Value Chain Analysis of Bamboo Production: The Case of Bule Woreda, Gedeo Zone, Snnprs

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Abstract
Bamboo plays very important role socially, economically and ecologically. Despite the fact that bamboo play important role in improving the livelihood of the local community it has an insignificant contribution due to the products are at a very rudimentary level and inexistence of well established bamboo industry. These situations hampered the opportunity of the potential of bamboo that will improve the poor living standards and hence sustainable utilization of the resources. This study was initiated to analyze the existing bamboo market chain in Bule Woreda Gedeo Zone, Southern Nations Nationalities and Regional State. The focus of the study was to analyze the determinants of marketable supply of Bamboo, identify actors involved in the processes and what do they actually do, investigate the costs incurred by each participants and the benefits driven by each. The data were collected by using a semi-structured questionnaires together with secondary data gathered from agricultural bureau offices and other unpublished sources. Robust Ordinary least square regression econometric model was used to analyze the determinants of market supply of bamboo. The results from this analysis indicates that price of bamboo culm, educational level of producers, distance to the nearest market, and access to market information were found to be significant variables influencing bamboo supply to the market. A significant amount (70.16%) of bamboo produced is channeled through producers- traders- processors- consumers chain. The concentration ratio of two firms measures of market structure indicated there exist super tight oligopolistic nature of bamboo market. Moreover, marketing margins also indicate that the producers get much lower benefit than any other market chain actors. The major problems of the production identified by bamboo producers in the study area arised from road infrastructure and market information. Therefore improving road infrastructure, provision of formal education and market information, and improving the existing chain through creating appropriate market linkage are recommended.
Keywords: Value chain, value chain analysis, structure- conduct- performance, concentration ratio, marketing channel and marketing margin.

1. Introduction

Global value chains are about linking local producers from developing countries to international markets. They link the raw-material producer and the final consumer. Global value chains are characterized by falling barriers on international trade due to the lowering of price support and export subsidies in the last decades. At the same time there is increasing concentration and consolidation in all links of these chains. Furthermore, advances in communication technologies and declining transportation costs facilitate coordination between chain actors (Gibbon *et al*., 2008), not by vertical integration but by standardization of processes and sophisticated information and communication technology, meaning that *''the rising integration of world markets through trade has brought with it a disintegration of multinational firm''* (Gereffi *et al*., 2005).

Globalization and expanding international markets as well as the fast-growing middle and high income classes in many developing countries offer opportunities for developing country producers to operate in emerging national and international markets. This means that producers must gain better control over production, trade and distribution in order to guarantee the quality and value added of their products and to operate in a cost-effective way. Moreover, these producers must adapt to stringent quality and safety standards and regulations in these markets (Dolan and Humphrey, 2004).

Important barriers for developing country producers are the lack of an enabling environment offering institutional and infrastructural support, availability of resources and efficient and effective coordination in value chains. In particular small-scale producers are at a disadvantage because they have little capital to invest, use traditional techniques, depend on family labor and lack contact with (international) market players (De Janvry and Sadoulet, 2005; Daviron and Gibbon, 2002; Reardon and Barret, 2000). In the literature a multitude of cases are described where small farmers search for new forms of collaboration so as to increase their bargaining position in the value chain (Rondot and Collion, 2001). Developing country producers that want to enter these chains are confronted with asymmetric power relationships (e.g. because of increasing global power of Western retailers and industries) that again impact on the distribution of costs and benefits over the chain participants, keeping value-adding activities in Western countries.

Non timber forest products(NTFPs) include fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences and a range of barks and fibers such as bamboo, rattans, and a host of other palms and grasses.

Non timber forest products trade is often constrained by conditions that typify underdeveloped areas, including isolation, limited local buying power, inadequate infrastructure, poor exposure and access to markets, weak political power, high transportation costs, communication problems, and inadequate education and levels of organization amongst producers and traders (Pérez, 2005). Moreover, Neumann and Hirsch (2000) indicated that the reason for the relatively low income for the collectors from NTFPs sale is attributed to lack of access to credit, transportation, information on price fluctuation and storage facilities.

Traditional bamboo marketing together with not well established bamboo industries in the country makes its contribution at minimal in Bule Woreda. Therefore, the aim of this research is to evaluate and analyze value chain of bamboo and the value added by the actors in the value chain. Moreover it will identify role played by the market participants and its marketing margin.

2. Research Methodology
2.1. Description of the Study Area
2.1.1. Location
The study area, Bule Woreda is situated 390 km far south of the capital city of the country, Addis Ababa; 120 km to south of the capital city of SNNPRS, Hawassa; and 27 km from the Zonal capital city, Dilla town. It geographically lies between 6^0 04' 16" -6^0 23' 50" North latitude and 38^0 16' 20" -38^0 26' 11' East longitude

2.1.2. Climate
The mean annual rain fall of Bule Woreda ranges from 1,200mm - 1,800mm and the mean annual temperature in degree Celsius is between 15.1ºc and 22.5ºc. The climate of Bule Woreda is 65% high land (Dega) agro- ecology and 35% mid- highland (Woina Dega). The Woreda has two rainy seasons namely, the short rainy season (from March to May) and the long rainy season (from July to December).

2.1.3. Land use and land cover types
It has a total land area of 257 sq.k.m and comprises a total of 30 kebeles. Of which 21,874.5 ha is a crop land, 497 ha is grazing land, 1,904.8 ha is forest land and 1,423.7 ha others. The major land use types of the Woreda in general is dominated by rain fed annual crops production which include Barley, Wheat, Maize, and pulse crops such as Beans and Peas. The dominant perennial crops grown in the Woreda includes coffee, enset, bamboo, apples and also other tree species such as *Aningeria attissima (Kerero)*, *Erythrina Abbyssnica (Korch), Cordia africana (Wanza), Millettica ferruginea (Birbira)*,, *Eucalyptus (particularly Eucalyptus globules species)*.

2.2. Method of Data Collection
To examine the overall structure of bamboo producers, traders, processors and consumers of bamboo marketing chain in the study area, the study used both primary and secondary data. The primary data were collected through questionnaires. The data collected through this way focused on the determinant factors affecting bamboo market supply by producers. These include age, sex, educational level, access to extension service, access to market information, price, experience, and distance to the nearest market.

Independent questionnaires were designed for bamboo producers, traders, bamboo product processors and consumers to gather all the relevant information regarding bamboo marketing in the study area. Development agents who have college diploma and working in district areas were recruited and trained as enumerator for the data collection process. Prior to formal survey, a rapid market appraisal (RMA) was conducted in order to get the overall picture of bamboo marketing. Beside the questionnaire, an informal survey were employed in order to strengthen the data which were collected through questionnaires. Secondary data were also collected from agricultural and development bureau officers.

2.3. Sampling Procedure and Determination of Sample Size
Prior to the main sampling, discussion was held with district experts from the relevant field to make clear the purpose of the study and facilitate collaboration during the study. A three stage sampling procedure was employed to select a specific bamboo producer household. Out of the total 30 kebeles, 24 kebeles in Bule Woreda are bamboo producers. Firstly, 24 bamboo producing kebeles were identified. Secondly, two potential bamboo producing kebeles were selected purposively from the 24 kebeles. Finally, representative households were selected. To do this, this research method used Yamane (1967) sample size determination formula. According to him to calculate the sample size for 95% confidence level and Precision = 0.5. He used the following formula.

$$n = \frac{N}{1+Ne^2}$$

Where n is the sample size, N is the population size, and e is the level of precision. Based on this from Elalcha Loke and Suko kebeles which have a total of 998 and 619 households respectively, a representative of 90 and 86 household were randomly selected.

Table 1. Sample Distribution of Bamboo Producer Farmers

Name of kebele	Bamboo producers house holds	Sample household taken
Elalcha	998	90
Suko	619	86
Total	1617	176

Basically, the sites for the trader's survey were market towns. Three market areas of Bule, Dilla and Hawassa were sampled. The total number of bamboo traders in the study area were 25 (15 traders, 10 bamboo product processors).

Table 2. Sample Distribution of Bamboo Traders

Market center	Traders	Bamboo product processors
Bule	2	1
Dilla	13	4
Hawassa	-	5
Total	15	10

2.4. Method of Data Analysis
Both descriptive and econometric methods of data analysis were employed.
2.4.1. Descriptive statistics
Various parameters were analyzed using the descriptive statistics like mean, standard deviation and percentile. The parameters described were producers and traders characteristics, marketing channels, and its marketing profitability (marketing margin).
2.4.2. Econometric analysis
For this study, the data collected from the sampled farmers and traders was first analyzed using descriptive statistics followed by determinants analysis of bamboo supply using econometric model. Stata 10 and statistical package for social science (SPSS) version 20 were used to analyze the data.

Data Diagnosis
When the assumptions of the Classical Linear Regression (CLR) model are despoiled, the parameter estimates of the OLS model may not be Best Linear Unbiased Estimator (BLUE). Hence it is important to check the presence of multicollinearity and heteroscedasticity among the variables that affect the supply of bamboo in the study area.

Multicollinearity Test
As Gujarati (2003) pointed out multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because there exists strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated. Therefore, the two measures that were used are variance inflation factor(VIF) for a continuous variables and Contingency Coefficients (CC) for dummy variables. In detect multicollinearity problem for continuous variables, variance inflation factor(VIF)= $1/1-Rj^2$, for each coefficient in a regression as a diagnostic statistic is used. Here, Rj2 represents a coefficient for determining the subsidiary or auxiliary regression of each independent continuous variable X. As a rule of thumb, if VIF value of a variable exceeds 10, which will happen if Rj2 exceeds 0.90, then, that variable is said to be highly collinear (Gujarati, 2003). Therefore, for this study, variance inflation factor (*VIF*) was employed to estimate the degree of multicollinearity among the explanatory continuous variables of supply

function. On the other hand, for dummy variables contingency coefficient(CC) = $\sqrt{\frac{X2}{N+X2}}$ where X^2 is chi-square

and N is the total sample size. The regression result shows that VIF rages from 1.12- 3.85 and CC ranges from 0.05 - 0.6 as a result multicollinearity is not a series problem both in continuous and dummy variables(The VIF and CC results are shown in appendix A).

Heteroscedasticity Test
There are a number of test statistics for detecting heteroscedasticity. Among them are Park, Breusch-Pagan-Godfrey, White's testes, Koenker-Bassett (KB) test of heteroscedasticity. However, according to Gujarati (2003) there is no ground to say that one test statistics of heteroscedasticity is better than the other test statistics. Due to its simplicity, Breusch-Pagan-Godfrey test of heteroscedasticity was employed in this study. The test indicated the existence of heteroscedasticity among the variables and hence were corrected by running robust ordinary least square.

Model Specification
The multiple linear regression model is used to study the relationship between a dependent variable and one or

more independent variables. The generic form of the linear regression model is,

$$y = f(x_1, x_2, ..., x_k) + \varepsilon$$
$$= x_1\beta_1 + x_2\beta_2 + ... + x_k\beta_k + \varepsilon \quad ....3$$

Where y is the dependent or explained variable and x_1, ..., x_k are the independent or explanatory variables. ε is the disturbance factor.

Following Green (2003) the multiple linear regression model is specified as Y=f (price, bamboo output, access to market information, access to extension services, education level, sex, access to credit, age, etc.). The econometric model specification of supply function in matrix notation is estimated by:-

$$Y = \beta X + \varepsilon \text{ -- 4}$$

Where Y = the market supply of bamboo

β = a vector of estimated coefficient of the explanatory variables

X= a vector of explanatory variables

ε = disturbance factor

3. Results and Discussion
3.1. Experience in bamboo marketing

The number of bamboo marketing experience is taken to be the number of years that an individual was continuously engaged in bamboo marketing activity. The majority of the respondents (31.8%) had experience less or equal to 5 years of bamboo marketing. The average years of experience for the entire sample was 11.65 and the minimum and maximum years of experience were 1 and 35, respectively. The overall bamboo marketing experience shows that bamboo producers are well experienced in trading activity.(See Table 3).

Table 3. Summary of Continuous Explanatory Variables (Min, Max, Mean, S.D)

Exp. var	N	Min	Max	Mean	S.D
Age	176	20	90	36.93	13.670
Education	176	1	12	6.32	2.915
Distance to nearest market	176	1	10	5.61	2.771
Price	176	3	5	3.85	0.793
Experience	176	1	35	11.65	7.808

Source: Survey result, 2012.

3.1.3. Access to extension services and market information

Access to services could be essential to improve production and hence increase income of the producers. More specifically, more than 55% of the sample respondent had access to both extension service and to that of market information. Table 8 shows the number and percentage of the respondents for extension service and market information.(See Table 4).

Table 4. Summary of Dummy Explanatory Variables(Frequency and Percentile)

Exp. var		N	Frequency	Percent
Sex	M		167	94.9
	F	176	9	5.1
Ext. serv.	Yes		104	59.1
	No	176	72	40.9
Mark. Info.	Yes		100	56.8
	No	176	76	43.2

3.2. Marketing Problems and Opportunities
3.2.1. Marketing problems

Considering marketing of bamboo producers has confronted some problems. The survey result pointed out that the major problems were arised from road infrastructure and market information. Of the total of 176 respondent, 71% indicted road infrastructure were their first threats for the delivery and marketing of bamboo to the market. On the other hand 76 respondents (43.2%) pointed out market information problem is the main obstacle for them. There is a problem of getting the appropriate market price information. Therefore, mechanisms such as road access, market information has to be developed to make the marketing system perform in a better way. With regard to traders the major problem also arises from road access.

3.2.2. Marketing opportunities

The existence of bamboo in large amount, the increasing demand in bamboo products as well as the due emphasis by government for the sector in the country is the major opportunities for all the marketing actors in the study area.

3.3. Structure- Conduct- Performance of Bamboo Market
3.3.1. Bamboo market structure
In order to know the structure of bamboo market at each market level, that is the level of competition existing in the bamboo market, the market concentration ratio were used as evaluation criteria.

Market Concentration Ratio

Since the number of traders at each local market level was few, the market concentration ratio was calculated at each town so as to analyze the concentration of bamboo market.

Table 5. Bamboo Traders' Concentration Ratio

No of traders (A)	Cumulative frequency of traders (B)	%of traders $D = \dfrac{A}{15}$	Cumulative %of traders (E)	Quantity purchased(Culms) (F)	Total quantity purchased (G=AXF)	% share of purchase $Si = \dfrac{G}{121,931}$	%of cumulative purchase $C = \sum\limits_{i=1}^{r} Si$
2	2	13.3	13.3	5,541.75	11083.5	9.1	9.1
13	15	86.7	100	8,526.79	110,848.37	91.9	100

Source: Own Computation

Kohl and Uhl (1985), suggested, as a rule of thumb, four largest enterprises concentration ratio(CR4) of 50% or more as an indication of a strongly oligopolistic industry. The result of the District level concentration ratio CR2 was found to be 100% (Table 11). This indicates that the traders residing in Bule and Dilla towns are dominant holders of the bamboo market. Hence, according to Kohls and Uhl (1985) the existing bamboo market structure were found to be super tight oligopolistic.

3.3.2. Bamboo marketing participants, their roles and linkages
Bamboo marketing participants in the study area includes producers, bamboo traders, bamboo product processors and product consumers.

Producers: This are the first chain in bamboo marketing in the study area. They sell their bamboo's to different buyers involved in bamboo market at their village town or at farm plot. According to the respondents mostly bamboo culms(stems) were sold on their farm land after the selling price is agreed. It is the buyers who costs labor and transportation fee. Accordingly one birr costs the buyers per culm for both preparation and loading (0.5 birr for each).

Table 6. Bamboo Output supplied (culms) to Different Market Participants by Producers

Market participants	Amount sold(in culms)	percentile
Consumers	16,719	11.19
Traders	121,931	81.61
Products processors	10,758	7.2
Total	149,408	100

Source: survey result, 2012

Traders: Bamboo culm traders in the study area are only found either in Bule Woreda or Dilla collect. This traders are can serve as intermediaries between the producers and the consumers. Of the total of 15 bamboo culm traders only two traders are found in Bule Woreda. And mostly they sell the culms to bamboo product processors from their store house. They set the price of culms according to their respective size and width. On average they buy bamboo culms for 3.85 birr and sell for 13 birr.

Bamboo Product Processors: These products processors are private enterprises recently established themselves in Dilla and Hawassa towns. The processors purchase bamboo from different areas including the study area and mostly they purchase bamboo from Traders. The different goods produced by the processors includes chairs, beds, baskets, walking sticks etc.

Consumers: Consumers for this particular study refers to those peoples who bought and uses the culms directly or after processed. The consumers buy processed products from their respective market towns or directly buy the Bamboo culms either from producers themselves or Bamboo culm traders.

3.3.3. Bamboo marketing channel
According to Mendoza (1995) marketing channel is the sequence through which the whole of the products passes from producers to consumers. The analysis of marketing channel is intended to provide a systematic flows of goods and services from their origin to the final destination. The following bamboo marketing channel were identified in the production to consumption chain.

Channel I. Producers ⟶ consumers (11.19%)
This is the shortest channel in which producers and consumers meet together. The producers simply sells its bamboo culms to the consumers on average price of 3.85 birr. As result of this consumers are much more benefited from this channel. Of the total bamboo supplied to the market 11.19% passed through channel I.

Channel II. Producers ⟶ traders ⟶ consumers (11%)
Bamboo producers also sold the produce to traders that resides both in Bule and Dilla town. They sell on average a culm for 13birr. The existence of traders between producers and consumers do not make both of them better-off. Here consumers are obliged to pay more per culm and producers get no additional income. Of the total amounts of bamboo 11 % are supplied to the market through this channel. The gross marketing margin for producers is 29.62 % and that of traders is 70.38 %. This indicates there exist unfair distribution of profit along chain actors.

Channel III. Producers ⟶ bamboo processors ⟶ consumers (7.2%)
In this channel bamboo processors directly buy the produce from the producers. The consumers pay higher amount of money compared to channel I and II above (25 birr per culm). The higher amount is due to bamboo were processed and converted to other products. The products are mainly chairs, baskets, beds, and walking sticks. This is the channel in which the smallest amount of bamboo are supplied to the market (7.2%). The gross marketing margin for producers is 15.4 % and that of traders is 84.6 %. This indicates that this channel is more exploitative than channel II .

Channel IV. Producers ⟶ traders ⟶ bamboo processors ⟶ consumers (70.61%)
This is the last channel that involves more of chain actors than any other channels. Most of the bamboo produced from Bule Woreda passed through this channel(70.61 %). The gross marketing margin for traders and bamboo processors were 48 % and 36.6 % respectively. This shows that although still it is exploitative the amount reduced by some amount. Therefore, since it is this channel through which most of the produce passes, it is better to let this channel to exist by making producers much more better-off than any other channels above.
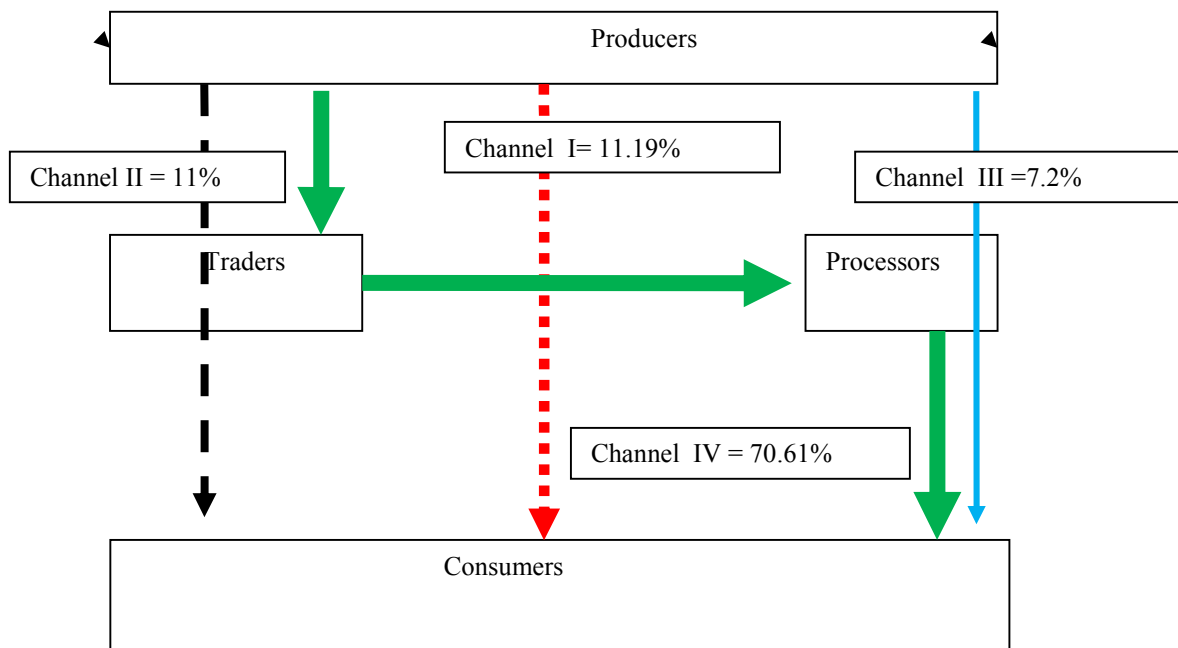

Figure 1. Bamboo Marketing Channels
Lines of marketing channels are identified for bamboo production of the study area. Channel IV is the dominant in the study area of which most of the produced bamboo passes while channel III is weaker in comparison (only 7.2 % of bamboo culm passes through it). The bamboo traders bought a significant amount of bamboo and store it for processors as well to consumers . Generally, the channel analysis of bamboo marketing of the study area is found to be a very short route involving maximum of four marketing chain actors.

3.3.4. Market Conduct
Producers Market Conduct
Bamboo is one of the most important cash income generating produces in the study area. During the survey, farmers indicated that the supply of bamboo to the market takes place at any time of the calendar year. The survey result were also pointed out that starting from production up to marketing, every farmers produces and sells on individual basis. This affects the bargaining power of producers during the sale of bamboo culms. Almost all bamboo producers reported that the price for bamboo increased during the last five years. One of the reason for

the increase in price was mainly due to an increase in demand for the bamboo culms and products.

Traders Market Conduct

The survey result indicated that the transaction made on bamboo marketing of the study area takes place with direct contact between sellers and buyers. There were no observed operational brokers in bamboo marketing channels during the survey period. All sample bamboo traders pointed out that their purchase price was negotiating with that of the producers.

3.3.5. Performance of the market

The method employed for the analysis of bamboo market performance were marketing margins by taking into account associated marketing costs for key marketing channel actors. Taking consideration of costs and purchase prices of the channel actors, profit at traders and bamboo products processors level was calculated.

Cost and Profitability Analysis for Bamboo Culm Traders

The cost and profitability analysis of the sample bamboo culms traders along the chain actors were found encouraging. Traders obtain up to a profit of 6.73birr at retail level which was higher by 1.75 than producers gain. With regards to cost of operation of traders', transportation cost were the highest (51.65%) followed by shop rent cost (27.69%). Therefore facilitation of road infrastructure and housing for storage helps to minimize the costs that otherwise added to the item to be sold.(See table 7).

Table 7. Cost and Profitability Analysis of Bamboo Traders.

Costs	Cost Per Culm(Birr)	Percentiles
Purchasing price	3.85	
Labor cost	0.5	20.66
Transportation cost	1.25	51.65
Shop rent	0.67	27.69
Total operation costs	2.42	100
Total cost	6.27	
Average selling price	13	
profit	6.73	

Source: Own computation

Cost and Profitability Analysis for Processors

As table 14 clearly shows, cost and profitability analysis of bamboo product processing were also highly encouraging. The processors gained 2.33 times profit than the bamboo producers. With regards to cost of operation of processors skilled employers cost were the highest (66.3%) followed by transportation cost (18.23%). Both of bamboo traders and processors cost- profit analysis indicates that the existing marketing chain were highly benefiting them in comparison to the producers. (See table 8).

Table 8. Cost and Profitability Analysis of Bamboo Processors.

Costs	Cost Per Culm(birr)	Percentile
Purchasing price	13	
Labor cost	0.5	5.53
Transportation cost	1.65	18.23
Shop rent	0.9	9.94
Skilled employ cost	6	66.3
Total operation costs	9.05	100
Total cost	14.05	
Average selling price	25	
Processors profit	10.95	

Source: Own computation

Marketing Margin

As table 9 below shows that 84.6% of total gross marketing margin was added to bamboo price when it reaches the final consumer alongside Dilla and Hawassa. Out of the total gross marketing margin 36.6% was gross margin of bamboo traders, while 48% was that of processors. This indicates that the producers have much lower marketing margin as compared to any other marketing participants.

Table 9. Average Price of Bamboo at Different Market Levels.

Marketing channel	Price(Birr/Culm)	Marketing cost	Gross profit(Birr/Culm)	Gross margin(%)	marketing
Producers	3.85	-	3.85	15.4	
Traders	13	6.27	6.73	36.6	
Processors	25	14.05	10.95	48	

Source: Own computation

Total Gross Marketing Margin (Complete distribution channel) = (25 - 3.85)/25 = 84.6%

Gross Marketing Margin (traders) = (13 - 3.85)/25 = 36.6%

Gross Marketing Margin (processors) = (25 - 13)/25 = 48%

Gross Marketing Margin Producers (producers participation)= 100- (36.6 + 48) = 15.4%

3.4. Determinants of Bamboo Market Supply

Bamboo is one of the most important cash earning crop for Bule Woreda bamboo producers. According to the survey result all the sample households were suppliers of bamboo to market. Several variables are hypothesized to determine the market supply of bamboo by producer. Before running the OLS regression model, all the hypothesized explanatory variables were checked for the existence of multicollinearity and heteroscedasticity problem. The study used Variance inflation factor to investigate the degree of multicollinearity among continuous explanatory variables and contingency coefficient among discrete (dummy) variables. A statistical package for social science(SPSS) version 20 was employed to compute the VIF and CC values. The results for all VIF values were ranging between 3.817 and 5.848. Likewise, the values of CC were ranging between 0.05 and 0.6 which is less than 0.75 and hence, multicollinearity was not a serious problem both among the continuous and discrete variables(Appendix Table A and B). In this study heteroscedasticity was also tested for all variables by running heteroscedasticity regression using an econometric software (Stata). The problem of heteroscedasticity were solved by undertaking robust ordinary least square(OLS) and hence all the explanatory variables were included for the model analysis of determinants of market supply of bamboo. The overall goodness of fit of the regression model is measured by the coefficient of determination (R^2). It tells what proportion of the variation in the dependent variable, or regressand, is explained by the explanatory variable. R^2 lies between 0 and 1, the closer it is to 1, and the better is the fit. The overall model goodness of fit represented by model count R-square is good (81.31%). This result indicates that about 81% of the variation in marketable supply of bamboo was attributed to the hypothesized variables.

OLS Estimate of the Supply of Bamboo

In this study eight explanatory variables were hypothesized to determine the market supply of bamboo by producers. From the hypothesized variables, only four variables significantly affected marketable supply of bamboo in Bule Woreda. These variables are education level of the household heads at 1%, access to market information at 5%, distance to the nearest market at 5% and price at 1%. The signs of the parameter estimates of the significant variables are as expected.

Age that was originally expected to affect marketable supply of bamboo did not affect significantly. This may be attributed to lack of appropriate market information throughout their life time which makes them not to be benefited much from it as expected. Access to extension service did not significantly affect marketable supply of bamboo and this can also be attributed to lack of sound extension service that can bring a significant difference between those who had and those had not. Experience and Sex also did not affect the marketable supply of bamboo. (See table 10).

Table 10. OLS Results of Determinants of Bamboo Market Supply (after correction of heteroscedasticity).

Variable	Coeff.	Std.Err	t-value	Sig.
Constant	1628.644	400.6295	4.07	0.000
AGE	5.411	3.729475	1.45	0.149
SEX	113.756	79.32357	1.43	0.153
EDLHH	69.359	16.86286	4.11	0.000***
ACCEX	99.891	66.62967	1.50	0.136
ACCMAR	175.105	72.88665	2.40	0.017**
DSTMAR	-44.185	19.75193	-2.24	0.027**
PRICE	453.364	55.88019	8.11	0.000***
EXPR	9.044	5.550511	1.63	0.105

Dependent variable= market supply of bamboo, N=176, R-Squared=0.8217, Adjusted R-squared=0.8131 and *** and ** shows the values statistically significant at 1%, 5% respectively.

Education level of bamboo producer household heads (EDLHH): It has a positive effect on bamboo market supply per household per year. It is statistically significant at 1% significance level. The model verified that one additional formal year of education level leads to an increase of 69.36 Culm yearly to the market by bamboo producers household heads. Assefa (2009) also found that educational level of the household significantly and positively affected marketable supply of honey in Atsbi Wemberta District. In similar way Holloway *et al.,* (1999) observed that education had significant and positive effect on quantity of milk marketed in Ethiopian highlands. This relationship indicates that education facilitates bamboo producers household ability to gain market related information, which in turn improves the bargaining power of the producers.

Access to market information (ACCMIF): as hypothesized the model showed that the market information has a significant impact on marketable supply of bamboo at 5% significant level. Rehima (2006) also found that access to market information significantly and positively affected the marketable supply of red pepper at Alaba and Siltie. Those who have access to market information increases their yearly bamboo Culm supply by 175.11.

Distance to the nearest market (DSNMKT): It has negative effect on the marketable supply of bamboo per household per year. The negative coefficient indicates that there is a negative relationship between it and market supply of bamboo by producers. It is statistically significant at 5% significant level. The study conducted by Holloway *et al.,* (1999) milk-market development in the Ethiopian highlands. His result indicates that distance-to market causes market surplus to decline. Similar issue was studied by Wolday (1994) on food grain market in the case study of Alaba indicated negative relationship between distance from the household residence to grain market and volume of marketed food grain. Furthermore, study conducted by Abonesh (2005)) indicated similar results. The results also verified that an increase in distance from the market place resulted in a decrease in 44.19 culms per year per household.

Price: Price was expected to affect the marketable supply of bamboo in the study area because prices stimulate production and thus marketable supply. As it was expected it affected positively bamboo market supply per household per year. It is statistically significant at 1% significance level. The model verified that a unit increase in price of culm leads to an increase of 453.36 culms yearly to the market by bamboo producers household heads. Alemnew (2010) also found that the current price affected positively and significantly the marketable supply of red pepper at Bure Woreda. In similar way Wolelaw (2005) also revealed that the current price had affected the market supply of rice at Fogera District.

4. Conclusion and recommendations
4.1. Conclusion
Bamboo supplied to the market passed through different marketing agents from producers to consumers. The major actors involved in marketing of Bamboo were producers, traders, processors and consumers. Starting from production to marketing, every producers produce and sold on individual basis. They simply sell bamboo culms for consumers, traders and processors. The traders were act as intermediaries between producers and consumers and producers and processors. The processors changes the culms of the Bamboo into different products like chairs, baskets, beds and walking sticks. The consumers either directly uses the culms they bought from producers or traders otherwise purchases the processed Bamboo culm products from processors. The cot and benefit analysis also showed that the traders and processors are much more benefited that the producers. Four marketing channels were identified. The shortest channel was producers- consumers chain (channel I). The dominant marketing channel was producers- traders- processors- consumers chain (channel IV).

The results of gross profit analysis and gross marketing margin pointed out that both traders and processors are much more benefited than producers in any of the existing marketing channels. This shows that there is unfair distribution of profit along chain actors. Moreover, the concentration ratio of two firms measures of market structure indicated that there exist super tight oligopolistic nature of bamboo market. Beside this the survey result indicated that the major constraints for bamboo producers as well as traders were arise from road infrastructure.

Estimation of determinants of marketable supply of bamboo with the help of Robust OLS regression analysis was employed with eight hypothesized variables. Only four variables namely price of bamboo culm at 1%, educational level of the household head at 1%, distance to the nearest market and access to market information at 5% were found to be significantly affected the supply of bamboo to the market.

4.2. Recommendations
- Provision of formal education and market information so as to increase the bargaining power of the producers. This could achieve producers to get more power on dealing while they sell their produces. Moreover, it could enable them to get fair price to their produces during marketing time.
- Facilitation of road infrastructure in the study area so as to increase the supply of bamboo culms to the market by producers. As a result, it could help them to increase their yearly income. Moreover, the buyers could also get easy accessibility of the area and hence reduces their transportation costs.

- Providing institutional support in the form of creating market linkage so as to minimize the dominancy of bamboo marketing in the study area by few individuals. In doing so the institution could help the producers to have the right linkage to their produces and hence get appropriate market price.
- All the problems faced by bamboo producers cannot be addressed by a single organization, various actors: including researchers, decision makers need to collaborate in search of appropriate solutions and implementation.

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