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Factors Affect Maize Production and Marketing in Wolaita and Dawuro Zones, SNNPR State, Ethiopia

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Abstract: ***Cereal crops are major food crops all over the world and their productions as well as marketing system demand alert follow up from its input supply to final market by all agents at each stage. The research entitled with Factors Affect Maize Production and Marketing is conducted in Wolaita and Dawuro Zones. The objectives of this study are to assess the maize market structure, conduct and performance, to identify the determinants of maize production and to identify factors affecting farmers' participation in maize marketing and volume marketed in the study areas.Primary and secondary data were used for this study. A total of 115 sample household heads, 25 maize traders were selected from both zones. The descriptive and econometric analysis output indicates that the maximum profit margin of wholesalers was 296.40 ETB/qt and farmers' profit margin was 167.10 ETB/qt. Heckman model was employed to identify factors that affect market participation decision and intensity of participation in maize markets. The selection equation outcome showed that participation decision was positively and significantly affected by age, market price, sex, quantity produced and land size. The result equation results shown that intensity of participation was found to be positively and significantly affected by land size, market information access, number of oxen and household head's literacy status. Therefore, the study recommends that timely market information and education accessing, using modern farming system, engaging productive work force in maize production and marketing are required in the study areas.***

Keywords: Maize, Heckman, Market Margin, Market Channel

1. Introduction

1.1. Background of the Study

In Ethiopia, cereal production and marketing are the means of livelihood for millions of small holder households and it constitutes the single largest sub-sector in economy. The contribution of cereals to national income is also large. According to available estimate, cereal production represents about 30% of gross domestic product (World Bank, 2007). Various types of cereal crops are being produced in different parts of Ethiopia that serve as a staple food for the majority of people. Maize is one of the most important cereal crops in Ethiopia in general and Southern Nation, Nationalities and Peoples' Regional State (SNNPR) in particular. It serves as a source of both food and cash income (BOARD, 2007).The country has one of the weakest market institutions and infrastructure, particularly with respect to the food staples sector (Eleni, 2001). Wolaita and Dawuro zone are one of the zones in the SNNPR. The zones are endowed with favorable climatic and natural resource conditions that can grow diverse annual and perennial crops required for household consumption and the market. According to zone reports the major cereals crops grown in the both zone include maize, teff, wheat etc.

1.2. Statement of the Problem

Though there is a step by step approach that integrates agricultural potential, problem identification and intervention processes that recognize farmer indigenous knowledge, includes capacity building, improvement of the production system, cooperative formation and market and institutional linkages need to be strengthened for agricultural development in the woreda (Melaku*et al.*, 2008).

Various factors can give rise to inefficiencies to a marketing system. These factors may originate in a technical barriers including lack of market information, structural elements and government programs and policies. Maize production in Humbo and Damot Woydewored as in Wolaita zone and Tocha and Loma woreds in Dawuro zonewas mainly with seasonality where surplus at harvest products is the main characteristics. The nature of the product on the one hand and the lack of organized market system on the other often resulted in low producers' price. No studies have been carried out to identify what the marketingsystems look like and no remedial measures were taken so far.

Thus, the purpose of this study is to investigate maize production and marketing and factors affecting farmers‟ participation in maize marketing in Wolaita and Dawuro zones. Besides it is intended to narrow the information gap on the area of interest by drawing attention to answer the questions like: who are the maize market agents and what are their activities in the system? What are the market channels in the study areas? What does the market margins look like in the areas? Therefore, the main focus of this study isto assess the maize production and its market structure, conduct and performance in the study areas.

1.3. Objectives of the Study

1.3.1. Major objective of the study

The major objective of this study is to analyze factors affect maize production and marketing in the Wolaita and Dawuro zones of SNNPR State.

1.3.2. Specific objectives of the study

- To identify determinants of maize production,
- To assess the maize market structure, conduct and performance,
- To identify factors affecting farmers' participation in maize marketing and volume marketed in the study areas.

2. Literature Review

2.1. Basic concepts

This section attempts to provide basic definition of maizemarket, marketing system, identifying the factors affecting the market supply, the approaches and methods of evaluating the efficiency of agricultural markets.

2.1.1. Marketing Channels

Formally, a marketing channel is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler and Armstrong, 2003). Marketing Chain is a term used to describe the numerous links that connect all actors and transactions involved in the movement of agricultural goods from the farm or point of production to consumers or final destinations (CIAT, 2004).

2.1.2. Supply and Marketable Surplus

An important aspect of supply chain is that they consist of some associated but distinct flows. One is the physical flow of the commodity and another is flow of money realized from final sale back to the producer and all the enterprises that have been involved in processing and marketing. The efficiency and effectiveness of the practices and procedures that govern this latter flow are as important as technical efficiency with which the commodity is produced, processed and marketed (Westlake, 2005).

Marketable surplus is the quantity of produce left out after meeting the farmer's consumption and utilization requirements for kind payments and other obligations such as gifts, donation, charity, etc. This marketable surplus shows the quantity available for sale in the market. The marketed surplus shows the quantity actually sold after accounting for losses and retention by the farmers, if any and adding the previous stock left out for sale (Thakur *et al.*, 1997).

2.2. Market Structure, Conduct and Performance Analysis (S-C-P)

The development of stable and reliable marketing system has been an important element in commercialization and specialization in the agricultural sector. To study how markets are functioning, many researchers used the approach known as Structure-Conduct-Performance (S-C-P) approach.

2.2.1 The structure of the market

Market structure is defined as characteristics of the organization of a market, which seem to influence strategically the nature of the competition and pricing with in the market. Market structure refers to the number, size, and diversity of participant at different levels of marketing system. Market structure includes the characters of the organization of a market that appear to exercise a strategic influence on the nature of competition and pricing within the market. The most important aspects or dimensions are sellers and buyers' concentration, the degree of product differentiation among the outputs of the various sellers in the market, and barriers to entry and freedom of exit (Wolday, 1994).

2.2.2. Conduct of the market

Conduct of marketing includes activities such as reliability, timeliness, quality control, standardization and so on. In addition Market conduct refers to the patterns of behavior that firms follow in adopting or adjusting to the markets in which they sell or buy. Such a definition implies the analysis of human behavior patterns that are not readily definitely, obtainable, or quantifiable. In other words, conduct focuses on trader's behavior with respect to various aspects of distinctive elements characterizing the functioning of agricultural commodity market. It is the patterns of behavior, which enterprises follow in adapting or adjusting to the market in which they sell or buy, or in other words, the strategies of the actors operating in the market. Elements of marketing conduct include: buying, selling, transport, storage, information and finance (Bain, 1968).

2.2.3. Performance of the market

Performance of the market is reflection of the impact of structure and conduct on product price, costs and the volume and quality of output (Cramers and Jensen, 1982). If the market structure in an industry resembles monopoly rather than pure competition, then one expects poor market performance. Market performance refers to the composite of end results which firms in the market arrived at by pursuing whether lines of conduct they espouse-end result in the dimension of price, output production and selling cost, product design and so forth (Bain,1968).

2.3. Methods of Evaluating Marketing Performance

Market performance can be evaluated by analysis of costs and margins of marketing agents in different channels, and market integration. A commonly used measure of system performance is the marketing margin or price spread. Margin or spreads can be useful descriptive statistics if used to show how the consumer's food price is divided among participants at different levels of the marketing system (Getachew, 2002).

Marketing costs refers to those costs, which are incurred to perform various marketing activities in the shipment of goods from producers to consumers. Marketing cost includes: Handling cost (packing and unpacking, loading and unloading putting inshore and taken out again), transport cost, product loss (particularly for perishable fruits and vegetable), storage costs, processing cost, and capital cost (interest on loan), market fees, commission and unofficial payments (Heltberg and Tarp, 2001). According to Jema (2008), a marketing margin is the whole price in excess of farm price and he found that the marketing margin is affected by the volume traded positively and significantly.

3. Research Methodology

3.1. Description of the Study Area

This research was undertaken in Wolaita and Dawuro zones of South Nation Nationality and People Regional State of Ethiopia. The selection of the districts was based on their maize potential of production.

Wolaitazone is located 390km southwest of Addis Ababa following the tarmac road that passes through Shashamaneto Arbaminch. Alternatively, it is located 330km southwest of Addis Ababa following the tarmac road that passes through Hosanna to Arbaminch. Wolaita Sodois the main town of the zone. It has a total area of 4,541km^2 and is composed of 12 woredasand 3 registered towns. It is approximately 2000 meters above sea level and its altitude ranges from 700-2900 meters. The population of Wolaita zone is about 1,527,908 million of which 49.3% are male and 51.7% are female. Out of these, 11.7% live in towns and the rest 88.3% live in rural areas. The area is divided into three ecological zones: Kola(lowland <1500m), WoinaDega(mid-altitude 1500 2300m) and Dega(highland > 2300m). Most of the area lies within the mid altitude zone.

Rainfall is bimodal, with an average amount of about 1000mm (lower in the lowlands and higher in the highlands). Mean monthly temperature vary from 26^{0}C in January to 11^{0}C in August. Soils (mainly Vertisols and Nitosols) vary in pH from 5-6. Primary occupation of the zone is farming. Mixed crop-livestock production predominates, but there are some pastoralists in the lowlands. Generally, the climatic condition is conducive to maize production.

Dawuro zone lies in between 60 36' to 7021' north latitudes and 36068' to 370 52' east longitudes. The Omo Rivers circumscribe and demarcate Dawuro from northwest to southwest in a clockwise direction. Dawuro shares boundaries with Konta Special Woreda in west, Jimma zone (Oromiya Region) in northwest, Hadiya and Kambata-Tambaro zones in northeast, Wolayita zone in east and GamoGofa zone in southeast.Dawuro has an area of 5,000 km2.The altitude of Dawuro ranges from 500 meters around the confluence of Zigna and Omo rivers to 3000 meters above sea level at Tuta in TochaWoreda. Thus, Dawuro exhibits climatic variations from lowland to highland(CSA, 2007).

3.2 Type and Sources of data

In this study both the primary and secondary data were collected.The source of primary data was smallholder farmers randomly selected from twelve different rural kebeles from each zone, and traders at different levels ranging from farmer traders to regional level wholesales. The data was collected formally by the method of individual interview using pre-tested semi-structured interview schedule questionnaire and formally through focus group discussion with key informants using checklists.Secondary data was obtained from various sources such as reports of bureau of agriculture at different levels, NGOs, CSA, previous research findings, internet and other published and unpublished materials, which are relevant to the study.

3.3 Sample Sizeand Sampling Method

The sampling process involves purposely identifying farmers traders etc. who were actually in the business of maize production, have simple farm tools. The target population was farmers engaged in maize production and marketing located within the study area. Furthermore, in the process of production farmers would be closely monitored and there would been discussion in order to gather information, and problem identification and solving.

3.3.1. Farmers' sampling method

To select respondent farmer's threestage sampling technique was used. In the first stage, out of the total woredas of Wolaita zone Humbo and DamotWoydeand from Dawuro Zone Tocha and Loma woredaswere selected purposively based on their maize production performance (potentials). In the second stage from the selected woredas twelve maize producing kebeles from each zonewere selected from total kebelesrandomly. Finally, a total number of farmers who produce maizewere selected by using probability proportional to size. Total of 115 household (70 household from Wolaita zoneand 45 from Dawuro zone) were randomly selected from the sampling frame using probability proportional to size.

3.3.2. Traders Sampling

Accordingly, selection of sample traders was made based on the number of, wholesalers' and retailers participating in maize marketing. To select sample traders, first the sites where maize market conducted was identified, then, out of the total traders identified, sample traders (wholesalers, assemblers, processors and retailers) 15 sample traders from Wolaita zone and 10 sample traders from Dawuro zone, then a total of 25 (twenty five) sample traders were selected randomly based on proportion to the number of wholesalers,assemblers and retailers in the identified market. If the population of traders are small in size all are included in the sample.

3.4 Methods of Data Collection

The interest of obtaining reliable information from farmers and traders in survey is an issue to be given top priority. In order to gain their trust, the respondents were carefully informed about the objectives of the survey and the direct and indirect benefits from the research. For farmers, in this regard, chair-persons of the respective rural kebeleswere first approached and efforts have made to convince them of the objectives of the study. Farmers and traders were also informed that information related to household and farm characteristics would be kept confidential. Questionnaires were prepared for maize producing farmers' andwholesalers' and retailers participating in maize market. Then interview questionnaires were tested prior to the actual data collection. Along with the formal survey, rapid appraisal using group discussion, key informant discussions and also direct observation was undertaken along the market chain.

3.5. Methods of Data Analysis

Both descriptive statistics and econometric analysis were used for the analysis of the data that have been collected from farmers and traders in the study area.

3.5.1. Descriptive statistics analysis

In this method of data analysis, ratios, percentages, means, variances and standard deviations were used to examine the relevant variables under consideration.

Structure Conduct Performance (S-C-P) Model

This model investigates the relationship between market structure, conduct and performance. The model has been used by different market researchers to address their objectives. As indicators of the market S-C-P, market concentration ratio and marketing margin analysis was used.

Market concentration measure

It refers to the number and relative size distribution of buyers/sellers in a market. It is generally believed that higher market concentration implies non-competitive behavior and thus inefficiency. The common measures of market concentration are concentration ratio, HirshmanHerfindahi Index (HHI), and Gini-coefficient.

Concentration Ratio (C)

The concentration ratio is the numerical index widely used by industrial organizations for measuring the size of firms in market (Shughart, 1990).

Kohl and Uhl (1985) suggested that as rule of thumb a four largest enterprises concentration ratio of 50 percent or more is an indication of a strongly oligopolistic industry, 33-50 percent, a weak oligopoly, and less than that, indicates unconcentrated industry. The problem associated with this index is the arbitrary selection of the number of firms that are taken to calculate the ratio and the ratio does not indicate the size difference of the firms.

Concentration ratio refers to the number and relative size of buyers in the market. The concentration of firms in the market is estimated using the common measure of market concentration ratio.Concentration ratio is one of the commonly used to measure market structure, which is given as:-

$$C = \sum_{i=1}^{r} S_i \; i = 1,2,3,4. \ldots\ldots\ldots\ldots (1)$$

Where Si= the percentage market share of the i^{th} firm and
r = the number of relatively larger firms for which the ratio is going to be calculated.Thus market concentration ratio would be employed to analyze the market concentration of the identified markets in the study woredas.

$$S_i = \frac{Vi}{\Sigma Vi} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where Si - market share of buyer i
V_i- amount of product handled by buyer i
ΣV_i - Total amount of product handled

Gini-Coefficient

Gini-coefficient is an alternative concentration measure that has some similarities with the Concentration ratio. It is based on the Lorenz curves. To use the Lorenz curve, the firms in an industry are ranked from smallest to largest in terms of their market shares. Then, the Cumulative percentage of firms is ranked to their cumulative shares. Gini-coefficient compares the area between the diagonal and the Lorenz curve with the area of triangle under the diagonal line (Shughart, 1990).

Marketing Margin

The cost and price information obtained from the survey would be used to evaluate the gross marketing margin. Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as percentage (Mendoza, 1995).

The method of analysis of marketing margin is as follows,

$$TGMM = \frac{\text{End buyer price - First seller price}}{\text{End buyer price}} x100 \ldots.(3)$$

Where, TGMM = Total gross marketing margin

The TGMM is useful to calculate 'producer's gross margin' (GMMp) which is the portion of the price paid by the consumer that goes to the producer.

The producer's margin is calculated as:

$$GMMp = \frac{\text{End buyer price –marketing gross margin}}{\text{End buyer price}} X100 \ldots..(4)$$

Where, GMMp = the producer's share in consumer

$$NMM = \frac{\text{Gross margin – Marketing costs}}{\text{End buyer price}} x100 \ldots\ldots\ldots (5)$$

Where, NMM = Net marketing margin

3.5.2. Econometric analysis

The Heckman two stage estimation procedures were employed in this study to examine maize market participation decision and to identify factors affect the amount of maize supplied to the market. Heckman sample selection model where a probit model for the participation or selection equation is estimated and a regression model, which is corrected for selectivity bias is specified to account for the level of the amount of maize market. From Heckman two stage models, the first stage in this study was market participation equation, which helps to identify factors affecting maize market participation decision using probit. Then in the second stage, OLS regression was fitted along with the probit estimated Invers Mill's Ratio in order to identify factors the marketed supply of maize.

According to Heckman (1979), the inverse mills ratio is a variable for controlling bias due to sample selection. Then, Heckman second stage account the mills ratio to the amount of maize supplied to the market equation or 'outcome' equation through ordinary least square equation. The Heckman two stage models, which are explained by Probit model for Maize market participation decision and amount of Maize supplied to the market are specified as follows:

Probit model: Market participation is expressed as:

$$Y_i = X_i\beta_i + \varepsilon_i \; i = 1, 2, \ldots, n \ldots\ldots\ldots\ldots\ldots (6)$$

Where: Y_i is a dummy variable indicating the market participation that is related to it as $Y_i=1$ if $Y_i>0$, otherwise $Y_i=o$
β_i= the variable determining participations in the Probit model
X_i = is the unknown parameter to be estimated in the Probit regression model.
ε_i = is random error term

The amount of marketed supply is expressed as:The parameters can consistently be estimated by ordinary least square over the given observations including values $Y_i$by

including an estimate of the Inverse Mill's Ratio, denoting by λ_j.

$$Y_i=X_i\beta_i+\mu\lambda_i+\eta_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where, Y_i is the volume of supply in the second step,
β_i are the explanatory variables determining the quantity supply
X_i is unknown parameters to be estimated in the quantity supply
μ is a parameter that shows the impact of participation on the Quantity supply
η_i is the error term

The Heckman-two stage model was estimated provided that there wasa sufficient observation that produces maize and do not participate in the market. If not, then, OLS regression model would be estimated. For identifying factors that influence maize supply, the main task is to analyze which factor influences and how? As a result, potential variables, which are supposed to influence maize market participation and quantity of maize supplied was explained.

3.6. Study Variables, Definition and its Working Hypothesis

All data about social, economic, demographic and efficiency among the categories of maize producers and traders were used for the study. The dependent and independent variables that would be considered are explained below.

The Dependent Variable

Maize market participation decision (PARTI-DECI)
It is dependent dummy variable in the first stage of Heckman two stage estimation procedures that is regressed. The illustration has value one if the respondent would participate in the maize market and zero otherwise.

Volume of maize supplied to the market (QTY-SOLD)
It is dependent continues variable in the second stage of Heckman two stage estimation equation that represent the amount of marketable maize supply by producers, selected for regression analysis, takes positive value.

The Independent Variables

Age of household head (AGE): It is a continuous variable and measured in years. This may be the fact that age is a proxy measure of farming experience of household. Aged households are believed to be wise in resource use, and it is expected to have a positive effect on marketable surplus.

Sex of the household head (SEX): a dummy variable taking zero if female and 1 if male is one variable to be considered. In mixed farming system, both men and women take part in crop production & management. Generally, women contribute more labor input in area of land preparation, planting, weeding, harvesting and sale of teff and wheat. However, obstacles, such as lack of capital, and access to institutional credit, access to extension service, may affect women's participation and efficiency in teff and wheat production (Tanga*et al*., 2000). Therefore, it is not possible to tell a prior about the likely sign of the coefficient of sex in sales volume of maize.

Family Size (FAM SIZE): It is a continuous variable, measured in man equivalent i.e. the availability of active labor force in the household which affects farmer's decisions to participate and volume sold in maize market. A study conducted by Wolday (1994), showed that household size had significant positive effect on quantity of teff marketed and negative effect on quantity of maize marketed. In this context family size is expected to have negative impact on maize market participation and volume of sale.

Education level of HHH (EDU-LEV): This variable was measured using formal schooling of the household head and hypothesized to affect marketable supply positively. It has taken dummy values 1 if the household head attended any formal education and 0 otherwise. This is due to the fact that a farmer with good knowledge can adopt better practices than illiterates that would increase marketable supply of maize.

Distance to the market (MKT-DIS): It is a continuous variable measured in walking time (minute) which farmers spend time to sell their product to the market. If the farmer is located in a village or distant from the market, he is poorly accessible to the market. The closer to the market the lesser would be the transportation cost and time spent. Therefore, it is hypothesized that this variable is negatively related to market participation and marketed surplus.

Use of improved production inputs (USE-INPU): This is a dummy variable taking a value of 1 if the farmer used improved production input and 0 otherwise. This variable is expected to affect the household marketable supply and participation decision positively due to the fact that if a producer used improved production inputs, this would increase production and productivity thus, increase the marketed supply.

Total size of land owned (TOT-LAND): The total size of farmland owned by a farmer is the variable that could influence both participation and supply. As a farmer owned more land, the probability of allocating for Maize would increase. It is a continuous variable expected to influence participation and supply decision positively.Kindie (2007), got a positive sign for sesame marketable supply those producers who own big land holding can produce more than a producers who own less area and thus to supply more to the market. So the expected sign is positive.
Experience (EXP): This continuous variable measured by number of years stayed in agriculture which is different from age influence market participation decision and the expected sign is positive.

Number of oxen owned (OXEN): From the perspective of the intensive labor requirement of maize production, it is expected that farmers with relatively larger number of oxen can produce more maize and can have better market participation and market supply. Maize production requires frequent tillage before plantation and hence the size of land that can be tilled and the produce could be a function of the number of oxen possessed by households.

Access to market information (MKT-INFO): This is measured as a dummy variable taking a value of 1 if maize producing farmer had access to market information and 0 otherwise. The general idea is that maintaining a competitive advantage requires a sound business plan. Again, business decisions are based on dynamic information such as consumer needs and market trends. This requires that an enterprise is managed with due attention to new market opportunities, changing needs of the consumer and how market trends influence buying. Here, market information has been hypothesized to affect maize marketable supply of farm households positively. Because, producers that have access to market information are likely to supply more maize to the market. Goetz (1992) noted that better market information significantly raises the probability of market participation for potential selling households.

Quantity produced (QTY): This is a continuous variable measured in quintal and it expects to affect participation decision and level of supply of maize product by farmers. It is expected to influence market participation decision and quantity sold positively. As Tomek and Robinson (1990) argued, yield is assumed to affect the marketable supply positively, because a farmer that obtains high yield can supply more to the market than a producer who has fewer yields.

Price of other crops (HOR-PRICE): it is a continuous variable that can affect the marketable supply and measured in birr per quintal. An increase in price of other crops produced in the farm is expected to have negative effect on marketable supply of maize.

Extension contact: It is a continuous variable and refers to the number of time extension agent visited/advised farmer. Agricultural extension services provided to the farmers are the major sources of agricultural information (Degnet and Belay, 2001; Teferi, 2003). It is hypothesized that timely contact with extension workers would increase a farmer's in marketable supply of maize.

4. Results and Interpretation

This section of the research discusses the results of the study such as finding of descriptive and econometrics analyses that are found in relation to the research questions and objectives. The descriptive analysis was used to explain the demographic characteristics and general socio-economic characteristics of the sample households, the features of maize production and marketing in the study area, and the costs and benefits of maize marketing channels in the area. Mean, percentage, standard deviations and marketing margins were employed to obtain the results. Econometric model was also employed to identify the factors affecting farmers‟ participation in maize marketing and volume marketed in the study area.

The household head is responsible for the controlling of the all activities at household level. As such it is related to contain some characteristics such as sex and education of the house hold head in the condition of market and other houseactivates decisions. The results on the table below illustrate that both male and female household heads were participating in production of maize. From total 115 sample respondents 91.4% weremale households headed and only 8.6% were female headed household in Wolaita zone and 84.5% were male headed households and 15.5% were female household headed in Dawuro zone respectively. The Chi-square test result ($\chi 2$ =5.93, p =0.01) shows that there is significant difference between two zone in terms of sex of household heads.

Educational status achieved by the heads of the household respondent who are important for decision-makers for communication in participating production and marketing activities of maize. Education also helps the person to do essential connections for selling and buying purpose. In the study areas 55.7% and 46.7% of household heads were literate in Wolaita and Dawuro zones respectively and 44.3 and 53.3 were illiterate in Dawuro and Wolaita zones respectively from the study area. The Chi-square test result ($\chi 2$ =3.01, p =0.05) shows that there is a significant difference between the two zones in terms of education of the household heads.

The result indicated about in the study area from the table below indicated that 68 (59%) of the sampled a respondent household heads have access to credit on cash or monetary terms and in kind in both zones. The remaining 47 (41%) of them did not take credit both on cash and in kind to purchase inputs like fertilizer (DAP and Urea), improved maize seed, chemicals and sprayer for protection of disease. This is because of fear of interest rate, availability of on time and other factors. There is no significant difference in access to credit among sampled districts in both zones.

The marketing decisions of the sample respondents in the both study areas are based on market price information, and inadequately included markets may express inaccurate price information, leading to incompetent product association. In this study, the majority of sampled households (90.4%) have access to market information. The amount of farm households who have market information access in Wolaita zone was found to be 91% whereas in that of Dawuro zone is (90%) with no significant difference between farmers in the two zone.

Table 1: Household characteristics variables (Sex, Literacy status, Access to credit and Access to market information)

Variable	Items	Wolaita zone (N=70)		Dawuro zone (N= 45)		Total (N= 115)		$\chi 2$ test
		N	%	N	%	N	%	
Sex	Female	6	8.6	7	15.5	13	11.3	5.93***
	Male	64	91.4	38	84.5	102	86.7	
Literacy	Illiterate	31	44.3	24	53.3	55	47.8	3.01**
	Literate	39	55.7	21	46.7	60	52.2	
Access to credit	Yes	41	58.6	27	60	68	59	0.02
	No	29	41.4	18	40	47	41	
Access to market Information	Yes	63	91	41	90	104	90.4	0.01
	No	7	9	4	10	11	9.6	

Note: ***and, ** statistically significant at 1%, and 5% significance level.

Source: survey result, 2016

The minimum and maximum family size in the study areas (Wolaita and Dawuro zones) was4 and 9, respectively. With

a minimum 4 and maximum size of 9 respectively.The average or mean family size of in the respondent household heads in Wolaita zone area was found to be 4.47 whichis significantly (P=0.05) higher than the mean or average family size of the respondent household heads in Dawuro zone which is4.11 in adult equivalent.

Other than farm income; non-farm income can be used to economics marketing behavior and also accessing on farm income has a bearing on market participation. The mean non-farm income of the respondent in household heads in the study areas was found to be 450 birr. The mean non-farm income of farm household heads in Wolaita zone two districts was found to be 524 birr which is no significant difference in nonfarm income of farm household heads in Dawuro zone which is 375 in birr.

The mean land holding of sample respondent household heads in Dawuro zone two districts was found to be 1.05 ha which is significantly (P=0.01) greater than the land holding of household heads in Wolaita zone two districts (0.65 ha). In the study areas farmers try to get access to additional land for production of maize through renting.

The distance to the main markets is important factors generate an opportunity for the communication ofthe farmers to the market entrance. The mean time taken to walk to main markets from respondent household heads in the study area was found to be 65 minutes per a trip. The mean time taken towalk to main markets of farm households of Wolaita zone district was found to be 45 minper a trip with no significant difference in mean time taken to walk to main markets of farm households in Dawuro zone which is 50 minutes per a trip.

Livestock rehearing is an essential part of the farming system in the study area and very much important for maize production in particular and to the whole crop production in general. The vital animals are kept by the sample respondents are cattle, sheep, goats, and etc. Oxen are the main source of draft power. As it is indicated in the tablebelow, the mean livestock holding of farm households in the study areas was found to be 2.87 TLU excluding oxen. The mean livestock holding of farm households in Dawuro zone district was found to be 3.49 TLU which is significantly (P=0.05) greater than the livestock holding of farm households in Wolaita zone an which is 1.93 in TLU.

In terms of farmland share, the leading crops produced by households are maize, white and teff with mean value of 0.36ha, 0.27ha and 0.20ha, respectively. There was a difference in production of maize and finger millet, white and Teff in the two zones districts at 1% and 10% significance levels, respectively. This is due to agro-ecology and natural resources difference existed between the districts.

According to the survey result, costs of inputs used by the respondent households to produce maize grain are different regarding its cost of the commodity and type of commodity. Households used modern inputs (seed, fertilizers and chemicals) for maize production. The main costs of inputs the producers incurred were to fertilizers, seed, and chemicals. The mean herbicide cost of farm households in the study area was found to be 30.57 birr/L. The mean herbicide cost of farm households in Wolaita zone district was found to be 40.84 birr/L which is significantly (P=0.01) lesser in of farm households in Dawuro zone which is 60.19 birr/L.

According to data collected 74% of the household heads sell the maize grain in to market. The mean market price of farm households in the study area was found to be 4.02 birr/kg. The mean market price of farm households in Wolaita zone district was found to be 4.69 birr/kg which is significantly (P=0.01) higher than the market price of farm households in Dawuro zone which is 3.01 birr/kg.

Table 2: Mean comparison test of household characteristics in the study area

Variables	Mean values of variables			t-value
	Wolaita Zone	Dawuro Zone	Both	
Age of the household head	44.35	48.20	47.05	-2.56***
Non-farm income	524	375	450	3.03***
Market price	4.69	3.01	4.02	3.71***
Size of land holding	0.75	1.05	1.79	0.85
Number of oxen	1.21	1.83	1.62	3.09***
Livestock holding	1.93	3.49	2.87	8.50***
Distance to the main market	45	50	65	0.36
Family size	4.47	4.11	4.33	-2.70***
Volume of Maize production	55.99	48.28	52.20	1.35
Quantity of marketed surplus of maize	11.19	9.59	10.37	2.53***
Input cost: Herbicide	60.19	40.84	30.57	8.63***
Seed	0.32	0.32	0.32	0
DAP	1.40	2.37	1.88	-1.19
Urea	2.19	1.98	2.09	0.14
Land allocation				
Maize	0.36	0.30	0.33	4.77***
White	0.27	0.17	0.25	4.79***
Teff	0.20	0.28	0.24	-5.98*

Note: ***, ** and *statistically significant at 1%, 5% and 10% significance level.
Source: survey result, 2016

4.2. Econometric Analysis

Maize is producedin Wolaita and Dawuro zonesto supply in to the market and also used for household consumption in the study areas. Different variables were assumed to determine the market participation choice and its marketed surplus by sampled households in the study area. In this section, the result of the Heckman selection model is given for maize production and supply. The Heckman selection model was employed in order to organize the selectivity bias and endogeneity problem; and obtain consistent and unbiased parameter estimates. It is important to check multicollinearity problem before running the model for both variable; that is for continuous as well as the dummy variables. The usual measure of multicollinearity among continuous and dummy variables is Variance Inflation Factor (VIF). As a result, the values of variance inflation factor of the variables were in the ranges of 1.09 and 1.79. As aresult, depending on the results of variance inflation factor multicollinearity was not aproblem among the hypothesized continuous and dummy variables. Hence,

multicollinearity, endogeneity and heteroscedasticity detection test wereperformed using appropriate test statistics.

The model analysis output of maize market participation decision result has been summarized in the table below. In thefirst stage, households decide whether they would sold the commodities in to market ornot. Based on the Heckman's selection assumption Out of thirteen explanatory variables, five of them were found to determine the participation decision in maize market. These aremarket price, age of the household head, sex of the household head; quantity produced,and land size. The summarized results of the model are given below.

Market price: As expected, market prices determine contribution choice positively and significantly with 1% significance level. The positive and significant relationship between the variables indicates that as market price of maize increases, the probability of market participation also increases.

Age of the household head: Theexpected power of age was assumed positive takingthe supposition that as farmers' getsbig they could get hold of skills and hence producemuch and developed skills to participate tomarket.

Sex of the household head: Sex of the household head is one of the variables that affect the market participation of maize in the value chain positively at 1% level of significance.

The econometric result of the study showed that being male household head increases the probability of market participation of the sample participant by 16.4%. The reason behind is that men contribute more labor input in the production of crops.

Land Size: The total size of farm land owned by a farmer is among the variables that couldinfluence both participation decision and quantity supply; it was found that household headswith large land size allocated more land to maize cultivation. The relationship of land sizein the participation decision is positive and significant at 5%.

Quantity produced: As hypothesized, the result shows that quantity producedsignificantly affected could both participation decision and quantity supplied to the marketat 1% significance level. The result also implied that, a quintal increase in the quantity ofmaize production has caused increase in 3.9% of the maize marketed.

Table 3: Results of determinants of maize market participation (Heckman First Stage Selection Model Result)

Variables	Heckman selection model(ML)			
	Coefficient	Standard error	T-Ratio	Marginal effect
Sex of the household	0.6**	0.3	2.3	0.18
Literacy status	0.085	0.13	0.6	0.03
Non-farm income	0.02	0.02	1.2	0.07
Family size(Adult equivalent)	-0.01	0.05	-0.00	-0. 07
Livestock holding(TLU)	0.081	0.04	0.54	0. 06
Land size	0.01**	0.062	1.67	0.03
Distance to the main market	-0.11	0.01	-0.92	-0.03
Market information access	0.25	0.22	1.13	0.92
Access to credit services	0.32	0.13	0.84	0.13
Market price	0.205***	0.151	13.26	0.70
Quantity produced	0.258***	0.679	3.03	0.04
No of oxen	0.13	0.804	1.61	0.39
Age of the household head	0.09**	0.05	1.88	0. 03
Number of observations	115			
The dependent variable (participation decision) is a binary variable that takes the value 1 ifthe household head had participated in maize, 0 otherwise. *, ** and *** represents significance at 5% and 1% probability levels respectively				

Source: Model output, 2016

Out of threaten hypothesized variables in the outcome equation of the model, fivevariables were found to be significant as determinants of the volume of maize marketed.As indicated in Table belowthe variables werequantity produced, literacy status, marketinformation access, land size and no of oxen. The amount of maize supplied in to themarket was measured in kilogram. To normalize the large volume of supply naturallogarithm was used.

Literacy status: Formal education determines the readiness to accept new ideas and innovations, and easy to get supply, demand and price information and this enhances farmers' decision to produce more and increase volume of sales. As expected, literacy increased the volume of maize supplied to the market by 25.2%.

Number of oxen: Owning good number of oxen could help them to00prepare their land in time and do planting0 in time as well. Being a power for plowing, maize supply would increase as farmers increased their number of oxen ownership. The expected influence is positive on supply to market. As hypothesized number of oxen has a positive and significant relationship with marketed volume of maize. It was significant at 5% level. The result shows that an increase in number of oxen resulted in a 10.8% increment in the volume of maize marketed.

Market information access: As hypothesized Market information affect maize marketable supply of the households positively. It was found that a positive and significant relationship which indicated that as the household have access for the market information, volume of market supply increased by 25.7%. This suggests that access to market information reduces farmers risk aversion behavior of getting a market and decreases marketing costs of farmers that affects the marketable surplus. The implication is that obtaining and verifying information helps to supply more quantity of maize.

Land size: The total size of farm land owned by a farmer is among the variables that could influence both participation and supply as expected, it was found that household heads with large land size allocated more land to maize cultivation. It was found that a positive and significant relationship which indicated that as the as market land size of the household increase by 1 hectare, volume of market supply increased by 1.3%.

Rho is the correlation between the error terms of the substantive selection models. Rho has a potential range

between -1 and +1 and can give some indication of the likely range of selection bias. A correlation with an absolute value of 1 would occur if the regression coefficients of the selection model and the regression coefficients of the substantive model were estimated by identical processes (i.e., potential selection bias). Conversely, a value of rho closer to zero would suggest that data are missing randomly or the regression coefficients of the selection model and the regression coefficients of the substantive model were estimated by unrelated processes (i.e., less evidence of selection bias) (Cuddeback et al., 2004).

Table 4: Maize market supply equation model

Variables	Heckman selection model(ML)		
	Coefficient	Standard error	T- Ratio
Literacy status	0.252***	0.087	2.88
Non-farm income	0.014	0.11	1.28
Familysize(Adult equivalent)	0.044	0.031	1.41
Livestock holding(TLU)	0.036	0.022	1.58
Land size	0.013***	0.004	3.24
Distance to the main market	0.002	0.007	0.03
Market information access	0.257*	0.158	1.63
Access to credit services	0.111	0.089	1.24
Market price	0.008	0.009	0.87
Quantity produced	0.039***	0.034	3.03
No of oxen	0.108**	0.054	2.1
Age of the household head	0.0038	0.0033	1.15
Lambda	0.071	0.206	
Rho	0.091	0.266	
Sigma	0.773	0.029	
Wald chi^2	51.53		
Number of observations	115		
*, ** and *** represents significance at 10%, 5% and 1% probability levels			

Source: Model output, 2016

4.3. Market Channels for Maize

The maize produced by farmers in the study areas has to pass different market channels from producer farmers to the final consumers. In the study area the possible market channels are shown below.

Channel-I: Maize producer → Assemblers → Wholesaler → Retailer → Consumers
Channel-II: Maize producer → Wholesaler → Retailer → Consumers
Channel-III: Maize producer → Assemblers → Retailer → Consumers
Channel-IV: Maize producer → Retailer → Consumers
Channel-V: Maize producer → Consumers

Of the above possible market channels in the study areas for maize market, the respondents reply indicated that channel II is mainly practiced market chain which is followed by the 4th channel. The other three channels were also practiced as an optional maize market channel in the study areas but most of the time their evenness is problem due to less organization among the market actors in the study areas which requires further task by the marketing departments to work out on market concerns in the study areas.

4.4. Challenges and Opportunities of Maize production and marketing

Maize producers'and traders were asked to identify their major production and marketing constraints of the maize survey for further technological, institutional and organizational innovation for upgrading the maize production and marketing in the study areas. Thus the major constraints and opportunities are briefly discussed in this subsection as follows.

4.4.1. Production constraints

According to producers report, factors that hindered the production of maize were identified. Major constraints such as drought, high cost of fertilizers and improved seeds, and delay in inputs areindicted in table 5below formaize production constraints identified by producers in percentages.

Drought: Natural factors such as drought and flood are often beyond the control of farmers and supportive institutions. According to the survey result 26.7% of the producers indicated drought as a constraint in production. Despite the availability of irrigation water for 13% of respondents water use is not well established. Due to shortage of water maize yield reduction occurs during the critical growth stages from tasseling to grain.

High cost of inputs: For higher yield of maize both physical and non-physical inputs are important. Primarily producers used improved seeds, fertilizers, pesticide/herbicides and labor with equal concern of services like research, extension service and technology dissemination from governmental and nongovernmental institutions. But those inputs are utilized in inappropriate amount by most producers due to its expensiveness and less supply in the market. Among the total sample of respondents 20% and 15.6% replied that the limited access and supply of inputs as their production problem due to high price of fertilizers and improved seeds respectively.

Late arrival of inputs: Since agricultural products are seasonal all useful inputs need early arrangement to boost the production by applying inputs on the right time. But the survey result revealed that 15.6% and 11.3% of the producers complain delay in the supply of improved seeds and fertilizers.

Table 5: Production constraints of maize in the study area

Major constraints	N=115	%
Drought	31	26.96
Price of fertilizers	23	20.0
Timely availability of improved seeds	18	15.6
Prices of improved seeds	9	7.8
Timely availability of fertilizers	13	11.3
Availability of credit to buy fertilizers	13	11.3
Availability of credit to buy seeds	8	6.9

N= number of HH, Source: Survey result, 2016

4.4.2. Production opportunities

Favorable land, climatic condition and high productivity potential are good opportunity of production of maize in the study areas. Maize is considered as the main cash crop and

food source for the farmers in many low lands and mid altitude zones of Ethiopia. This opportunity enabled farmers to produce this commodity for commercial purpose. Thus, these situations increased the production volume of maize in the study areas.

Throughout time increased institutional support to production of maize by government bodies, research centers and nongovernmental organizations is observed. Government via its researchers and district agents' intervention increased correct use of inputs (fertilizers, seeds and chemicals) and organized trainings on business development to improve their role in production and marketing. Non-profitable institutions also play a great role in conducting researches, organizing trainings on business development strategies and postharvest management of maize.

4.4.3. Marketing constraints

Table 6 below indicates unstable price, weak market information, presence of non-licensed traders and absence of grades and standards were the major market constraints that hinder maize market.

Price instability: It is a common problem for agricultural products. Thus, maize as agricultural product price instability is the major market constraint. This is because of its nature of seasonal supply with unsatisfied demand in the market. According to the survey result 7 (28) of respondents' replied that unstable price hindered the product marketability.

Weak market information: In the surveyed maize and producing areas, 5(20%) respondents, traders are unable to access regular market information. It is a major problem in developing marketing plans and in price discovery. The lack of information is increasing both transaction cost and resistance to risk taking. All respondents suggest that a simple price and volume information system would develop their marketing decision making.

Poor coordination among traders: According to the survey result 4 (16%) of the traders pointed out presence of non-licensed traders in the market. Most of maize traders are not part of formal trading organizations. They are informal and often non licensed traders. Consequently very poor business coordination among traders has been observed. It was difficult for these informal traders to gather information and access opportunities in new area of the business. If traders were to be given support in terms of business skills development, they would wish such an intervention to apply across commodities. This situation also decreases competitiveness of licensed traders who obliged to pay annual taxes. But in non-licensed traders side the tax is used to develop their business. However, they have less access to different services like trainings, credit and information.

Limited access to credit: Traders in the study are requested for the access of credit and 3(12%) of respondents replied that there is strong limitation to get credit from the financial institutions as per the required time and need of the user traders. This situation affected the marketing of maize grain in the study areas. Therefore, the government bodies in the study areas should make the credit access available for the traders and then the livings as well as the profitability of the actors along the main market chain would be improved and then the economic development as a whole would be ensured.

In addition to above all, less role of government support to strengthen grain marketing, limited access to credit to purchase required amount of maize covering other marketing costs, and non-transparent taxation system are identified as constraints of maize which hinder improvement of a special market supply-value chain actors/traders in the business.

Table 6: Major marketing constraints identified in the study areas

Major marketing constraints	N=25	Response in %
Prices are unstable	7	28.0
Presence of non-licensed traders	2	8.0
Poor coordination among traders	4	16.0
Weak market information	5	20.0
Poor quality of grains	2	8.0
Limited access to credit	3	12.0
Inadequate market infrastructure	2	8.0

Source: Own computation from survey result, 2016

4.4.4. Marketing opportunities

Major maize market opportunities pointed out by respondents were presence of potential sellers and buyers, presence of storage facilities and improved trends of quality.

Presence of potential traders: The major opportunity for marketing is presence of potential sellers and buyers in markets. Trader's pool and transport for maize to different parts of the country as well as abroad market the presence of high consumer demand for the commodities increased the marketing activities. Proximity of urban wholesalers, large volume carriers of the products, to processing factories was considered as an opportunity to maize market.

Availability of storage facility: The traders use different types of stores to keep their maize properly with a possible minimized loss and fetch a reasonable price. Mainly used types of stores were sealed warehouse, non-sealed warehouse, stores and shades.

5. Conclusions and Recommendations

5.1 Conclusion

The study was undertaken with the objective of factors affect maize production and marketing in Wolaita and Dawuro zones of southern nation nationality people regional state of Ethiopia. From total 115 sample respondents 91.4% were male householdheaded and only 8.6% werefemale householdheadedin Wolaita zone and 84.5% were male householdheaded and 15.5% were female household headed in Dawuro zone. The Chi-square test result ($\chi 2$ =5.93, p =0.01) shows that there is significant difference between two zone in terms of sex of household heads. Education has positive impact on the production and marketing of maize in the study areas. The amount of farm households who have market information access in Wolaita zone was found to be

91% whereas in that of Dawuro zone is (90%) with no significant difference between farmers in the two zone.

The mean land holding of sample respondent household heads in Dawuro zone two districts was found to be 1.05 ha which is significantly (P=0.01) greater than the land holding of household heads in Wolaita zone two districts(0.65 ha). In the study areas farmers try to get access to additional land for production of maize through renting. The mean livestock holding of household heads in the study areas was found to be 2.87 TLU excluding oxen. The mean livestock holding of household heads in Dawuro zone districts was found to be 3.49 TLU which is significantly (P=0.05) greater than the livestock holding of farm households in Wolaita zone an which is 1.93 in TLU.

Households used modern inputs (seed, fertilizers and chemicals) for maize production. The main costs of inputs the producers incurred were to fertilizers, seed, and chemicals. The mean herbicide cost of farm households in the study area was found to be 30.57 birr/L. The mean herbicide cost of farm households in Wolaita zone district was found to be 40.84 birr/L which is significantly (P=0.01) lesser in of farm households in Dawuro zone which is 60.19 birr/L.

Of the 115 maize producer household heads,74% participate in maize market. Market participation decision andvolume of sales are found to be important elements in the study of the maize production and marketing.Therefore, Heckman selection model (ML) procedure was used to analyze factors affecting marketparticipation decision and volume marketed separately. The model output revealed that ageof the household, sex of the household, quantity produced; market price, district dummyand land size were found to exert significant effect on households' maize marketparticipation. Moreover, the supply equation identified quantity produced, land size,number of oxen, market information access and literacy status as important factors affectingsales volume of maize.

The major production and marketing constraints in the study area for producers are drought, high cost of production and delay in inputs arrival for purchase. Traders arealso constrained by price volatility, weak market information, poor coordination amongsttraders, and absence of grades and standards. There are a lot of opportunities for productions and marketingin the study areas.

5.2 Recommendations

The research output indicates that there are promising conditions in one aspect and also some problems to be filled out by different bodies in the study areas. The basic gaps to be worked over as an intervention strategy are mentioned as follows:

- Due to the average land holding size by maize producer farmers is 0.85ha in both zones, it requires modern improved farming system to improve the living standard of producers in the study areas and government bodiesas well as agricultural professionals are expected to shoulder the responsibility,
- There is an opportunity to use the existing livestock potential in the study areas as source of fertilizer and other financial support to the maize producers in the areas,
- Market information should be accessed to the maize producer farmers in modernized manner rather than fragmented information flow from the source to the user farmers via the marketing departments in the study areas,
- Inputs for maize production should be accessed to the producers on time for better performance of the farmers,
- The government bodies should work over the market constraints of the traders in the study areas so as to make the marketing process smooth and responsive,
- Factors affect the supplied maize volume to the market should be given due focus by the marketing departments in the study areas at each level of the administration

Generally, the production and marketing opportunities in the study areas should be exploited wisely and the constraints have to get solved in the study areas via united hands and responsive thinking of so many talented minds in the study areas.

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