Value Chain Analysis of Lowland Bamboo Products: The Case of Homosha District, Northwestern Ethiopia

Fayera Bakala[1]   Tsegaye Bekele[2]   Teshale Woldeamanuel[2]   Eckhard Auch[3]

1.Mizan-Tepi University, P.O.Box 260, MizanTeferi

2.Hawassa University, Wondo Genet College of Forestry and Natural Resources, P.O. Box 128, Shashemene, Ethiopia

3.Technische Universidad Dresden, Institute of International Forestry and Forest Products

Abstract

Ethiopia is well endowed with bamboo resources and products. To date, however, the contribution of these resources for local and national economies was below its potential. In the Homosha district, despite the abundant and valuable lowland bamboo resources, the livelihood of smallholder farmers in the area was desperate. This study, therefore, was initiated to analyze the value chain of lowland bamboo products from Homosha district (Benishangul Gumuz region). Primary data were collected via household survey from 124 household heads who harvest bamboo products, as well as 10 local traders, 11 craftspersons and 30 end users in three villages via key informant interviews, focus group discussions market assessment and stakeholder consultation workshops. Field observations supplemented by informal discussions were employed to complement and verify the findings. Secondary data comprises various documents on the study area and related materials from the internet were used. It was found that there were three market channels in value chain of lowland bamboo products. The first channel was the channel that directs bamboo products from harvester to local traders to end users/consumers; the second channel directly connects bamboo harvesters and end users/ consumers, while the third channel connects harvesters and end users/consumers via craftspersons. The largest numbers of bamboo culm bundles were transacted through the first channel, while, the third channel, in which relatively more value addition is carried out, stands last in terms of the volume of bamboo transacted. Moreover, it was found that bamboo products have different market concentration ratio, ranging from 51 % for raw bamboo culms to 79 % for bamboo baskets. The transactions of bamboo culms and products took place under a tight oligopoly. Analysis of the market conduct showed that bamboo traders and end users had higher bargaining power in price setting for bamboo products than harvesters with an unequal value addition on the different knots of the value chain. That is, local traders collecting bamboo culms altogether added lowest value per bamboo culm as compared to craftspersons that convert raw bamboo into different products and resulted in highest marketing margin. Value chain of lowland bamboo showed a poor diversification in products and was rather dominated by middlemen. This calls for improving the marketing of lowland bamboo. Attention should be given to three up-grading interventions: (1) widen the market linkage by increasing the bargaining power of the harvesters, (2) improve the market conduct, to make the market more competitive and transparent, and, (3) increasing the capacity of the marketing actors to create innovative value added products of bamboo to the market.

Keywords: Concentration ratio, Marketing channels, Marketing margin, Oxythenanthera abyssinica, Value chain actors, Value addition

1. Introduction

Bamboo subsumes woody grasses distributed widely in tropical, subtropical and mild-temperate zones, except Antarctica (Inga and Camille, 2011). It is one of the fastest growing and highest yielding renewable resource (INBAR, 2006). The recent classification describes about 1200 bamboo species exist in the world (Bystriakova et al., 2004). Among which 38 species are found in Africa; of which fivespecies are found in the mainland of Africa and the remaining 33 species are found in Madagascar.

Specifically, Ethiopia has got two bamboo species, both of them are native to the country, namely lowland bamboo (*Oxythenanthera abyssinica* [A. Richard] Munro) and highland bamboo (*Yushania alpina* [K. Schumann] Lin) which was formerly named as *Arundinaria alpine* (Kalbessa et al., 2000, Starke, 2014).No specific and precise data about the area of bamboo in Ethiopia are available (Starke, 2014). According to Embaye et al. (2005), Ethiopia has over one million hectares of highland and lowland bamboo resources in Africa. Separately, it is estimated that lowland bamboo and highland bamboo covers 850,000 hectares (85%) and 350,000 hectares (15%) of Ethiopian bamboo resources, respectively (INBAR, 2011). Notably, Benishangul Gumuz Regional State is characterized as an area with the largest natural stands of lowland bamboo coverage that comprise 48 % of the total lowland bamboo resources of the country (Anonymous, 1997). The very difference of the two native Ethiopian bamboos is shown in Fig. 1. The lowland bamboo has a completely solid culm, with high bulk density and greater stability while the highland bamboo has a hollow culm, which is easier to process (Starke 2014).
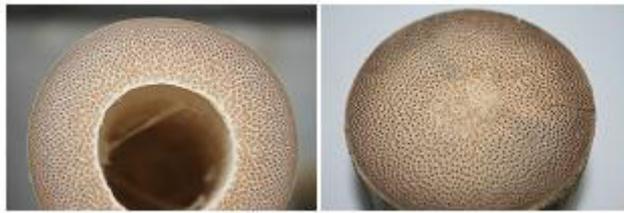
Fig 1. Transversal section of highland bamboo *Yushania alpina* (left) and lowland bamboo *Oxythenanthera abyssinica*
Source: Starke (2014, p. 3)

Although Ethiopia is well known in bamboo resources, the use of this resource is usually limited to traditional house construction, fences, and some rudimentary furniture and household utensils (Kalbessa et al., 2000; INBAR, 2006). In Ethiopia there are new bamboo products under development, e.g. thermal modified panels (Starke, 2014), bamboo flooring and sealing panels from Adal (personal communication) or the establishment of production of cement bound bamboo fiber board (plant in Asosa), but up to now all developments do not create significant impact on the bamboo culm production. This shows that despite their potential, Ethiopian bamboo resources are continued to be utilized and managed on a low level (INBAR, 2007). Notably, in Homosha district, despite the abundant and valuable lowland bamboo resources, the livelihood of smallholder farmers in the area is desperate. This means, that the communities in the district are not able to employ the bamboo resource for the benefit of their livelihoods. Rather, huge areas of bamboo forests have been progressively converted to enable large scale agricultural investment in Northwestern western Ethiopia (Anonyms, 1997). In Ethiopia, to compensate the temporarily lost bamboo income opportunity due to mass flowering, many communities convert the recovering bamboo forest area into agriculture fields or grazing pastures (Sertse et al. 2011).

Moreover, further study was not done on the value chains of lowland bamboo resources, nor identified the constraints in the whole system that inhibited bamboos' potential for benefit of livelihoods of smallholder farmers in particular and its contribution for the national economy in general. This is true for the Benishangul Gumuz region and especially for the Homosha district. There bamboo is not considered as significant non-timber forest product and is seen as underutilized. This study, therefore, was initiated to analyze respective value chains of lowland bamboo products. The study addressed the following objectives: (i) identifying actors and their functions in the value chain of lowland bamboo, (ii) mapping the market channels of lowland bamboo products, and (iii) investigating the market structure, conduct and performance for lowland bamboo products. In addressing these objectives, a detailed account of bamboo value chain is provided with deepened knowledge about bamboo product marketing and bamboo related income. This paper will also contribute towards understanding the wider issues of the marketing channels and value chain of lowland bamboo products in Ethiopia and beyond.

2. Methodology

The study was conducted in Homosha district in Asosa zone, Benishangul Gumuz Regional State (BGRS). The district is located at a distance of 711 km from Addis Ababa to Northwestern and 36 km from the regional capital, Asosa to the West. The total land area of the District is 48,325 hectares and comprises 15 villages. Data collection for the study was carried out in the three villages Tumet, Ashura and Jima (Fig. 1).

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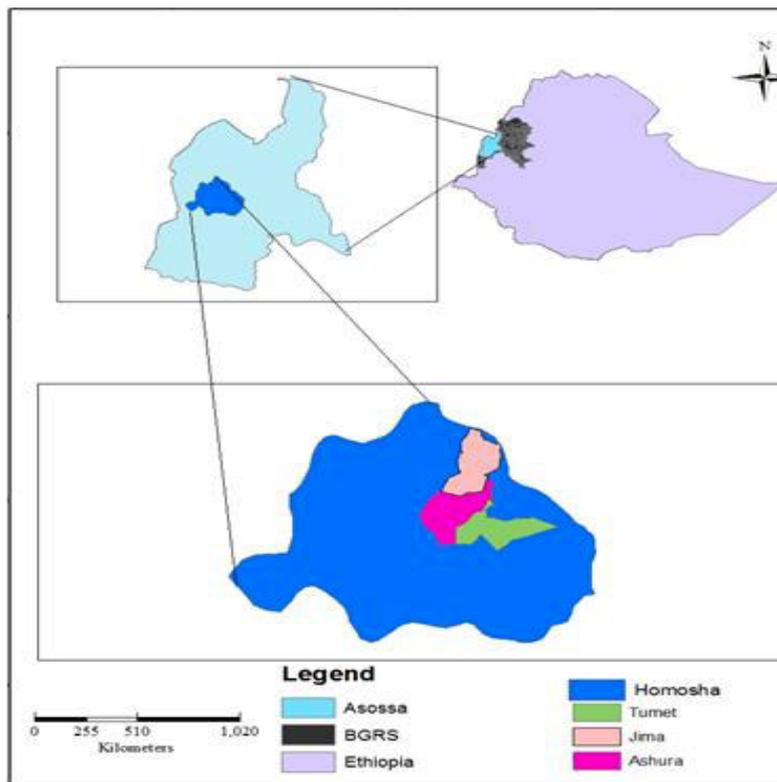
Fig2: Map of study area

In the study area lowland bamboo is harvested from natural stand. For bamboo production there is no further bamboo management in place, rather destructive activities like intensive browsing and frequent fires, which suppresses bamboo growth and regeneration. The recent large scale flowering and dying of bamboo is seen as a possible reaction of the bamboo stands on the harsh conditions created by unsustainable resource (Forest Research Center of Ethiopia, personal communication).

The study employed multi-staged sampling techniques for primarily data collection. In the first stage the study area, Homosha district, was selected purposively based on the availability of bamboo resources, its production and marketing activities. In the second stage, three villages, namely Tumet, Ashura and Jima, were purposively selected for the study due to the high intensity and level of bamboo harvesting and marketing activities. In the third stage sample households were randomly selected for sampling of household surveys.

Secondary data employed in this study were documented sources from the study area and other related materials from the internet. Primary data were collected by household surveys, focus group discussions, key informant interviews, field observations, market assessments and a PIP[1] stakeholder consultation workshop[2]. For the household surveys a questionnaire with both closed and open questions was prepared, adapted with individual checklists for bamboo culm harvesters, local traders, craftspersons, and end users of bamboo products. Additionally individuals from different sectors as well as local people with knowledge and experience about bamboo products marketing were selected as key informants and then interviewed on the issues related to lowland bamboo products marketing. Also focus group discussions were held in each selected villages with separate groups of elders, youth and women.

The sample size was determined by considering margin of error (8%) by using the formula by Israel (1992) which was estimated as:

$$n = \frac{N}{[1 + N(e^2)]}$$

Where n is the sample size, N is the total household size of the district and e is the level of precision. The sample size is proportional to the household size of each selected villages.

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[1] PIP is participatory innovative platform -an actor-centered method for upgrading forest/natural resource based value chains with focus on empowerment and cooperation of involved actors, supporters and regulators. See: Asmamaw and Auch (2016).
[2] CHAINS Workshop on bamboo value chain held at Wondo Genet College of Forestry and Natural Resource, Hawassa University on March 23-25, 2015.

Table 1: Sample size distribution of bamboo user households in the selected villages.

Name of Village	Number of households	Sample households	Sample craftspersons	Sample traders	Sample end users
Tumet	223	61	3	5	10
Ashura	108	30	4	2	10
Jima	119	33	4	3	10
Total	450	124	11	10	30

Craftspersons, local traders, and end users were purposively selected from Tumet, Ashura and Jima villages and interviewed. Due to the absence of registers it was not possible to indicate the proportion of these actors that the samples represent. However, in order to get representative results all craftspersons and local traders identified by the snowball method were interviewed.

Data were analyzed using both quantitative and qualitative analysis. Survey data were analyzed quantitative with descriptive statistics (tables, minimum, maximum, frequency, percentages, means, ratios and standard deviations). Data collected during focus group discussions, key informant interviews, and participative observations were analyzed qualitatively, with regard to value chain structure and pattern as well as interactions and relationships of actors.

Definition of indicators and management ratios used for analysis
Market channels: Refers the flow of bamboo products that reaches from the point of product origin to the consumer with the purpose of moving products to their final consumption destination.
Value chain: indicates full range of activities, which are required to bring bamboo products from conception, through the different phases of production delivery to final consumers.
Market concentration: refers to the number and size of distribution of buyers and sellers in a market.
Market margin: Marketing margin refers to the difference between prices of bamboo product/products obtained by market actors at two different market levels in various market channels. Gross Market Margin (GMM) is the difference between the prices of product/products before marketing costs are deducted between two market levels. However, net marketing margin is difference between the prices of product/products after marketing costs are deducted between two market levels. Total Gross Marketing Margin (TGMM) is the sum of marketing margins obtained at different market levels before marketing costs deducted.
Market transparency: Refers to the degree of getting market information, which enables value chain actors to make a decision on the selling and buying of bamboo culms and manufactured bamboo products.
Bamboo culm harvester: Refers to members of local households harvesting bamboo culms from natural forest, either for domestic consumption or for sale
Local traders: Denotes households whose members buy and sell bamboo culms and/or related manufactured bamboo products locally.
Craftspersons: Households producing traditional bamboo products using their skills and indigenous experience, under use of simple tools and working materials.
End users: End users or final consumers are the ultimate/last users of bamboo culms and/or manufactured bamboo products (no reselling of products).
Market concentration ratio (CR): The degree of market concentration of lowland bamboo culms were estimated using the "concentration ratio" (CR). The CR is calculated by taking the annually sold bundle of bamboo culms and products manufactured from bamboo culms by value chain actors and it is used to identify type of market structure of bamboo products in the study area.

3. Results
Tables 2 and 3 present the socioeconomic characteristics of the studied groups. Result shown in Table 2 varies with the respondent's group membership; age and experience were significantly different at 1% significance level. Average ages of local traders, craftsperson and producers were 40, 50 and 38 years, respectively. The average family size of local trader was lowest for traders (6 members) and highest for craftsperson (9) and harvesters (8). Harvesters have an average experience of 4.5 years in harvesting bamboo culms for sell. Nevertheless, the information from local elders shows that they had long experience in harvesting bamboo for domestic utilization. Amongst the studied groups the local traders had the shortest experience with 3.3 years for commercial bamboo culm trading. Longest experience showed craftsperson with 16.6 years in manually processing of bamboo products for sell.

Table 2: Socioeconomic characteristics of main actors (*continuous variables*)

Variable	Harvesters (N=124)		Local traders (N=10)		Craftsperson(N=11)		t-test
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	
Age [years]	40	10.71	38	9.88	50	15.29	-2.201***
Family size[no.]	8	1.10	6	3.02	9	5.00	-1.228
Experience [years]	4.52	4.39	3.3	0.82	16.64	11.52	3.489***

Note: N is sample size of respondents. *** is statistically significant at 1% significance level.

Results from Table 3 show that from all interviewed bamboo harvesters about 75% belong to male-headed households and 25% belong to female-headed ones. On the contrary, all the interviewed local traders and craftsperson were male. Gender of the household heads of studied actors had a significant difference at 5% significance level. About 89.5% and all (100%) of the interviewed harvesters and craftsperson were married, whilst, the remaining 11.5% of harvesters were unmarried. Only 41% of harvesters had access to extension services for bamboo management and utilization, however, none of craftsperson had access to extension services related to bamboo product designing and processing. This shows a significance difference at 1% significance level. About 12% of harvesters and 40% of local traders had marketing linkages. Similarly, 40% of both studied harvesters and local traders had access to market information. Marketing linkage and access to market information revealed significant difference at 1% significance level. Regarding education level, about ¾ and ½ of the interviewed craftspersons and local traders have not received formal education. Education level showed significance difference at 5% significance level.

Table 3: Socioeconomic characteristics of main actors (*categorical variables*)

Variable	Category of variable	Direct actors						x^2-test
		Harvesters (N=124)		local traders (N=10)		craftsperson (N=11)		
		N	%	N	%	N	%	
Gender	Female	31	25.0	0	0	0	0	6.68**
	Male	93	75.0	10	100	11	100	
Marital status	Unmarried	13	10.5	2	20	0	0	2.62
	Married	111	89.5	8	80	11	100	
Access to extension services	Yes	51	41.1	3	30	0	0	16.2***
	No	73	58.9	7	70	11	100	
Marketing linkage	Yes	15	12.1	4	40	0	0	19.16***
	No	109	87.9	6	60	11	100	
Access market information	Yes	50	40.3	4	40	0	0	9.0***
	No	74	59.7	6	60	11	100	
Formal education level	None	52	41.9	5	50	8	72.7	6.65**
	Primary school	54	43.5	2	20	2	18.2	
	Secondary school	18	14.5	3	30	1	9.1	

Note: N is sample size of respondents. *** and ** are statistically significant at 1% and 5% significance level, respectively.

The quantity of commercialized bamboo culm bundles supplied by male- and female-headed households was statistically and significantly different at 1% significance level (Table 4). More culms were supplied by male-headed households. As well, the quantity of bamboo culms supplied by harvesters with different services (access to extension service, access to market information and marketing linkage) were significantly different at 1% significance level from harvesters without these services.

Table 4: Association between quantities supplied for sale and some socioeconomic activities

Variable	Variable category	Harvesters (N=124)	Mean of bamboo Culm bundles supplied to market	Standard deviation	t-test
Access to market information	No	74	36.3	21.5	-2.9***
	Yes	50	49.9	31.5	
Marketing linkage	No	109	36.4	21.6	-7.2***
	Yes	15	80.9	28.6	
Gender	Female	31	21.5	15.6	5.4***
	Male	93	48.5	26.3	
Access to extension services	No	51	21.4	8.5	-9.2***
	yes	73	56	26	

Note: N is sample size of harvester households, *** indicates all values are significantly different at 1% significance level.

3.1 Market structure of lowland bamboo products

In the studied value chain of lowland bamboo, harvesters, local traders, craftspersons and end consumers were identified as actors of the bamboo value chain. These value chain actors are divided into two groups: direct actors and indirect actors.

Direct actors

The direct actors are those who were involved in marketing activities of bamboo culms and/or bamboo products manufactured from culms in the chain. These include harvesters, local traders, craftspersons and end users.

Harvesters: Harvesting and transportation of bamboo culms from natural stands is done manually, including the transport of culms on foot. The activity is done with family labor of the harvester households, so they do not need liquid cash to pay additional labor. In the study area bamboo is mostly harvested during the dry season from November to April, when farm activities are off. Farmers use bamboo harvesting as a seasonal activity to complement agricultural activities. For marketing the bamboo culms are tied together, one bundle contains ten single bamboo culms and it is the locally marketing unit. In Homosha the local market demand for lowland bamboo culm and other bamboo products was low, because the natural bamboo resource is freely accessible to the community. Bamboo commercialization in Homosha is an activity that provides farmers the opportunity to earn some cash, although it is unattractive because bamboo culms are sold at very low prices. None of the farmers have own bamboo plantations ready for harvest, they all harvest standing bamboo from the natural bamboo forest, usually without paying fees for a harvesting permits. Only recently some few farmers have started to plant bamboo in their home garden for domestic use purpose only.

Local traders: All responding traders participated in bamboo culm trading only; there was no evidence for trade of crafted bamboo products to other areas. Their role in the lowland bamboo value chain is buying bamboo culms from harvesters and bundling the culms to larger lots for buyers seeking larger amounts at once. Local traders participated in bamboo trading mainly during the dry seasons. Like the harvesters their livelihoods mostly depends on agriculture, complemented by bamboo trading. Bamboo product trader reported difficulties in finding appropriate working premises. Aside of the sector's poor recognition, low market demand, lack of knowledge about culm handling, lack of financial capability and poor infrastructure affects value chain improvement.

Craftspersons: These actors manufacture several traditional products from bamboo culms by using indigenous crafting skills and simple tools. Their main products were mats, tables, chairs, traditional beehives and baskets. Craftsperson sold their products at directly to consumers, without intermediaries. Most of the time the craftspersons produced bamboo products for their stock and only sometimes they produced upon request. In Homosha, both quality and types of the bamboo products was extremely low. Despite the fact that bamboo processing is based on a longstanding traditional knowledge, the performance of the craftsperson in the study area was poor. The lifetime of the products is short not more than a couple of month, due to poor working quality and lack of treatment against borers and fungi. This results in poor reputation of and low demand for bamboo products. High wastage of raw bamboo material was observed during study. There is lack of efficient utilization (high wastage) of bamboo culms by craftspersons. By removing the upper and bottom part of the culm, rural craftspersons used only around 1/3 (middle part) of the whole bamboo culm.

End users: End users purchased bamboo culms and/or bamboo related products for domestic use. Most are from the local place, but some come from outside the study area to purchase culms for construction of their fences, houses and cattle barns. Crafted bamboo products were bought directly from the craftspersons, without intermediaries. In general consumers perceived bamboo products as of low quality and short durability, even

below their real quality and durability. Due to this the local users show only reserved preference to them, which resulted in a comparatively low demand for it.

Indirect actors

Indirect actors are supporters and regulating organizations and agencies. For the study area only two were identified as being present and visible; while the many other institutions with impact could not identified during the field work.

District Office of Agriculture and ***District Office of Custom and Revenue:*** They provide regulation services for direct value actors. Local communities request the Agricultural Office for permission to cut specified number of bamboo culms. The Agricultural Office provides the permission. By issuing harvesting permits Agricultural Office have some control over the bamboo utilization by community members. Correspondingly, District Office of Custom and Revenue monitors and regulates bamboo marketing in Homosha slightly by collecting permit fee from users who take bamboo to other areas. But in general, bamboo culm harvest and marketing were informal.

Market channels of lowland bamboo products

Three marketing channels of lowland bamboo products were identified, as displayed in (Fig. 2). Compared to the large potential of the bamboo resource in the in Homosha district, the marketing channels were quite short and few in number. About 3,995 bamboo culm bundles, 262 mats, 61 tables, 155 chairs, 170 traditional beehives and 113 baskets were transacted by the interviewed respondents. The percentages indicate the volume of bamboo products transacted in 2014 in the respective channels. The red line indicates the organizations that control the bamboo marketing and utilization through the permit system. District Agricultural Office controls bamboo management and utilization community by providing permission for communities to harvest based on their request as well, District Office of Custom and Revenue monitors and regulates bamboo marketing in Homosha by collecting permit fee from users. But in general, bamboo culm harvest and marketing were informal. The green one shows the flow of raw bamboo culms, starting from the forest through different actors to the final users. The black line represents the flow of products from bamboo produced by craftsperson to the final users.

Market channel 1: Harvesters → Local traders → End users

This channel is the most important channel in which about 49% of bamboo culm bundles were transacted to local traders. These local traders concentrated bamboo culms together in particular places and resold these culms to end users. End users came from different places outside the study area. This may explain the high number of bamboo culms transacted through this channel.

Market channel 2: Harvesters → End users

This channel is found to have nearly the same importance of the first channel; about 46% bamboo culm bundles are transacted through it. It is the shortest of the identified channels in with which harvesters directly sell to end users, without any middlemen.

Market channel 3: Harvesters → Craftspersons → End users

This channel transacts the smallest amount of bamboo culm bundles. From the total transected culm bundles, about 5% culm bundles were traded through this channel. Craftspersons produce various products from the purchased bamboo. All production is directly sold locally to end users.

Market concentration ratio **of bamboo culms and products**

For the market channel 1 the value of CR_4 (market concentration ratio of the four leading local traders) was 50.88%. This indicates that in the district bamboo culm trading is characterized by a rather concentrated market, categorized as "tight oligopoly". This means that the bamboo trading activity is concentrated in the hands of some few local traders, while, due to the unrestricted open-access resources of bamboo forests, many harvesters are in the market arena, heavily competing against themselves. Since the absolute market demand is limited, only few traders have participated in the bamboo culm trading.

For the market channel 2 the CR4 value is about 17.04%. This indicates that bamboo culm marketing through channel 2 is characterized as competitive. All the interviewed respondents were engaged in bamboo culm selling. The market concentration ratio for the channel 3 products was estimated by using the four leading suppliers (craftspersons) of the products. The concentration ratios for the various products of the four leading suppliers (CR_4) ranged between 64.15 and 79.17% (Table 5). Since the values were larger than 50% market structure is categorized as "tight oligopoly" or "concentrated" suppliers as that of raw bamboo culms. The market of the considered bamboo products was characterized by a tight oligopoly market structure, meaning the supply of these bamboo products was concentrated in the hands of few craftspersons. Due to the high labor input and the low local price in the study area bamboo processing results as an activity with low return on labor. So, craftspersons have no incentive to invest in bamboo processing and in the area only few craftsperson produce bamboo products and supply for sale. This results in the oligopolistic market structure of bamboo products in Homosha district. Baskets and tables manufactured from raw bamboo have a fairly high degree of market concentration. This is attributed to the fact that some craftspersons were specialized in the production of these particular bamboo products.
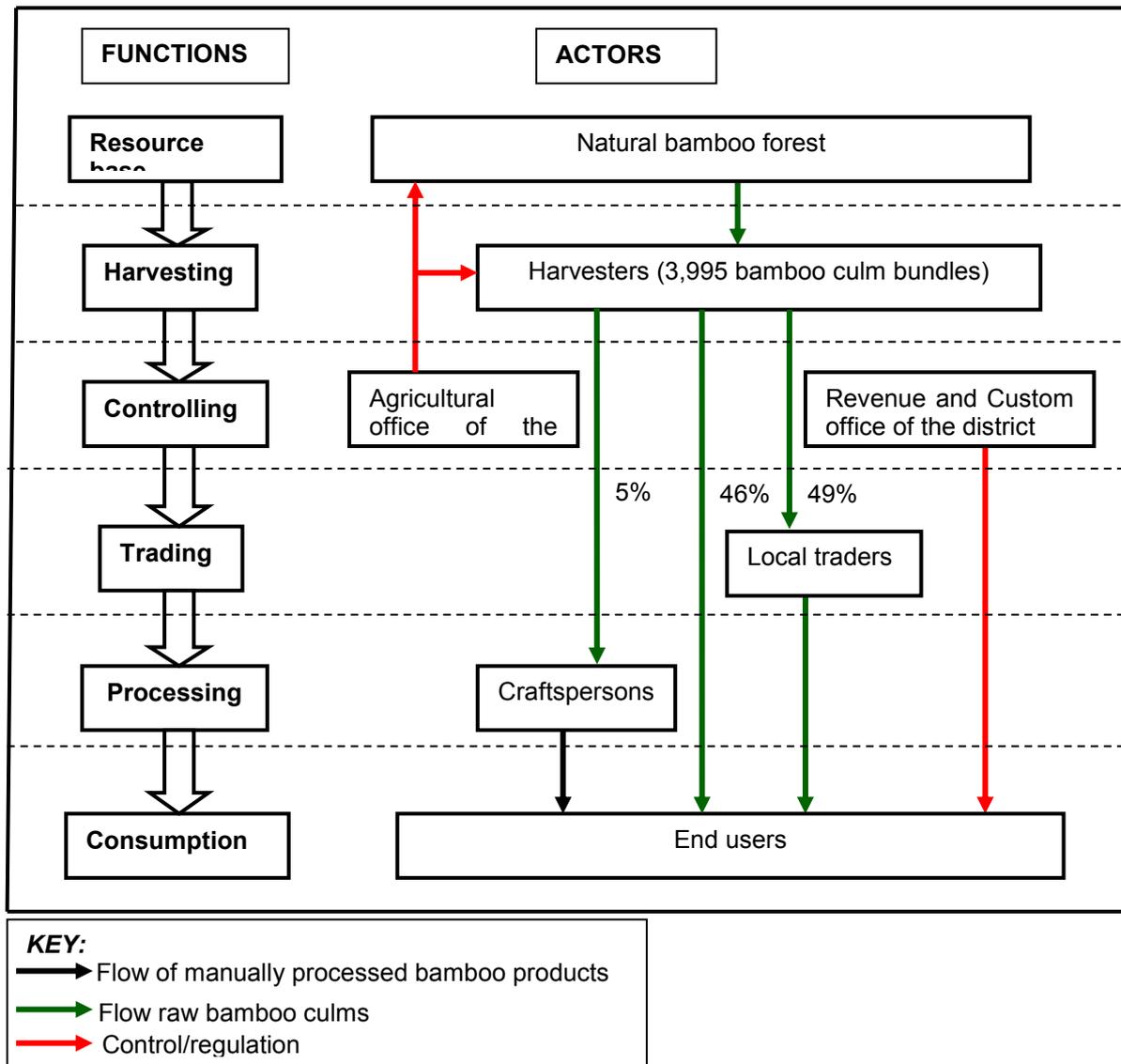
Fig 3: Bamboo product market channels

Table 5: Concentration ration of different products produced from bamboo

Bamboo products	Market concentration ratio (CR4) [%]
Mats	64.15
Tables	75.41
Chairs	71.61
Traditional beehives	74.12
Baskets	79.12

Degree of transparency

Market transparency or information dissemination, enables value chain actors to make evidence based decision on selling or buying bamboo related products for a certain price. Bamboo market information is supplied mostly by local traders through personal contact in the form of dialoging with harvesters. The results show that 59.70% of local traders and 40.30% of harvesters had access to bamboo market information, while the remaining respondents had none.

3.2 Market conduct

Harvesters and local traders participated in bamboo harvesting and marketing mostly during the dry season (November to April). Compared to local traders, bamboo culm harvesters had low bargaining power and hence were price taker. The bargaining power of the harvesters is low due to quasi unlimited local supply, low local demand and lack of access to market information. Regarding the terms of payment, about 83% of the harvesters

indicated that payments for bamboo sales were received in cash. Only 17% of producers sold on credit base. About 75% of craftspersons sold products for cash, while the remaining 25% accepted credit. However, local traders only sold in cash, none on credit. For advertisement, harvesters, local traders and craftspersons usually displayed their products on roadsides or in open areas, to attract buyers and interested buyers purchase from there.

3.3 Market performance

The figures in Table 6give the performance of bamboo culm marketing in the different channels, evaluated with the marketing margins.

Market channel 1: Bamboo harvesters sold each bamboo culm to local traders for averagely 0.1059 USD. At this stage harvesters received the value of 0.1059 USD per culm for their labor, since they harvest largely informally without other monetary cost; so the financial value of the standing culm is considered as zero since the cost for growing the culm were externalized. Local traders finance the storage and concentration of bamboo culms for resale to end users, their selling price is at averagely 0.1475 USD per culm. Similar to harvester, local traders have practically no additional cash expenses for marketing costs, only the payment to purchase the culm. Thus, averagely a trader obtains a margin of 0.0416 USD per bamboo culm, which is covering the costs for advance financing the culms and their profits. The gross margin for local trader is estimated to 28 % of end user's price. This relative small marketing margin discourages local traders to engage in bamboo marketing. A harvesters' share of the end user price accounted for 72%.

Market channel 2: This was the shortest channel in which harvesters and end users interact without any other market actor in-between. Bamboo was sold for averagely 0.1222 USD per culm; all end users' price was earned by the harvester, so its share was 100%.

Market Channel 3: Harvesters sold bamboo culms to craftspersons for averagely 0.0960 USD per culm. After transforming these raw bamboos into different products, craftspersons sold it to end users. At this stage they added comparatively high value to bamboo culm in each product.

Table 6: Market performance of bamboo culms across market channels

Actors	Determinants	Bamboo culm marketing channel		
		I	II	III
Harvesters	Selling price [USD]	0.1059	0.1222	0.096
	Harvester's share [%]	71.78	100	14.11
	TGMM [%]	28.20		85.89
Local traders	Selling price [USD]	0.1475		
	Total cost [USD]	0		
	Gross market margin [USD]	0.0416		
	GMM_T [%]	100		
	Net market margin [USD]	0.0416		
Craftspersons	Selling price of bamboo culm [USD]			0.6068
	GMM_{Crp}[%]			100
	Net market margin [USD]			0.5846
Final consumer price [USD]		0.1475	0.1222	0.6806
Total Gross Marketing Margin (TGMM) [USD]		0.0416		0.5846

TGMM = total gross marketing margin, GMM_{Crp} and TMM_T = total marketing margin of craftsperson and local traders, respectively.

The monetary cost of production of mats, traditional beehive and basket were the money spent for the bamboo culm purchase. Regarding mats, the craftsperson's' additional input was splitting bamboo and weaving them together. For chairs and tables the production costs on top of the bamboo culms and the craftsmen's labor are the expenses for nails and mounting materials, averagely 0.9897 and 0.8413 USD per chair and table, respectively. Cost for replacement of tools for processing was negligible, as craftspersons use most tools dually for farming activities and bamboo processing. The results showed that higher profit was earned (high value addition) when bamboo culms were processed to mats, baskets and tables (Table 6). Lower profits gained per bamboo culms when it was converted to traditional beehives. In average the partial selling price for one bamboo culm was about 0.6806 USD in the studied products. In the considered products the average profit per bamboo culm employed was estimated to be 0.5846 USD.

Table 7: Average values used to estimate market performance bamboo culm in theproducts produced by craftsperson from bamboo

Cost items	Mats	Baskets	Beehives	Chairs	Tables	Average
Average number of bamboo culms required to produce one unit [no.]	2.14	2.33	2.21	2.57	2.42	
Family labor used to produce one unit [hour]	3	6	5	9	7	
Cost of nails and mounting materials per furniture [USD]				0.9897	0.8413	
Cost of purchasing per culm[USD]	0.0990	0.0891	0.0792	0.1089	0.1039	0.0960
Total cost [USD]	0.0000	0.0000	0.0000	1.2696	1.0928	
Selling price per furniture[USD]	1.6600	1.5635	0.6223	2.1540	2.0243	
Selling price per culm[USD]	0.7757	0.6710	0.2816	0.8381	0.8365	0.6806
Market margin per culm [USD]	0.6767	0.5819	0.2024	0.7292	0.7326	0.5846
Profit per furniture[USD]	1.6600	1.5635	0.6223	0.8844	0.9315	
Profit price per culm[USD]	0.7757	0.6710	0.2816	0.3441	0.3849	0.4915

4. DISCUSSION

4.1 Market structure of lowland bamboo products

Actors and their role in the value chain of lowland bamboo products

INBAR (2011) identified in Asosa area harvesters, cooperatives, urban housing developers, transporters, private processing industries, trans-boundary harvesters to Sudan and consumers as value chain actors in bamboo marketing. These bamboo value chain actors were hardly organized and only loosely connected, due to low market price and demand for bamboo products. Additionally, Levang et al. (2005) report that the bamboo utilization of Ethiopian communities is generally isolated, not integrated with potential markets and their natural bamboo habitats often lack management. The present study identified harvesters, local traders, craftsperson, custom and revenue office of the district, consumers and agricultural office of the district. The fewer value chain actors in the Homosha area here could be attributed to the following factors: First, the fact that currently more bamboo traders and processing units are found near and in Asosa town than in the remote areas of the Homosha district. Second, the cooperatives organized in 2009/2010 were dispersed nowadays. Third, to some extent the Agriculture Office imposed restrictions on illegal bamboo harvesting and transporting as well as on Sudanese trans-boundary harvesters.

Harvesters: All the interviewed households harvest bamboo culms from natural forest during dry season, either for home consumption or for sale. Belcher et al. (2005) have got similar findings; forest products are utilized for both home consumption or sold and traded as needed. In Homosha, the income generated from traded bamboo culms was used to complement the agriculture dominated livelihood activities of harvesters. Bamboo is an important non-timber forest product (NTFP) that provides more regular income to harvesters than most agricultural crops which depends on seasons and favorable weather conditions (Sertse et al. 2011). By this bamboo is contributing to the household's resilience and can be considered as an asset with relevance for climate change adaptation. Many rural African communities rely on local NTFP harvest to complement their farming activities, in order to achieve more resilient livelihoods. However, their contribution to individual households ranges widely (Shackleton and Shackleton, 2004; Tesfaye et al., 2011). According to Hunde and Brias (2009), lowland bamboo stands in Asosa area are often found on very steep slopes, which are difficult to reach and harvesting is a labor intensive business. In the study area harvesters use family labor for bamboo harvesting and transporting, giving to family members in the working age some income opportunities.

Since bamboos were mostly informal, quasi unrestricted harvested from natural forest, there was only a low local market price for bamboo products, and due to the remoteness of the place only a low demand. Martin et al. (2007) found a similar situation in Laos. In Houaphanh province, where bamboo from natural forests had a low demand at the provincial bamboo market, because these bamboo resources were more or less freely available to most of the people and processing industries were far. Nevertheless, bamboo commercialization in Homosha provides farmers the opportunity to earn some cash, although it is not attractive as bamboo culms are sold at very low prices. Similarly, Emana (2010) found that in Northwest Ethiopia, Benishangul Gumuz Regional State, the role of bamboo production as income generation activity is limited due to the low price and remoteness, meaning that a transport to the nearby urban areas was not financially viable. Consequently, due to lack of adequate utilization, after flowering in 1997/98hundreds of hectares of natural bamboo forests in Metekel Zone (Benishangul Gumuz Region) were left to decay on the site. Since many substitute products for household

items and construction materials are on the market, in Sheka in Southwestern Ethiopia the decline of bamboo prices have resulted in reduced contributions of bamboo production to household incomes (Belay et al., 2013).

Local traders: In Benishangul Gumuz Region bamboo is traded at the local level for different purposes, including house construction, fencing, construction of cattle barns, furniture (stools, chairs, mats, etc.), baskets, grain stores, tools and vessels, but also for fuel. Young bamboo shoots are consumed as vegetable during food gaps in June and August (Emana, 2010). Cross border trade of bamboo raw materials and products into other East African countries was extremely limited and fluctuated significantly from year to year (Adnew and Statz, 2007). This imposed challenges on bamboo trading and marketing expansion generally in Ethiopia and specifically in Homosha.

Even if ample bamboo resources exist in Sheka, processors in Addis Ababa and Hawassa showed that it was not listed as a source of raw material by any of the interviewees Belay et al., (2013). The reason for not choosing Sheka as a raw material source was its remoteness (700km from Addis Ababa and 975km from Hawassa) and poor road conditions. Traders and processors had no incentive to travel over long distance on poor roads when they could obtain sufficient raw materials from nearby areas with cheaper transportation costs. Medium-sized bamboo-manufacturing enterprise in Addis Ababa obtained culms from many other locations, Awi, Sidama and Guragie were the first, second and third major sources of raw materials, respectively based on relative proximity and better road access to the city. In the same way, in Homosha bamboo culms were harvested from distant and poor road access areas and it was not easy to travel to the center of the country due to remoteness. This discouraged individuals from investing in bamboo culm trading activities. Additionally, in Homosha district, due to low margins, the income earned by traders were minimal, hence, only few individuals run bamboo culm trading business. Local traders had about 3 years of experience in bamboo culm trading. The commercial bamboo sector in Africa is considered to be inefficient due to a lack of skills regarding the ways of doing business, poor infrastructure, and weak and inconsistent market demand (Ingram et al., 2010).Other studies confirm that bamboo culm trading in Ethiopia is locally limited to production areas. For instance, Adnew and Statz (2007) indicated that in Ethiopia the supply and demand of bamboo culms are highly localized and confined, and the market system is on a small base in terms of market connections (geographic locations, distribution, customers).

Craftsperson: The Lack of treatment against borers and fungi lead to very short lifespan of bamboo products in Ethiopia, this cause poor reputation of and low demand for bamboo products. Various technologies (treatments) available to increase a product's service life, but these are not practiced and hardly known by the rural communities in Ethiopia (Embaye, 2003).Consequently, local bamboo product processors have hardly opportunities to earn higher income (Anonyms, 1997). High susceptibility to biodeteriorating agents (termites, beetles and fungi) is among the major challenges in processing, value addition, marketing and rational utilization of the bamboo resource in Ethiopia (Tolera and Mulatu, 2015). This has been lacking strong attention and action of processors, other stakeholders and end users. In Homosha district craftspersons are selling traditionally processed bamboo products at a comparative low price as well as processing and marketing of bamboo products in Asosa area is not well organized and market actors were not allied thoroughly, which is seen as caused by the low price of bamboo products in rural markets which do not pay back the organization cost (Zenebe et al., 2014). The limited market in Homosha is not incentivizing craftsperson's to increase their small scale production for realizing the benefits of the economy of scale. Craftspersons of Homosha district engaged in production of baskets and simple household furniture (Tolera and Mulatu, 2015). There only exists a very limited local market for bamboo handicrafts, which is not further developed or organized in a systematic way to create market linkage between manufacturers and suppliers. Thus, bamboo-based handicrafts producing for the market are not as widespread in the rural communities. This due to lack of access to road, transport, awareness on market orientation, business plan development and entrepreneurship, market promotion, support in establishing local market areas, working spaces, credits facilities, costumers' handling and support experiences sharing events from existing organized groups ((Tolera and Mulatu, 2015))

Consumers: Due to the short services life of bamboo products, consumers perceived bamboo products as non-durable and poor quality products. Such consumer perception is seen as main hindrance for realizing the potential demand in Ethiopia (Adnew and Statz, 2007).

Marketing channels of lowland bamboo products

The findings confirm that in general, the market channels for bamboo products in Ethiopia consist of short chains (INBAR, 2006; Getachew and Wubalem, 2014). As compared to industrially manufactured bamboo products, manually produced bamboo products have short and few market channels. For industrial bamboo processing with machines are various options available. The market for such products is considered as not saturated and with potential for growth (von Reitzenstein, 2004). There is also a strong interest from designers and architects to use bamboo as a sustainable innovative industrial material (Von Reitzenstein, 2004; CORPEI, 2005). Hence, the market demand for industrial bamboo products is high and increasing over time. Bamboo marketing in Homosha district was informal, despite the marketing of bamboo products was monitored and

regulated with a permit/license system by government agencies. According to UNIDO (2006), this was a characteristic for all Ethiopia. In spite of the fact that regional government has formulated regulations for bamboo resource utilization and management in 20111/12, these regulations were not well implemented on ground because of both inadequate resources to enforce and less attention for the resource. This is confirmed from Yemiru et al. (2010); they found the Ethiopian government has implemented regulations to reduce access and reliance on timber products due to widespread deforestation; however these regulations are rarely enforced due to lack of resources.

Degree of transparency and market information dissemination
From interviewed respondents about 59.70% of local traders and 40.30% of harvesters had market information. According to Marshall et al. (2006) lack of market information constrains producers, processors and traders from advancing within NTFP value chains. Value chain actors in study area were not benefiting from bamboo resources due to poor information accessibility regarding bamboo marketing. In Bolivia, households with market information were found to achieve significantly higher values than households with no market information (Marshall et al., 2006).

4.2 Market conduct
Most of the interviewed harvesters and craftspersons were price takers. Harvesters had less negotiation in price setting and sell culms for the price determined by local traders. In this regard, studies in Awi zone (Northwestern Ethiopia) and Sidama Zone(Southern Ethiopia)showed that due to increasing demand and presence of sufficient alternative buyers, farmers had got a more powerful position in prices negotiations (Belay et al., 2013).

4.3 Market performance of bamboo products
Local traders obtained a margin of 0.0416 USD per culm. This may be seen as a small portion per culm, since culms are sold in bundles or even truck-loads, the total margin for the trader can be still substantial due to the economy of scale. Their value adding was limited to bundling and interim financing only, further grading, transport and or preservation treatment could not be found. Similarly, KEFRI (2008) indicated that bamboo culms sold in timber yards in Nairobi were not processed nor preserved, and the added value for plain re-distribution of such products was very low. The value chain actors of bamboo products in the study area are not well networked, because value chain actors were not sturdily interdependent (interconnected) in running bamboo businesses or market. The gross margin for local trader is estimated to 2.82% of end user price. Other research on the value chain of bamboo in Ethiopia confirms that the use of bamboo resources in the country is sub-optimal (Ensermu et al. 2000). Especially the traders, with their central position in the value chain, have room for increasing both value added and profits.

Comparing the three channels, it is obvious that the highest margin per bamboo culm is realized in Channel III, with highest value added per culm. This is to explain to the fact that only in this channel raw bamboo was converted into products for final use before selling it to end users. Craftsmen producing chairs and tables added more value to the bamboo than those who produced basketry and traditional beehives. Similar ranking was found from Andargatchew (2008).

From an actor's point of view, the total margin earned as return on labor is arbitrative. To explain the real profitability of a single actor, and of the products the actor's inputs of personal and/or family labor has to be considered. A trader may spend only some seconds per culm to buy and resell it in bulk to, e.g. a lorry driver. So, despite the profit per culm is comparatively small, the total profit within some hours of a day may be quite high, just due to the economy of scale. In opposite, a chair maker may spend a whole day to process some few culms, the value added allocated to some culms may be high, but the picture change if is related to his labor input, his income created on a day may be quite low compared to the one of the trader. To determine the profitability and contribution to income and livelihoods the results need to be complemented with labor and capital inputs, which is a challenging job rather considered as too resource intensive (Angelsen, 2011) nevertheless, the study clearly proves the high benefits of processing products local instead of exporting unprocessed.

The development of the bamboo sector may provide one option to answer the existing socioeconomic problems, especially unemployment. In channel III, the total Gross Marketing Margin was 85.89 % which implies higher end users' price share for craftspersons (Table 6). On the other hand, harvesters have lowest share of end users' price (14.11 %). This indicated the highest margin was achieved by craftspersons in the channel. Rather than selling raw bamboo culms, processed bamboo products benefited local the communities.

In average, harvesters achieved for the same product, the raw bamboo culm, most by selling it direct to end users, while craftspersons paid the least price to them. The abundance of the product and the unrestricted access may lead to the comparative low price of raw culms, making the export to other regions more attractive than the local processing. This can be attributed to the commodity itself, for construction and fuel purpose the culms have been processed respective burned on the end user's site only. But it may be also an attribute that the labor in the region may be better to use for other activities than to processing bamboo. Share of the total end

users' price for harvesters was highest in channel I accounted about 71.78% except in channel II which has no value chain actors' interventions between the harvesters and end users. This higher harvesters' share is indicated in channel I and implied lower marketing margin for local traders (2.82%).

5. Conclusion and Recommendations

This study was conducted in Homosha District in order to analyze the value chain of lowland bamboo products. In the study region bamboo was harvested from natural stands. Similar to other forest products, farmers use and sell bamboo culms and bamboo related products for income generation. Actors of the value chain include harvesters, local traders, craftspersons and end users. Three marketing channels were identified and characterized as short and confined to local levels. End users came from different places outside the study area to purchase bamboo, so a high number (46% of total harvested in studied villages) of bamboo culms go from harvesters to end users through local traders. This explains the high number of bamboo culms transacted through this channel. Like the marketing channels of other NTFPs, the value chain of lowland bamboo products in the study area has few actors and channels. Except the channel that connects harvest to end users, the remaining channels were characterized as a tight oligopoly market, implying that only few local traders and craftspersons dominated the market. Besides, in the majority of the cases, price of bamboo products was determined by buyers, not by suppliers. A harvester gets the best price when he directly sells to end users or as second choice to local traders. Among all studied value chain actors, craftspersons add highest value to a bamboo culm.

The studied value chains were delimited to the district of Homosha. Further studies would be required to study the value chain segment of the bamboo culms leaving the region via the traders and end user buyers. Nevertheless, bamboo is an asset of very high potential, already available and continuously renewable for innovative activities and businesses to benefit the local community. The fact that currently the final bamboo products were not traded like the raw culms is an indicator for their lack of competitiveness and is in the same time a big potential for improvements and innovations to boost, upgrade and upscale the local bamboo industry. Government, development partners and especially the actors themselves need to participate in organizing actors to gain more power in the market and to create competitive products and innovative production processes to achieve access to attractive, national markets. A strong processing industry would employ more people and would facilitate to establish a sustainable management by the institutions in charge.

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