

Industrial Uses Of Highland Bamboo In Selected Cities In Ethiopia

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Abstract: Bamboo is an alternative construction material to substitute the declining supply of wood raw material in the construction sector and this study aimed to assess its amount and industrial use type in cottage and medium scale bamboo industries. The study was done in Injibara town and Addis Ababa city in Ethiopia; a snowballing sampling technique was used and both quantitative and qualitative data were collected from primary and secondary sources. Descriptive statistics showed that except the two medium-scale bamboo industries, most of the cottage scale bamboo furniture industries processed insignificant share of the country's huge bamboo resources and this study also found that most of the cottage factories in the study areas used bamboo culms for classical furniture products such as sofa, chair, stool, table and shelf, bed, etc. whereas only two medium-scale bamboo industries used bamboo for advanced products such as boards and floorings.

Keywords: Highland bamboo, Industrial uses,

1. INTRODUCTION

In the 1990s, the forest cover of Ethiopia was estimated at 35-40 % and in 2010; it was down to 11.2% (Hatsay, 2015). Nowadays, 17.2 million hectares of forests covering 15.5% of the national territory following the revised national forest definition, MEFCC, 2015 (MEFCC, 2018). As deforestation continues, the most important indigenous species will degrade unless alternative species comes in to use to substitute the demand of wood products in the construction industry. Bamboo is one of this alternative species, which can be alternative construction material to substitute the declining supply of wood raw material in the construction sector. Bamboo is pretty increasingly important in the world since it is a superior wood substitute; it is cheap, efficient, and fast growing; it has a high potential for environmental protection; it has wide ecological adaptation; and the state of the forest cover is shrinking globally (Kant, 1996). Globally, 1500 distinct uses of bamboo have been recorded, and the number of its uses is growing rapidly with new development and innovation initiatives (Zhaohua, 2001). Different bamboo products that are excellent substitutes for timber-produced materials have been innovated in mainly China, India and western countries. For example, bamboo floorboards, fabricated panels, handicrafts, curtains, modern ceilings, bio-energy, charcoal, paper, clothes, medicine, edible bamboo shoots, bamboo beer, bamboo soft drinks, etc. are important bamboo products in China (Bay, 2003). Fortunately, Ethiopia has a significant amount of bamboo resources, which can cover 67% of Africa's bamboo resources, which is about 7% of the world total (Consult, 1997). The total bamboo forest area in Ethiopia is estimated as 519,124 ha. Two species of bamboo are known to exist in the country: *Yushania alpina* (also known as highland bamboo) and *Oxytenanthera abyssinica* (also known as lowland bamboo) (MEFCC, 2018). However, different from other countries, bamboo utilization in Ethiopia has been habitual and mainly limited to hut construction, fencing and to a lesser extent production of handicrafts, furniture, containers for water transport, and storage, baskets, beehive, firewood, fodder, house utensils, various art-facts, and walking sticks (Bay, 2004). Although bamboo has, a great

contribution to the local household, bamboo handicraft industry has limited in the area. Therefore, this study mainly aimed to assess its amount and industrial use category in cottage and medium scale bamboo industries.

METHODOLOGY

Description of the Study Areas The study was done in Injibara and Addis Ababa.

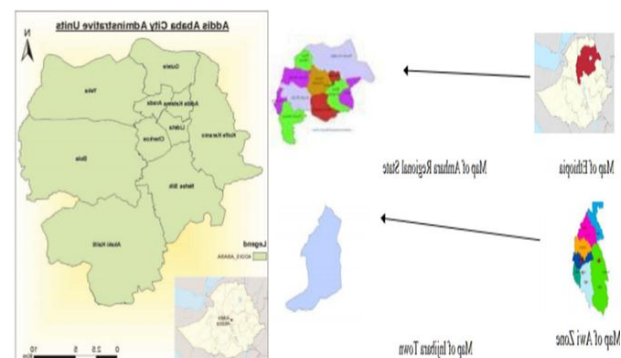


Figure 1: The map of Addis Ababa and Injibara cities

Sources (Yetnayet, 2012) and (Zewditu, 2017) Injibara Injibara is a town in Ethiopia. It is the administrative center of the Agew Awi Zone in the Amhara Region. Injibara is located at 10°57'N 36°56'E, in Banja Shekudad woreda at an elevation of 2560 meters above sea level, which is the potential area for *Yushania alpina* bamboo species. The average annual rainfall is 1750 mm while the average monthly temperature ranges from 17°C to 27°C (Wikipedia, 2017). In this Zone, *Yushania alpina* bamboo grows in the highlands above 2200 m asl and the town is well networked with all-weather roads and local communities have easy access to transportation to move their products to markets and centers of consumption. In this area, there are many cottages bamboo industries, which are settled along the roadside of Addis Ababa to Bahir dar, and they are consuming the available bamboo resources in the areas. Addis Ababa Addis Ababa is the capital city of Ethiopia. Geographically, Addis Ababa lies at an altitude of 7,546 feet

(2,300 meters) and is a grassland biome, located at 9°1'48"N 38°44'24"E or 9.03000°N 38.74000°E Coordinates: 9°1'48"N 38°44'24"E or 9.03000°N 38.74000°E. The annual temperature of the city is 15.9 degrees Celsius (60.7°F) and it provided with on balance 1089 mm (42.9 in) of rainfall per year (Wikipedia, 2015). Bamboo processing and marketing in Addis Ababa, which is the capital of Ethiopia, is proliferating in recent years. Mainly two groups conduct the processing. The first group is traditional processors who came from Injibara or Kosober and settled in Addis Ababa and produce low-quality products aimed at low-income customers. The other group is modern workshops that are producing high-quality products. Most commercial processing takes place in urban areas with the largest concentration in Addis Ababa. There are about 500 furniture producers in the country out of which 58 in the capital city Addis Ababa and this city is one of the major urban bamboo consumption centers in Ethiopia (Getachew Desalegn and Wubalem Tadesse, 2014; Moard, 2013). Sample Data and Sampling Procedure The study has focused on areas considering the availability of different cottage scale bamboo furniture industries, which are going to use *Yushania alpina* bamboo as a raw material. These areas are Addis Ababa and Injibara. A snowball sampling technique was used because the bamboo industry is not yet registered as an independent sector, there was no information about the address of bamboo industries, also the industries are located in scattered and inaccessible ways and most of the former industries have closed their work due to many problems they faced. Then the available sixty cottage and two medium-scale bamboo furniture industries were used for data collection for the study.

DATA COLLECTION METHODS

Primary data collection

Interview survey has done to gather information about the amount and the use type of *Yushania alpina* bamboo culm in cottage and medium bamboo furniture industries and socio-economic parameters.

Secondary data collection

These types of data were collected from Central Statics Agency (CSA) and International Network for Bamboo and Rattan (INBAR) data bank in Addis Ababa and differently related literature such as textbooks, manuals, journals, and reports were reviewed.

DATA ANALYSIS METHODS

Descriptive statistics

Both qualitative and quantitative data collected from various sources were encoded in the computer, processed, categorized, variables were formulated and summation, average, percentage and other tests.

RESULT AND DISCUSSION

Socio-Economic Characteristics of Respondents 62 questionnaires were distributed and collected back making the response rate of 100%. From these, 60(96%) questionnaires from cottage and 2(3.2%) questionnaires from medium scale industries were used for descriptive analysis. A Socio-economic characteristic of the respondents is

summarized as follows: Sex of respondents: Out of the 62 respondents 52(83.8%) of them were males and the remaining 10 (16.1%) were females. This result shows that females were yet far from bamboo business activities and on the other hand, males were the major participant of this sector. Thus, special attention should be given on males to expand bamboo sectors. Besides, proper affirmative action should be taken to attract a female to this sector. Age of respondents: The average age of respondents was 30.2 years. This tells that most of respondents engaged on this business were on good productive age and it is an advantage for the country to mobilize and support these powerful human resources for the overall development of the country through scaling up the industrial uses of bamboo. Education level of respondents: The distribution of education level of respondents told that 6(9.6%) respondents were from primary school, 25(40.3%) were from secondary school, 9(14.5%) were from preparatory school, 20(32.2%) were from college diploma and 2(3.2%) were master's degree holders. This indicates that majority of the respondents were not educated and expected to have limited technical and theoretical knowledge on industrial use of *Yushania alpina* bamboo culm in bamboo furniture industries and expected to have little knowledge about its alternative use for panel products. From this result, we want to underline the advantage of further education and training to develop the industrial uses of bamboo. Work experience of respondents: According to interviews made to know the experiences, responsibilities, and roles of respondents in their industries, 30 (48.4% of) respondents had work experience of 1 up to 5 years, 22 (35.5% of) respondents had experience of between 6 to 10 years and 10 (16.1% of) respondents had more than 10 years experiences. These statistics indicate that the majority of the respondents were not experienced enough to lead bamboo sectors and to solve the main challenges in industrial uses bamboo. Industrial Uses Highland Bamboo Culms In Ethiopia, highland bamboo culms were used as a raw material in different bamboo furniture industries such as cottage and medium scale industries. This study found that the only two medium scale industries located in Addis Ababa were used substantially more bamboo culms with an average annual input of 820000 culms. Whereas cottage bamboo furniture industries located in Addis Ababa and Injibara cities were used a reduced amount of bamboo with an average annual input of 3272 and 2124 culms respectively. This result is somehow higher than the study by Ensermu Kelbessa, et al.,(2000) found that the average annual consumption of raw bamboo by manufacturers in Injibara was 500 culms; while the corresponding figure for those in Addis Ababa was 2690 culms. From this result, we agreed that there was no significant improvement in the number of industrial uses of *Yushania alpina* bamboo culms within the past two decades. According to this result, the gap between the amounts of bamboo culms used in the two cities also proved the difference in accessibility to facilities, training, capital, market, demand, etc. in these two cities. This result also showed that except the two medium scale industries, most of cottage industries process insignificant share of the country's huge bamboo resources which is 150, 000 ha (Melese, 2016).

Table 1: Industrial uses highland bamboo culm in two study areas

Location	Industry type	Number of Industry	Average annual industrial uses (culms)
Addis	Cottage	30	3272.89
	Medium	2	820000
Injibara	Cottage	30	2123.54
	Medium	0	0
Total		62	825,396.4

CURRENT USES TYPES OF BAMBOO CULMS

Despite the overall small amount of highland bamboo culm used annually, most of cottage bamboo furniture industries in the two study areas were used bamboo in raw culm and sliced forms for classical furniture products such as sofa, chair, stool, table, shelf, bed, etc. while only two medium scale bamboo industries were used bamboo in both raw culm and board form for advanced products such as the board, flooring, furniture house wares, curtain, toothpick, incense stick, handcraft, charcoal, charcoal briquettes and saw dust briquette (Figure 2). From this result, we have concluded that the industrial uses of *Yushania alpina* bamboo in the study areas were not developed enough to produce improved furniture and panel products, which can be competent with products made from wood species and lacked to utilize the currently available resource and to substitute most important over exploited endangered wood species. This findings strongly agrees with Yigardu Mulatu & Mengistie Kindu, (2010) reported that bamboo utilization in Ethiopia has been customary and mainly limited to hut construction, fencing and to a lesser extent production of handicrafts, furniture, containers for water transport, and storage, baskets, beehive, firewood, fodder, house utensils, various art-facts, and walking sticks

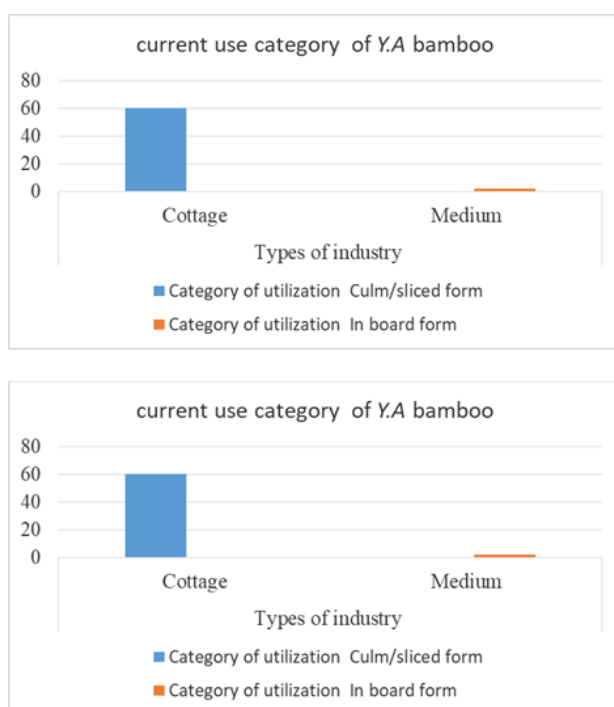


Figure 2: Use category of highland bamboo culm

CONCLUSIONS

This study indicated that most of the cottage bamboo furniture industries were processed considerably small amount of bamboo culms whereas only two medium scale bamboo industries were used a substantial amount of bamboo per year. This shows the size of industry mainly capital was the main determinant for the industrial uses of bamboo culms. At the same time, the cottage furniture industries situated in Addis Ababa have processed more bamboo culms than those located in Injibara city and this explained the effect of the location of industry mainly infrastructure and accessibilities of facilities and training on the industrial uses of bamboo culms. In addition to the low level of its industrial uses, its category of uses in most cottage industries mainly limited to classical furniture products produced from unprocessed sliced and round culms. Furthermore, based on this survey, there was no organized marketing system even for customary bamboo products. Much bamboo remains unused, in rural areas such as Injibara where transportation is a constraint. Most of cottage industries are financially weak and found it difficult to upgrade their production and marketing. The obstacles for industrial use highland bamboo should be solved through integrated work from government, NGO, and research institutions. Further research on advanced utilization of highland bamboo is needed to exploit this untapped resource. Therefore, considering these issues the government and responsible bodies should put their crucial attention to build the capacities of bamboo industries and to develop the sector through implementing and promoting the right policies and adoption of the latest technologies related to bamboo processing.

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PROCEEDINGS

1. Effective Lumber Seasoning Technologies and Uses of *Pinus patula* ssp *tecunumanii* Tree Species Grown at Bonga, Ethiopia Getachew Desalegn, Gemechu Kaba, Anteneh Tesfaye, Saifu Amanuel, Tsegaye Wubshet, Tesfanesh Ababu Wood Technology Research Center
2. Seasoning Characteristics and Potential Uses of *Gmelina arborea* Lumber Tree Species Grown at Bonga Getachew Desalegn, Anteneh Tesfaye, Gemechu Kaba, Saifu Amanuel Wood Technology Research Center

附件

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Educational background

From	To	University/Institution	Degree and Major
1981	1985	Beijing Forestry University	Bachelor in Forestry Economics & Management
1985	1987	Beijing Forestry University	Master in Forestry Economics & Management
1996	1999	Beijing Forestry University	Ph.D. in Forestry Economics & Management

Research projects

From	To	Title of Project	Position	Project Description
2007	2010	Research on the resource of the woody oil plant and exploitation mechanism in China	Project chief	National Natural Science Foundation of China(NSFC) financed project
2011	2013	Study on the operation mechanism and the promotion pattern of biomass solid forming fuel project in Beijing rural areas	Project chief	Ministry of personnel and social security: The scientific and technological activities for the selected students studying abroad
2013	2015	Research on global renewable energy development prospect	Project chief	The project funded by the climate department of National development and reform commission
2013	2015	Study on commercial application model of biomass pellet fuel replacing fossil fuel	Project chief	Funded by UNDP China
2015	2017	Study on farmers' income increase and forestry development model in huairou water conservation	Project chief	Funded by Beijing beilin advanced eco-environmental technology research institute co. LTD
2018	2019	Forging strategies for sustainable development in Zhouqu County of Gansu province	Project chief	Funded by UNDP China

Publications

Year	Publication
2018	Fiscal decentralization and environmental pollution -- from the perspective of new structural economics, Journal of financial research, 2018(03), 50-70
2018	Evaluation on the carbon footprint and economic cost of power generation enterprises from the perspective of resource value stream, Journal of industrial technology economics, 2018 Vol. 37 (12)
2018	Analysis on the spatial and temporal evolution of per capita net income of farmers in ecological conservation areas in Huairou district, Beijing, Journal of forestry economics, 2018,40(03)
2018	Forest biomass energy resource potential estimation and change trend in China, Journal of world forestry research, 2018,11.3
2017	Review and revelation of research on the raw material supply of foreign biomass energy, Exploration of economic problems, 2017(06)
2017	Environmental value measurement and potential economic impact analysis of biomass energy projects, Technology management research, 2017(11)
2017	National Mangrove Restoration Project in Malaysia. Journal of Environment and Earth Science, Vol. 7, No. 11: 119-125
2016	Spatial and temporal pattern evolution of the forestry total factor productivity in China, Statistics and decision making, 2016(08)
2016	Study on the consumption of carbon emissions from residents - take Henan province as an example, Resources and environment In dry area, 2016(06)