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Value Chain Analysis of Maize: The Case of Bako Tibe and Gobu Sayo Districts in Central West Ethiopia

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Abstract
This research attempted to generate useful information on maize value chain, which helps governmental institutions and NGOs to assess their activities and redesign their operations in Bako Tibe and Gobu Seyo districts. The research was done by identifying actors and mapping their interactions, evaluating incentives and cost structure, estimating determinants of maize marketed surplus. Data was collected from 199 randomly selected households, 53 maize traders, and 7 input suppliers. For data analysis, both descriptive and econometrics analysis of Tobit model were used. The result of the study showed that, maize average production, yield and marketed surplus were 36.95 quintal, 31.44 quintal per hectare and 18.23 quintal, respectively. Input suppliers, producers, traders and consumers were the main actors in the value chain. In the chain, no maize processors and exporters identified in the study areas. Through the value chain, the maximum value added was about ETB 49 per quintal and rural assemblers obtained the highest share of gross profit next to producers. The econometric model result showed that current price, district, fertilizer used, marketing costs, land allocation, distance to main market and non-farm income were significantly determining maize marketed surplus.
Keywords: Mapping, Marketed surplus, Marketing Margin, Tobit model, Value chain.

Introduction

Agriculture continues to be the dominant sector in Ethiopian economy until 2006/07. Its contribution to the GDP was 47% in the year 2003/04, 44.3% in 2006/07 and 41.1% in 2010/11. After 2006/07, service sectors take over the dominancy. For example, in 2010/11, the contribution to GDP was 41.1% and 46.6% agriculture and services sectors, respectively. Average growth rate of agriculture was 10.2% during 2003/04 to 2010/11. The growth rate of industry was 12.8% while service sectors grown by 10.8% during 2003/04 to 2010/11 (MoFED, 2010/11). Crop production contributes more than 60% to agricultural GDP, while livestock represents about 30% and the other sub-sectors contributes about 10% to the agricultural GDP.

Maize accounts for the largest share among cereals in total production and the total number of farm holdings. In 2010/11, it accounted for 28% of the total cereal production, compared to 20% for teff and 22% for sorghum, which are the second and third most cultivated crops. Maize yield is the highest among cereal crops and it is the only crop with significant use of commercial inputs. In 2008, about 37 % of maize farmers used fertilizer, compared to the national average of 17 % for all cereal farmers. An estimated 26% of the maize growers used improved seed, which is again about twice the national average for all cereal farmers (Rashid *et al*., 2010).

The major surplus maize production zones in Ethiopia were West Gojam, Jimma, East Shoa, East Wellega, West Wellega, Illubabor, Arsi, West Shoa, East Hararghe, Agewawi, West Hararghe, and Sidama (USAID, 2010). Most of the marketed quantity of maize (or 94%) comes from smallholders, and the rest is from commercial and state farms. The marketed volume of maize passes successively through a number of channels before it reaches the final consumer. These are producers, rural assemblers, wholesalers, Ethiopian Grain Trade Enterprise (EGTE), Emergency Food Security Reserve Administration (EFSRA), cereal exporters, processors and retailers (RATES, 2003).

Ethiopian agricultural sector today is in need to strengthen all actors along the entire agricultural value chain, from input supply and distribution, through aggregation of smallholder production and trading, to downstream processing and export. Actors cover public and private institutions including seed enterprises, farmer cooperatives and unions, agricultural processors, traders, aggregators and rural credit providers and a favorable environment to operate effectively. These actors are needed to realize the full potential of Ethiopia's natural endowments and to bring efficiency and quality to the value chain. The majority of actors across the value chains are small and informal with limited resources and gaps in funding and technical skills. This imposes barriers to agricultural growth, efficient scale of activities, high transaction costs and inefficient information flows from end market to producers (BMGF, 2010).

The central western Ethiopia such as Bako Tibe and Gobu Seyo districts are the major surplus maize production and marketing areas in which a number of farmers and traders dominantly involved in these activities. However, there was information gap in the flow of commodities, actors involved and their interaction, incentives through the activities, opportunities and constraints in the value chains. Therefore, this study intends to assess the characteristics of actors, crops flow, profit and cost structure, distribution of benefits and identify determinants of marketed surplus of maize.

Methodology

Description of the Study Areas

The study was conducted in two districts, namely, Bako Tibe and Gobu Sayo. **Bako Tibe** district is located 250 km west of Addis Ababa. The district has 26 *kebeles* (lower level structure of government administration). It is characterized by topography ranging from 1600 to 2870 meters above sea level and its annual rainfall varies between 800-1200 mm per year. It has temperature ranging from 11^0c to 24^0c. The population of the district is about 139,051 of which 49.6% are male and 50.4% are female. It has a total area about 638 km^2 and the population density of about 217 per square kilometer (CSA, 2011a, BTWAO, 2011).

Gobu Seyo district is located at about 265 km west of Addis Ababa. The district is contiguous with Bako Tibe district in the east. It has nine *kebeles* and characterized by topography ranging from 1200 to 1960 meters above sea levels. Its annual rainfall reach to 2000 mm per year and has temperature ranging from 15^0c to 20 ^{0}c. The population of the district is about 46,166 of which 49.5% are male and 50.5% are female. The district has a total area of 344-km2 and population density of 134 persons per square kilometer (CSA, 2011a, GSWADO, 2011).

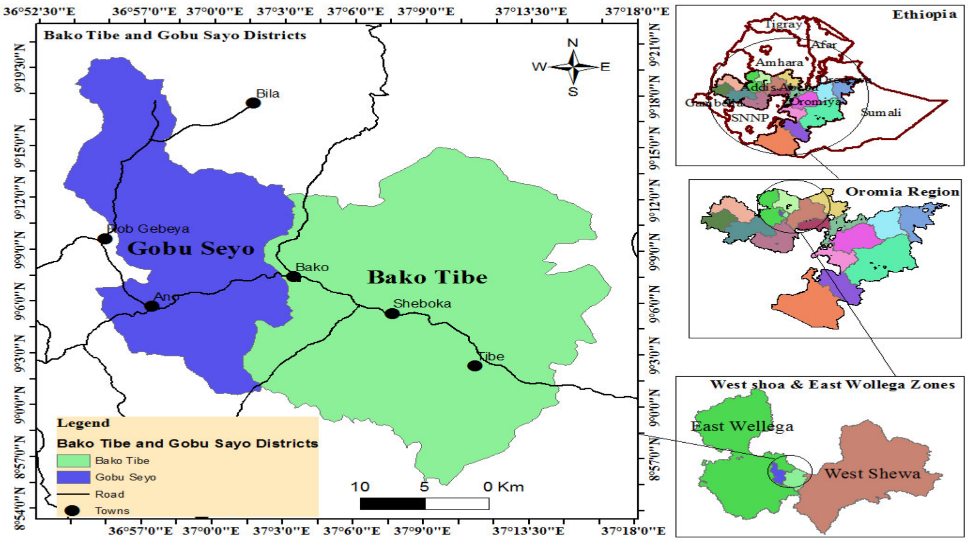


Figure 1: Geographical location of the study areas

Types and Sources of Data

The study used both primary and secondary data. Primary data was collected from households, traders and input suppliers. Input suppliers data was collected from union, cooperatives and private seed agent. Data of grain traders was collected from assemblers, cooperatives, wholesalers and retailers. Secondary data was collected from International Maize and Wheat Improvement Center (CIMMYT), Ethiopian Institute of Agricultural Research (EIAR), Central Statistics Agency (CSA), Bako Tibe and Gobu Seyo Agricultural offices, farmers' cooperatives development offices, trade and market development offices in the respective districts.

Sample Size and Sampling Technique

As Bako Tibe and Gobu Seyo were the two SIMLESA project implementation districts in central western Ethiopia, the two districts were selected purposively based on the aim of the project. Based on the objectives of the project, it was implemented on ten kebeles in Bako Tibe and three kebeles in Gobu Seyo districts. Sample size of each kebele was selected based on probability proportional to the size (PPS) sampling technique. Accordingly, 199 sample households were selected from the two districts: 149 from Bako Tibe and 49 from Gobu Seyo districts and five input suppliers were selected from the two districts. Regarding traders, 52 grain traders were selected from Bako Tibe, Gobu Seyo, Ambo and Dendi districts.

Methods of data collection and analysis

The data collected from value chain actors were cross sectional. The data collected from all actors in the value chains using semi structured questionnaire in which the questions asked were decided in advance. Data was analyzed using descriptive statistics and econometric analysis.

Marketing margin is one of the approaches to measure the market performance. Market margin is the difference between the price paid by consumers and received by producers. Margins can be calculated all along the market chain and each margin reflects the value added at that level of the market chain. Total Gross Marketing Margin (TGMM) is the final price of the produce paid by the end consumers minus farmers' price divided by consumers' price and expressed as the percentage (Mendoza, 1995).

$$TGMM = \frac{p_c - p_p}{p_c} \text{ X } 100 \quad (1)$$

where, TGMM is total gross marketing margin

P_c is the consumer (or final) price

P_p is producer price

It is useful to introduce the idea of 'farmer's portion', or 'Producer's Gross Margin' (GMMp) which is the share of the price paid by the consumer that goes to the producer. The producer's margin is calculated as:

$$GM_p = \frac{p_c - TGMM}{p_c} \text{ X } 100 \quad (2)$$

Where, GMp is the producer's share in consumer price

The Net Marketing Margin (NMM) is the percentage of the final price earned by the intermediaries as their net income after their marketing costs are deducted. An efficient marketing system is where the marketing cost are expected to be closer to transfer costs and the net margin is near to normal or reasonable profit.

$$NMM = \frac{TGMM - MC}{p_c} \text{ X } 100 \quad (3)$$

where, NMM is net marketing margin

MC is marketing cost

$$TGMM = \frac{Retailing\ price - Farm\ gate\ price}{Retailing\ or\ consumer\ price}$$

$$GMM_i = \frac{selling\ price\ \ of\ i - purchasing\ price\ of\ i}{Retailing\ or\ consumer\ price} * 100$$

$$NMM_i = GMM_i - TMC$$

Econometrics Model

The Tobit model is a statistical model proposed by Tobin (1985) to describe the relationship between a non-negative dependent variable (y_i) and independent variables (X_i). The model can be described in terms of latent variable y*. The model also called a censored regression model, because some observation on y_i* (y_i* ≤ 0) are censored. In other words, the latent variable y* is observed only if yi*>0. The model has been used in a large number of applications where the dependent variable is observed to be zero for some individuals in the sample. This model is for metric dependent variable and when it is "limited" above or below some cut off level. This suggests that the model proposed by Tobin is appropriate for analyzing happening or non-happening events.

The model enables one to estimate the likelihood and extents (intensity) of events. The intensity of marketed surplus was estimated by the following Tobit model (Tobin, 1985; Cameron and Trivedi, 2009; Greene, 2012).

$$y^* = X\beta + \varepsilon_i \quad (4)$$

$$y_i = \begin{cases} X\beta + \varepsilon_i & if\ y^* \quad > 0 \\ 0 & if\ y^* \quad \leq 0 \end{cases} \quad (5)$$

Where, y_i is the marketed surplus of maize by households expressed as natural logarithm of kilogram.

x is a vector of explanatory variables determining intensity of marketed surplus of maize;

β is a vector of parameters to be estimated, and

ε_i is the error term assumed to be independently and normally distributed.

Maddala (1997) proposed the following techniques to decompose the effects of explanatory variables into quantity supply and intensity effects. Thus, a change in explanatory variable has the two effects. In this study, the marginal effect of explanatory variables on the expected value of the maize marketed surplus (equation 6) and the change in intensity of marketed surplus with respect to a change in an explanatory variable (equation 7) among sellers were used to estimate marketed surplus of maize by smallholders in the study areas.

$$\frac{\partial E(Y_i)}{\partial (X_i)} = F(Z)Y_i \quad (6)$$

Where, F(Z) is the value of the derivative of the normal curve at a given point

Z is the Z score for the area under normal curve, $Z = \frac{\beta_i X_i}{\sigma}$

σ is the standard error

$$\frac{\partial E\left({Y_i}/{Y_i^*} > 0\right)}{\partial X_i} = \beta_i \left[1 - Z\frac{f(Z)}{F(Z)} - (\frac{f(Z)}{F(Z)})^2\right] \quad (7)$$

Where, F(Z) is the cumulative Normal distribution of Z

β_i is a vector of Tobit maximum likelihood estimates.

Hypothesis of explanatory variables

Dependent variable of the model refers to marketed surplus of maize by farm households which expressed as natural logarithm of transformed kilogram. The hypothesis of explanatory variables, types of data and their effect on marketable surplus of maize are summarized in Table 1 below.

Table 1: Hypothesis of explanatory variables

Variables	Types of data	Expected effect
Dependent variable		
Marketed surplus of maize	Continuous	
Explanatory variables		
Family size	Continuous	-
Size of land allocated for maize	Continuous	+
Livestock holding (TLU)	Continuous	+
Contact with extension agents (log)	Continuous	+
District dummy	dummy	-/+
Credit use (log)	Continuous	+
Current selling price (log)	Continuous	+
Improved seed used (log)	Continuous	+
Fertilizers used (log)	Continuous	+
Market costs (log)	Continuous	-
Distance from main market (hr)	Continuous	-
Non-farm income (log)	Continuous	+

Discussion

Household characteristics

Demographic characteristics of household result showed that the proportion of female-headed households constituted for 5% of the total sample households in the two districts. The proportions of illiterate and married household head living with spouse were about 28% and 96% of the sample households respectively. Average age of household head in the study areas was 40 years and their family size was 6.5 persons. Land holding varies among sample households, which ranges from no land holding to maximum of 9.5 hectares. About 5.5% of sample households did not have their own land for cultivation. On average, the own land holding was 1.55 ha which was on average 1.28 ha in Bako-Tibe and 2.3 ha in Gobu-Seyo districts.

Distance to the main market and walking time to sell their products varies from farmers to farmers. The minimum walking hours to main market was 5 minutes and the maximum was 4 hours. On average, time taken to the main market was 50.4 minute in Bako Tibe and 93 minute in Gobu Seyo. There was highly significant difference (at 1% significant level) in mean waking time to main markets between the two districts. This showed that sample households in Gobu Seyo walked more hours to take their products to the main market.

Maize production and marketing

Cereal crops produced in the areas were maize, *teff*, sorghum, barley, wheat and finger millet. Maize was the most important and dominant cereals in production and productivity, which constituted for 46% of cereals production in the areas, followed by *teff* 34% and sorghum 14%. Farming was the main occupation and source of livelihood for farm households in the areas. Majority of respondents have been practicing mixed cropping (crop and livestock production). On average, experience of maize farming was 21 years in Gobu-Seyo and 17 years in Bako-Tibe districts (Table 2 below)

Table 2: Production, yield and marketed surplus of maize in the two districts

	Bako Tibe (N=146)		Gobu Seyo (N=50)		Total (N=196)		
Variables	Mean	Sdt. Dev.	Mean	Sdt. Dev.	Mean	Sdt. Dev.	t-test
Farming experience	17.18	10.66	20.94	12.12	18.14	11.14	-2.08**
Land allocation (ha)	1.11	1.02	1.79	1.08	1.28	1.07	-3.99***
Production (kg)	31.61	31.24	52.55	35.39	36.95	33.53	-3.95***
Yield (qt/ha)	30.83	16.86	33.20	17.61	31.44	17.04	-0.85
Marketed surplus (qt)	14.00	23.87	30.56	29.75	18.23	25.77	-3.59***

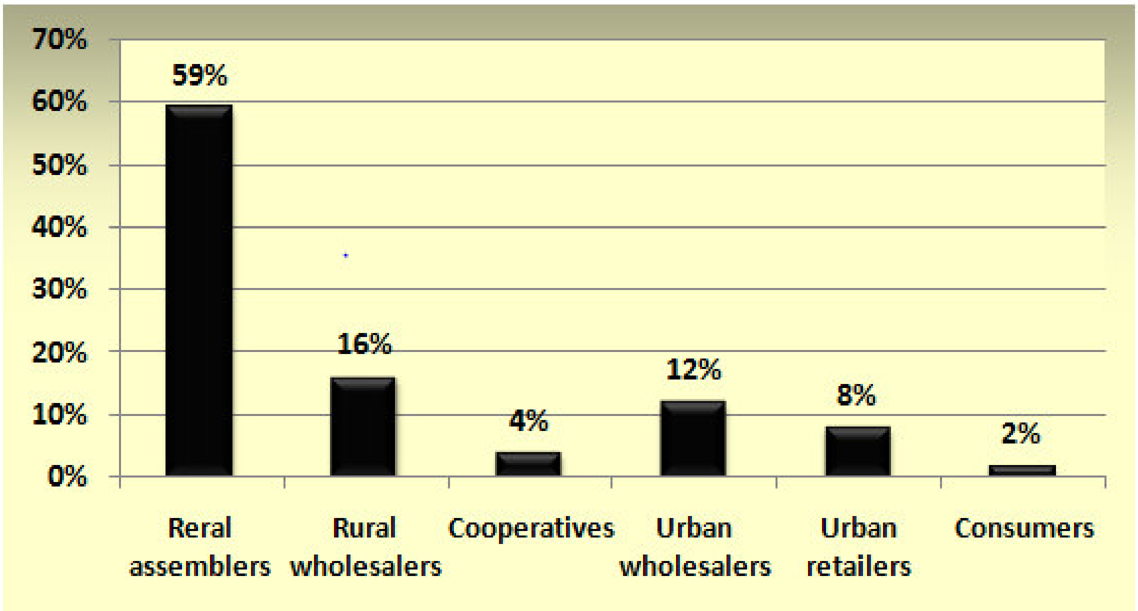
Source: own computation from 2013 survey result

Note: *, ** and *** show statistically significant difference between the districts at 10%, 5% and 1% level of significance, respectively

Regarding to production, maize producers used inputs such as improved seeds, fertilizers and plant protection chemical. On average, land allocated for maize production was1.28 ha of land. About 5% of sample households did not use improved maize seeds and fertilizers (DAP and UREA). More land for maize production was allocated in the Gobu Seyo than Bako Tibe district. Average production and yield of maize was 36.95 quintals and 31.44 quintals per hectare. This is higher than the national average yield of maize, which was 25.4 quintal per hectare (CSA, 2011b). Marketed surplus of maize was higher in Gobu Seyo, which was on average 30.56 quintal than Bako Tibe 14 quintal. There was statistically high significant difference in farming experience, land allocation, production and marketed surplus between the two districts.

Producers' characteristics by market outlets

The alternative buyers that purchased maize directly from producers were six in channels of distribution. These were rural assemblers, rural wholesalers, cooperatives, urban wholesalers, urban retailers and consumers. Among buyers, rural assemblers were the most important one, who purchased 58.8% of marketed surplus of maize. Rural wholesalers and urban wholesalers were the next more important buyers of maize directly from farmers (Figure 2).

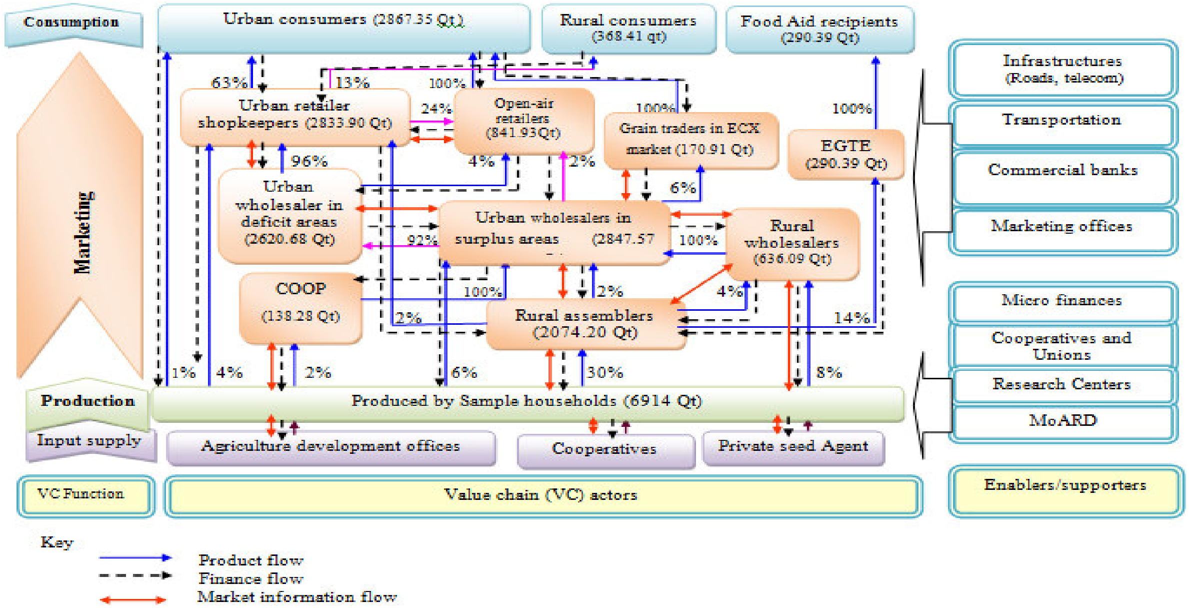


Source: own sketch from 2013 survey data
Figure 2: Share of maize buyers directly purchased from producers

Value Chain Analysis

Mapping is a central element of value chain analysis. It is used to show the flow of transactions from sourcing of raw materials and inputs, to production, processing, marketing and final sale. It is made up of three inter-linked components namely value chain actors enabling environment and service providers. The value chain actors are those directly involved in value chain activities. These are input suppliers, producers, grain traders, processors, exporters and consumers. The enabling environment is activities related to infrastructure and policies that shape production and market environments. The service providers are those who provide services such as transportation, extension service, credit, information, etc that support the value chain.

In maize value chain, three key actors that connected producers and consumers were assemblers, wholesalers and retailers. As depicted in Figure 3 below, the flow channel: producers →assemblers → wholesalers → retailers → consumers was the longest channel and large volume of marketed surplus flowed from producers to consumers. There were no actors that used maize as a raw material for processing in flour form. Moreover, there were no exporters identified that export the commodity in the value chain.



Source: own sketch from 2013 survey result
Figure 3: Map of maize value chain in the study areas

Marketing Channels and Performance Analysis

Marketing channels analysis describes the direction and volume of goods and services flow from producers to consumers. Maize marketing channels were analyzed based on their direction and volume of flow. Ten maize channels were identified that pass the commodity from producers to consumers. The major actors in the channels were producers, cooperatives, rural assemblers, urban wholesalers, retailers and consumers. In the maize channels, the largest volume flowed through channel IV which was 1659 quintals and the smallest flow was through channel I (69 quintals). The market channels are described as follow:

I. Producers → consumers (69 quintals)
II. Producers → urban retailers → consumers (277 quintals)
III. Producers → rural assemblers → urban retailers → consumers (41 quintals)
IV. Producers → urban wholesalers → urban retailers → consumers (245 quintals)
V. Producers → Cooperatives → urban wholesalers →urban retailers → consumers (138 quintals)
VI. Producers → rural assemblers → urban wholesalers → urban retailers → consumers (1659 quintals)
VII. Producers → rural assemblers → rural wholesalers → urban wholesalers → urban retailers → consumers (83 quintals)
VIII. Producers → rural wholesalers → urban wholesalers →urban retailers → consumers (553 quintals)
IX. Producers → urban wholesalers in surplus areas→ grain traders in ECX market → consumers (171 quintals)
X. Producers → Rural assemblers → EGTE → Food Aid recipients (290 quintals)

Value added structure was analyzed using costs (production and marketing costs), marketing margins and returns. The analysis standardized unit of measurement into Ethiopian Birr (ETB) per quintal. Actors incurred marketing costs for transportation, storage, sorting, packing, cleaning, loading, seller searching, commission, taxes and others. Marketing margin used to measure the share of the final selling price that is captured by a particular actor in the value chain. Marketing margins were computed for producers, rural assemblers, wholesalers and retailers.

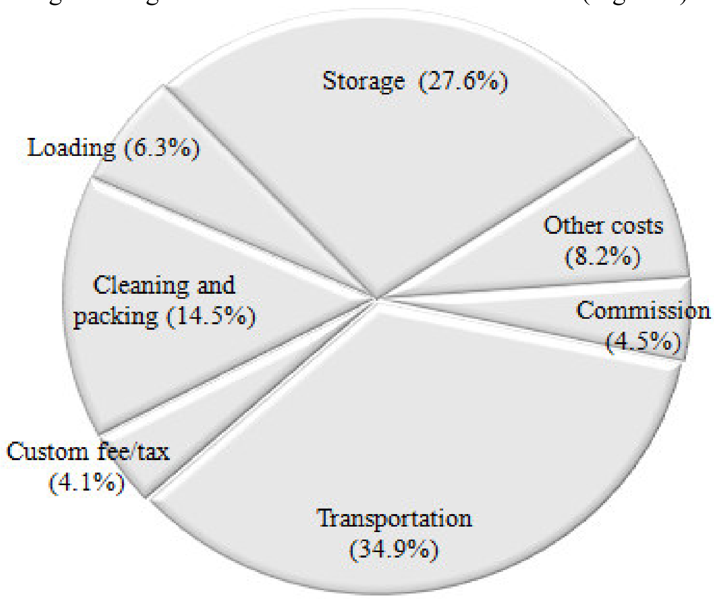
Actors in the value chain add value through marketing costs such as .transportation, loading, seller/buyer searching, cleaning, packaging, sorting, storage costs like rent, pest/rodent control and weight loss. Production costs such as seeds, fertilizers, plant protection chemicals, land, labour and oxen were computed. As most of households used their own family labour, oxen and land, opportunity costs were used to compute costs of production. Accordingly, average cost of maize production for a sample household was 181 ETB. When the commodity flows from producers to consumers, actors in the value chain add costs. The result showed that rural assemblers add more costs (ETB 48.77 per quintal) than other actors. In the chain, Producers had the highest share of market margin (35.56) and profit margin (75.45%). From traders, rural assemblers had 12.64% and 10.02% share of market margin and profit margin, respectively (Table 3 below).

Table 3: Marketing margin and gross profit of actors in maize value chain.

Cost items (ETB/qt)	producers	Rural assemblers	Urban wholesalers	Urban retailers
Purchasing price	-	378	448	496
Production cost	181	-	-	-
Marketing costs				
Transportation	6.25	15.75	19.65	14.85
Storage	24.5	11.35	3	5.86
Cleaning/packing	0	7.36	5.3	10.75
commission	0	0.75	4.55	2.03
Custom fee/tax	2	1.79	1.31	1.47
Loading/unloading	0	4.53	2.5	3.17
Other costs	5	7.0	0.67	0.55
Total marketing cost	37.75	48.77	36.98	38.68
Total cost	218.75	429.8	484.98	534.68
Selling price	378	448	496	554
Market margin	197	70	48	58
% share of margin	35.56	12.64	8.66	10.47
Profit margin	159.25	21.47	11.02	19.32
% share of profit	75.45	10.17	5.22	9.15

Source: own computation from 2013 survey result

Value was added to the product when it passed from one actor to another. More value was added as transportation, storage and cleaning/packing. Actors in the value chain incurred 34.9% of marketing costs for transportation, 27.6% for storage costs, 14.5% for cleaning and packing, 6.3% for loading/unloading, 4.5% for commission, 4.1% custom fee/tax and the rest for personal expenses such as transport, food, mobile card and other utilities. Storage costs were incurred for storage rent, control storage pest and rodents, and weight loss during stocking. Weight loss during cleaning was also considered as cost for traders (Figure 4).



Source: own sketch from 2013 survey result

Figure 4: Percentage share of maize marketing costs

The result showed that there was a difference in the consumers' price spread along the market channels. Total gross marketing margin was high in channel VI and low in channel II in which 39.3% of Total Gross Marketing Margin (TGMM) added to maize price in the channel when it reached the final consumers. Of this, rural assemblers received 23.4% and urban retailers 15.9 %. In other words, the market channels with only one actor between producers and consumers showed low TGMM. This implied that as the market margin becomes wide, price becomes high for consumers and low to producers.

Net marketing margin was computed from the difference between percentage shares of gross marketing margin and total marketing costs as the percentage of retail prices in the channels. Accordingly, channel VI was the highest NMM, which constituted for 33.1% of net income. These marketing margins difference among market chains and actors were evidence for the existence of market inefficiency, which arose due to differences in marketing costs and price difference between producers and consumers.

Econometrics Analysis

Econometric analysis result showed that 51% of maize production supplied the commodity to markets. On the other hand, among the 199 sample households, 31 of them did not supply maize to the market. The values of dependent variable for these observations were zero that censored to the left. If zero values of dependent variable were the result of rational choice of farmers, a Tobit model would be appropriate for econometrics analysis. The econometrics analysis of the Tobit model that analyzed determinants of maize marketed surplus is shown in Table 4 below.

Table 4: Tobit model results for maize marketed surplus

Variable Description	Coefficient	Standard Error	Marginal effect $\frac{\partial E(Y_i)}{\partial (X_i)}$	Marginal effect $\frac{\partial E(y_*/y_i^*>0)}{\partial X_i}$
Dummy Bako Tibe	-0.468	0.145	-0.468***	-0.468***
Family size	-0.013	0.026	-0.013	-0.013
Seed used (log)	-0.008	0.093	-0.008	-0.008
Fertilizers used (log)	0.397	0.077	0.397***	0.397***
Distance to main market (hour)	-0.116	0.071	-0.116*	-0.116*
Current price (log)	1.633	0.096	1.633***	1.633***
Marketing costs (log)	0.191	0.047	0.191***	0.191***
Credit used (log)	-0.005	0.017	-0.005	-0.005
Extension contact (log)	0.027	0.0546	0.027	0.027
Land allocated (ha)	0.198	0.0685	0.198***	0.198***
Livestock holding (TLU)	0.018	0.013	0.018	0.018
Non-farm income (log)	-0.035	0.016	-0.035**	-0.035**
Constant	--3.715	0.621	--3.715***	--3.715***
Sigma	0.726	0.040	0.726	0.726
Number of observation			196	
LR chi2 (12)			575.36***	
Pseudo R^2			0.610	
Left censored observations			31	
Right censored observations			0	
Predicted value (log)			5.665	

Source: Author analysis from 2013.survey result

Note: Dependent variable is quantity of maize supplied to market (log),

*, ** and *** show explanatory variables were significant at 10%, 5% and 1% level respectively

Twelve explanatory variables that were expected to determine marketed surplus of maize were hypothesized and analyzed using the Tobit model. The results showed that district dummy, fertilizer used, current price, marketing costs, land allocated, distance to main market and non-farm income significantly determined marketed surplus. The remaining five variables were found to have no significant effect on maize marketed surplus. Among these districts dummy, distance to main market and non-farm income affected negatively.

Dummy Bako Tibe: Study areas of the two districts differ in their total production and volume supplied to market. The result showed that there was statistically significant difference between the two districts in supplying to the market. Sample households in Gobu-Seyo supplied to market more than Bako-Tibe district. When compared with Gobu-Seyo district, maize supplied to market in Bako Tibe less by 0.468 percent from 1% increase supply in Gobu Seyo.

Fertilizer used (log): The rate of fertilizers used for maize production has significant and positive effect on the yield. The result showed that use of fertilizers had significant and positive effect on marketed supply of maize. For 1% increased in use of fertilizer application, increased marketed surplus of maize by 0.397 percent.

Maize current price (log): Producers are sensitive to market price. Markets price of maize in the study areas were set by negotiations between the buyers and sellers as well as by prevailing market price as generally known in the market. When the selling price increased from the prevailing market price, they were encouraged to supply more to the market. The result shows that selling price was highly affecting the marketed supply of maize at 1% significant level. When the current market price is increased by 1%, maize supplied to market also increased by 1.633 percent.

Maize marketing costs (log): Households incurred costs such as transportation, storage and sales tax when they supplied maize to market. It is a continuous variable which is expressed as the percentage of total marketing costs incurred in ETB. It was hypothesized that as marketing costs increased, the quantity supplied to market decreased. However, the result showed that total marketing costs significantly and positively affected marketed supply. It implied that for 1% increase in marketing costs, the volume supplied to market also increased by 0.191 percent, which was in contrast with the hypothesis. The contrast may be due to high transportation costs incurred associated with transporting large volume of maize to main market. That is, the larger the volume transported to distant market, the higher the transportation cost incurred.

Land allocated for maize (ha): As hypothesized**,** the more the allocation of land for maize, the more increase in production. This in turn increased the volume of marketable supply**.** The result showed that the more the land is allocated for maize, the higher the production that in turn increased marketed supply of maize. It implied that as the land allocated increased by one hectare, marketed supply also increased by 0.198%. But other variables remain constant.

Non-farm income (log): It was hypothesized that as family non-farm income increase, it help in generating additional income and invest more on production of maize which in turn increase the quantity supplied to market. However, the result was in opposite direction which indicated that as non-farm income increase by 1%, quantity of maize supplied to market decrease by 0.035%. This may be due to the fact that households who generate more income from nonfarm activities, tends to sell less and increase family food consumption.

Distance from main market (hr): The distances from the main market influence households in buying inputs and selling outputs. The closer the market place to farm gate, the lesser would be the transportation costs, transaction costs, time, and more access to market information. Therefore, the time taken to market negatively affected quantity supplied to the market. .The result showed that for an hour increase in time taken to nearest market, marketed surplus of maize decrease by 0.116%.

Conclusion

The survey results showed that among cereals produced, maize was the most important and dominant crop in the areas. Moreover, it was the commodity which used improved seed and fertilizers intensively. Production and productivity of the commodity was much higher than other crops produced in the areas. Its yield was more than the national average by six quintals. From maize total production, households supplied about half to markets.

In the maize value chains, more value was added as transportation. Therefore, decreasing transportation costs could increase profit share of actors in the value chains. Urban wholesalers handled large volume of the commodity in which they mainly purchased from other traders in the markets. All grain traders except urban retailers sold their product to the wholesalers. As they had fewer competitors and potential buyers in the markets, they had a decision-making power on quantity, quality and prices.

The performance of maize market was evaluated by considering costs, returns and market margins. Among marketing costs, actors incurred high costs on transportation and reducing this cost increase gross profit of actors in the value chains. Producers obtained higher percentage share of profit when they sold their product directly to consumers. Net marketing margin was highly associated with gross marketing margin. The higher the share of gross marketing margin, the more net marketing margin obtained.

Factors determining volume of maize supply to market were identified using econometrics analysis of Tobit model. Explanatory variables such as fertilizer quantity used, current maize price, marketing costs and land allocated determined volume of maize supplied positively. In other hand, district dummy Bako Tibe, non-farm income and distance from main market determined negatively. The most important determinant factors were location differences, current price and quantity of fertilizer used.

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