of operation	6	4	4	4	4
Number of employees	3	6	5	3	4
employee experience	9	10	5	7	4

Source: Primary data estimates (2017)

3.2 Bamboo Culm Utilization

The survey result indicated that 86.7 per cent of the cottage industries use highland bamboo while only 13.3 per cent use both high land and low land bamboo for the furniture production. Those industries using both high land and low land bamboos were only industries found in Addis Ababa. Though data was collected from high land bamboo dominant areas, there was implication that lowland bamboo was not conducive for furniture production. Most industry owners (83.3%) are aware of the bamboo availability from Sidamo, Guraghe, Injibera, and others (like Dirre Inchine and Jimma). The utilization of bamboo localities in bamboo industries depends up on the proximity to the locality and accessibility of that bamboo species. The survey result showed that most of industries in Addis Ababa use bamboo from Guraghe due to the proximity of the locality. Industries in Hawassa, Hagereselam and Shashamane used Sidamo bamboo. While Industries found in Bahridar and Injibara used bamboo from Injibera. However, most of industries indicated that they preferred Sidamo bamboo due to it is relative resistance to attack by bio-degrading agents, its culm nature and size. Regarding bamboo resource availability, except industries in Hawassa most industries found in other cities/towns indicated that there was no scarcity of the bamboo resource. As bamboo workers reported in Hawassa, there was the scarcity of bamboo supply in the town due to broker's interventions and no customs of marketing bamboo culm in the town. Most of the industries (66.7%) dried bamboo by stacking culms horizontally until they use it. The survey showed that Industries lacked information on appropriate drying and storing methods. The most common bamboo furniture produced in last two years by these industries were chair, shelf, table, sofa, stool, bed and bowl. With exceptions of table, bowl and sofa, other types of furniture produced did not show significant variation. The most preferred furniture by customers was sofa, chair and shelf equally, and table respectively (Table 2). There were no significant differences for preferences in furniture. However, qualitative data indicated that all bamboo products furniture were affordable in comparison to wood furniture, aesthetically attractive design and indicated cultural significance. The sofa and shelf were largely preferred in homes and traditional houses, while stool, chair and table were preferred by mini coffee houses and cafes.

Table 2. Quantity of furniture produced in last two years by Industries

Furniture's type	N	Mean	S.D	1 sample K-S test	P-Value
Chair	24	393.67	379.09	1.179	0.124
Table	25	341.76	401.64	1.400**	0.040
Bed	25	49.36	58.41	0.995	0.275
Child bed	25	70.96	82.94	1.075	0.198
Bowl	25	880.20	2339.52	1.840***	0.002
Stool	23	526.17	492.84	1.326	0.059
Shelf	25	271.04	268.49	1.130	0.155
Sofa	24	169.17	208.31	1.478**	0.025

Primary data estimates (2017), ***and ** are significant at $\leq 1\%$ and $< 5\%$ probability level respectively

3.3 Bamboo workers skill and bamboo culm selection

Majority of bamboo workers (73.3%) acquired furniture making skills through experience with an exception of Hawassa town, and partly Hageresalam and shashamane towns, indicative of informal training (Figure 1). There was significant difference among categories provided for acquiring skills in bamboo furniture making. The Chi-square result ($\chi^2 = 17.304$, P-value = 0.000) shows that there is significant differences at less than one per cent probability level. To produce high quality bamboo furniture, most industries considered culm size, age and locality as conditions to select bamboo raw materials in multiple responses. Thus, owners in Addis Ababa furniture industries gave priority for locality of bamboo, Hawassa furniture industries equally for culm size and locality, Injibara furniture industries for both culm size and age of the culm, BahirDar furniture industries for culm size, and Industries in other towns for age of the culm. As shown in the Table 3 below, there is significant difference for culm size and price being as either condition for selection of bamboo culm or not.

Table 3 Multiple responses for bamboo Culm selection across different towns

Culm selection	Location of Bamboo Furniture Industry						Binomial Test	p-value
	Addis Ababa	Hawassa	Injibara	Bahir dar	Others	Total		
Culm size	F	4	5	5	5	2	21	
	%	44.4	100	83.3	83.3	50	70	.04
Locality	F	6	5	-	1	3	15	
	%	66.7	100	-	16.7	75	50	1.00
Age	F	2	4	5	4	4	19	
	%	22.2	80	83.3	66.7	100	63.3	.20
Price	F	2	1	-	2	1	6	
	%	22.2	20	-	33.3	25	20	.00
MC	F	1	3	3	2	2	11	
	%	11.1	60	50	33.3	50	36.7	.20

Source: Primary data estimates (n=30), ** and *** significant difference at $< 5\%$ and 1% level respectively

Most of furniture industries (88.9%) procured bamboo as raw material in green condition. Accordingly, the survey result indicated that with a few exceptions industries in Addis Ababa and Injibara, all furniture industries in BahirDar, Hawassa, and other towns acquired bamboo culm in its green condition. Approximately, 93.3 percent industries

did not consider its present moisture content during bamboo processing, owing to lack of awareness of the necessity of drying and moisture content removal. The chi-square ($\chi^2 = 24$, p-value= 0.000) test showed that there was difference between getting bamboo culm as green and dry conditions at less than one percent probability level (Table 4). The study highlights the following in the bamboo industrial sector: non-use of drying techniques, raw bamboo stocked in open air, piled horizontally one over the other without considering the traditional drying techniques and limited storage space for bamboo raw materials and finished furniture. Relatively, bamboo furniture industries found in Hawassa had better spaces for bamboo processing and bamboo culm storage.

Table 4 Nature of bamboo Culm procured by Bamboo Furniture Industry

Condition of bamboo	Location of Bamboo Furniture Industry						
	Addis Ababa	Hawassa	Injibara	Bahir dar	Others	Total	
Green	F	7	4	4	5	4	24
	%	77.8	100	80	100	100	88.9
dry	F	2	-	1	-	-	3
	%	22.2	-	20	-	-	11.1
χ^2							24***
P-value							0.000

Primary data estimates: *** significant at $< 1\%$ probability level

In Addis Ababa, partly in Bahir Dar and other towns, the survey result showed that there was problem when joining parts together to produce furniture. Other problems confronted include: problems of splitting, lack of correct dimensional measurement and shrinkage problem while and after joining parts. Except in Hageresalam and Shashamane, most of furniture industries mixed bamboo with wood and metal to produce furniture. Industries used manual method for finishing and did not have separate rooms for finishing materials application. Most of the industry owners thought that their products had good quality with respect to design, joints and finishing. Researchers observed that there was a problem of borer attack on stocked raw materials as well as finished furniture due to lack of appropriate treatment methods. With the exception of Hawassa furniture industries, most of respondents in other towns implicated that they did not use improved technologies due to lack of training (Table 5). Furniture industries in Hawassa have informal training especially on furniture design but they reported that there was lack of profitability on bamboo furniture in comparison to wood furniture due to lack of awareness among customers.

Table 5. Reasons for not using improved technologies by Industries

Reasons for not using improved technologies	Location of Bamboo Furniture Industries						Total	Binomial Test
	Addis Ababa	Hawassa	Injibara	Bahirdar	Others			
Lack of awareness	F	-	2	-	2	-	4	29***
	%	-	40	-	33.3	-	13.3	
Lack of training	F	5	1	4	5	4	19	11
	%	55.6	20	66.7	83.3	100	63.3	
Time taking	F	1	-	1	1	2	5	25***
	%	11.1	-	16.7	16.7	50	16.7	
Not profitable	F	4	4	-	-	-	8	8**
	%	44.4	80	-	-	-	26.7	
Other problem	F	-	-	1	-	-	1	29***
	%	-	-	16.7	-	-	3.3	

Source: Primary data estimates (n=30), ** and *** are significant difference at <5% and ≤1% level

3.4 Source of Bamboo Culm

The major source of bamboo for Industries was market. However, few industries had access to bamboo through farmers. BahirDar furniture industries got bamboo culms exclusively from market. There was also an exceptional case for Hawassa, which had access to bamboo through brokers and suppliers (Table 6). With an exception of Addis Ababa, bamboo culm was available on time for Industries in surveyed towns. The survey also indicated that industry owners purchased the amount they need every year. Moreover, in case of Addis Ababa, majority of respondents said bamboo was not available on time, and are also unable to purchase amount they need every year. The possible reasons for this case were shortage of supplier and bamboo farm being at a far distance from Addis Ababa in comparison to other towns.

Table 6. Source of bamboo for workshop Industries in different Towns

Source of bamboo	Location of Bamboo Furniture Industry						Total	Binomial Test
	Addis Ababa	Hawassa	Injibara	Bahirdar	Others			
Market	F	9	3	4	6	25	25	
	%	100	60	66.7	100	83.3	83.3	25***
Farmers	F	1	2	3	-	8	8	
	%	11.1	40	50	-	26.7	26.7	22**
Other sources	F	-	2	-	-	2	2	
	%	-	40	-	-	6.7	6.7	28***

Source: Primary data estimates (n=30), ** and *** are significant difference at <5% and ≤1% level

3.5 Credit and Utilization

The survey result indicated that majority of industries faced cash shortage to purchase inputs with an exception of those of Hawassa, which had access to government loan and save money (Table 7). This was entirely the case for respondents of Addis Ababa Industries. There was an indication for cash

shortage owing to high house rent. Addis Ababa and BahirDar industry owners solve cash shortage by borrowing money from friends and relatives. While Injibara industry owners, solve such case partly by borrowing money from friends and relatives too as well as through moneylenders, and in Hagerselam and Shashamane through pre-payment from customers to ease cash shortage.

Table 7. Cash shortage by Location of bamboo Industries

Cash shortage	Location of Bamboo Furniture Industry						Total	Binomial Test
	Addis Ababa	Hawassa	Injibara	Bahirdar	Others			
Yes	F	9	2	5	5	3	24	
	%	100	40	83.3	83.3	75	80	24***
No	F	-	3	1	1	1	6	
	%	-	60	16.7	16.7	25	20	

Source: Primary data estimates, *** significant at < 1% level

3.6 Access to Market and Price of Furniture

The study highlighted poor market access Majority of industries in Addis Ababa indicated poor access to market, while industries in Hawassa indicated a balance between medium and poor, Bahir Dar and Injibara inclined to medium response and others a majority resorted to poor response (Table 8). The chi-square test ($\chi^2= 5.600$, p-value= 0.61) shows difference among category at < 10 percentage level.

Table 8. Access to market by Industries across different Towns

Access to market	Location of Bamboo Furniture Industry						Total
	Addis Ababa	Hawassa	Injibara	Bahirdar	Others		
Good	F	-	1	1	1	1	4
	%	-	20	16.7	16.7	25	13.3
Medium	F	2	2	3	4	1	12
	%	22.2	40	50	66.7	25	40
Poor	F	7	2	2	1	2	14
	%	77.8	40	33.3	16.7	50	46
χ^2							5.600*
P-value							0.061

Source: Primary data estimates

A majority of the industries sold their bamboo products to local people without any intervention. Nevertheless, most of the furniture industries in Addis Ababa and other towns like Hagerselam and Shashamane thought that they were not getting fair price for their products. In Bahir Dar and Injibara, the survey depicted a balance between responses; i.e., on getting fair price and not. However, industries found in Hawassa were relatively getting fair prices for their bamboo products. As most of industries indicated that the reasons for the low price were due to lack of awareness among consumers for the bamboo products. Particularly in Addis Ababa, the primary reason was due to less market niche available while industries in Injibara indicated that the most likely problem was lack of effective promotion.

Generally, the test statistic (Binomial Test= 20, p-value=0.100) showed that there was no significance difference between group responses. Almost all furniture industries sold bamboo products at their workshop with the exception of few industries in Hawassa and Injibara, which sold their products at showrooms. There was no significant difference among most of similar bamboo furniture's unit price in different industries of different towns. However, sofa and childbed depicted a significant difference at less than five per cent (Table 9). Except industries in Injibara, most industries had the opinion that the input price was too expensive. Industries in all cities accomplished new furniture designs and modifications based on market condition to attract customers.

Table 9. Type of furniture sold with unit price in last two years

Type of furniture	N	Mean	S. D	1sample K-S Test	P-value
Chair	25	264.80	157.013	.888	.410
Table	23	261.65	160.644	.771	.592
Bed	18	1951.94	1480.305	.958	.318
Sofa	24	1470.83	1669.282	1.581**	.013
Stool	16	130.94	61.731	.946	.332
Child bed	18	754.44	658.074	1.554**	.016
Shelf	24	457.29	275.196	1.072	.200

Source: Primary data estimates, ** significant difference at <5% level

3.7 Labour Supply and Extension contact person

Most industries in Addis Ababa, Hawasaa, and other towns like Hagerselam and Shashamane recruited employees through personal acquaintance, while industries in Injibara and BahirDar recruited employee through brokers. Some industries considered experience and professionalism for an employment, although largely work ethics like free from drug abuse and motivation for work was the crucial consideration. Industries in BahirDar and partly in Hagerselam and Shashamane towns experienced labour shortage. There was no extension contact person and few get advice other than extension agent on producing bamboo furniture. Only furniture industries of Hawassa, got advice from technical colleges, University and Kaizen Institute, on bamboo utilization with metal and wood as well as space and product management.

3.8 Bamboo Worker Perception

Bamboo workers perception was collected on both traditional and improved practices. Approximately, 90 per cent of respondents agreed and indicated the significance and relevance of improved bamboo practicing. With the exception of a few industries in Addis Ababa, bamboo practitioners believed that it is worth practicing modern bamboo technology than the traditional methods adopted. Similarly, it was believed that using improved bamboo technology increases the quality of bamboo products, which could serve as an alternative raw material for furniture making in place of wood. Nearly all bamboo industry owners valued the role of researchers in endorsing an increase and change in the the ways of bamboo production and utilization practices.

4. Conclusion and Recommendation

The study found that bamboo was among the the neglected sectors and its industries have low capacity and produce low quality of furniture products due to various barriers. Industries in surveyed towns were unregistered and merged in the wood working sector. However, industries started as new business startups and operated relatively for few years. There were various factors and challenges for its development. Majority of bamboo industry practitioners did not avail any training in appropriate technologies like bamboo culm selection, drying and treatment. Furthermore, industries did not consider its moisture content during bamboo processing, due to a lack of awareness regarding drying and moisture content removal. In addition to lack of training, the most common problems reported by all industries included the borer attack on bamboo furniture and raw materials, shortage of production space and lack of capacity with regard to tools/machine and finance. The survey result also indicated that majority of industries practitioners faced cash shortage to purchase inputs with exception of those of Hawassa, which had access to government loan. Majority of bamboo industry owners and practitioners in all cities did not participate on bamboo related meetings, workshop or seminars. Majority of the industries in surveyed towns thought they were not getting fair price for their products, and access to market by industries seemed to be poor. Almost all furniture Industries sold bamboo products at their workshop with the exception of few industries in Hawassa and Injibara, which sold their products at show rooms. There was no extension contact and few get advice other than extension agent on producing bamboo furniture in surveyed towns. In order to improve bamboo Industries, attention should be given to the sector by government and other development actors. Bamboo sector need to be separated from wood industry sector independently. There should be separate registration of bamboo industries and support for the improvement of the sector. Bamboo practitioners should trained on knowledge and skill about improved bamboo technologies like appropriate selection of its culm, drying, treatment and storage. Addressing other bottlenecks of the industries like space for processing, access to credit and loans, and market promotion could paves for bamboo industry development. Therefore, all sectors working on bamboo should cooperate and engage by involving all stakeholders for the development of the sector.

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