

# Determinants of Market Participation and Intensity of Marketed Surplus Among Maize Producers in Fogera District of South Gondar Zone, Ethiopia: Heckman Two Stage Equation Approach.

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## Research

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# **Determinants of Market Participation and Intensity of Marketed Surplus Among Maize Producers in Fogera District of South Gondar Zone, Ethiopia: Heckman Two Stage Equation Approach.**

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## **ABSTRACT**

*The agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with or no access to market facilities and low participation of the smallholder farmers. Hence the study focused on the specific objectives were to identify factors that affect market participation decision of households and to determine factors affecting the volume of market supply of maize. Quantitative and qualitative data were collected from primary and secondary sources. The cross-sectional survey was conducted using structured questionnaire, key informant interviews, and focus-group discussions. A stratified stage sampling technique was used to draw 150 sample units using systematic random sampling technique. Descriptive statistics and Heckman Two-Stage model was employed. The result indicated that 56 % of market participant were male headed, while 30.67 % were female headed. Whereas 15.58% of non-market participants were male headed households, while 5.84% of non-market participants were female headed households. Out of 17 potential variables, seven variables age, area of maize, oxen number, distance to market, access to market information, member of cooperatives and inverse mill's ratio were significantly influence the decision & extent participation in maize marketing. Therefore, the following points are recommended to develop sustainable production and marketing of maize that is locally adaptable and acceptable to increase the competitiveness of smallholder farmers: improving access to credit to apply fertilizer, farmers should rely on intensive cultivation rather than extensive cultivation and strengthen extension service.*

**Key words:** Hackman two-stage, market Participation, Volume of participation, Fogera

## CHAPTER ONE

### INTRODUCTION

#### 1.1. Background

Agriculture is the main stay of Ethiopian economy contributing about 43% of the GDP, 80% of employment and 90% of the export. However, the agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with or no access to market facilities resulting in low participation of the smallholder farmers in value chain or value addition of their produces etc. Moreover, due to the ever-increasing population pressure, the land holding per household is declining leading to low level of production to meet the consumption requirement of the households. As a result, intensive production is becoming a means of promoting agro-enterprise development in order to increase the land productivity. Horticulture production gives an opportunity for intensive production and increases smallholder farmers' participation in the market (Negassa, 2009).

The economy of Ethiopia depends on agriculture and in turn other economic activities depend on agriculture, including marketing, processing, and export of agricultural products. A huge part of exports commodity is supported by the small agricultural cash crop sector. Exports are almost entirely agricultural produce, and coffee is the largest foreign exchange earner. Understanding the role of agriculture as the source of all development endeavors, the government of Ethiopia has found agricultural development strategy known as Agricultural Development Led Industrialization (ADLI, 2001). The government of Ethiopia, in its guiding policy document, ADLI strategy, has explicitly stated that the plan of industrialization in Ethiopia would not be achieved without increasing intensively the agricultural production and productivity and strengthens the linkage of agriculture with market.

Market development is considered as one of the priorities for increasing agricultural production. 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. 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. According to available estimate, cereal production represents about 30% of gross domestic product (GDP). This

calculation follows from the fact that cereals contribute to agricultural GDP is 65% (Diao et al., 2007). In the country, Cereal products are also the major staple food crops. Out of the total grain crop area, 78.17% (9,601,035.26 hectares) was under cereals. Teff, maize, sorghum and wheat took up 22.23% (about 2,730,272.95 hectares), 16.39% (about 2,013,044.93 hectares), 13.93 % (1,711,485.04 hectares) and 13.25% (1,627,647.16 hectares) of the grain crop area, respectively. Cereals contributed 84.96% (about 196,511,515.46 quintals) of the grain production. Maize, teff, wheat and sorghum made up 26.63% (61,583,175.95 quintals), 16.28% (37,652,411.66 quintals), 14.85% (34,347,061.22 quintals) and 15.58% (36,042,619.65 quintals) of the grain production, in the same order (CSA, 2013).

In the Amhara Region; Agriculture is the backbone of the regional economy; contributing for about 73% of the regional GDP and more than 90% of the total employment. Out of the total land size of the region of land had been used for the production of cereals, 3,254,156.12 hectares; the estimated production was about 59,051,697.91 quintals at yield of 16.75 of these 494,625 hectares was covered by maize contributing 13,387,027.21 quintals (CSA, 2013). Cereals account for more than 80 percent of cultivated land and 85 percent of total crop production. The principal cereal crops in the Amhara Region are teff, barley, wheat, maize, sorghum and finger millet (ibid). Pulses and oil crops are the other major categories of field crops. Based on the report of BOARD (2007), East Gojam, west Gojam, South Gondar zones and Fogera district are the major cereal producing areas in the region.

In South Gondar Zone; Agriculture is the backbone of the economy. Out of 370,138.47 hectares of cereal crops, 6,450,970.22 quintal is produced of which 36,417.32 hectares was covered by maize with total production of 860,616.98 quintals (BOARD, 2007). In fogera districts, where the study focused, maize crop is one widely cereal crop grown in the area. The entire maize production in the districts is mainly for market sometimes which is utilized much for home consumption.

## **1.2. Statement of the Problem**

In the rural areas of Ethiopia, farmers do not have the opportunity to sell their products at competitive prices. Important inputs, such as fertilizer, improved seed and chemical, are either unavailable or their prices are usually high making them very costly and unprofitable to farmers to use. Limited resources, low levels of adoption and use of improved technologies and lack of

adequate infrastructure and institutions that support agricultural development are the major factors behind low productivity of small-scale agriculture in Ethiopia that lead to production patterns dominated by the satisfaction of subsistence requirements and food insecurity at both household and national levels (Fufa, 2004).

The efforts of increasing agricultural production and productivity have to be accompanied by a well-performing marketing system which satisfies consumer demands with the minimum margin between producers and consumer prices (Feyissa, 2009). Supply of agricultural crop in the study area is subjected to seasonal variation where surplus supply at harvest and surplus supply peak season are the main feature. The nature of the product on the one hand and lack of properly functioning marketing system on the other, often resulted in lower producers' price.

Teff, wheat, maize, red paper and rice are the major cash crops grown in the study area mainly for market. However, marketing aspects of only rice were undertaken while leaving marketing of maize, is not yet done as far as researchers knowledge concerned. Moreover, there is a need to employ a commodity market to fully understand and resolve the problem of maize at all levels. Yet there is no such study which tries to look into the all of these areas of market participation of maize and determinants of their supply in Fogera District. This makes undertaking determinants of maize market supply in the District imperative.

### **1.3. Objectives of the study**

#### **1.3.1 General objective**

The overall objective of this study is to assess determinants of maize market supply in Fogera district.

#### **1.3.2 Specific objective**

1. To identify factors that affect market participation decision of households.
2. To determine factors affecting the volume of market supply of maize.

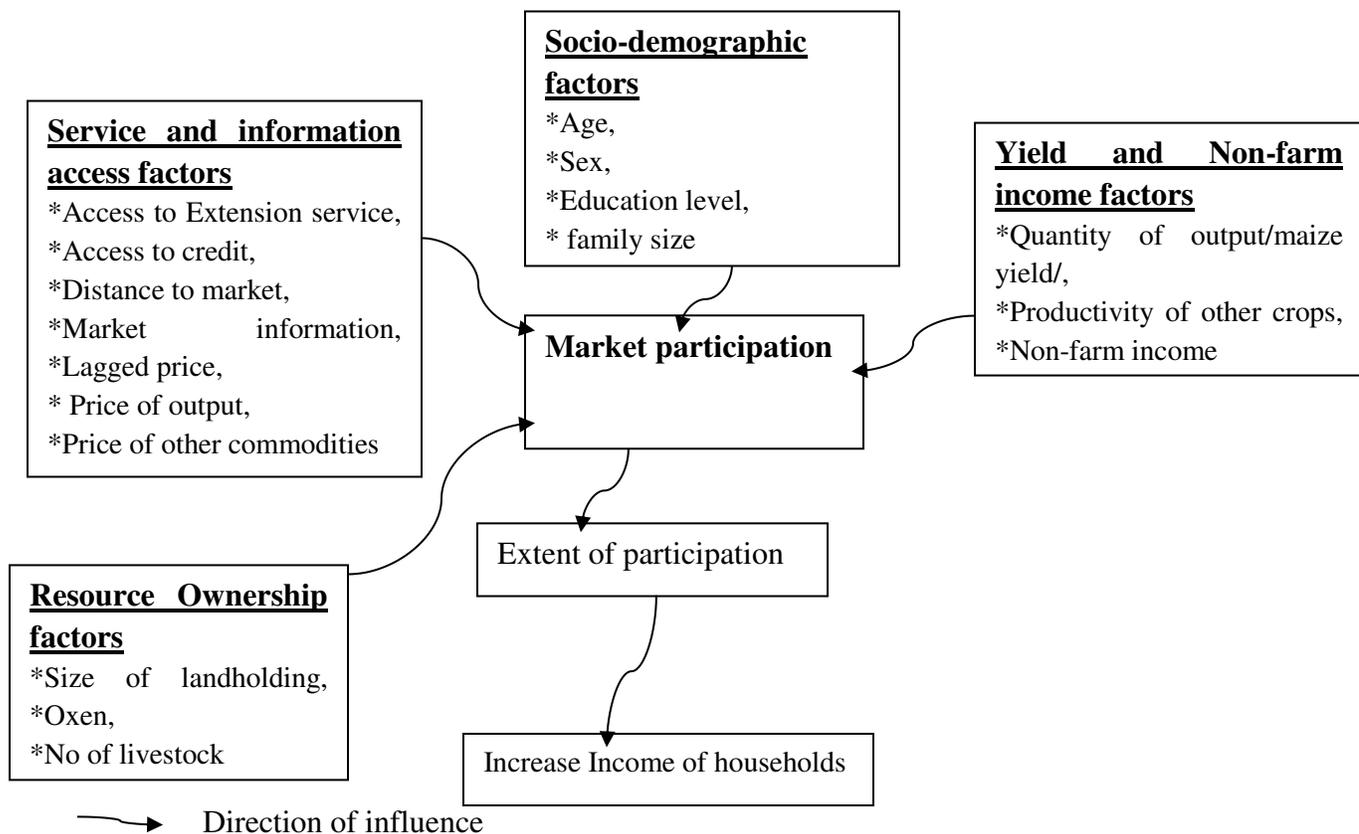
### **1.4. Research questions**

1. What are factors that affect market participation decision of households?
2. What are the determinants of market supply of maize in the study area?

## 2. Conceptual framework

The conceptual framework in Figure 1 illustrates the interrelationships of variables in the study, the key variables involved and how they were be interrelated. Socio-demographic characteristics are the background factors like (age, education level, sex, family size ), service and information access factors like ( access to extension service, access to credit, prices of output, price of other crops, lagged price, marketing information, and distance to the market), yield and non-farm income factors like (quantity of output, productivity of other crops and non-farm income) and resource ownership (landholding, oxen and number of livestock) had an influence on market participation. The market participation decision leads to the level/extent of participation. The extent/amount of maize/ participation in turn increases the households' income.

Figure 1: Conceptual frame work of the study



Diagrammatic representation of the conceptual framework.

Source: own conceptualization based on literatures

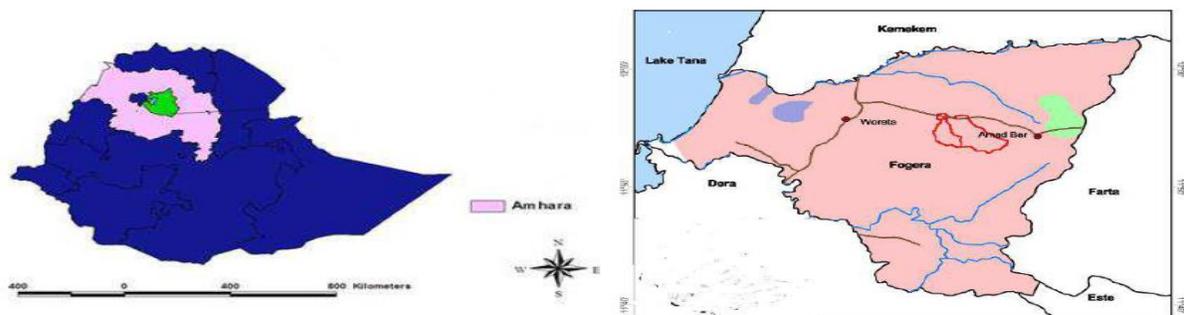
## CHAPTER THREE

### 3.1. DESCRIPTION OF THE STUDY AREA

This study was conducted in south Gondar, specifically in Fogera district. It is one of the 126 districts in the region. It has an area of 117,405 hectares divided administratively into 32 kebeles (30 rural and 2 urban). The population size was 233,529. The total number of households who engaged in agriculture was 42,746 of which more than 39,277 are maize producers. The capital is Woreta located at the North East on the main road to Gondar from Bahir Dar. The District is known for its plain nature where flat land accounted nearly 76 %. The mean annual rainfall is 1216.3 mm, with Belg and Meher cropping seasons. Its altitude ranges from 1774 up to 2410 meters above sea level allowing a favorable opportunity for wider crop production and better livestock rearing.

The district is characterized by subsistence mixed farming system in which production of both crops and livestock is common economic activity. The current land use pattern includes 59.03 % cultivated land, 22.73 % pastureland, 18.24 % water bodies and the rest for others. Most of the farm land was allocated for annual crops where cereals covered 52,759.99 hectares; pulses cover 9819.98 hectares; oil seeds 6137 hectares; root crops 1034.29 hectares; and vegetables 882.08 hectares. Crop production takes the lion's share of consumption and income generation of the household. Cereals crops widely produced in the area include teff, finger millet, rice and maize, pulse crops like chickpea and noug are the major crops grown. Moreover, vegetables and root crops produced in the area include onions, potato, tomato, pepper, cabbage and sweet potato.\

Figure 2: Map of the study area.



Source: IPMS (2005)

### 3.2. Source of data, Methods of Data Collection and Sampling procedure

In this study both quantitative and qualitative data were collected from primary and secondary sources. The cross-sectional survey was conducted using structured questionnaire, key informant interviews, and focus-group discussions. Focus group discussions were held with two groups based on predetermined checklists and a total of 10 key informants were interviewed from different organizations and institutions. The sample frame of the study was the list of small farmers in Fogera district and Kebeles Administrations (KAs). A stratified stage sampling technique was used to draw sample units. In the selection process Fogera districts agricultural office experts were consulted. There are two urban and 30 rural Kebeles in the district, out of which 25 administrative Kebeles are producing maize. These Kebeles were selected purposively and stratified based on agro ecology (lowland and upland agro ecology). From each of agro ecology, two Kebeles Administrations (KAs) from each zone were randomly selected based on lottery method, (Four KAs were selected). Then, the intended sample size from each sample Kebeles were determined proportionally to household size of maize grower farmer. Finally using the household list of small maize producers, the predetermined size which is 150 of the sample farmers from each Kebeles were randomly selected using systematic random sampling technique.

### 3.3. Sample size selection

Table 1: sample size distributions by kebeles

	Sample kebeles		Sample household populations	Sample size
Fogera plain	1.	Shina	2011	52
	2.	Abana Kokit,	921	24
Fogera high lands	1.	Bebeks,	1465	38
	2.	Quahr Michiel,	1411	36
Total			5808	150

### 3.4. Methods of data analysis

#### 3.4 Data analysis

Data from the field was edited, coded, and cleaned to ensure consistency, uniformity, and accuracy. Data was entered into computer software for analysis. STATA version 15 computer programs

was used to process the data. Two types of analysis, namely: descriptive and econometric analysis have been used for analyzing the collected data.

### 3.4.1 Descriptive Statistics

The main descriptive indicators that has been employed are t-test and Chi square to investigate the relative difference between market participants and non-market participants of maize marketing. This method of data analysis refers to the use of ratios, percentages, means, and standard deviations in the process of examining and describing marketing facilities, services and household characteristics.

### 3.4.2 Econometrics Analysis

Econometric analysis was used for processing the data obtained from the survey. The appropriate econometric models that can help identify the factors affecting the amount of maize sold to the market and the market participation decision are Tobit or Heckman Two-stage (Gujarat, 2004; Heckman, 1979). Heckman Two-Stage model was employed because of its advantages over the Tobit model in its ability to eliminate selectivity bias and it separates the effect of variables on the probability of market participation from the effect on the volume of maize that can be sold (Bellemare and Barret, 2006; Heckman, 1979). Using the Heckman sample selection model, the first stage is 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 estimate of the Inverse Mill's ratio to identify factors that determine the volume of marketed supply of maize

1. The probability of a household's head to participate in supplying will be given by the selection equation as:

$$Y_i = \beta_i X_i + \varepsilon_i \dots\dots\dots(1)$$

Where  $\varepsilon_i \sim N(0, 1)$

$i = 1, 2, \dots, n.$

$Y_i =$  A dummy variable that takes a value of 1 if a household's head has participated and 0 otherwise

$\beta_i =$  Vector parameter

$X_i =$  Parameters to be estimated in the model

$\varepsilon_i$  = error term and it is normalized to 1 since a farmer who participated is observed

and it is assumed to bivariate, and normally distributed (with correlation coefficient,  $\rho$ )

2. The amount (intensity) of maize supply will be given by the following equation by including an estimate of the inverse Mill's Ratio ( $\lambda_j$ ) as:

$$Y_j = \beta_i X_i + \lambda_j \mu + \varepsilon_j \dots\dots\dots(2)$$

$$Y_j = \beta_0 + \beta_1 QUAPROD + \beta_2 PRCLAG + \beta_3 FARMSIZE + \beta_4 FAMSIZE + \beta_5 EXTSER + \beta_6 MARKINFO + \beta_7 EDUC + \beta_8 AGE + \beta_9 SEX + \beta_{10} CRACC + \beta_{11} OTHERPRC + \beta_{12} OXEN + \beta_{13} NONFARINC + \beta_{14} NO.LIV$$

where  $\varepsilon_i \sim N(0, \delta^2)$

$Y_j$  = the amount of maize supply and observed if only participation is yes, that is  $Y_j = 1$

$\beta_j$  = Unknown parameter to be estimated in the outcome equation

$X_j$  = Explanatory variable that can affect the amount of maize supply

$\lambda$  = A correction factor for selection bias (Inverse Mill's Ratio)  $\lambda = \frac{f(Y_i)}{1 - f(Y_i)}$

$\varepsilon_j$  = Error term, this is assumed to be bivariate, and normally distributed with correlation coefficient,  $\delta^2$

Gujarat (2004) indicated that Variance Inflation Factor (VIF) is used to check multicollinearity among continuous variables. Before fitting important variables in the model, it is necessary to test multicollinearity problem among continuous variables and check associations among discrete variables, because it highly affects the parameter estimates. If the value of VIF is greater than 10, the variables are said to be highly collinear.

$$VIF(X_j) = 1/(1-R_j^2) \dots\dots\dots(3)$$

Where,  $R_j^2$  is the multiple correlation coefficients between explanatory variables, the larger the value of  $R_j^2$ , the higher the value of  $VIF(X_j)$  causing collinearity in the variable ( $X_j$ ).

The multicollinearity between discrete variables can be calculated using contingency coefficient. The value ranges between 0 and 1, with 0 indicating no association between the variables and value close to 1 indicating a high degree of association between variables.

$$CC = \sqrt{\frac{\chi^2}{N + \chi^2}} \dots\dots\dots (4)$$

Where, CC - Contingency coefficient,

$\chi^2$  -Chi-square test and

N - Total sample size.

If the value of CC is greater than 0.75, the variables are said to be collinear.

### **3.5. Hypothesis, Variables formulations and their Definition**

Social, economic and demographic data among maize producers has been used for the study. The dependent and independent variables that was considered are explained below.

#### **3.5.1. Dependent variables**

##### **Maize market participation decision (part)**

It is dependent dummy variable which is regressed in the first stage of Heckman two stage model. This variable has a value 1 if the respondent had sold and 0 otherwise.

##### **Amount of Maize supplied to the market (qs)**

It is continuous dependent variable in the second stage of Heckman two-stage estimation equation that represents the amount of marketed supply of maize. It has been selected for regression analysis and takes positive value.

The Independent Variables: - The following explanatory variables were hypothesized. The major variables expected to have influence on the decision to participate and on volume of supply are explained as follows:

- (1) Farmers’ personal and demographic characteristics.

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. Previous studies report mixed results on the relationship between age and market participation but Aged households are believed to be wise in resource use, and it is expected to have a positive effect on marketed surplus. Mathenge *et al.*, (2010) found that the age of the household head had a positive and significant effect on market participation of marginalized and poor smallholders in Kenya. This may be due to the fact that older farmers have more experience than young farmers in participating

in markets and in contrast (Tshionza *et al.*, 2001). found a negative association between age and market supply in cooking banana marketing in Nigeria. As the farmer gets older, she/he may not be able to sell more of her/his produce as compared to younger farmers due to social networks fomented over a period of time. Hence, the expected effect of age on market participation and extent of market participation in this study is deemed indeterminate.

Sex of the Household Head (SEX): it is a dummy variable 1 for male and 0 for female. 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 maize. Therefore, it is not possible to tell a priori about the likely sign of the coefficient of sex in sales volume.

Education (FORML\_ED): This variable was measured using formal schooling of the household head and hypothesized to affect marketed supply positively. It has a dummy value 1 if the household 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 market supply. Gani and Adeot (2011) found that in Nigeria, farmers' market participation decision was positively influenced by the level of education.

Family Size (SIZ-FM): Family size is a continuous independent variable to the number of members in the family including children, adults and dependent. Measured in terms of adult equivalent Mahamoud (2010) was included in the model as a variable explaining variation in market participation. Families with more household members tend to have more labour. Since production is the function of labour, availability of labour is assumed to have positive relation with volume of supply. However, family size is expected to have positive impact volume of sales, but larger family size requires larger amounts for consumption, reducing marketed surplus. In this context family size will be expected to have positive or negative impact on volume of supply. Wolday (1994) found that household size had a positive and significant effect on quantity of teff marketed. However, Singh and Rai (1998) found the marketed surplus of buffalo milk in Haryana to be negatively affected by family size. In this study therefore, family size was expected to have an indeterminate relationship with market participation and the extent of maize market participation in the maize marketing in the study area.

## (2) Households' resource ownership

Oxen Ownership (OX\_No): This is a continuous variable that was measured with the number of oxen owned by the head of the household and is expected to affect the market supply of maize positively. This is due to the fact that producers who own oxen are more likely to till in time than producers who own no oxen. Thus, they produce more which can be reflected on market supply.

Area of Maize (A-MAZE): This variable is a continuous variable measured in terms of number of hectares allocated to maize and is expected to affect the household level of maize marketed supply positively. This is because, producers who own big area holding can produce more than a producer who own less area and thus to supply more to the market. Mussema and Dawit (2012) found that as land allocated to red pepper increased in Aalaba Special District the amount of pepper marketed also increased. Martey *et al.*, (2012) also found that maize and cassava market participation increased as farm size increased. This was because increase in farm size provides opportunity to increase surplus production, which is critical in improving market participation.

## (3) Economic factors

Lagged Price (LAGP): The variable market price of the maize product was measured in Birr per quintal. Urgessa (2011) argued that the product price has direct relations with market supply and hence it was expected to affect the household marketed supply of maize positively in such a way that prices of previous years can stimulate production of maize, and thus marketed supply for this year. In this study lagged price was hypothesized as positive influence on participation decision.

Price of Other Crops (OTHR-PRC): It is a continuous variable that can affect the market 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 marketed surplus of maize. In this case, price of wheat was taken as variable since it is important and potential substitute crop grown in the study area.

Non-farm Income (NONF-IM): It is a continuous variable which refers to part of the total amount of annual income measured in Birr that is earned from non-farm activities which are not

related to agriculture. Therefore, in this study it is hypothesized that nonfarm income affects maize supply to the market in such a way that this income may strengthen the farming activity or make the household head reluctant to produce maize to generate money from maize. Getting income from non-farm activities was expected to have either a positive or a negative relation with market participation and marketed surplus. This expectation was supported by Martey *et al.*, (2012) who found that an increase in non-farm income reduced maize market participation whereas an increase in non-farm income increased the extent of cassava market participation in Ghana. Hence in this study NONF-IM was hypothesized as negative or positive effect on market participation decision and extent of participation.

Time of sale (TM-SL): This variable is measured as a dummy variable that was coded the value of 1 if the producer sells maize immediately after harvest and 0 otherwise. Time of sell was expected to affect the marketed supply of maize positively. Because a farmer that supplies his maize to the market soon after harvest is assumed to get better price than a farmer supplies lately.

#### (4) Institutional factors

Distance to Market (DS-MKT): Access to market is a continuous variable that has been measured in kms from the household residence to the market centers. The closer the residence of the household to the rural market center, the more is the quantity of marketed surplus. Mussema and Dawit (2012) found that market participation among smallholder pepper producers in Silte and Aalaba in Ethiopia was negatively associated with distance to the market. Martey *et al.*, (2012) in Ghana found distance to nearest market to be significantly associated with a lower level of cassava sales and every additional kilometer reduced the extent of market participation by 0.4 percent. In Ethiopia, it was reported that smallholder households who were away from market centers had lower market participation (Gebremedhin and Jalata, 2012). Hence, DS MKT was hypothesized to be negatively related to market participation and the extent of participation.

Use of Improved Production Inputs (IM-IPT): This is a dummy variable taking a value of 1 if the farmer uses improved production input and 0 otherwise. This variable was expected to affect the household market supply of maize positively due to the fact that if a producer uses improved seed and fertilizers, this will increase production and productivity thus, increase the market supply.

Access of Extension Service (ACEX\_SER): The variable Access of extension service was measured as a dummy taking value of 1 if the household head has a contact with a development agent and 0 otherwise. Extension is expected to have positive effect for market participation through its stimulation of production and productivity. Farmers that have frequently contact with DAs will have better access to information and could adopt better technology that would increase their market supply of maize. Farmers who have contact with extension agents are more likely to have knowledge about production, quality, and price of inputs and information on markets and output prices of poultry (Zeberga, 2010). In this study, therefore, number of contacts with extension workers was expected to have a positive relationship with market participation decision and the extent of participation.

Access to Credit (CRD\_ACC): Access to credit is measured as a dummy variable taking value of 1 if the maize producing farmer had access to credit and 0 otherwise. This variable is expected to influence the market supply of maize positively on the assumption that access to credit improves the financial capacity of maize producing farmers to buy modern inputs, thereby increasing production which is reflected in the market supply of maize. Alene *et al.*, (2008) found that limited access to credit constrains farmers' ability to buy agricultural inputs, which in turn reduces farmers' market participation in Kenya. Martey *et al.*, (2012) found that access to credit from both formal and informal sources had a positive effect on smallholder maize and cassava farmers in Ghana. Negassa (2009) found credit to have a positive relation with likelihood of selling raw milk in Ethiopia, indicating access to credit increased milk market participation.

Access to Market Information (ACC\_MKTI): This is measured as a dummy variable taking a value of 1 if the 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. It is being hypothesized to affect positively maize market supply of farm households. Because, producers that have access to market information are likely to supply more maize to the market. ACC-MKTI was expected to influence positively the participation as well as the extent of participation. Better information significantly raises the probability of market participation among potential selling households. In Nigeria, Gani and Adeoti (2011) found that access to market information positively and significantly influenced farmers' market participation decision.

Membership in a Cooperative (MBR-COP): This is a dummy variable which can take the value of 1 if the farmer is a member of a cooperative and 0 otherwise. This variable was expected to affect the supply of maize positively. Because, producers who are members of cooperatives are likely to get inputs and market information, thus could supply more maize to the market than non-members. Alene *et al.*, (2008) found that membership in farmer organizations significantly raised the probability of market participation for selling households in Kenya. Furthermore, Gani and Adeoti (2011) also found membership to cooperative society positively and significantly affect market participation decision by farmers in Nigeria. This means, market participation would be motivated if they belonged to a cooperative society. Cooperative members would likely here access to information and other inputs that encourage them to participate in the market.

**CHAPTER FOUR**  
**RESULT AND DISCUSSION**

**4.1. Description of Maize production and marketing**

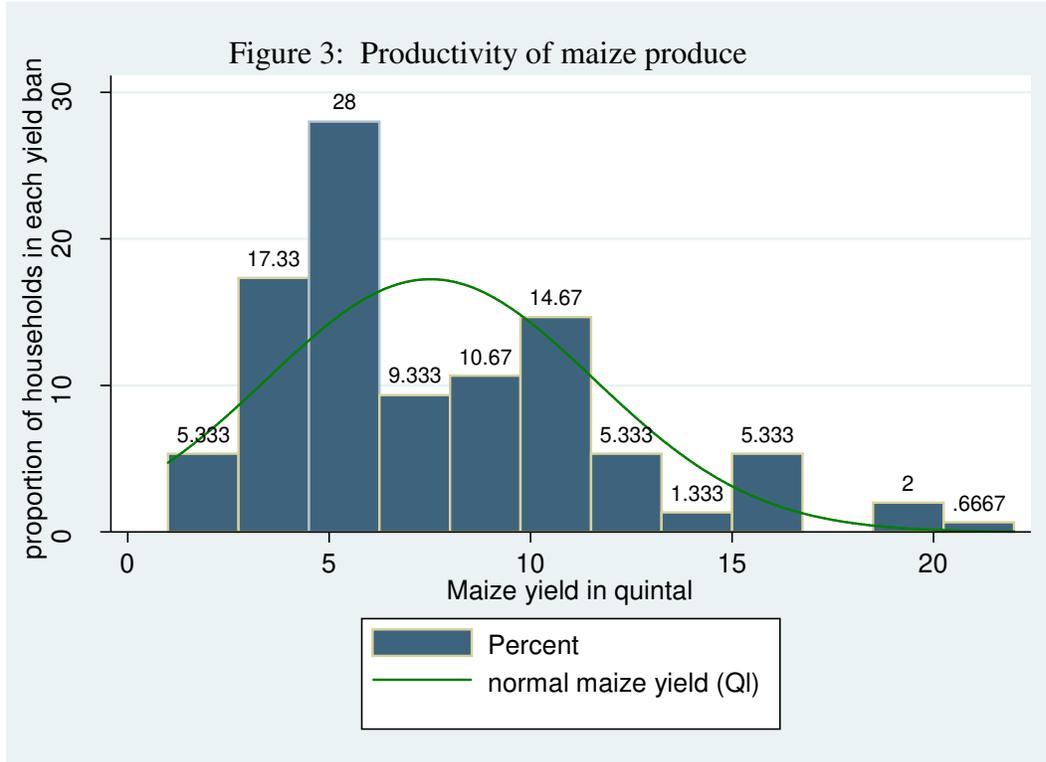


Figure 3 above indicates that most of the maize producers were producing between 5 quintal and 10 quintals per hectare. The extreme maximum & minimum proportions of households' in yield band of maize were 0.67 % and 5.33 % respectively.

The total sample size of the farm respondents handled during the survey was 150. Out of the total sample respondents, 86.67% were male headed households and 13.33% were female headed households. In terms of market participation, 56 % of market participant were male headed, while 30.67 % were female headed.

**4.2. Socio-economic Characteristics of Households**

Table 2 presents the demographic and socio-economic characteristics of the sample respondents in relation to market participation. The total sample size of the farm respondents

handled during the survey was 150. Out of the total sample respondents, 86.67% were male headed households and 13.33% were female headed households. In terms of market participation, 56 % of market participant were male headed, while 30.67 % were female headed. On the other hand, 15.58% of non-market participants were male headed households, while 5.84% of non-market participants were female headed households. The chi-square result in Table 2 showed that sex is statically significant at 5% significance level. This indicates that there is an association between market participant and non-participant. Majorities of sample respondents were male headed households in the study area (district). This implies that the participation of women/females/ in maize cultivation was very low; this might be related with unequal distribution of resources as well as cultural barriers and belief of the society.

Table 2: Mean and Proportion comparison of demographic and socio-economic characteristics of sample respondents' relation to market participation.

<b>Continuous variables</b>	<b>Market participant (N=97)</b>	<b>Non-market participant (N=53)</b>	<b>Over all mean</b>	<b>t/x<sup>2</sup> value</b>
Age(years)	49.45361	44.24528	47.61333	-2.2996***
Size of family (Hectare)	2.237113	2.226415	2.233333	-0.0818
Areas of maze (Hectare)	.3663015	.2558962	.3272917	-3.4357***
Oxen number (Number)	1.505155	1.169811	1.386667	-2.3229***
Distance to market center (Kilometer)	36.47423	33.16981	35.30667	-1.0499
Lagged price (Birr)	541.3711	544.3962	542.44	0.2128
Other crops price (Birr)	560.567	563.0755	561.4533	0.1869
Non-farm income (Birr)	1114.948	962.2642	1061	-0.3175
Number of livestock (TLU)	1.866629	1.717925	1.814087	-0.8907
<b>Dummy variables</b>	<b>Market participant (N=97)</b>	<b>Non-market participant (N=53)</b>	<b>Over all mean</b>	<b>t/x<sup>2</sup> value</b>
Sex (male, %)	56	30.67	86.67	0.0011
Formal education (literate, %)	26	16	42	0.3626
Improved inputs use (yes, %)	58.67	28	86.67	3.9064**
Time of sale (immediately after, %)	41.33	0.00	41.33	57.7437***
Access to market information (yes, %)	50	13.33	63.33	23.1252***
Credit access (yes, %)	22	6	28	4.9360**
Access to extension service (yes, %)	62.67	32.67	95.33	1.5286
Members of cooperative (yes, %)	52.67	21.33	74	7.9052***

Note: \*\*\*, \*\*and\* are statistically significant at 1,5 and 10% significance level respectively

Source: survey data ,2019

In terms of area of maize, the result indicates that the average land size for maize owned by market participants was 0.37 ha, while that of non-market participants was 0.26 ha. The overall mean of area of maize size owned by sample farmers was 0.33 ha. The result of t-test indicates that area of maize size is statistically significance at 1% significance level. This means that the mean maize land sizes owned by market participants are greater than that of non-market participants. Therefore, land is the single most important factor of production and a measure of wealth in the study area.

In terms of oxen owned, the result indicates that the mean of oxen owned by market participants was 1.51 numbers, while that for non-market participants was 1.17 numbers. The overall mean of oxen owned by the sample household farmers were 1.39 numbers. The result of t-test shows that number of oxen owned was statistically significant at 1% significance level. This indicates that market participant farmers owned more numbers of oxen than non-market participant farmers. Oxen increases agricultural production and productivity. This implies that increasing the volume of production increases the market participation of farmers.

In terms of distance to the nearest market, the assessment on this variable, measured in kilometer. Most of the sample farmers have to walk a long distance from home to the nearest market to sell their agricultural products. Access to physical market infrastructure is fairly low in the villages thus farmers to take their commodities to the nearest market. The result indicates that the mean of distance to the nearest market for market participant was 36.47 km, while that of non-market participant was 33.17 km. The overall mean of distance to the nearest market for sample respondents was 35.31km. The result of t-test shows that distance to the nearest market was statistically insignificant. This indicates the mean distance to the nearest market for market participants and non-market participants were not a factor whether or not participant.

An age of sample farmers, the measurement on this variable is in years. The independent sample t-test revealed in Table 2 that there was a mean age significant difference among the participate and non-participate household heads and mean age of sample farmers was 49.45 years for participant and 44.25 years for non-participants respectively. the overall mean age of the respondents is 47.61 years. This may be due to the fact that older farmers have more experience

than young farmers in participating in markets and in contrast youngers do not have wise use of resources in producing outputs which could have an impact on participation.

In terms of agricultural input use of household head, agricultural inputs are important elements for production and productivity. As a result, the typical inputs utilized for the production of maize were improved seed, fertilizer, chemicals and farm implements. Almost all maize farmers used fertilizer and chemicals for the production of maize but the only difference was with regard to the use of fertilizers. The result indicates that 58.67% of market participants were utilized improved inputs, while 6% was not used improved inputs. On the other hand, 28% of non-market participants were utilized improved inputs, while the remaining 7.33% was not utilized improved inputs. The overall agricultural input use status of sample households was dominated by improved input users, which accounts for 86.67% and the remaining 13.33% was non-users. The result of chi-square shows that the use of improved input was statistically significant at 5% significance level. The use of agricultural inputs increases the volume of production. This implies that increasing the volume of production increases the market participation of farmers.

When Time of sale was considered, As the chi-square result indicates that 41.33% of market participants were selling their maize product immediately after harvest, while 23.33% was not. On the other hand, no one of non-market participants were selling their maize, while the remaining 35.33% was not selling maize product after harvest. The overall maize time of sale status of sample households was 41.33%. The variable time of sale had statistically significant at 1% significance level. It means producers of maize will likely earn a better price if maize market participation is immediately after harvest as compared to those farmers who supply their produce later. This is due to the fact that supply would increase at a time when all households are planned to sell their maize products after threshing all their crops harvested and therefore price would decrease at that time. The same study was conducted by (Tegegn, 2013). time of sale affect sesame market chain analysis: the case of Metema woreda, north Gondar zone, Amhara national regional state positively and significantly.

In terms of access to market information, Access to market information is extremely limited in the Ethiopian maize market. At the producer level, farmers have very limited information on price prevailing even in nearby markets (Amare, 2010). It is assumed that producers and traders who have market information can decide how much to produce and market. There was statistical

difference among participant and non-participant according to their level of information access at 1% significant level. Producers that have access to market information are likely to supply more maize to the market. The survey data result shown that 22 % were not accessed to information so that were not participated in the market. The rest of 13.33% got market information but did not participate in the market. And 14.67% of sample household heads participated in the market without market information where as 50% of household heads got market information caused them to participate in the market. Whereas 6% of farmers had Credit access but did not participate, 29.33% had no access to credit so did not participate in maize market. While 22% of sample farmers had access to credit that were participant of maize market but 42.67% of household heads were participated in maize market that did not participate in credit use. The overall level of participants in farmer households in credit access were 28% where as non-participant were 72%. the Chi-square test also revealed that participant and non-participant sample household heads were significantly different at 5% significant level. this means farmers had access of participation in credit service produces more maize hence can supply maize to the market than non-participants.

In terms of members of cooperative, 52.67 % and 21.33% of participated sample household heads and non-participant were member of primary cooperatives. Whereas 12% and 14% of participant and non-participant household heads were not members of primary cooperatives. Maize market participant and non-participant were significantly different at 1% significant level in member of primary cooperatives. This mean being a member of cooperatives had an advantages of information access, input access and better utilities than non-members. Therefore, member of cooperative farmers was producing more maize than non-members due to the reasons listed above.

### **4.3. ECONOMETRIC RESULT ANALYSIS**

The Heckman sample selection model was employed to identify the determinants of maize market participation and marketed surplus. Before running Heckman two-step selection model, Multicollinearity test was carried out. In this study, the result showed that Multicollinearity was not a problem.

## **Factors influencing maize market participation**

The results of first stage Heckman two-step selection model estimation of the determinants of maize market participation of the sample households are given in Table 3. Out of 17 potential variables, six variables significantly influence the decision to participate in maize marketing.

**Age of household heads:** previously the likely sign of the coefficient of age on sales participation was not hypothesized since older farmers have more experience than young farmers in participating in markets in one way and/or as farmer gets older she/he may not be able to sell more of her/his produce as compared to younger farmers due to social networks fomented over a period of time. However, age of the household head influenced the decision of maize market participation positively and statistically significant at less than 5% significant level. This explanatory variable tells that as age of households increased by a year, the decision to participate increases by 2.6 %, other things held constant. From this result it can be stated from the fact that those older farmer households are believed to be wise in resource use, management and due to their experience in preparation and tillage of their farm land which will increase their production level and finally their marketed surplus. Therefore, as the age of sample household heads gets old, the likelihood of maize market participation tends to increase.

**Area of maize:** as the result indicates the variable size of the cultivated land for maize production had positively and significantly influenced the likelihood of participation of farmers in maize market at less than 1% significance level. The result of the study indicates that as the cultivated land for maize increases by a hectare, the probability of maize farmers' market participation will increase by more of 11.8 %, other things being constant. This implies that a farmer who has relatively large plot of land can cultivate all of his land to increase surplus of his production and finally to increase his maize market participation. The finding of the study is in agreement with many researches (Paudel and Matsuoka, 2008; Negash, 2007) which showed that size of cultivated land was significant and positive to the participation study.

**Oxen number:** oxen ownership had a positive and significant relationship with participation decision at less than 5% probability level. This is in line with earlier hypothesis that farmers who own oxen are more likely to till in time and thus, produce more which can be reflected on marketed supply. This variable reflects that as farmers own one more number of oxen, the probability of

maize market participation will increase by 46 %, other things being equal. Evidence from the study area reflects that farmers who had more number of oxen are wealthier and had sufficient number of oxen to plough their field timely as a result of which they quickly decided to participate in the agricultural production activity. Oxen ownership is very important for farm operations. The same results were reported by (Desale, 2008); Biru, 2003). This implies that oxen ownership has an influence on the participation decision in marketing in different areas.

**Distance to the market:** The closer the residence of the household to the rural market center, the more is the probability quantity of market participation and marketed surplus. As it was hypothesized to be negatively related to market participation, it had influenced the decision to participation at less than 5% significant level. It therefore implied that when the distance increases by 1 kilometer to the market center, then the probability of maize market participation decreases by 1.9 %, holding other things constant.

Table 3: Heckman two-step selection equation result.

Variables	dy/dx	Coef.	Std. Err.	Z	P> z
Sex	.0296934	.0296934	.54077	0.05	0.956
Age	.0264784**	.0264784	.01297	2.04	0.041
Formal education	.2175492	.2175492	.32596	0.67	0.505
Size of family	-.3756284	-.3756284	.24103	-1.56	0.119
Area of maize	2.117855***	2.117855	.76124	2.78	0.005
Oxen no_	.4596815**	.4596815	.19603	2.34	0.019
Improved input	.1800856	.1800856	.53698	0.34	0.737
Distance to market	-.0187469**	-.0187469	.00865	-2.17	0.030
Time of sale	-.1187264	-.1187264	.37446	-0.32	0.751
Lagged price	-.0003085	-.0003085	.00276	-0.11	0.911
Access to market information	.8837682**	.8837682	.37932	2.33	0.020
Other crops price	.0040909	.0040909	.00277	1.48	0.140
Credit access	.5286882	.5286882	.33462	1.58	0.114
Access to extension service	.4856562	.4856562	.90719	0.54	0.592
Non-farm income	-.0000224	-.0000224	.00006	-0.41	0.684
Members of cooperatives	1.32172***	1.32172	.47013	2.81	0.005

No_ of livestock	-0.0331393	-0.0331393	.16359	-0.20	0.839
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Note: Dependent variable: - Maize market participation.

\*\*\*, \*\* and \* are statistically significant at 1%, 5% and 10% significance level respectively.

Source: Survey result, 2019.

Table 4: Hackman two-step outcome equation result

Variables	Coef.	Std. Err	Z	P> z
Sex	-.4005143	.3742865	-1.07	0.287
Age	.0382401***	.0093663	4.08	0.000
Formal education	.3622019	.2313956	1.57	0.120
Size of family	-.4487667***	.1692206	-2.65	0.009
Area of maize	2.214285***	.6162356	3.59	0.000
Oxen no_	.5825642***	.1542189	3.78	0.000
Improved input	.2879113	.3260337	0.88	0.379
Distance to market	-.0212768***	.0068002	-3.13	0.002
Time of sale	.6754701***	.1570619	4.30	0.000
Lagged price	-.000551	.0019488	-0.28	0.778
Access to market information	1.393301***	.2819753	4.94	0.000
Other crops price	.0048129**	.0020352	2.36	0.020
Credit access	.6434742***	.2471124	2.60	0.010
Access to extension service	.3412101	.5348321	0.64	0.525
Member of cooperatives	1.403254***	.3404601	4.12	0.000
Non-farm income	.0000203	.0000382	0.53	0.596
No_ of livestock	-.09338	.1099541	-0.85	0.397
lambda	2.098698***	.5192368	4.04	0.000
-cons	-5.960341***	1.317559	-4.52	0.000
Number of observations = 150		Waldchi2(17) = 54.10		
Censored observation = 53		Prob>chi2 = 0.0000		
Uncensored observation = 97				

Note: Dependent variable: - Maize marketed surplus. \*\*\*, \*\* and \* are statistically significant at 1%, 5% and 10% significance level respectively.

Source: Survey result, 2019.

## **Factors influencing maize marketed surplus**

Heckman second stage estimation identifies factors that determine the extent of maize market participation by using the selection model which included the inverse Mill's ratio calculated from probit estimation of maize market participation. The coefficient of Inverse Mill's ratio ( $\lambda$ ) in the Heckman two-stage estimation is significant at less than 1% probability level (Table 3). This indicates that sample selection bias, existence of some unobservable farmer characteristics determines farmers' participation in maize market and thereby affecting marketed surplus. The chi-square result indicates that the overall goodness of fit (model adequacy) of the Heckman two-step selection model is statistically significant at a probability of less than 1%. This shows that jointly the independent variables included in the selection model explain the level of maize market participation.

**Age:** It was hypothesized that the age of household head could influence quantity of supplied to the market for each commodity indeterminate. But age has had a positive influence on volume of sales. Hence, the amount of maize produced by households is one of the major factors that determine the volume of maize supplied to the market.

**Family size:** The influence of family size (measured in adult equivalent) of households on the extent of maize marketed was predicted as indeterminate in the original hypothesis. The number of family size that the household head holds negatively and significantly influences the quantity of maize supplied to the market at 1% level of significance. This indicates that as the number of family size household head holds increases by one, the quantity of maize supplied to the market decreases by 0.449 quintal, all other factors held constant. The reason behind is obvious: a larger family size requires larger amounts for consumption, reducing marketed surplus which in turn decreases the quantity of maize supplied to the market.

**Area of maize:** The influence of this variable on the extent of maize marketed was as predicted in the original hypothesis. The landholding size of farmers'/household head positively and significantly affects the quantity of maize supplied to the market at 1% level of significance. It indicates that as the landholding size of household head allocated to maize production increases by a hectare, the quantity of maize supplied to the market increases by 2.214 quintal, all other factors held constant.

**Oxen number:** The influence of oxen number owned by households on the extent of maize marketed was as predicted in the original hypothesis. The number of oxen owned by household head positively and significantly influences the extent of maize supplied to the market at 1% level of significance. This is due to the fact that producers who own oxen are more likely to till in time than producers who own no oxen. Thus, they produce more which can be reflected on market supply.

**Distance to the market:** The distance of nearest market to the household heads home had negatively and significantly influences the extent of maize supplied to the market at 1% level of significance. As the distance of nearest market to households' home increase by a hectare, the volume of maize supplied to the market decreases by 0.0213 quintal. This is due to the fact that, Access to market is a continuous variable that has been measured in kms from the household residence to the market centers. The closer the residence of the household to the rural market center, the more is the quantity of marketed surplus.

**Time of sale:** The influence of time of sale on the extent of maize marketed was as predicted in the original hypothesis. The time of sale had positively and significantly influenced the extent of maize supplied to the market at 1% level of significance. Hence as the farmers tendency to sell their maize product increases by 1%, then the amount of maize to be supplied to the market increases by 67.5%. Because a farmer that supplies his maize to the market soon after harvest is assumed to get better price than a farmer supplies lately.

**Access to market information:** As expected, market information positively and significantly influences the farmer's level of participation in maize marketing at 1% significance level. This is because; producers that have access to market information are likely to supply more maize to the market. As households' probability of having market related information increase by 1%, then the level of maize market supply also increased by more than 39%.

**Other crops price:** it was expected that other crops price will influence marketed supply of maize negatively but it had positive and significant influence on the farmer's level of participation in maize marketing at 5% significance level. This was because an increase in price of other crops produced in the farm is expected to be stored for the next better price expectations by households as farmers can shift their supply to expensive crops. Hence the result shows as the price of a substitute crops (wheat) price increases by a birr, the supply of maize increased by 0.005 quintal.

**Credit access:** As expected, access to credit positively and significantly influence the farmer's decision to participate in maize marketing at 1% significance level. This indicates that a farmer who has credit access increases the probability of participating in maize market by 64.35%, all other factors held constant. This suggests that access to credit improves the financial capacity of farmers to buy improved inputs, thereby increasing production which is reflected in the marketed surplus of maize.

**Member of cooperatives:** This variable was as expected to affect the supply of maize positively. Therefore, it influences level of maize market participation positively and significantly at less than 1% significant level. Because, producers who are members of cooperatives are likely to get inputs and market information, thus could supply more maize to the market than non-members. Hence as farmers are cooperative society, the level of market participation of maize increased by more than 40% (other variables held constant).

## **CONCLUSION AND RECOMMENDATION**

Maize is an important cash crop in Fogera District. It takes the lion's share of the available cultivable land and produced mainly for market. Maize market participation and extent of market participation were influenced by different sets of factors in the Heckman two-step selection model. To this effect, age, area of maize, oxen number, distance to market, access to market information and member of cooperatives influence farmers' decision to participate in maize marketing. On the other hand, age of household head, size of family members (adult equivalent), area of maize, oxen number, distance to market, time of sale, access to market information, other crops price, credit access, member of cooperatives and inverse mill's ratio were found significantly influencing the extent of maize market participation. Therefore, based on the finding of this study, the following points are recommended to develop sustainable production and marketing of maize that is locally adaptable and acceptable to increase the competitiveness of smallholder farmers: improving access to credit to apply fertilizer, farmers should rely on intensive cultivation rather than extensive cultivation and strengthen extension service.

### **Availability of data and materials**

The authors want to declare that they can submit the data at any time based on publisher's request. The datasets used and/or analyzed during the current study will be available from the author on reasonable request.

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### **Contributions**

The research design and all the activities were conceived by authors. Data cleaning and analysis have been carried out by authors. The write up of the paper has been carried out by authors. All the authors read and approved the final manuscript.

### **Competing interests**

The authors have not declared any competing of interests.

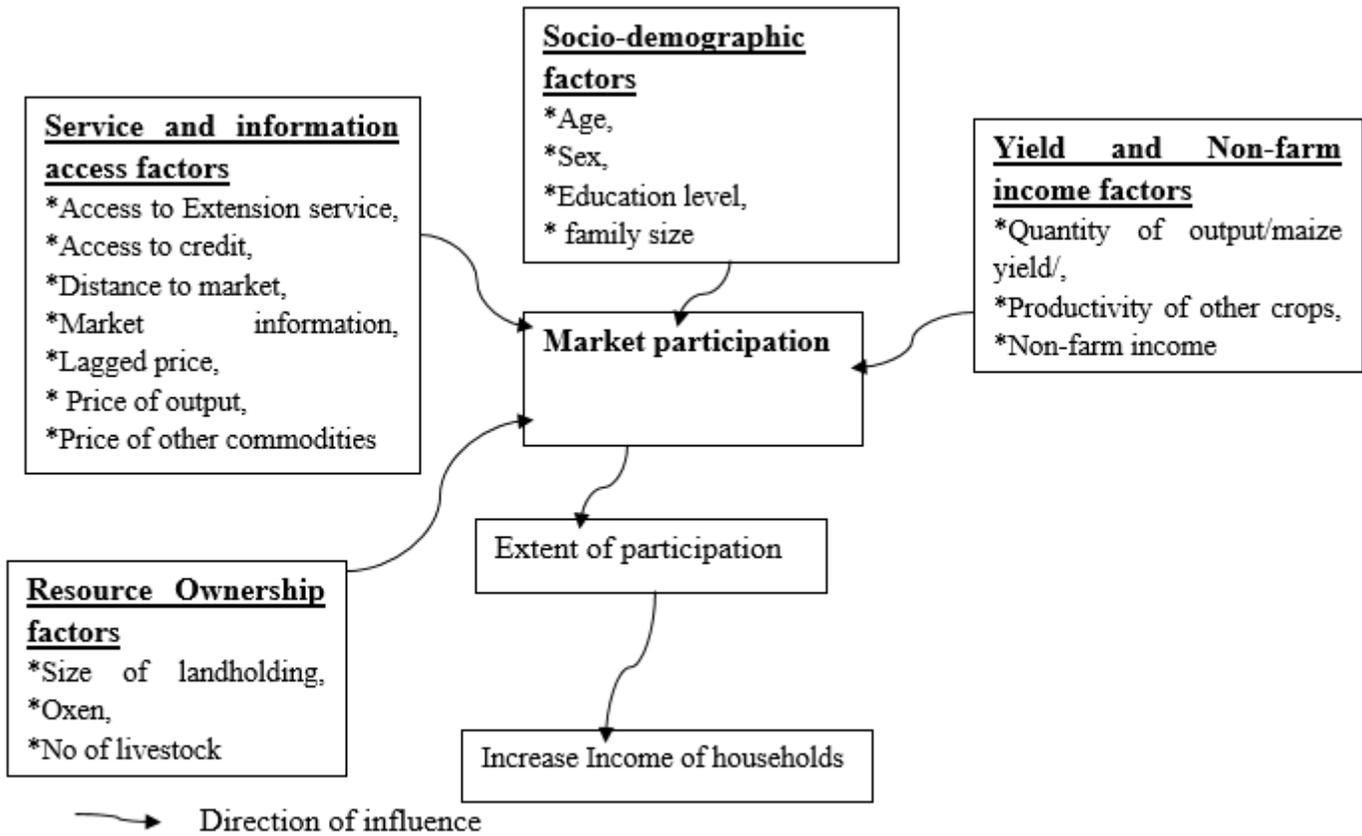
## REFERENCES

- ADLI (Agricultural Development Lead Industrialization) (2001). Rural Development Policies and Strategies: Department of press and Audiovisual, Ministry of Information. Addis Ababa, Ethiopia.
- Alene, A.D., Manyong, V.M., Omany, G., Mignouna, H.D., Bokanga, M., and Odhiambo, G (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, 33:318–328.
- Asfaw Negassa (2009). "Improving smallholder farmers' marketed supply and market access for dairy products in Arsi Zone, Ethiopia. Research Report 21. ILRI (International Livestock Research Institute), Nairobi, Kenya. 107 pp."
- Ashenafi Amare (2010). Analysis of grain marketing: The case of Southern Zone of Tigray Region, Ethiopia. MSc. Thesis, Presented to the college of Business and Economics, Department of Cooperative studies, Mekelle University. 62pp.
- Bellemare, M., & Barrett, C (2006). An Ordered Tobit Model of Market Participation: Evidence from Kenya and Ethiopia. *American Journal of Agricultural Economics*, 88(2), 324-337. Retrieved December 14, 2020, from <http://www.jstor.org/stable/3697725>
- Biru, H (2003). Adoption of crossbred dairy cows in Arsi Zone: The Case of Tiyo and Lemu- Bilbilo Weredas. An M.Sc. thesis Presented to the School of Graduate Studies of Alemaya University, Ethiopia. 85pp.
- BOARD (2007) (Bureau of Agriculture and Rural Development), Post-harvest evaluation report of 2006, Proceeding, Bahir-Dar, Ethiopia.
- CSA (2013) Agricultural sample survey. Volume II, Report on livestock, poultry & beehives population (private peasant holdings) available at: SF55.E75 A63 2013/2014.
- Diao, Xinshen & Fekadu, Belay & Haggblade, Steven & Seyoum Taffesse, Alemayehu & Wamisho, Kassu & Yu, Bingxin (2007). "Agricultural growth linkages in Ethiopia: Estimates using fixed and flexible price models," IFPRI discussion papers 695, International Food Policy Research Institute (IFPRI). <<https://ideas.repec.org/p/fpr/ifprid/695.html>>

- Feyissa, A (2009). Grain marketing and Livelihoods in Ethiopia. A case of structure, conduct and performance of grain market in Lume wereda of Oromiya region. LUMID International Master programme in applied International Development and Management available at: <http://lup.lub.lu.se/student-papers/record/1435213>.
- Fufa, B (2004). " Agricultural supply response under production risk: The case of small-scale farmers in East Hararghe Zone of Oromia Regional National State in Ethiopia, PhD dissertation, University of Pretoria." <https://www.google.com/search>.
- Gani, B. S. and A. I. Adeoti (2011). Analysis of Market Participation and Rural Poverty among Farmers in Northern Part of Taraba State, Nigeria. Department of Agricultural Economics, University of Ibadan, Ibadan. Oyo State. Nigerian Journal of Economics, 2(1):23-36.
- Gebremedhin, Berhanu & Tegegne, Azage (2012). "Market Orientation and Market Participation of Smallholders in Ethiopia: Implications for Commercial Transformation", <https://ideas.repec.org/p/ags/iaae12/125847.html>, 2012 Conference, August 18-24, 2012, Foz do Iguacu, Brazil, 125847, International Association of Agricultural Economists.
- Gujarat (2004). Basic of Econometrics, Fourth-ed. McGraw hill Company, United States Military Academy, West Point.
- Mahamoud Abdi (2010). Determinants of participation in milk marketing of smallholders in Jijiga Woreda, Ethiopia, Thesis. Mekelle:MU. Available at: <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/5169>
- Martey, E., Ramatu, M.A., and John, K.M.K (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *African Journal of Agricultural Research*, Article Number - F96A14939032 Vol.7(14), pp. 2131-2141, April 2012 <https://doi.org/10.5897/AJAR11.1743>.
- Olwande, John & Mathenge, Mary K (2012). "Market Participation among Poor Rural Households in Kenya," 2012 Conference, August 18-24, 2012, Foz do Iguacu, Brazil 126711, International Association of Agricultural Economists. DOI: 10.22004/ag.econ.126711.

- Negash, R. Haramaya University, Haramaya (Ethiopia) (2007). Determinants of adoption of improved haricot bean production package in Alaba special Woreda, Southern Ethiopia. MSc (Rural Development and Agricultural Extension). 137p. Haramaya (Ethiopia): Haramaya University. <https://hdl.handle.net/10568/682>
- Paudel, P., & Matsuoka, A (2008). Factors influencing adoption of improved maize varieties in Nepal: a case study of Chitwan District. *Australian Journal of Basic and Applied Sciences*, 2(4), 823–834.
- Rehima, M., & Dawit, A (2012). Red pepper marketing in Siltie and Alaba in SNNPRS of Ethiopia: factors affecting households' marketed pepper. *International Research Journal of Agricultural Science and soil Science*, 2, 261-266.
- Tegegn, A (2013). "Value chain analysis of vegetables: the case of Habro and Kombolcha woredas in Oromia region, Ethiopia. Alemaya University, M.Sc thesis." <https://www.academia.edu/32829465/>.
- Tshionza, M., lemthi, thaode (2001). "The factors Influencing Farmers" Decision to Produce Cooking Banana for Market in SE Nigeria". *African Crop Science Journal* 9(3) 537-547."
- Urgessa, M (2011). Market chain analysis of teff and wheat production in Halaba special Woreda, southern Ethiopia. MSc. Thesis. Haramaya University. view at Google scholar.
- Virender Singh and K.N. Rai (1998), Economics of Production and Marketing of Buffalo Milk in Haryana, *Indian Journal of Agricultural Economics*, 53, (1) <https://EconPapers.repec.org/RePEc:ags:inijae:297589>
- Wolday, A (1994). "Food and Grain Marketing Development in Ethiopia, after the market reform of 1990: A case study of Alaba Siraro District. Koster Publisher, Berlin. 328p." at google scholar.
- Zeberga, A (2010). Analysis of poultry market chain: The case of Dale and Alaba 'Special' Woredas of SNNPRS, Ethiopia. MSc thesis in Agricultural Economics. 127p. Haramaya (Ethiopia): Haramaya University. <https://hdl.handle.net/10568/2569>.

# Figures



Diagrammatic representation of the conceptual framework.

Figure 1

Conceptual frame work of the study Source: own conceptualization based on literatures

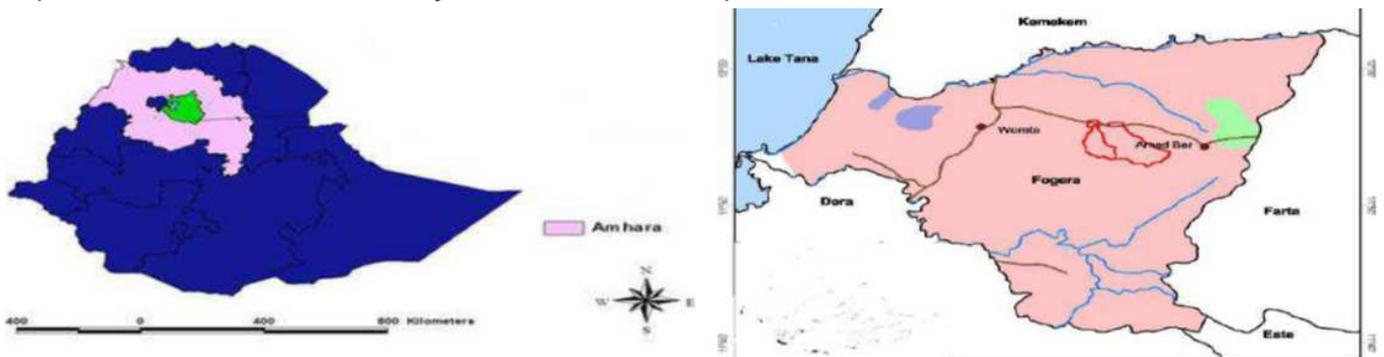


Figure 2

Map of the study area. Source: IPMS (2005) Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research

Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

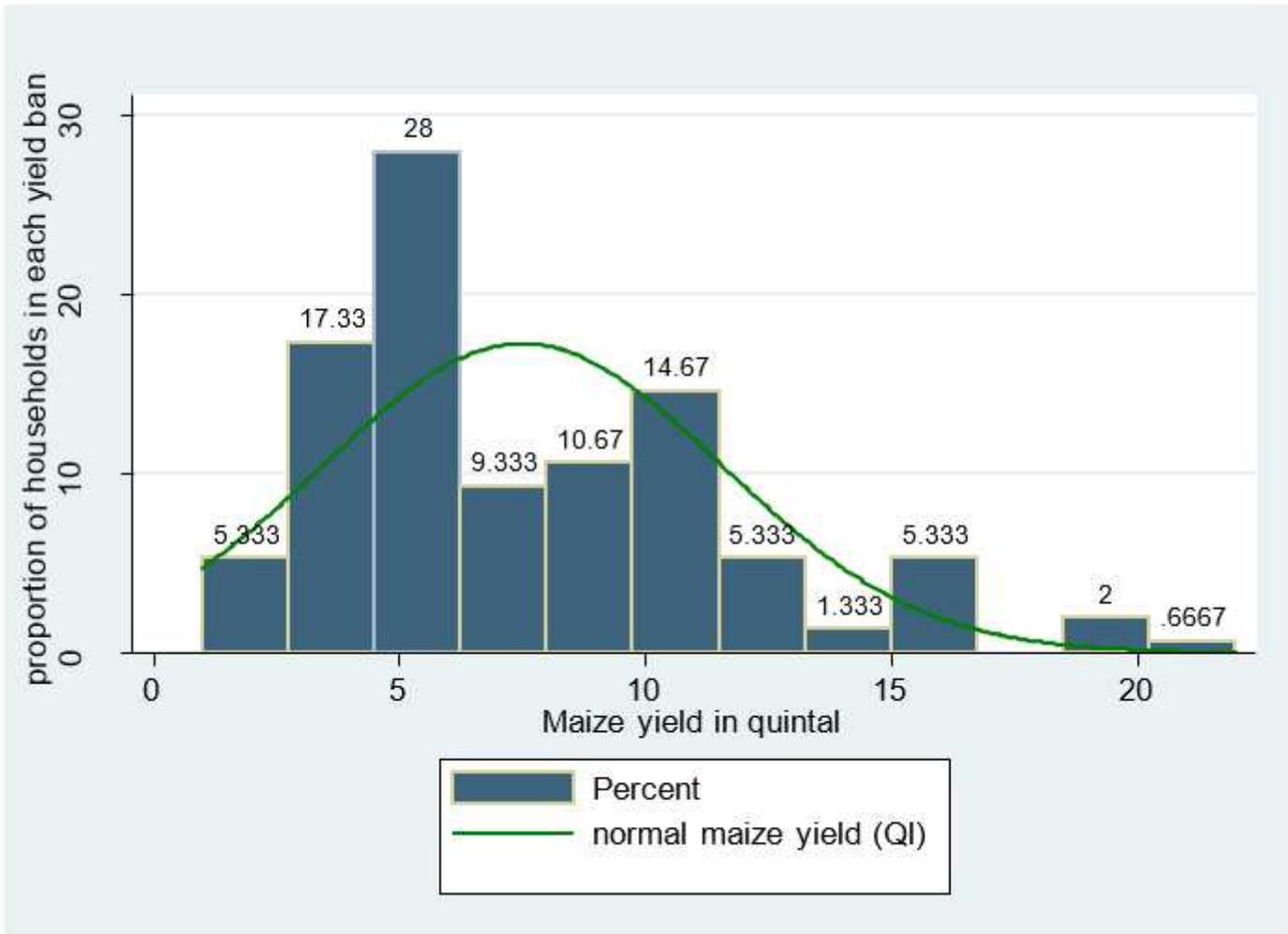


Figure 3

Productivity of maize produce