RESEARCH ARTICLE

ANALYSIS OF BREAD WHEAT MARKET CHAIN: THE CASE OF LEMO DISTRICT, SOUTHERN ETHIOPIA

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ABSTRACT

Bread wheat plays a significant role in the national economy and food self-sufficiency. The marketing system and channels differs for different areas. Production of bread wheat by smallholder farmers of the lemo district is mainly for market which is the most important and widely known cash crop of the area but there was lack of properly functioning marketing system and this often resulted in lower producers' price. Therefore, this study focused on identifying bread wheat market chain actors and their channels and factors that affect the volume of wheat marketed. Three stage sampling technique was employed in this study. Data were collected from both primary and secondary sources. The primary data were collected from 160 producers and 35 traders. Secondary data were gathered from district agriculture and rural development offices and trade and industry office. Both descriptive and econometric analyses were employed for data analysis. The study indicated, out of the total wheat produced in 2016/17 cropping season, 64.8% was supplied to the market. The result showed that about seven marketing channels were identified in transferring 2083.5Qt wheat from producers to final consumers. The result of a multiple linear regression model indicated that quantity produced and number of oxen affects volume of wheat supply positively while distance to market and family size affect negatively and significantly. Therefore it is advisable that wheat producers in the study area should be encouraged owning good number of oxen to prepare their land in time and responsible bodies should work on development of infrastructure in the area.

INTRODUCTION

Background of the study: In Ethiopia, Cereal production and marketing are the means of livelihood for millions of smallholder households and it constitutes the single largest sub-sector in the economy. Cereal accounts for roughly 60% of rural employment, 80% of total cultivated land, more than 40% of a typical household's food expenditure, and more than 60% of total caloric intake (Sultan, 2016). Cereal production represents about 30% of gross domestic product (GDP) of the country. This calculation follows from the fact that agriculture is 48% of the nation's GDP (World Bank, 2007), and that cereals' contribute to agricultural GDP is 65% (Diao *et al*, 2007). Ethiopia is the second largest wheat producer in Sub-Saharan Africa (SSA), next to South Africa (Gashaw *et al*, 2016). The two main types of wheat consumed in the country are bread wheat (*Triticum aestivum L)* and durum wheat *(Triticum turgidum*). Bread wheat is softer, has lower protein content, and is suitable for making various types of bread products.

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Durum wheat is harder, with higher protein content, and is used primarily in the production of pasta. Nationally, durum wheat accounts for 50-80% of wheat imports in most years. One reason for this imbalance is most of the wheat grown in Ethiopia is bread wheat, yet the demand for pasta is growing more rapidly than the demand for other wheat products (Nicholas *et al,* 2015). A well-developed market for wheat in developing countries like Ethiopia provides access to consumers who depend on the market for their food supplies and to farmers who needs to shift from subsistence to market oriented production (Lutez, 1994). Low crop yield is one of the challenges of Ethiopian to ensure food security and self-sufficiency. Wheat is one of the major crops with low yield and high demand (Gashaw *et al* 2016*)*. The country imports wheat every year or every other year from abroad because of the low level of wheat production and the high demand from consumers (ATA, 2014). Hadiya zone is one of the zones producing most cereals especially it is potential bread wheat production area in southern Ethiopia. The Zone is known with favorable climatic and natural resource conditions that can grow diverse annual and perennial crops required for household consumption and the market. Despite this

production of bread wheat and other agriculture are largely dependent on rainfall but cannot boost the production through irrigation (HZADD, 2014). Lemo is one of the ten districts in the Hadiya zone which has a great production potential of agricultural products like Wheat, *teff*, maize, barley and bean. Production of wheat by smallholder farmers of the district is mainly for market which is the most important and widely known cash crop in the area. The land area covered by wheat in the district was 9323 hectares and produced 279,690 quintals of wheat (Woreda Agricultural Office, 2016).

Statement of the problem: The recognition of critical role of markets in economic development led to sweeping market reforms across a number of developing countries for the past two decades. In spite of these reforms, symptoms of poorly functioning markets in much of Sub-Saharan Africa are evident in the segmentation of markets, low investment in the market infrastructure and the persistence of high margin (Eleni, 2001). Marketing of agricultural products in Ethiopia are characterized by inadequate transport network, with inadequate capital facilities, high handling costs, inadequate market information system, and weak bargaining power of farmers and underdeveloped industrial sectors (Kinde, 2007). Bread wheat has high potential production volume and marketability in the study area. However Supply of wheat in the study area is subjected to seasonal variation where surplus supply at harvest is the main feature and lack of properly functioning marketing system often resulted in lower producers' price. Farmers in Ethiopia in general are affected by low producer's price, on one hand, and high consumer's price, on the other. Given the potential for wheat production, processing, marketing and consumption, there is scanty information about bread wheat market chain and market access for farmers and other actors in the study area. Therefore, this study tried to identify bread wheat market chain actors, their roles, their relationship and factors that determine volume of bread wheat marketed in the study areas so as to reduce the information and awareness gap that contribute to better understanding and possible improvement strategies to upgrade bread wheat market chain for the benefit of smallholder farmers and traders.

Objectives of the Study

The general objective of the study was to analyze the bread wheat market chain in the study area.

The specific objectives of the study were:

- To identify the marketing channels of Bread wheat of the study area
- To analyze the determinants of the farmers' quantity supply of Bread wheat in the study area

MATERIALS AND METHODOLOGY

Research Design: A cross sectional survey research design was employed for this study. Quantitative and qualitative research data were collected from primary and secondary data sources. Quantitative data was collected from sampled farmers and traders, whereas qualitative data was collected from focus group discussion (FGD) and key informant interview (KII).

Sampling Technique and Sample size: Three stage sampling technique was employed to select representative households in the study area. In the first stage, Lemo district was selected

purposively as it has the largest area under bread wheat production in the study zone. In the second stage out of 35 kebele's of lemo district, four Kebeles` were selected purposively based on better production potential of bread wheat with the consultation of district agricultural experts. In the third stage by using the population list of bread wheat producer farmers from sampled Kebele's, 160 sample size households were selected by systematic random sampling method. In social science research involving econometric analysis Green (1991) proposed a sample size determination procedure based on the rule of thumb i.e. N ≥ 50+8m developed. Where N is sample size and m is the explanatory variables proposed to be included in the econometric model. For this study the explanatory variables are 13. N>=50+8*13=154 this is the minimum sample size so by adding 6 the researcher was selected 160 respondents.

There are N of the population and n units were selected, then R= N/n where R is known as sampling interval.

For this study N=960, n=160 then R=960/160=6

Where R=is sampling interval N = is number of population n= is sample size

The first respondent was selected from list of farmers' and then by taking each respondent from every 6th intervals.

By using the population list from sampled *kebele* the intended sample size was selected by proportional sampling techniques. Sampling proportion= n/N= 160/960=0.16667=16.7%

This means 16.7% of each kebele farmers were selected. Finally based on the sampling frame from each kebele systematic sampling technique was used to select farmers.

Table 1. Distribution of study sample by kebele and household heads

S/N	Kebele Name	Wheat Producers			Sample producers		
		Male	Female	Total	Male	Female	Total
1	Lembuda	220	35	225	37	6	43
2	Jewe	180	20	200	30	3	33
3	Shurmo Wixbira	190	25	215	32	4	36
4	Shurmo dacho	250	40	290	42	7	52
	Total	840	120	960	140	20	160

Source, survey result (2017)

In addition to smallholder farmers, traders (wholesalers, retailers, processors and cooperatives) were interviewed purposively from the total list of district trade and industry office of licensed traders. Licensed traders were considered since was difficult to get the unlicensed traders. Thus their number depends up on the availability of the licensed traders. The sites for the trader's survey were market towns (*shurmo, gabo and jewe*) in which a representative sample of wheat traders existed. That means if they were limited in size, all of them were selected. The numbers of traders surveyed were totally 35. These were 14, 12, 3,3, and 3 from wholesalers, retailers, processors, cooperatives and collectors respectively.

Method of Data Analysis: In this study both descriptive and econometric methods of data analysis were employed.

Descriptive statistics: Descriptive statistics like frequency, ratio, mean, variance standard deviation and percentile was used to analyze various parameters used in the study. The

parameters describe producers and traders characteristics, marketing channels, and its marketing profitability (marketing margin).

Market chain analysis approach: A market chain comprises the economic actors who produce and transact a particular product as it moves from primary producer to final consumer. These actors include small and large-scale producers, input suppliers, traders, processors, transporters, wholesalers and retailers (Tony Banks, 2010).

Mapping: mapping the value chain used to visualize the chain actors, identify their roles, linkage among them. This data can be obtained by conducting surveys and interviews as well as by reviewing secondary data from various sources. The Market Map is a tool used to visualize the market as a system. A market system describes a set of actors, relationships, functions and issues which together describe the relationships between the different actors in the sector that your product/service operates within (Mark *et al,* 2008).

Econometric analysis: In this study, multiple linear regression models were used to analyze data to generate information about determinants of wheat supply. Multiple linear regression model was employed to estimate the determinants of *teff* and wheat supply (Mohammed, 2011). This model is also selected for its simplicity and practical applicability (Greene, 2003). Based on literatures, the wheat supply model to be estimated in this study was taking the following form. Model is like.

$$Y_i = f(x_1, x_2, x_3, x_4 x_5 x_6 x_7 x_8 x_9 x_{10}, x_{11}, x_{12}, x_{13})$$

Where: Y_i = quantity of wheat marked
X_1 = Age of respondents X_8 = Number of oxen
X_2 = Quantity produced X_9 = Land size
X_3 = Experience in wheat production X_{10} = Family size
X_4 = Access to market information X_{11} = Sex of household
X_5 = Frequency of extension contact X_{12} = Cooperative membership
X_6 = Educational level of household head X_{13} = Distance to market
X_7 = Access to credit

Econometric model specification of supply function is the following:-

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta x_{11} + \beta x_{12} + \beta x_{13} + \varepsilon_i$$

Where, Y_i = market supply of wheat for each model,
α = intercept
X_i = a vector of explanatory variable, and 'i' is 1, 2, 3… n of the above
β_i = coefficient of x_1, x_2, x_3, x_{13} of the independent variable which are implies importance of variables among significant explanatory variables.
ε_i = unobserved disturbance term

RESULTS AND DISCUSSION

Wheat marketing channel: A marketing channel is a business structure of interdependent organizations that stretch from the point of product origin to the final-users with the purpose of moving products to their final destination (Kotler and Armstrong, 2003). The analysis of marketing channels is intended to provide a systematic knowledge of the flow of the goods and services from their **origin (producer) to the final**

destination (final-use). Farmers sell through different channels. Seven marketing channels of wheat were exhibited in the study areas. It was estimated that 2083.5 quintals of wheat were transacted by sampled farmers in the year 2017. Wholesalers and retailers were the main receivers of wheat with percentage shares of 45.9% and 20.8%, respectively. The market channels identified during the survey were**:-**

Channel I: Producer- Consumer: This channel is the shortest channel in which producers sell directly to consumers at market day. It represented 12.5% of the total bread wheat marketed which amounted to 261.5 quintals of wheat during the survey period. It was the fourth channel in terms of the total volume of wheat marketed.

Channel II: Producer-Retailer-Consumer: District retailers in the production area buy without the involvement of brokers depending on the volume of the product and resale to consumer. It represented 20.8% of total wheat marketed, which was 433.5 quintals during the survey period. The channel was found to be the third marketing channel in terms of volume of wheat marketed.

Channel III: Producer-Wholesaler-Consumer: This is the largest and most important channel; accounting for approximately 24.83% of total marketed volume of wheat i.e. 517.50 quintals during survey year. The wholesalers buy bread wheat at the farm gate or at local market directly from producers and sell it to retailers. This channel was the first most important channel compared to other wheat market channels considering the volume of wheat transacted.

Channel IV: Producer-Wholesaler-Retailer-Consumer; This is the channel wholesalers directly buy bread wheat from producers and sell to retailers before the product reaches final end users via retailers. It comprises 440 quintals of wheat transacted in the study area in the survey period that accounts 21.1% of the quantity marketed in the chain. This channel is the second most market channel compared to other wheat market channels considering the volume of wheat transacted.

Channel V: Producer-Collector-Wholesaler-Retailer-Consumer: Rural collectors are buying wheat from producers in the study area and they sell to wholesaler. This is the smallest channel in terms of volume of bread wheat marketed. It accounted for 4.2% of total wheat marketed 88 quintals during the survey period. This channel was the least channel compared to other wheat market channels considering the volume of wheat transacted.

Channel VI: Producer-Cooperatives-Processor--Consumer: there were about three primary cooperatives in the study area which buy wheat and sell it to *Licha* flour factory. In this channel producers sell their wheat produced to cooperatives which in turn sell to processors and after the row grain is processed it is reached to ultimate consumers. In this channel 117 quintals of wheat is supplied that comprises 5.6% of total volume of wheat marketed. It was the sixth market channel in quantity marketed.

Channel VII: Producer-Cooperatives-Processor—Wholesaler-Consumer: This channel is the channel producers sell the wheat they produced to cooperatives that in turn supply to processor after that the grain was changed in to flour and wholesalers sold it to the consumers. It transfers 226 quintals

that comprises 10.85% of total bread wheat transacted in the whole wheat market chain which indicate one quintal of wheat and one quintal of flour is equal but the difference was their selling price. It is the fifth channel in terms of the total volume of wheat marketed.
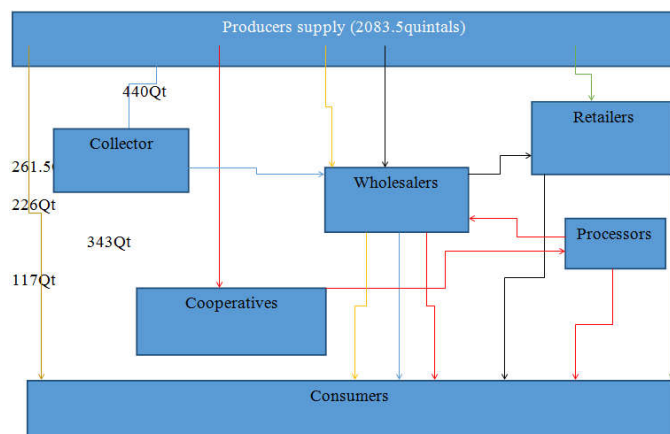
Map of the Wheat chain

Fig. 1. Market chain map

Econometric Results: In this section the results of the econometric analysis on the determinants of the volume of marketed supply of wheat is presented. Several variables are hypothesized to influence the volume of market supply of wheat by sampled farmers. The results for all VIF values were ranges between 1.17 and 6.89. Likewise, the values of CC were ranging between 0.0001 and 0.25. Hence, multicollinearity was not a serious problem both among the continuous and discrete variables. Heteroscedasticity was tested by running heteroscedastic regression using Econometric software. There was no serious problem of heteroscedasticity in the model. And hence all the explanatory variables were included for the model analysis of determinants of market supply of wheat. The problem of endogeniety occurs when an explanatory variable is correlated with the error term in the population data generating process, which causes, the OLS estimators of the relevant model parameters to be biased and inconsistent. Test of endogeniety showed that the quantity of wheat produced is endogenous to the model. This problem can be overcome by using two stages least square (2SLS) estimator for wheat market supply. To overcome the problem of endogeniety we have to apply two stages least squares (2SLS) estimator using instrumental variable technique. It is made by regressing the suspected endogenous variables over the pre-determined or pure exogenous variables to get their predicted values. Here land size of household and level of education were used as instrument to quantity of wheat produced.

The overall goodness of fit of the regression model is measured by the coefficient of determination (R^2). R^2 values of the model were; 0.889 and adjusted R^2 values were; 0.879. It tells what proportion of the variation in the dependent variable 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. Hence, the overall model goodness of fit represented by model count R-square is very good and this result indicates that about 88% of the variation in marketed supply of wheat was attributed to the hypothesized variables. In table 2, estimates of the parameters of the variables expected to determine volume of wheat

marketed are presented. There are 8 continuous and 5 dummy independent variables of which 4 variables significantly affect the market supply of wheat at less than 1% and at 5% significance level.

Table 2. Determinants of market supply of wheat

Variables	Coefficient	Std. Error	T-value	P-value
Sex	.4270157	.4114263	1.04	0.299
Age	.0219512	.0323362	-0.68	0.497
Edu	.1026181	.1560685	0.66	0.511
Dist-mark	-.3879718	.0946285	-4.10	0.000***
Farm-size	-.3358192	.138108	-2.43	0.015**
Farm-Exper	.0467184	.371918	1.26	0.209
Land-hec	2.624347	1.769497	1.48	0.138
Wheat-quant	.5212821	.0622888	8.37	0.048**
Noox	1.475189	.6914526	2.13	0.033**
Freq.ex.con	.128046	.2087589	0.61	0.540
Coop-memb	.5063351	.3262469	1.55	0.121
Credtwt	-.4766028	.3440913	-1.39	0.166
Mrktinfo	-.489701	.8930257	-0.55	0.583
Cons	2.347081	2.13049	1.10	0.271

Source; Survey result (2017)
Note: dependent variable- amount of bread wheat supplied to the market, Number of observations = 160, R-square=0.889 and Adjusted R-square=0.879 (*** and ** represent significance level at less than 1% and 5%).

Determinants of Market Supply of Bread Wheat: In the econometrics model thirteen explanatory variables were used out of which four variables were found to be significant determinants of volume of wheat marketed. As shown in Table 2 above the significant variables were Quantity of wheat produced, number of oxen, distance from market and family size.

Quantity of wheat produced: As hypothesized quantity of wheat produced positively & significantly affected the supply of wheat at 5% significant level. A positive coefficient implies that an increase in quantity of wheat produced, increase marketed supply of wheat by farmers. It indicates that households who produce more quantity of wheat had also supplied more to the market. As the production of wheat increases, the farmers are going to supply more quantity of wheat to the market. That is, a farmer that obtains high yield can supply more to the market than a farmer who had fewer yields. The regression coefficient showed that as quantity produced increases by one quintal, the volume of wheat marketed increased by 0.5 quintal. This is in line with Adugna (2009); Ayelech (2011) and Abraham (2013) who illustrated an increase fruits and vegetables production by farming households has increased market supply of the commodities significantly.

Number of oxen: Owning enough number of oxen could help them to prepare their land in time and plant timely. Ox ownership helps the farmers as a power for plowing, increases wheat supply. It affected the wheat supply positively and significantly. As hypothesized number of oxen has a positive and significant influence on marketed wheat supply. The result indicates that keeping other variables constant, a unit increase in number of ox increases the volume of wheat marketed by 1.47Qt. This could be due to the fact that farmers with more livestock holding tend to produce crops having more trash for livestock feed like wheat. It was significant at 5% level. This is in line with Kindie (2007) who found that the number of oxen owned by the household affected the marketable supply of sesame in Metema *woreda*.

Distance to the nearest market (DIST-MKT)*:* This variable affects the quantity wheat supply negatively and significantly at 1% significance level. The result of regression model confirmed that a one kilometer increase in distance to the market causes a 0.386Qt decreases in amount of wheat to be marketed, keeping other variable constant. That is the closer the residence of the household to the market center that reduces cost of transportation so the more would be volume of wheat supplied to the market. However, the result from the current study shows that the longer the distance from nearest market to the commodity, the smaller the amount supplied to the market. A smaller market distance also improves return to labor and capital and increase farm gate price and the incentives to participate in production and marketing. A study by Tadesse (2011) on vegetables, Tura *et al.,* (2016) on *teff* and Amentae (2016) on *teff* value chain and postharvest loss also gained similar result on impact of nearest output market distance.

Family size (FMLYSZ): This variable has a negative impact on volume of wheat marketed and it was significant at 5% level. The coefficient confirms that when the family member increases by one, the volume of wheat supplied will decreases by about 0.33 quintal. The negative and significant relationship indicates that households with more number of family members supply less amount of wheat to the market than those households with relatively less number of family members because of the increase in consumption at home. This is also confirmed by the findings of study found marketed surplus of durum wheat to be negatively affected by family size Haymanot (2014); And also Girma, 2015 found marketed surplus of *Teff* to be negatively affected by family size.

Conclusion

In the study area wheat is the most important and widely known cash crop mainly produced for the market. This study focused on identifying wheat market chain actors and channels and factors that affect the volume of wheat marketed in the study area. Three stage sampling technique was employed . In the first stage, Lemo district was selected purposively as it has the largest area under bread wheat production coverage in the study zone. In the second stage out of 35 kebele's of lemo district, four Kebeles` were selected purposively based on production potential of bread wheat in consultation with district agricultural experts. In the third stage by using the population list of bread wheat producer farmers from sampled Kebele's, 160 sample size households were selected by systematic random sampling method. Both primary and secondary sources were used. The primary data were collected from 160 producers and 35 traders. The survey result indicates on average 3,212 quintals of wheat produced by sample smallholder farmers. Out of the total wheat produced in the study area 64.8% (2083.5 Qt) was supplied to the market and distributed through farmers to consumers. The most important market actors of wheat market chain are producers, wholesalers, retailer, rural collectors, processors (flour factory) and cooperatives. About seven marketing channels were identified in transferring 2083.5Qt wheat from producers to final consumers. In terms of volume of wheat transacted Channel III was the dominant channel in the study area. Multiple linear regression models was used to identify determinants of volume of wheat marketed. The result of the regression models indicates that among 13 explanatory variables hypothesized to determine the household level of

market supply of wheat, four variables namely; family size, amount of wheat produced, distance from the market and number of oxen were found to be significant. The amount of wheat produced and number of oxen had positive and significant influence whereas family size and distance from the market had negative influence on   supply of wheat to the market.

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