DETERMINANTS OF SMALLHOLDER TEFF FARMERS' MARKET PARTICIPATION; A CASE STUDY IN GENA-BOSSA DISTRICT, DAWRO ZONE, ETHIOPIA

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF JIMMA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF DEVELOPMENT ECONOMICS (MSC)

BY

DERESSE DALANGO DAWANA

JIMMA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

MAY 2018

JIMMA, ETHIOPIA

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UNDER THE GUIDANCE OF:

WONDAFERAW MULUGETA (PHD/ASSOCIATED PROF.)

AND

TESFAYE MELAKU (MSC.)

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DECLARATION

I hereby declare that this thesis entitled "Determinants of Smallholder Teff Farmers' Market Participation; A Case Study in Gena-Bossa District, Dawro Zone, Ethiopia", has been Carried out by me under the guidance and supervision of Dr. Wondaferaw Mulugeta (Associated Pro.) and Mr. Tesfaye Melaku (MSC.).

The thesis is original and has not been submitted for the award of degree or diploma in any university or institutions.

Researcher's Name	*Date*	*Signature*
Deresse Dalango	_____	_____

CERTIFICATE

This is to certify that the thesis entitled "*Determinants of Smallholder Teff Farmers' Market Participation; A Case Study in Gena-Bossa District, Dawro Zone, Ethiopia*", *submitted to Jimma University for the award of the Degree of Master of Science in development economics and is a record of valuable research work carried out by Mr. Deresse Dalango, under our guidance and supervision.*

Therefore we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree of diploma.

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ABSTRACT

Increasing market participation for smallholder farmers has a big potential to uplift living standards of poor household through increasing production and consumption. Although, smallholder farming made 95% of total crop production in Ethiopia, they are exposed to a marketing bottleneck that hinders benefits from their produce. The objective of this study was to identify determinants of smallholder teff farmer decision to participate in output market and level of marketed output. The study used data on 190 respondents that are collected through structured questioner from Gena-Bossa districts in Dawro Zone. The descriptive statistics and Heckman two stage econometric methods were employed to analyze the data. Out of sampled household, 75% participated in teff output market, while the remaining 25% not supplied teff output in survey time. The farming activity were the main source of income and livelihood in study area. Among interviewed, about 21.58% have off-farm activity option but the remaining 78.42% of respondent have no other alternative even in dry season, in which no agricultural bustle takes place. About 89.5% of teff farmers' have access to extension services while only 30% obtain credit; 24.74% have access to price information and 28.42% of household have membership to producer group. The significance of coefficient of inverse Mill's ratio (λ) indicates the presence of self-selection bias and the effectiveness of applying Heckman two stage model. The results of study show that the smallholder decision to participate in output market were positively influenced by size of land holding, availability of family labor force, education status of household head, accessibility of credit service and access to market price information. On the other hand, size of family member, sex of house hold head being female and distance to market place discourage probability of teff farmer market participation decision. Moreover, the second stage estimation reveals that, the education status of house hold head, size of farm land, amount of teff crop produced, accessibility of market information, the size of family labor force and being member to farm cooperative increase the quantity of marketable output, whereas, large number of family size decline the level of teff crops marketed. The policy that assist poor farmers in obtaining market skills; create affordable credit service; strengthen community based producer groups and capacitating the females socially and economically in the community believed to minimize the problems encountering small farmers in a way to market their crop.

Key Words: Smallholder, market participation, Heckman two stage, Gena-Bossa.

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ACRONYMS

- ADLI- Agricultural development led industrialization
- BLUE - Best Linear Unbiased Estimates
- CSA- Central Statistical Authority
- EGTE- Ethiopian Grain Trade Enterprise,
- ECX- Ethiopian Commodity Exchange
- FAO- Food and agricultural organization of the United Nation
- GDP-Gross domestic product
- GTP - Growth and transformation plan
- GIAHS-Globally important agricultural heritage systems.
- HH- Head of household
- IAASTD- International Assessment of Agricultural Knowledge, Science and Technology for Development.
- IFAD -The environment; the International Fund for Agricultural Development
- IFC- International finance corporation
- IIED-International Institute for Environment and Development
- IMR - inverse Mills ratio
- JICA - Japan International Cooperation Agency
- MoARD – Ministry of agricultural and rural development
- OLS - Ordinary Least Square
- OMF - Omo micro finance
- SNNPRS - South Nation Nationalities and peoples regional state
- VIF - variance - Inflating factor.
- UNEF- United Nation Environment Program
- USD- United States Dollar

CHAPTER ONE

INTRODUCTION

1.1. Back Ground of the Study

Output market participation has been identified both as a cause and consequence of development because when markets are accessible they provide an opportunity for households to sell their surplus output which increases their incomes (Boughton *et al*., 2007). Majority of smallholder farmers in rural areas are surrounded in a vicious circle of poverty due to low opportunity of market participation. Poverty reduction and improving the livelihood of the rural smallholders has strong relationships with their market participation (Mathenge et al., 2010). Increased market participation by the poor has been found to be vital as a means of breaking from the traditional semi-subsistence farming and a key factor to lifting out rural households from poverty.

The Smallholders considered more than 80 per cent of the world's estimated 500 million small farms and afford over 80 per cent of food items consumed in a large part of under developed world, contributing significantly to poverty reduction and food security (UNEP, 2013). They harvest foodstuff and non-food products on a small scale with inadequate external inputs, cultivating field and tree crops as well as livestock, fish and other aquatic organisms. The extraordinary and interconnected challenges facing small farmers at global level like increasing competition for land and water, increased influence of changing markets, rising fuel and fertilizer prices, and climate change(Bioversity et al., 2012). Moreover, smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets holding, but there is great variation in the degree to which each of these applies around world (Murphy, 2010). Due to high transaction cost resulted from their geographical dispersion and unreliable supply, many smallholders have limited opportunities to participate in markets (FAO, 2015).

In Ethiopia cereal crop based agricultural account for roughly 60 percent of rural employment, 80 percent of total cultivated land, more than 40 percent of a typical household's food expenditure, and more than 60 percent of the calorie consumption and in terms of contribution to national income cereal sub-sector accounts for roughly 30 percent of the national income (Rashid, 2010).

Teff, which is the most valued staple crop in Ethiopia, Cultivated over approximately 2.8 million hectares and accounts for 28.5 percent of land area under cereal cultivation, which is the largest share of all staple grains in Ethiopia. It is indigenous to Ethiopia and is a vital part of the culture, tradition and food security of people (MoARD, 2010). This elaborates why both economic growth and poverty alleviation strategies of the government have placed so much emphasis on rural based sector specially on cereal crop. The agricultural marketing policy of the country focuses increasing the volume and quality of products for both domestic and export markets and establishment of affordable market mechanism in which all actors can benefit. However, smallholder farmers face difficulty to participate even in local markets due to subsistence production and inability to penetrate other influencing factors in searching for markets.

Thus, this study intended to identify these factors that determine market participation and the extent of marketing of smallholder teff farmers in Gena-Bossa districts of Dawro Zone in South nation nationalities and people's regional state. It analyzed the influence of demographic, socio-economic and institutional factor on household decision to participate in output market using Heckman two stage selection model.

1.2. Statements of the Problem

The reason why most rural communities cannot improve their living standard is due to the fact that they face difficulties in accessing market (Heimen, 2002). In most part of rural Ethiopia, even farmers who produce surplus remain in poverty trap due to lake of opportunity to profitable market and they are forced to sell their crop at whatever price set by buyers. This is mainly because of lack of access to basic market inducing factors such as available market information, lack of credit service, lack of infrastructure etc.

To identify the problems of smallholder farmers some research have been done in Ethiopia. Mohammed (2011), in Halaba special district in Southern Ethiopia; Tadele et al (2016) in Dendi district of west Showa zone and Azeb et al. (2017) in Ambo district of west Shewa zone, all analyzed factors determining market supply of smallholder teff farmers in different way. Their result show that , sex of the household head, quantity of teff produced, access to market information; access to extension service; increasing production and productivity of Teff significantly affect marketable supply of Teff. However, they all employed multiple linear regression model to confirm the influence of explanatory variable on market supply. Since the

market supply decisions of farmers are discrete, applying linear regression cannot be consistent method. Thus, this study designed to solve such problems by using Heckman –two stage models to analyze the impact of influencing factor on farm household market participation decision and extent of their participation.

On the other hand, Rehima et.al. (2013), found the positive and significant effect of distance to all weather road on the probability and intensity of small farmer grain market participation in Ethiopia. While Geremew (2012), found the negative effect of distance to market on income earned by sesame farmers in Diga district of Wellega zone in Ethiopia. Moreover, Efa et.al. (2016), indicated negative association of family size on smallholder teff producer probability of market participation, whereas, Moono (2015), shown the positive influence of size of family on probability of market participation among smallholder rice farmers in Western Province of Zambia. This varied result indicates that the problems of farmers differ from place to place and the absence of similar and cross-cutting determinants of their market participation decision. The idea of heterogeneity of farm problem also supported by Mather et al., (2011), which analyzed smallholder farmer heterogeneity and maize market participation in Southern and Eastern Africa.

Furthermore, the theoretical and empirical analysis by Pender et.al.(2007), show that the increment in output of maize and teff, access to road, ownership of livestock and farm equipment's enable smallholder to increase production and crop commercialization. The analysis by Abafita et.al (2015) identified that the market participation decision of smallholder cereal farmers of Ethiopia was strongly influenced by their market orientation. This study also examined that higher level of crop production, farm land size, access to credit service and availability of all-weather road infrastructure uplift the smallholder market participation. Moreover, the World Bank (2004), Bultossa T. (2016) and Demeke et al. (2014) identified the hindering factors of smallholder marketing performance and trends of grain price in Ethiopia. Their study mostly stressed on product quality and commercialization and factor influencing it like technology adaptation, training, infrastructural facility and reasons of food price increment. On the other hand, most of these study found insignificant impact of possession of equipment's, gender and education of heads, distance to nearest towns, and access to extension services on smallholder market participation. But, other study like Agete (2014), found the positive and significant influence of ownership of transportation means, number of extension visits per year, market information,

family size, access to credit, and gender. This articulate the need for additional investigation to analyze demographic, socio-economic and institutional factors hindering the market participation and level of marketed outputs of rural poor farmers.

Thus, it requires further research basically on the factors that hinder the market participation decision of smallholder teff producer in peripheral part of Ethiopia. Gena-Bossa district in Dawro Zone, which located at South Western part of the country, was endowed with a good agro-ecological nature for cereal crop production in general and for teff in particular. Contrasting to its natural endowment, the crop sells ratio was the lowest relative to other areas in South nation nationality and people's regional state (JICA, 2012). In addition, there was no research done concerning the hindering factors on marketing process of small farmers in area. Hence, it need empirical analysis to verify the factors responsible for low status of market participation in study area. Therefore, this study was undertaken in order to fill the gap by identifying the demographic, socio-economic and institutional factors that determine the marketing decision and level of participation in output market.

1.3. The Objectives of Study

The general objective of this study was examining the factors that determine market participation decision and level of marketing among smallholder teff farmers in Southern Ethiopia specifically Gena-Bossa districts of Dawro Zone.

The specific objectives include:

(i) To analyze the demographic; socio-economic and institutional factors that determine market participation decision among smallholder teff producers;

(ii) To examine the demographic, socio-economic and institutional factors that influence the level of marketed output among smallholder teff supplier;

(iii) To characterize smallholder teff farmers according to their market participation;

(iv) To come up with recommendations that might assist smallholder teff farmers' to access markets for their agricultural produce.

1.4. Research Questions

The following research questions were addressed by this study:-

1. What are the factors responsible for smallholder teff producer's decision to enter the output market and level of marketed teff outputs?
2. Do the institutions provide enough support to teff farmers in facilitating marketing process?

1.5. Scope and Limitation of the Study

The core limitation of this study was its restriction on scope of sample site decision only four selected kebele of the Gena-Bossa district. That is because, the study only aimed to identify household specific, socioeconomic, and institutional factors explaining the teff cultivator market participation status of smallholder farmers based on data from only 190 smallholder farm household representatives of selected kebele in districts. However, the researcher believes it would be possible if additional sites and households are included in sample, the issue of marketing would be elaborated in detail.

1.6. Significance of the Study

The participation of poor farmer's in agricultural market could be the main weapon against hunger to lift millions of them out of poverty (Mignouna et.al, 2015). With absence of strong market participation access, the smallholder farmers cannot benefit even from increased production of crop. Beyond the supply sides of agricultural sector, the current Ethiopian government gave a priority for agricultural marketing channels in its ADLI program. However, still there is a marketing bottleneck that hinders smallholder benefits from their produce. To solve the problem the grass root factor identification in empirical method would be the primary excitement.

This study believed to fill the gap specially by examining the determining factors of farm marketing in Gena-Bossa district. The analyses address the limited knowledge and literature about the marketing problems of smallholder's in Ethiopia in general and Gena-Bossa district in particular and therefore can serve as a reference material for policymakers, academicians and for long researchers.

1.7. Organization of the Research

This thesis was organized as: in the second chapter it outline about relevant literatures and the theoretical framework in relation to factor influencing smallholder farm marketing. It was followed the research methodology including description of the study area and the way of data collection and analysis. In the fourth chapter the main findings of this study was shown by analyzing household survey data through descriptive and econometric data analysis technique. Final chapter contain conclusions and policy implication of the results based on the major findings of the study. At the end the paper also occupied the reference, questioner and STATA results in appendix parts.

CHAPTER TWO

LITERATURE REVIEW

2. Overview

This chapter outlines the relevant literature review regarding smallholder farm household market participation and extent of participation. In the first section it start with theoretical approach containing smallholder food grain production and marketing in global level and smallholder household models about characteristics of farm decision, followed by the empirical works about influencing factors of smallholder market participation decision and degree of participation. In the third section, based on theoretical and empirical review the conceptual frame work of the study developed. In the fourth section smallholder teff farmer production and marketing in Ethiopia was specified and finally about characteristics of smallholder marketing and market channels in Ethiopia was presented.

2.1. Theoretical Review

2.1.1. Overview about Smallholder Farming

About 2.5 billion people live directly on agricultural production systems, either as full- or part-time farmers, or as members of farming households that support farming activities (FAO, 2008). Smallholders make up 85 percent of the world's farmers and farms but own an average of just two hectares of land (IFC, 2013). There is no crosscut definitions for smallholder farm household. According to Chamberlin (2008), the smallholder farmers are those with limited land availability, poor-resource endowments, subsistence-oriented and highly vulnerable to risk. Smallholder farm households are those who live in many countries significantly less than 2 hectares of land (FAO, 2015). For instance, average size of a smallholder farm in Bangladesh and Viet Nam is 0.24 and 0.32 hectares respectively and it is 0.47 hectares in Kenya and 0.9 hectares in Ethiopia. Smallholders account for 60 percent of agricultural land in Africa, while they lacks access to advice, varieties, inputs, and finance and depends on insecure or volatile markets, making them vulnerable to food insecurity(IFC,2013).

According to United Nations food and agricultural organization repot, the smallholder produce a wide range of developing World food grains, often wider than larger and commercialized farms (FAO, 2015). The smallholder farming produce a major share of food grain in developing countries and in many instances their contribution is growing (Koohafkan, 2011). The food production share

of smallholder in Africa estimated to be 70% and 80% of food consumed in Asia and sub-Saharan Africa (IAASTD 2009, IFAD 2011).

The average farmer in sub-Saharan Africa produces only one ton of cereal per hectare – less than half of what an Indian farmer produces, less than a fourth of a Chinese farmer's production, and less than a fifth of an American farmer's production (World Bank, 2007). However, Smallholder agriculture continues to play a significant role in African economy. In East African economies; smallholder based agriculture play a pivotal role in employment opportunity creation and overall economic growth. For instance, in Ethiopia and Tanzania it contributes 47% and 43% of GDP, respectively (Salami et al, 2010). Accordingly, smallholder agriculture accounts for about 75 percent of the labor force in four East African countries, i.e. Uganda, Ethiopia, Kenya and Tanzania, heightening the importance of the sector in job creation and poverty reduction across countries. The Share of Smallholder farming in Production accounts 75% in three East African countries namely Uganda, Kenya and Tanzania and 87.4% in Ethiopia (Salami et al, 2010).

The international finance corporation (IFC) report states that the quality and productivity of smallholder farmers varies widely depending on their ability to invest in production (IFC, 2013). For instance, smallholder may own the productive assets as basic as a hand hoe in one corner or as expensive as a tractor in the other; farmers may have no knowledge of postharvest processing in one part, or they may be capable of highly detailed grading and processing in the other. In practical example, fertilizer consumption is near zero in some African countries, while it exceeds 500 kg per hectare in China and Egypt (IFC, 2013).

"Selling just a small part of their production contributes towards smallholders' livelihoods, but significantly less than most people think" (FAO, 2015). This report reveals that most small farmers in developing country sell only small part of their production in market due to marginalized accessibility of local market. For instance, in Kenya and Ethiopia, the smallholder farmer market participation in agricultural product market is only less than a quarter of their production and it is about 38%, 23% and only 12% in Vietnam; Bangladesh and Nepal respectively (FAO, 2015).

2.1.2. Approaches to Market Participation Decision of Farm Households

Although, the concept of household varies from cultures to culture, the group that shares the same residence or family life generally referred as house hold. The vital element in defining the household is identifying the decision-making unit which sets the strategy concerning the generation of income and the use of this income for consumption and reproduction (Sadoulet, 1995).

Contrary to traditional consumer theory, in which the decision maker face fixed income, agricultural smallholder households simultaneously a producer and consumer endogenously determining his income. Thus, an increase in the price of a normal food good could potentially lead to an increase in the consumption of that good. The agricultural household model addresses this counterintuitive characteristics farm house hold problems.

The central objective of the smallholder farm household is to maximize expected utility from consumption of leisure, self-produced goods, and purchased goods subject to several constraints. According to the work of Singh et al. (1986), the necessary agricultural household model can be developed as follows. The model assumes that risk neutral household, all prices are exogenous and that household and hired labor forces are perfect substitutes. Let the household maximizes utility from the consumption of three commodities: a staple food good (x_s), a good purchased from the market (x_m), and leisure (x_l),

$Max\ U = f(x_s, x_m, x_l\ )$ ---------- (2.1)

Utility is maximized subject to three constraints:

Cash Income Constraint: $p_m x_m = p_s(Q - x_s\ ) - w(L - L_h) - gk$

Production Technology Constraint: $Q = f(L, K\ )$,

Time Constraint: $x_l + L_h = T$

Where; $p_m, p_s, w\ and\ g$ are the prices of the market good, the staple food, labor and capital, respectively, Q is the quantity of the staple food produced by the household, L is the total labor used in production, L_h is the total household labor used in production, K is the capital available to the household, x_l is home time and T is the household total time endowment.

The three constraints can be combined into a full income constraint:

$Y = p_s x_s + p_m x_m + w x_l = p_s Q(L, K) - wL - gK$ ---------- (2.2)

Full income is determined by standard profit function ($i.e.\ \pi = p_s Q - (wL + gK)$) and the value of household's self-labor. These equation shows that household can choose the level of $x_s, x_m, x_l, L\ and\ K$. Now the first order condition of household income with respect to L and K can be given as:-

$$Y_l = p_s \frac{\partial Q}{\partial L} - w = 0$$

$$Y_k = p_s \frac{\partial Q}{\partial K} - g = 0$$

According to the first-order conditions, production decisions are made independently of consumption decisions. The choice of total labor and capital are functions of prices (p_s, w, and g) and the technology constraints of the production function; they do not depend on$x_s, x_m\ or\ x_l$.

Since farm-profits can be maximized when the household chooses the optimal level of total labor (L*) and capital (K*), the factor demand function for labor and capital should be obtained i.e.

L = $L^*(p_s, w, g)$ and K= K*(p_s, w, g) ---------- (2.3)

Y* = $p_s x_s + p_m x_m + w x_l$

As a consumer, the problem of house hold is to maximize utility subject to a budget constraint. Thus, the associated Lagrangian (Z) equation is:-

$Z = U(x_s, x_m, x_l) + \lambda[Y^* - (p_s x_s + p_m x_m + w x_l)]$ ---------- (2.4)

The first order condition linked with this utility maximization problem is:-

$$Z_{x_s} = \frac{\partial U}{\partial x_s} - \lambda p_s = 0$$

$$Z_{x_m} = \frac{\partial U}{\partial x_m} - \lambda p_m = 0$$

$$Z_{x_l} = \frac{\partial U}{\partial x_l} - \lambda p_l = 0$$

Z_λ = Y* - $(p_s x_s + p_m x_m + w x_l) = 0$

Therefore, the standard demand functions (X_i) for consumption are;

$X_i = X_i^* (p_s, p_m, w, g, Y^*(p_s, p_m, w, g))$ ---------- (2.5)

Where; $i = s, m, l$.

As conditional consumer theory, demand depends on prices and income. However, the farm household income is now influenced by its production too. The change in production ultimately change the consumption pattern of house hold.

Using the above equation (2.5), the comparative static result for the staple crop with respect to own-price is given as:-

$$\frac{dx_s}{dp_s} = \frac{\partial x_s}{\partial p_s}\Big/_{U=\bar{U}} + (Q - x_s)\frac{\partial x_s}{\partial Y^*} \text{ ---------- (2.6)}$$

The first partial effect on the right hand side is the pure substitution effect and is definitely negative. The second term on the right hand side is the income effect which can be broken into two parts. The profit effect which is resulted from an increase in income due to an increase in the own-price of the staple grain, influencing the farmer to grow a larger quantity of the good. In addition, as in conditional consumer theory, an increase in the own price effectively decreases the farmer‘s income allocated for consumption, thus decreasing the quantity of the staple good consumed. If the farmer‘s production exceeds his consumption (Q >x_s), then the net effect of an increase in the price of the staple good is to increase the farmer‘s income.

The marketed surplus (MS) is the quantity of a crop that a household has available to sell on the market, which is from the above model; MS = Q –x_s. According to the model, household can be characterized as:-

- Supply marketed surplus if $Q - x_s > 0$;
- Purchase for home if $Q - x_s < 0$;
- Self-sufficient if $Q - x_s = 0$ and house hold labor requirement decision can be:-
- Hire in labor force if $L - L_h < 0$;
- Hire out labor force if $L - L_h > 0$.

Since the production and work decision of household affect the level of income achieved, whether a household is a net seller or a net buyer of a commodity (food or labor) whose price has changed has vastly different consequences for its welfare. A higher price for a staple thus lowers the welfare

of a net purchaser of food while raising the welfare of a net seller, or farmers with a marketable surplus. On the other hand, for net sellers of labor, typically smallholders with little land and large families' labor, a higher wage raises welfare while lowering it for net buyers for whom it is a production cost. This disparity in position is principally determined by inequalities in access to productive assets and differential transactions costs in relating to markets.

As it was shown in empirical literature review section, one of the main determinants of farm household market participation was transaction cost. Depending on house hold capacity to response for such constrain, we can expect three possibilities, i.e. whether the household is a net buyer, net seller or self-sufficient and neutral to market as it was shown below:-

$$P_i = p_i^* - r_i(Z, A, G, Y) \; if \; Q_i > x_s(net\ seller) \text{ ---------- (2.7)}$$

$$P_i = p_i^* + r_i(Z, A, G, Y) \; if \; Q_i < x_s(net\ buyer) \text{ ---------- (2.8)}$$

$$P_i = p_i^* \qquad if \; Q_i = x_s(self\ sufficient) \text{ ---------- (2.9)}$$

Where; $\boldsymbol{p_i^*}\ is$ are market prices;

$\boldsymbol{r_i}\ is$ Transaction costs which are commodity-specific and determined by house hold characteristics such as distance to markets, number of family members, age and education of household head, etc.).

Z - implies assets owned by the household like land, animals,

A - is access to infrastructure provided by the government, it may include irrigation and extension services,

G -implies cash (liquidity) potential of the household.

The transaction cost therefore explains the existence of a notable market participation selection of production and consumption arrangements. Accordingly, the smallholder farmers may choose the level of market participation depending on the underlying cost-benefit structure.

2.2. Empirical Literature

The central aim of this section is to identify the socio-economic, institutional and household specific factors that affect market decision of farm house hold and the relation between variables and household decision through reviewing different related articles.

The analysis by Mather et al., (2011) examined, smallholder farmer heterogeneity and maize market participation in Southern and Eastern Africa. The double hurdle bivariate generalization of the Tobit model was applied to verify factors that determine market participation in Kenya, Mozambique and Zambia. According to this study the market participation was heterogeneous among these country and within different regions of countries. The outcome of the study show that in Kenya the decision to enter the market was positively determined by; use of fertilizer, age of household head, ownership and price, while in Mozambique total area planted, total assets owned, ownership of animal and distance to fertilizer dealer. On the other hand, in Zambia it was positively influenced by; size of land owned, use of fertilizer and planting hybrid seed, but negatively influenced by education level of household head, age of household head, distance to road and gender of the heads.

Using double hurdle econometric model, Efa et al (2016), indicated that family size, credit access, farm size, lagged market price, agro-ecology and transport equipment affect the market participation of teff supplier in Bacho and Dawo districts of Oromia region. Furthermore, access to nearest market, perception of farm gate price, family size, farm size, on/off farm income, agro-ecology and livestock ownership were found to be statistically significant factors determining the intensity of marketed surplus of teff producers. The analysis by Azeb et al. (2017) on factors determining smallholder teff farmers' market supply in Ambo district of West Shewa Zone, employed multiple linear regression model to verify the influence of explanatory variable on market supply. The result show that quantity of teff sold on the market; family labour force, income from nonfarm and market price of teff significantly affect the market decision of smallholder farmers.

Mohammed (2011), analyzed factors determining market supply of teff and wheat in Halaba special district in southern Ethiopia. By applying multiple linear regressions model, the author runs separate regression analysis for teff and wheat. The result show that among explanatory variables, sex of the household head, quantity of teff produced, access to market information and extension

service were statistically significant factors affecting teff market supply; on the other hand, price of other crops(pepper), quantity of wheat produced and credit access affect market supply of wheat. In the same manner, Tadele et al (2016) assessed determining factors of teff and wheat market supply in Dendi district of West Shewa Zone, in Ethiopia. He also used multiple linear regression model to verify the influence of explanatory variables on teff and wheat market supply in separate analysis. To him, increasing production and productivity of teff and wheat per unit area of land is better alternative to increase marketable surplus of teff and wheat. Most importantly, introduction of improved varieties, application of chemical fertilizers, using of modern technologies, controlling disease and pest practices should be promoted to increase output, then it lead increment in marketable supply.

The adoption of new agricultural technologies enables farmers to tackle poverty by increasing agricultural productivity and then by enabling to sell surplus which is the main source of farm income. The analysis by Tigist (2017), point out the impact of agricultural technologies on smallholders' output market participation in Ethiopia, by using endogenous treatment effect and sample selection models. The study found that, adoption of improved cereal crop varieties help farmers to produce marketable surplus crops. Although, this study prioritized improved technologies as the main bicycles for boosting rural households productivity and marketable surplus production, it also identified the influence of other factors like access to the market, infrastructure development, efficient input distribution mechanism, and provision of economic incentives like pricing have big role in smallholder market decision.

Agete (2014), assessed factors influencing red bean smallholder farmers in South Nation Nationality and people's regional state Halaba special district. The study used a Heckman two-stage model to analysis factors affecting market participation decision for red bean and extent of market participation decision. According to this study, the brokers are a major obstacle to red bean marketing in the district due to their confusing acts on farmers by giving wrong price information and makes farmers to earn less. The study found that the market participation decision of red bean producer was significantly determined by price, ownership of transportation means, number of extension visits per year, amount of red bean produced, awareness about quality standards; market information, family size, access to credit, and gender. The study recommended the policy intervention that creates good market networks, reliable market information system, strong

extension service, and training farmers on quality production of red bean can boost the market participation of smallholders.

The analysis by Masuku et al. (2001), identified the factors influencing the smallholder farmer's market decision to sell maize and choice of marketing chain in Swaziland using a logistic regression model. This study found that the maize marketing decision of small farmers in Swaziland was influenced by income from off-farm activities, past experience of farmers, access to market information, participation in agricultural schemes, family members without education and farm size and the choice of the maize marketing chain was determined by cost of transportation and farm size. He recommended the policies measures that would help farmers to co-operate themselves and their marketing activities to reduce transportation costs and increase the cultivable area have possibility to ensure efficient utilization of the formal markets and can improve farmers' income.

By applying Heckman two stage selection model, Nuri et al. (2016), analyzed the influencing factors of status and extent of market participation among kocho producers in Hadiya zone. The result discloses that the probability of house hold kocho market participation decision positively influenced by access to market information, availability of family labour, livestock holding, price of kocho and quantity of kocho while negatively affected by age of household head, sex of the household head and off farm incomes. On the other hand, the quantity of kocho output marketed positivity determined by availability of labour, livestock holding, price, quantity of kocho and inverse Mill's ratio, whereas, negatively impacted by age and sex of the household head.

2.3. Smallholder Teff Production; Marketing and Market Channels in Ethiopia

2.3.1. Teff Production in Ethiopia

In Ethiopia, crop production constituted on the average about `68% of agricultural GDP and smallholders generated about 95% of the total production of the main crops like cereals, pulses, oil seeds, vegetables, root crops, fruits and cash crops(Alemayehu et al, 2012). Teff is one of the leading crops for farm income and food security in Ethiopia. It accounts for the largest share of the cultivated area (28.5%) in 2013, followed by maize (20.3%) and the second in terms of quantity of output (Efa et al., 2016).

Efa et al. (2016) verified that, in Ethiopia Teff is primarily grown in Amhara and Oromia, with smaller quantities in the Tigray and SNNP regions. Accordingly, there are 46 zones and 9 special districts in the country in which production of teff is widely practiced. These include five zones in Tigray regions, ten zones and one special District in Amhara regions, seventeen zones in Oromia regions, three zones in Benishangul regions and eleven zones and eight special districts in SNNPR regions. However, more than 83 percent of the country's teff production comes from 19 zones found in Tigray, Amhara and Oromia regions. East Gojjam is the leading zone in teff production constituting more than 10 percent of the national annual teff production. There are also potential teff producing zones in Amhara (North Gonder, North Shewa and West Gojjam zones) and Oromia (West Shewa, East Shewa and South West Shewa zones) regions, which contribute five to ten percent of the national annual teff production (Efa et al., 2016). Table-2.1 below show the regional share of teff production and marketing in detail.

About two thirds of cereal production is consumed by the producing households themselves, with only just over 16% being supplied to the market(Tamru, 2013). According to Birara (2017), teff have relatively highest marketable surplus shares at 29% of total production. It is the country's second most important cash crop (preceded by coffee), generating almost 464 million USD income per year for local farmers (Efa et al., 2016).

Table 2.1 Regional share of teff production and marketing in Ethiopia for the year 2015/16

Region	**Area (ha) Production**		**For house hold consumption in %**	**For sale in %**	**For seed in %**	**For other in %**
	Output in quintal	Share (%)				
Tigray	1,899,259.53	4.2	69.04	15.14	12.43	3.4
Amhara	17,570,224.12	39.3	58.29	24.44	11.41	5.77
Oromia	22,156,257.67	49.6	54.86	27.07	14.59	3.48
SNNPRS	2,773,600.93	6.2	39.16	43.9	14.23	2.71
Benishangul	315,276.69	0.7	61.31	21.52	12.43	4.75
Total	**44,714,618.94**	100	-	-	-	-

Source: - Birara (2017)

2.3.2. Teff Marketing in Ethiopia

Teff is a commercial crop of Ethiopia mainly due to the fact that the high price it realizes and lack of alternative cash crops (like coffee, tea or cotton) in the major teff cultivating areas like Gojjam in Amhara and Shewa in Oromia regions (FAO, 2015). Teff originated and has been domesticated in Ethiopia since 4000 to 1000BC (Crymes, 2015). However, it is not known to the outside world until very recently. With increased globalization and labor migration, teff began to be exported to the Middle East, North America and Europe to satisfy the demand of Ethiopians abroad (Demeke. et al., 2013; FAO, 2015). In line with its nutritional properties of high fiber, calcium and iron continents its demand has been increasing in European and North American markets (FAO, 2015).

The marketable surplus of Teff depends on the annual use of improved agricultural technologies, weather condition suitable to Teff cultivation and availability of family or hired labor for ultimate agricultural activities (Engdawork, 2009). The price of teff has increased at a faster rate in recent years relative to other cereals (Birara, 2017).Therefore, small farmers growing teff have benefited in recent years, as the relative selling price of teff has increased.

2.3.3. Characteristics of Smallholder Farm Marketing

Making agricultural marketing right indicates markets in which buyers and sellers are well coordinated, transaction costs are low, contracts are enforceable, risks are manageable, exchange is impersonal, price volatility is dampened, transactions are liquid and highly responsive to shifts in supply and demand, and which ultimately benefit the rural poor(World bank, 2004). According to the World bank report, the Ethiopian agricultural market participants are exposed to greater risk due to high transaction costs linked with market distribution, which are passed on to consumers; and small markets which unable to stabilize itself in periods of either surplus or deficit; and also the market continues to be weakly integrated, both domestically and internationally. On the other hand, the private sector grain market participants are characterized weak or micro-enterprises agents with limited modern business administration skills, low capacity to take risk, and very small financial liquidity.

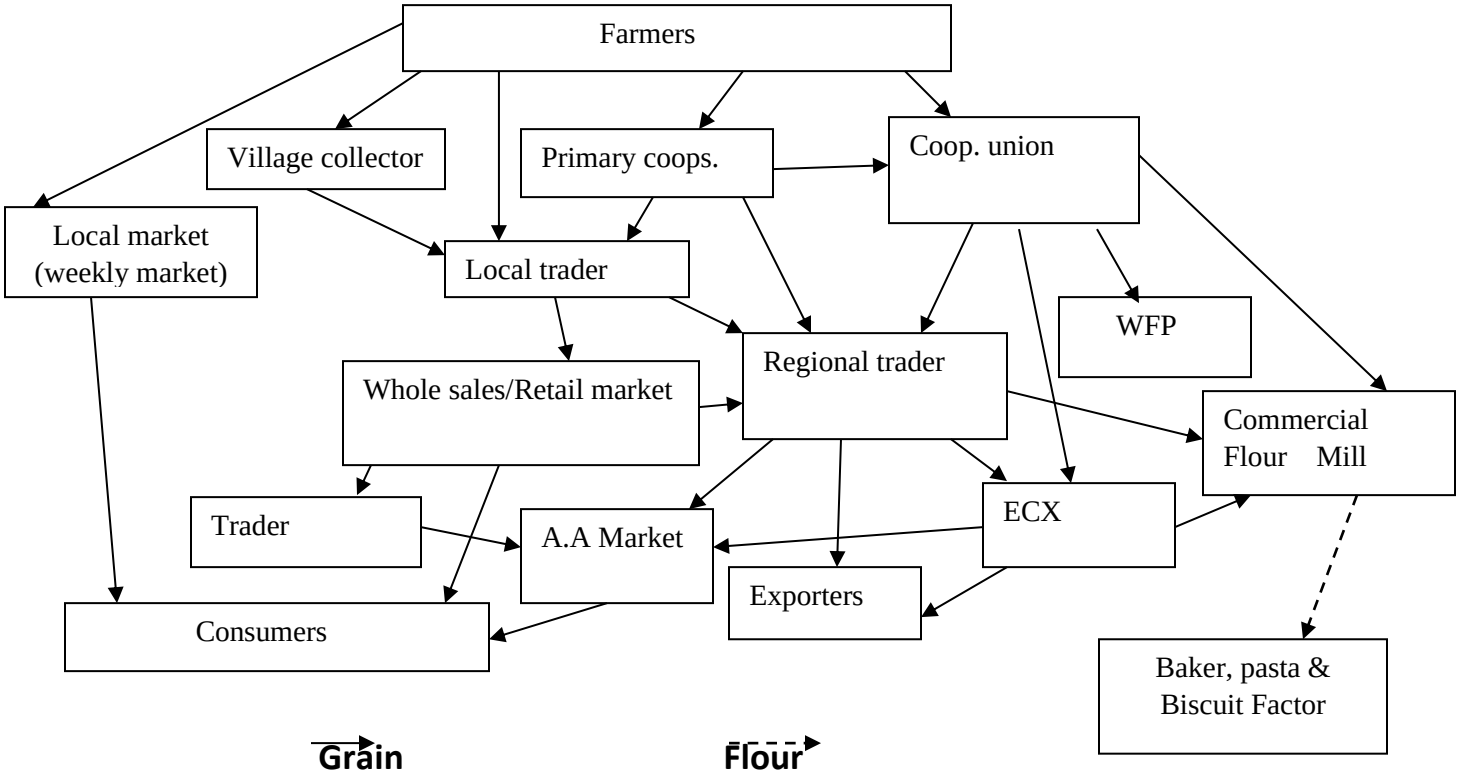
As result of their spatial dispersion ; weak asset base, lack of access to transport and due to weaker telecommunications, smallholder farmers are passive players in agricultural output and input market. On the other hand, marketing information system has a vital role in any level of market. In Ethiopia, small farmers and traders have a little information about the prices for their

produce other than their traditional trading points (World Bank, 2004). The report also shows that the limited access of public institutions that provide market information to the stakeholders and even the existing once are scarcely effective because their output is not timely, accurate and comprehensive. The marketing institutions often lack information on short and medium term marketable surplus and stock, which limits their ability to make reliable decision now and for future, and lead failure to make their marketing strategy accordingly. Lack of timely market information mechanism leads to higher risk in production and marketing and therefore to higher costs and margins than under conditions of full market transparency.

2.3.4. Smallholder Farm Market Channels

In Ethiopia the marketing channel for cereals consists of different marketing actors. The marketing actors include producers (farmers), cooperatives, cooperative unions, and collectors, assemblers, marketing agents and brokers, wholesalers, retailers, importers/exporters, Ethiopian Grain Trade Enterprise (EGTE), Ethiopian Commodity Exchange (ECX) and consumers (JICA, 2012). These marketing actors have different objectives (their own interest). Among these, wholesalers play important roles in the marketing channel. They purchase the surplus cereals from farmers, cooperatives, cooperative unions, traders (collectors) and wholesalers in the producing areas and supply them to Addis Ababa central markets and sometimes to the food deficit areas. Wholesalers in surplus producing areas tend to ship the cereals that local collectors purchased from farmers, cooperatives, cooperative unions, to the remote marketplaces. Wholesalers in food deficit areas tend to purchase the cereals from Addis Ababa and other main marketplaces and sell to the local retailers and consumers in deficit areas. Mostly, smallholder farmers sell surplus cereals such as maize and wheat to traders at weekly marketplaces, or to village traders. Although traders pay less for those cereals with low quality, they don’t increase prices even if quality is good due to lack of farmers marketing skill. The marketing channel flow of farm house hold was summarized in the following figure.

Figure 2.1. Marketing channel for Cereals and Pulses



Source: Japan International Cooperation Agency (JICA, 2012)

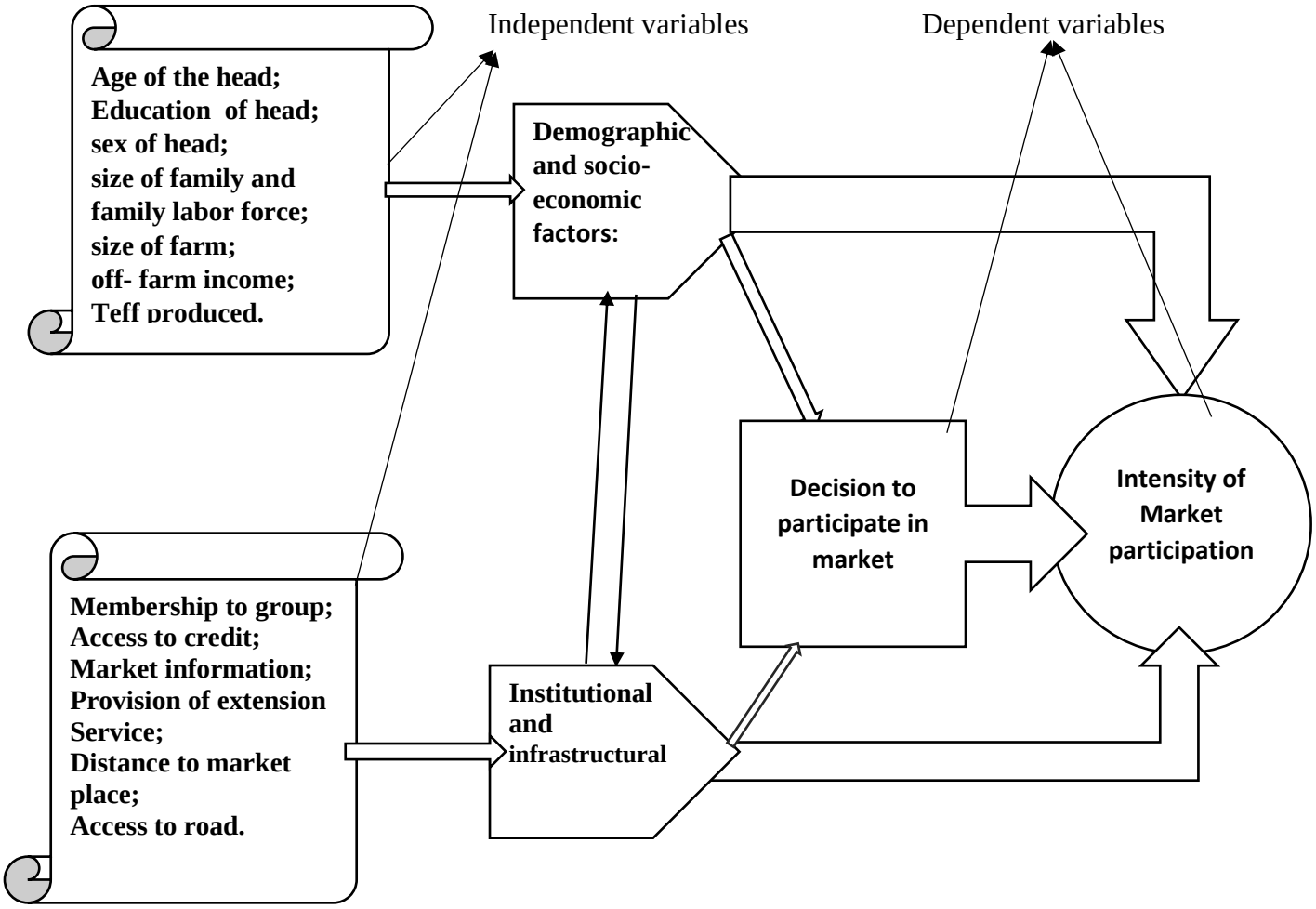
2.4. Conceptual Framework

The basis for this conceptual framework were the work of major authors cited in theoretical and empirical section of this study like Mather et al., (2011); Singh et al. (1986); Azeb et al. (2017); Tadele et al (2016); Masuku et al. (2001); Nuri et al. (2016) and Efa et al (2016). It was assumed that smallholder market participation decision and its intensity influenced by factors related to household and household head characteristics, market related factors, and institutional support service.

An examination of theoretical and empirical reviews provides insight information for conceptual frame work of the study. Demographic and socio-economic factors affecting market participation of farmers include gender, age of household head, education status, household size, and size of farm land hold, off-farm income of the household and availability of active family members.

On the other hand the institutional factors like membership to a producer group, access to extension services, access infrastructural factors like road conditions and storage facilities, and accessibility of credit service determine whether or not teff farmers participate in output markets. The study hypothesized that factors influencing the market participation decision in turn determine the degree of smallholder market participation after decision has been made. Figure 2.1 shows the conceptual framework of the demographic, socio-economic and institutional factors determining farm household level market participation and degree of marketing.

Figure 2.2. The conceptual framework of the study



2.5. Summary of Review

The literature reviewed in the fore-going sections shows that there are many factors that determine market participation decision and extent of participation of farm house hold. These factors can be summed-up to demographic and socio-economic factors including gender of farmer, age, education level, household size, farm size and off-farm income of the household and institutional factors like membership to a group, access to extension services, credit access; access to market information and infrastructural actors like road conditions and storage facilities can determine whether small farmers participate in crop markets or not.

Moreover, various model was applied by different authors' to analyze the effect of explanatory variable on dependent or probability of market participation decision. This study initiated to use the Heckman two-step model due to its ability to handle selection bias.

CHAPTER THREE

RESEARCH METHODOLOGY

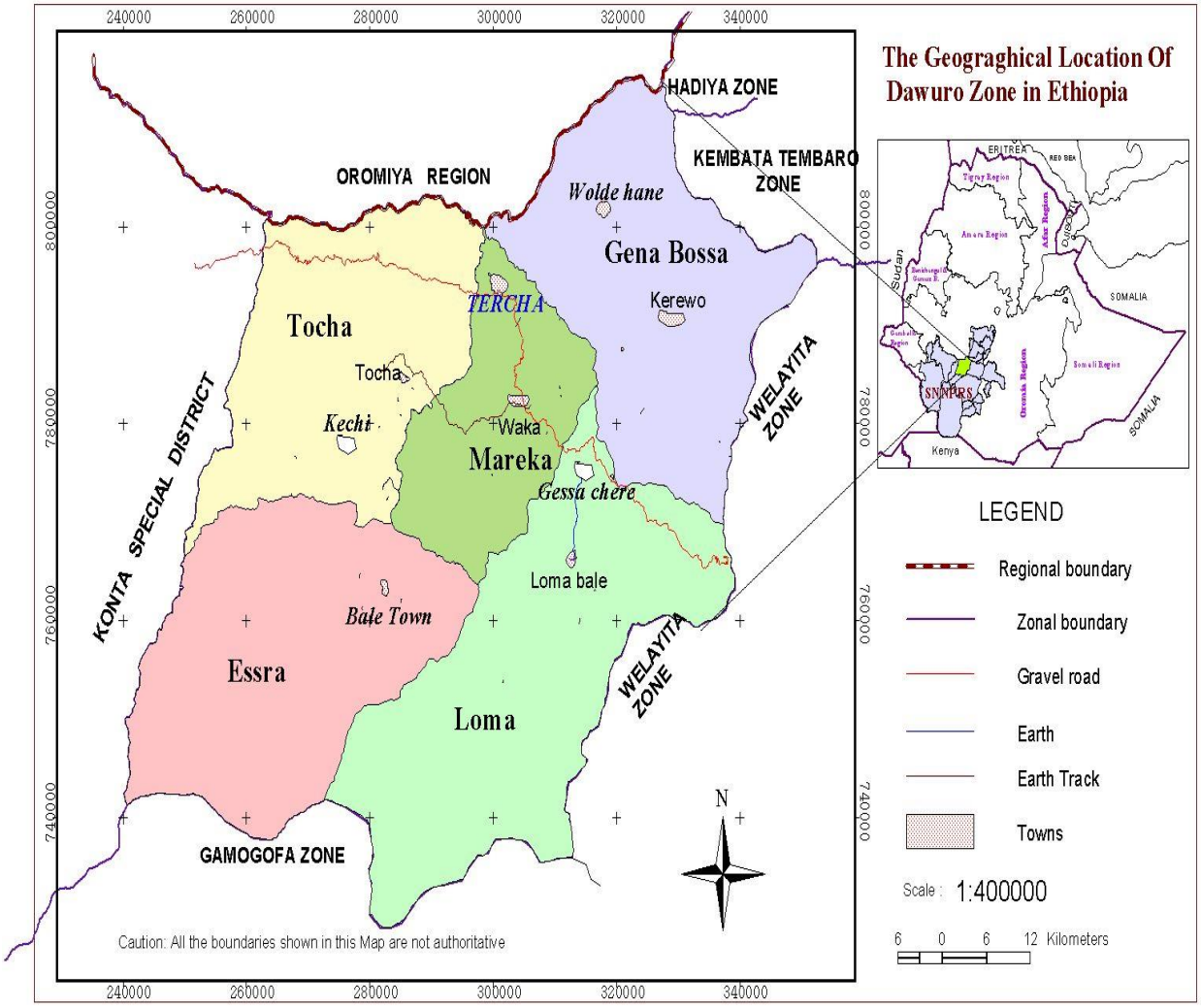
1.1. Descriptions of the Study Area

This study was take place in South nation, Nationality and people's regional state Gena-Bossa district of Dawro Zone. Dawro Zone is one of the fourteen Zones in South Nations, Nationalities, and Peoples' Regional state (SNNPR). Dawro zone lies in between 6^0 36' to $7^0$21' north latitudes and $36^0$68' to 37^0 52' east longitudes. The Gojeb and Omo Rivers circumscribe and demarcate Dawro from northwest to southwest in a clockwise direction. Dawro shares boundaries with Konta Special Wereda in west, Jimma in northwest, Hadiya and Kambata-Tambaro zones in northeast, Wolayita zone in east, and Gamo-Gofa zone in southeast. It has five Woreda and one Town Administration, namely Esera, Tocha, Mareka, Gena-Bossa, Loma, and Tarcha respectively. The political center of the zone is Tarcha, which is located in 486 km from south western of Addis Ababa through Jimma road, and 282 km from Hawassa.

Gena-Bossa is one of the districts of Dawro Zone, it is bordered on the south by Loma, on the west by Mareka, on the north by the Gojeb River which separates it from the Oromia Region, on the northeast by the Hadiya Zone and Kambata-Tambaro Zone, and on the east by the Wolayita Zone. The eastern and northeastern border of Gena-Bossa is marked by the Omo River. Towns in Gena-Bossa include Weldehane, Karawo (which is the administrative center of district). Based on the 2007 Census conducted by the CSA, this woreda has a total population of 115,648 of which 58,010 are male and the remaining 57,638 women and more than 95% of population are rural dwellers.

The climatic condition of the district divided in to thee including Dega, Woina-dega and kola. Agriculture is the predominant economic activity in the Gena-Bossa district. Crop and livestock production is the main household activities and the basis of subsistence in district. Rain fed mixed farming is practiced in all parts of the district i.e. livestock husbandry and crop production entirely practiced and irrigation (flood) farming practiced in very few area. Due to agricultural dependence on rain water, many crops are planted during rainy seasons (meher). The dominant cereal crops like maize, teff and wheat produced in meher season and collected from October to December. Major crops produced in the area include maize, teff, wheat, barley, sorghum, pulses, enset etc.

Figure-3.1. The Location of Gena-Bossa district in Ethiopia



Source: - Dawro zone finance and economic development department

The sales of some food grains and livestock are the main sources of the household cash income, supplemented by seasonal coffee and honey sale which occurs at least once in a year. Regarding marketing, farmers bring cereals by donkey, horse or cart to the nearest marketplaces and collection points. As farmers have no warehouse for storage, they sell the surplus cereals at the market shortly after threshing. The major selling area is main local marketplaces such as Weldhane; Duga; Karawo; Angela and the like local site. In the areas with good road conditions, traders collect cereals from local markets and collection points and bring them to out of the zone.

Many of the farm house hold affected by income poverty due to low farm productivity and poor market access.

3.2. Sampling Technique and Sample Size Determination

3.2.1. Sampling Technique

The total number of farm household population size of the district is around 23,372 of which 21,322 are male-headed and the rest 2050 are female headed households. To select sample respondents for this study, two stage stratified sampling technique was employed. In the first stage, using purposeful sampling technique four kebeles such as Dilamo, Baza-Koysa, Wozo-Hylata and Denba-Gena are selected from 36 kebeles based on their better cultivation and marketing of teff crops. Next, the list of household heads was obtained from kebele administrative body and then following a systematic random sampling technique, the researcher select 190 sample households from four sample kebele.

3.2.2. The Common Characteristics of the Sample Sub-Site Farm Household

The selection of these kebeles for conducting this study was based on similarity in market accessibility and the same agro-ecological set-up that result in cultivation of similar agricultural crop mainly cereal and livestock breading. Agriculture is the main occupation of their live. In the sample areas, there are two cropping seasons of belg and meher. They have belg cropping season with very short rainy period whereas meher season is the long rainy period. Farmers depend on meher season for rain-fed crop production. The main crops grown in the study area are teff, wheat and maize and they also cultivate beans, peas and enset. Among the cereal crop, teff is dominantly cultivated and referred as the main occupation of household in area and the primary source of food gain to Tarcha town through local merchants. Since agriculture depends on rain water, many crops are planted during rainy seasons. In belg all the crops are cultivated, usually maize and sorghum is sown, starting from late February and March. Teff is cultivated May to August and collected from October to November in all sample kebele. Agriculture is both source of food item and family income in study area. The sale of gain is the main source of the household income followed by sale of cattle's.

Even though, the live of the farmer in area based on cropping for family food item and income, their market participation mechanism is very weak and back ward. Most of time they use enset products and some portion of other crop to house consumption and sale the remaining to market.

When we see their marketing, they bring cereals by donkey, horse or carry to the nearest market places and collectors points. They sell the crops as soon as collected at the market shortly after threshing. The major selling area is main local marketplaces. Their commonly known local market place is "Sunday" market in Weldhane town, which is the big market by itself. Sometimes the local traders come up to home and they sale to them without any market information of the time. In all their marketing process they do not get the real benefits due to lack of market skill. As result their life situation like stagnant one time to time. To change this situation it needs external pushing factors such as local government, farm cooperative and other governmental and nongovernmental agents that stand for poor. Due to this reason this study selected this site as the main concern and the data was collected from them with structured questioner.

3.2.3. Sample Size Determination

The Samples for this study distinguished according to the formula for sample size determination for finite population given by Kothari (2004) as shown below;

$$n = \frac{z^2.p.q.N}{e^2(N-1)+ Z^2.p.q} \text{---------- (3.1)}$$

Where:-

- n stands for estimated sample size,
- e is the allowable error;
- N number of population under the study;
- p = sample proportion of successes;
- q = 1 – p;
- z = standard variate for given confidence level (as per normal curve area). It is 1.96 for a 95% confidence level.

Assuming confidence level 95.5%; N=3240; e = 0.02; z =2.05; p = 0.02 and q = 1-0.02 we can have the following:-

$$n = \frac{(2.05)^2 \times 0.02 \times (1-0.02) \times 3240}{(0.02)^2 \times (3240-1) + (2.05)^2 0.02 \times (1-0.02)} = \frac{266.875}{1.3779} \cong 193$$

Hence, 193 respondents rounded off to 190 to enable the distribution of the sample in to five selected kebele. Based on the size of farm household in each kebele these 190 potential respondent segregated in to four sampled area.

Table 3.1. The list of selected Kebeles and Sample size in each study site

Selected site	No. of household in kebele			Sampled respondent
	M	F	Total	
Dilamo	308	22	330	50
Baza-Koysa	379	23	402	60
Wozo-Hylata	222	30	252	38
Denba-Gena	264	14	278	42
	1173	89	1262	190

Source: survey data (2018)

3.3. Methods of Data Analysis

3.3.1. Descriptive Statistics

In this study the descriptive statistics such as mean, standard deviation, percentages, frequency, t-test, Chi-square and graphs were used in analyzing the data. Descriptive statistics are important tools to present research results clearly and concisely. For example it enabled to compare and contrast teff output market participants and non-participants with respect to the desired characteristics so as to draw some important conclusions.

3.3.2. Econometric Model Specification

It was assumed that smallholder farmers who cultivate teff may or may not participate in output marketing, that is, may sale or not sale. Therefore, the dependent variable in this model is discrete consisting of two outcomes, yes or no. In this case, the use of Ordinary Least Square/OLS technique for such variables poses inference problems, and thus not appropriate for investigating dichotomous or limited dependent variables. In such circumstances, maximum likelihood estimation procedures such as logit or probit models are generally more efficient (Gujarati, 1995). However, it is conceivable to use Heckman's (1979) two step procedure in case of anticipated problem of selection bias in the sample. Selection bias was anticipated in this study because among the representative not all households are believed to participate in output market.

The Heckman two-step selection model allows for separation between the initial decision to participate in market ($Y > 0\ versus\ Y \leq 0$)and the intensity of their participation in teff output market. The model uses in the first step a probit regression to assess the probability of participation

and in the second step uses ordinary least squares (OLS) to determine the intensity of market participation (Green, 2007) and the method correct sample selection bias.

This technique used in order to control the selectivity bias and endogeneity problem and to obtain consistent and unbiased parameter estimates (Green, 2007). In selection model procedure, sample bias is determined by the relationship between the residuals of the two stages (stage 1 and stage 2). Estimates are biased if the residuals in the stage 1 and 2 are correlated. Similarly, Stage 1 does not affect stage 2 results if the residuals are unrelated. Positive and negative correlations between residuals are indicated respectively, by positive and negative mu (μ) values, which is the correlation between error terms of two regression model.

The first stage heckman two step or the probit model that analyze the factors determining the probability of market participation decision specified as:

$$pr(Y_{1i} = 1/x_{1i}, \beta_{1i}) = \Phi\big(f(x_{1i}, \beta_{1i})\big) + \varepsilon_i \quad \text{---------- (3.2)}$$

Where;Y_{1i} is an indicator variable that is equal to unity for teff market participant households; Φ is the standard normal cumulative distribution function; x_{1i} is variable that affect market participation decision and was described in table 3.2; β_{1i} is a coefficient to be estimated. The variable Y_{1i} takes the value 1 if the house hold participate in teff market and zero otherwise.

This can be shown mathematically:-

$$Y_{1i}^{*} = \beta_0 + \beta_{1i}X_{1i} + \varepsilon_i \quad \text{---------- (3.3)}$$

Where; i = 1, 2, 3…….n

$$Y_{1i} = \begin{cases} 1 \;\; if \; Y_{1i}^{*} > 0 \\ 0 \; if \; Y_{1i}^{*} \leq 0 \end{cases} \quad \text{---------- (3.4)}$$

Y_{1i}^{*} is a latent variable of marginal utility the farmer's get from participation in teff market,

β_0 is Constant term,

ε_i is error terms in the first stage model assumed to be normally distributed with zero mean and constant variance (σ^2).

In the second stage parameters can consistently be estimated by OLS by incorporating an estimate of the inverse Mills ratios denoted as λ_i from probit regression model as additional explanatory variable as specified bellow:-

$$Y_{2i} = \alpha_0 + \alpha_i X_{2i} + \mu_i \lambda_i + v_i \text{---------- (3.5)}$$

Y_{2i} - is the quantity of teff supplied to market,

X_{2i} - implies the control variables influencing the quantity marketed shown in table 3.2,

α_0- is the Constant term in OLS regression model,

α_i- is the Parameters to be estimated in the second stage,

λ_i- is the inverse mills ratio computed from first stage estimation,

μ_i- implies the Correlation between first and second stage error terms or corr (ε_i,v_i),

v_i- is the error terms in the second stage.

The additional variable λ_i in the second model is the inverse Mills ratio (IMR). According to Heckman (1979), the IMR is a variable for controlling bias due to sample selection. This term is constructed using the model in the probit regression (first stage) and then incorporate into the model of the second stage (OLS) as an independent variable.

It can obtained:-

$$\lambda_i = \frac{\phi(\beta_0 + \beta_{1i} X_{1i})}{\Phi(\beta_0 + \beta_{1i} X_{1i})} \text{---------- (3.6)}$$

Where, $\phi(.)$denotes the standard normal probability density function and $\Phi(.)$ denotes the cumulative distribution function for a standard normal random variable.

But the value of λ_i is not known, the parameters β_0 and β_{1i} can be estimated using a probit model, based on the observed binary result. Then the estimated IMR calculated as:-

$$\widehat{\lambda_i} = \frac{\phi(\widehat{\beta_0} + \widehat{\beta_{1i}} X_{1i})}{\Phi(\widehat{\beta_0} + \widehat{\beta_{1i}} X_{1i})} \text{---------- (3.7)}$$

3.3.3. Diagnostic Test

To have efficient and consistent outcome, all the hypothesized explanatory variables were checked for the existence of statistical problems such as multicollinearity, heteroscedasticity problems and normality distribution.

3.3.3.1. Test for Multicollinearity

This kind of problems may arise due to a linear relationship among explanatory variables and it might cause the estimated regression coefficients to have wrong signs, smaller t-ratios for many of the variables in the regression and wrongly high R^2 value. Hence, it may be difficult to estimate accurately the effect of each variable with presence of multicollinearity (Gujarati, 2004; Woodridge, 2002).

There are different methods suggested to detect the existence of multicollinearity problem between the explanatory variables. Among different mechanisms of testing for multicollinearity, this study choice the variance - inflating factor (VIF) techniques due to its effectiveness to check the problems. The VIF shows how the variance of an estimator is inflated by the presence of multicollinearity (Gujarati, 2004).

VIF for individual explanatory variable (Xi) mathematically can be expressed as;

$$VIF = \frac{1}{1-R^2} \text{----------} (3.8)$$

Where; R^2 is the coefficient of correlation among explanatory variables. The larger the value of VIF indicates the more co-linearity among independent variables (Gujarat-2004). In addition, multicollinearity was also tested both for continuous and dummy variables using a Pearson correlation matrix. Accordingly, the presence of cross entry value greater than 75 percent indicates presence of multicollinearity on the data set (Gujarat-2004).

3.3.3.2. Test for Heteroscedasticity

Heteroscedasticity refers to the absence of constant variance of each disturbance term or conditional on the chosen value of the explanatory variables. If it present in the data the estimates cannot be the Best Linear Unbiased Estimates (BLUE) (Gujarati, 2007). The data were tested for heteroscedasticity using the Breusch-Pagan test using STATA software (Wooldridge, 2012). The Breusch-Pagan test evaluates the null hypothesis of a constant variance in the data.

In addition the normality distribution of our data set were tested using nonparametric density estimation (kernel density).

3.3.4. Definition, Hypotheses and Justification of explanatory Variables

One of the important parts in this section is to specify and hypothesize the dependent and explanatory (independent) variables that was used in the model. Regarding to its definition, Measurement and Hypotheses of Variables, which was used in our model, summarized in the following table.

Table-3.2 Explanation of hypothesized Effect of Explanatory Variable on Market Participation and intensity

Dependent variable	Nature of variable	Variable definition and measurement	Expected effect
Teff market participation decision	Binary	1 if household participate in market, o otherwise.	
Quantity of teff marketed	Continuous	Teff output in kg	
Independent variable			
Age of the farm household head	Continuous	Age of the household head in year	-/+
Farm size	Continuous	Farm land size in hectare	+
household labor	Continuous	household labor force or number of family in working age	+
size of family	Continuous	number of family members	-
Quantity of teff produced	Continuous	Teff yield in kilogram	+
Distance to the market	Continuous	Distance from selected farm household to the market place in Km	-
sex of farm head	Dummy	sex of farm household head (if female=1, 0, otherwise)	-
educational status of the household head	Dummy	Educational status of the household head (0 illiterate, 1 below 6, 2 if 7 to 12 and 4 diploma and above)	+
participation in nonfarm activity	Dummy	participation in nonfarm activity(if have =1,0, otherwise)	-/+
Road condition	Dummy	Road condition to the market place (if Good=1, 0, Otherwise)	+
Membership of cooperative	Dummy	Households membership to cooperative (if member Yes=1,0 Otherwise)	+
Access to extension	Dummy	Access to extension agent support (if have access Yes=1, 0 Otherwise)	+
use of credit	Dummy	use of credit (having access=1, 0, otherwise)	+
access to information	Dummy	access to market information (having inf. =1, 0, otherwise)	+

Source: Authors Hypothesis (2018)

Rationales for inclusion of explanatory variables

In Heckman selection model procedure, the household first makes a separate decision on whether or not to participate in the teff market. In this case, the first stage dependent variable, Y, is binary in the sense that the household either participates (Y=1) or does not participate (Y=0) (see equation 3.2). In the second stage, an OLS was used to evaluate the factors that influence the quantity of teff supplied to the market once the farmer has decided to participate in the market and the dependent variable in this case is amount of teff supplied to market in kilo gram (see equation 3.5).

On the other hand, continuous and dummy independent variables of importance in this study are those variables, which are assumed to have influence on smallholder farm household market participation. These includes demographic, socio-economic and institutional factors as defined follows;

- **Farm size:** Land is one of the primary input for crop and the key asset for farmers everywhere. Thus, any kind of decision made by farm household is basically and highly influenced by size of their land holding. Basically, in our case the decision to participate in crop market is mainly influenced by farmers land holding size, because the surplus crop production and other staples crops mainly depend on such basic resources. Thus, we expect that a household who holds a greater farm land are more likely to participate in crop market and supply more compared to low holder.
- **Sex of household head**: - This is a qualitative/discrete variable that takes a value of "1" if the household head is female and "0", otherwise. In this study, it is assumed that male household heads have more exposure and access to information and new innovations than female household heads, which might enable them to participate in crop market. Thus, in this study female household head is taken as a disadvantageous and expected to less participation chance than male household heads.
- **Educational level of household head: -** Generally it is recognized that education enables individuals with the necessary knowledge of how to make living decision. Thus, in this study, it is believed that those who are literate and have at least some formal education chance are better to make the marketing decision than those of illiterate.
- **Access to extension visit: -** This variable is a dummy variable to proxy the contact condition of farmer's and the extension experts. Farmers who have good contact access 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). Therefore, in this study, the farmers who have good contact with extension workers will expected to have a positive relationship with teff market participation decision.

- **Size of family labor: -** Is a continuous variable referring to number of farm household family labor force or family member in working age. The presence of active working family member expected to positively affect the household marketing decision compared to those of with less labor force. This is because agricultural production in general and teff cropping in particular needs strong labor force in all process of cultivation and even bringing to market center.
- **Amount of teff crop produced: -** This is a continuous variable represent the annual yield of teff crop produced in 2017/2018 cropping season. It represents the amount of teff produced by each household in the specified production year measured in kilogram. The quantity of teff production was hypothesized to have a positive effect on market participation decision and extent of participation. Agete (2014), found that output of red bean had a positive effect on the quantity supplied to the market in Halaba special districts.
- **Access to Credit**: - This is a discrete variable that takes value 1 if farmers have access to credit service and 0 otherwise. Due to the reason that production of any cereal crop requires capital as much as possible which is lacking by smallholder farmers, we expect that this variable positively determine smallholder farmers' decision to produce and market teff.
- **Family size: -** This is considered as a continuous variable and measured by number of family member. This variable could be serving as a proxy for member of family who consume from crop production. Thus, this variable is expected to adversely affect farmers' decisions to participate in teff market participation decision.
- **Age of the household head: -** This variable is measured in years as a continuous determinant factor. Mathenge et al. (2010) assessed that the age of the household head had a positive and significant effect on market participation of disfavored and marginalized poor smallholders farm house holds of Kenya. This is due to the reason that older farmers have more experience than young farmers in making decisions for market participation compared to younger headed farmers. On the other side, Abafita et.al (2015), analyzed the negative association between age and market participation of smallholder in Ethiopia. For them, Younger households are more likely to participate in selling than older one and they are also more

likely to supply marketable surplus. Thus, in this study the expected effect of age on market participation decision indeterminate.

- **Household's participation on off-farm activities: -** This is a discrete variable indicating that presence of off-farm income access to farmer's household. In this study it is generally assumed that if farmers have access to other alternative works to farm income sources, they are less likely to participate in crop production and marketing. Because crop production requires full scarification of household labor and time to both for house consumption and marketing surplus production. On the other hand, presence of optional income source enable farmers to purchase inputs and new technology of production possible to increase their production and productivity which in turn increase marketable surplus. Thus, the hypothesized sign of participation on other income source is indeterminate.
- **Households' membership status to cooperatives: -** This is dummy variables which refers to whether farmers enables to be members of the local farmer's cooperative or not. It is assumed that, cooperatives have a number of contributions for smallholder poor farmers in small economy. For instance, cooperative institution distributes necessary inputs, provide market information and even buy their produce at better prices. Thus, in this study, it will be believed those farmers who are members of local cooperative more likely to participate in cereal crop markets compared to those who are not members.
- **Distance to the nearest market place: -** It is a quantitative variable represented by distance in kilometer (km) from home to the nearest market place. Nearness to market centers initiate farmers to produce market-oriented crops through making easy access to inputs and market related accesses such as transportation and price information and enable to market crops simply. Therefore, it is expected that household who lives nearer to market center have better chance to participate in cereal crop production and marketing than that of distant one.
- **Access to market information: -** This is a qualitative variable taking value 1 if farmers have access to information, and 0 otherwise. It is an important variable in any kind of marketing because price information highly influences the commodity prices, and has a significant impact on income earned. Therefore, it is expected that access to information positively affects the market participation of smallholder farm house hold decision.

CHAPTER FOUR

RESULTS AND DISCUSSION

4. Overview

This chapter discusses quantitative and qualitative data that was collected from selected respondents through structured questionnaires in order to analysis the determinants of teff farmers' market participation decision and its extent in Gena-Bossa district. In the first section descriptive statistics of the demographic and socioeconomic characteristics of the sampled households were shown, followed by econometric analyses of the factors determining the market participation decision of smallholder farming households.

4.1. Descriptive Analysis

4.1.1. Demographic and Socio-Economic Characteristics of Teff producer Household

4.1.1.1. Demographic Characteristics of teff Producer Household

This study was Proceed on total sample size of 190 teff producer farm house holds in Gena-Bossa district. Out of these interviewed farmers, 143(75%) participated in teff output market, while the remaining 47 (25%) was not joined teff output in survey time.

Table 4.1 presents summary statistics of sampled household's demographic features by segregating participant; non-participants and pooled survey data. The t-test statistics show that, there was no statistical significant difference between market participant and non-participant in age of household head and family size distribution. However, there was a statistical difference between teff market participants and non-participants in family labor force at 5% level. This illustrates the importance of family labor force whether the household to participate or not to participate in teff market.

The mean age of the sample household head is 47.21 with the minimum of 26 and the maximum 82 years. The average household age of participants in teff output market is 47.24 and non-participants is 47.1 years. The average household size of the total survey household was 7.45 persons, with minimum of 3 and maximum of 13 family members. The mean family size of the market participant household was 7.4 persons, with minimum of 3 and maximum of 13, whereas non-participants have 7.6 average persons with 4 and 13 minimum and maximum of family members respectively (table 4.1).

Table 4.1: Demographic characteristics of Teff farmers

Variables	Participant (OBS=143)			non- participant (OBS=47)			total survey (OBS=190)			t-value
	Mean	Min.	Max.	Mean	Min	Max.	Mean	Min.	Max.	
Age of HH	47.24	26	82	47.1	28	75	47.21	26	82	0.0685
Size of family	7.4	3	13	7.6	4	13	7.45	3	13	-0.4889
Size of active family member	3.5	1	8	3.02	2	10	3.4	1	10	2.0869**

***, ** and * imply statistically significant at 1, 5 and 10% respectively.

Source: Own survey data (2018)

The active family member is about family labor who can participate in teff production and marketing. According to data in table 4.1 on average there were 3.4 active family members for survey house hold with minimum of 1 person per family to maximum of 10 labor force per family. The market participant household have 3.5; 1; and 8, average, minimum and maximum family labor force respectively, non-participant on the other hand, have 3.02; 1; and 10 average, minimum and maximum family labor force respectively. On average, the market participant have better access to labor force relative to non- participant. This is also one of indication for the positive influence of labor force on farmers' market participation.

4.1.1.2. Educational Status of the Household Head

Table 4.2 illustrates, the education status of household heads of survey area. Accordingly, about 60 percent of the sample household heads were found to be illiterate; 34.74% below grade sixth; 4.21% were grade 7 to 12 and only 1.05% have diploma and above educational level.

There was a statistically significant difference between teff market participant and non-participant concerning education status of family head at 1% level of significance. When education level of market participant compared to that of non-participant; 48.95% of participants are illiterate; while about 93.62% of non-participants are uneducated. About 44.06 participants household heads have attained below grade 6; whereas only 6.38% of non-participant's household heads have this grade level.

Table 4.2 Educational status of the head

Education level of house hold head	Participant		non- participant		total survey		t-value
	Frequency	Percent	frequency	Percent	Frequency	percent	
Illiterate	70	48.95	44	93.62	114	60	5.3550***
below 6	63	44.06	3	6.38	66	34.74	
7 to 12	8	5.59	-	-	8	4.21	
diploma and above	2	1.4	-	-	2	1.05	
Total	143	100	47	100	190	100	

***, ** and * imply statistically significant at 1, 5 and 10% respectively.

Source: Own survey data (2018)

On the other hand, no one of non-participant attained above grade 7, but among teff market participant; 5.59% have grade 7 to 12 and 1.4% have diploma and above education status. This shows the positive linkage between education level of head of family and household market participation. It is factual because education capacitate head of house hold to grasp timely market information and enable to apply improved production and marketing strategy.

4.1.1.3. Sex of the Household Head

Out of 190 sampled teff farm households, 35(18.4%) are female headed and the remaining 155(81.6%) were male headed households. When we recognize the comparison by market participation; out of the 143 participant households 11.89 percent are headed by females and the analogous figure for non-participants is about 38.3% percent headed by females.

Table 4.3 Sex of the Household Head

Sex of HH	Participant		non- participant		total survey	
	Frequency	Percent	Frequency	Percent	Frequency	percent
Male	126	88.11	29	61.7	155	81.58
Female	17	11.89	18	38.3	35	18.42
Total	143	100	47	100	190	100

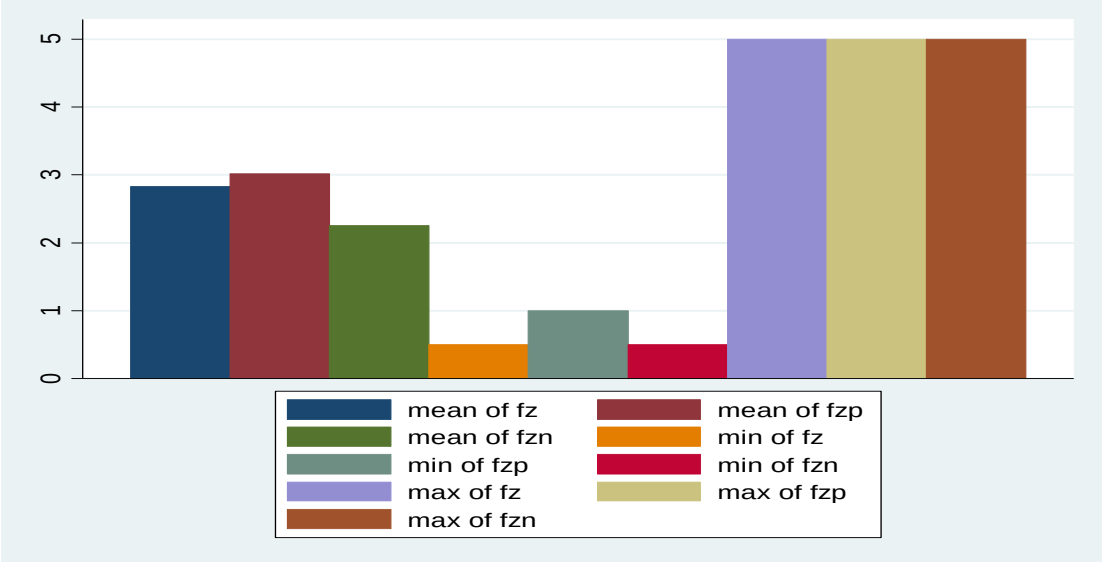
Source: Own survey data (2018)

According to Table 4.3, the larger proportion of the sampled household were a male headed. However, the percent share of female headed household is relatively greater in non-participant than market participants' family. This result realizes the vulnerability of females for the problems like lack of market information, credit service and education access that believed to limit the probability of market participation among poor farmers.

4.1.1.4. Land Holdings of Household

The survey data reveals that almost all of the respondent have their own land, irrespective of the land size they hold. The average landholding size is computed to be approximately 2.85 hectares and the minimum and maximum holding size per household is 0.5 and 5 hectares of land respectively (see figure 4.1).

Figure 4.1. Land size holding of household



Where; fz – implies land size of total survey household; fzp – farm size of market participant and fzn – is farm size for non-participant.

Source: Own survey data (2018)

Teff market participant and non-participant have statistically different land holding at significance level of 1 %(P = 0.0001 and t = 3.8450). The average land size owned by teff market participant and non-participants was found to be 3.01 and 2.25 hectors respectively. The minimum and maximum land size owned by participant was 1 and 5 hectors; whereas non-participants have 0.5

and 5 hectors of land respectively. The result shows that wide land holding create better opportunity for household to participate in crop market.

4.1.2. Income Sources of Household's

The farming activity were the main source of income and livelihood in study area (crop production and livestock rearing). As the result of chi-square, there was no statistically significant difference between teff market participant and non-participant in accessing off-farm income in study area. According to survey data (table 4.4) about 21.58% of interviewee have off-farm activity option but it was not the main occupation. The remaining 78.42% of respondent based their life on farming activity. Among teff output market participant 22.38% have off-farm activity participation whereas, 19.15% of non-participant have off-farm engagement. Petty trading and unstructured labor activities were found to be the major off-farm activities in which sample households were involved to earn additional income. These who participate in off-farm activity practice in dry seasons in which the main agricultural activity was not commenced.

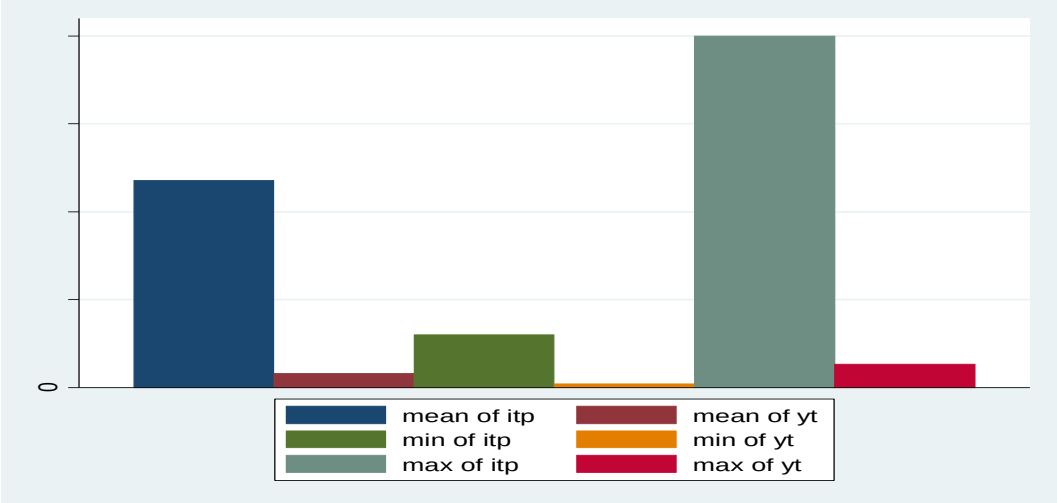
Table 4.4 off- farm activity participation in household

Non-farm activity	Participant		non- participant		total survey		chi2(1)
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Participate	32	22.38	9	19.15	41	21.58	0.0679
Not-participate	111	77.62	38	80.85	149	78.42	
Total	143	100	47	100	190	100	

Source: Own survey data (2018)

Rain fed mixed farming is the predominant source of income in study area. Major crops produced in the area include teff, maize, barley, sorghum, and horticulture like abakado, mango and banana has been practiced. Among the crops, sale of teff and horticultures are the dominant source of family income. Figure 4.2 below shows the income received and quantity of teff output supplied by survey household for the year 2017/2018.

Figure 4.2 Income from sale of teff and quantity of teff supplied for the year 2017/2018.



Source: own survey data (2018)

Where; itp – income from sale of teff; yt- quantity of output in kg; min – minimum income and max implies maximum incomes received from sale of teff. The average income received by participant household from sale of teff in 2017/2018 years was birr 2358 and the average output level sold was 161kg. In the same period minimum income received by sale of teff was birr 600 and maximum birr 4000 with sale of 40kg/266kg minimum and maximum output respectively.

4.1.3. Access to Institutional Services

Through adopting new production technology and innovation, availability of agricultural extension service is expected to positively influence the production and market participation of farmers. Table 4.5 illustrates that out of the total interviewee of teff supplier households, around 89.5% had access to extension services provided by development agents of the kebele Office of Agriculture and Rural Development. In comparing the market participant and non-participant, out of market participant 90.91% have access to extension, whereas 85.11% of non-participant receive the service. But, only 9.09% participant and 14.89% of non-participant have no on time access to extension. It can be noted that in this study availability of extension service is not the problem, but the efficiency and effectiveness of the extension service needs further study.

Table 4.5 Different service accessibility to household

Variables		Participant (OBS=143)		non- participant (OBS=47)		total survey (OBS=190)	
		Frequency	Percent	Frequency	percent	Frequency	percent
Have access to extension	Yes	130	90.91	40	85.11	170	89.47
	No	13	9.09	7	14.89	20	10.53
Have access to credit	Yes	52	36.36	5	10.64	57	30
	No	91	63.64	42	89.36	133	70
Have member to cooperative	Yes	47	32.87	7	14.89	54	28.42
	No	96	67.13	40	85.11	136	71.58

Source: Own survey data (2018)

Accessibility of credit enables farmers' to purchase inputs such as improved seed and fertilizer which improve small farmer's productivity. Farmers with access to credit can minimize their cash constraints and buy inputs more eagerly than those with no access to credit. Thus, it is expected that access to credit increase the production of crops then by allow to supply marketable surplus. In study area, credit service was delivered to farmers through the woreda Omo micro finance (OMF) branch office with facilitation of rural development office. In this regard, farmers' cooperative have big role in building capacity of farmers how to manage resource and outsource credit through small credit and saving enterprise.

According to table 4.5, 36.36% of teff market supplier and only 10.64% of non-suppliers have access to credit while the remaining majority 63.64% of participant and 89.36% of non-participants have no opportunity to receive credit. Out of total respondents only 30% obtain credit but the remaining 70% have no chance. The main reason for most farmers not participating in credit was limited supply of credit, bureaucracy, gap of knowledge of farmers and high interest payment especially linked to credit from OMF. Thus, the accessibility of credit was limited and it is not affordable for the farmers in study area. The table also show the survey household membership to cooperative. Accordingly.32.87% of market participant and 14.89% of non-participants are replied as they have membership in cooperative. The remaining large portion; 67.13% of participant and 85.11% of non-participants have no access to cooperative.

The availability of market information reduce risks and uncertainties in decision making related to output market and enable farm households to make the right decision. According to Table 4.6, only 24.74% of survey house hold have access to price information, while more than 75% of respondents' sale their crop whatever price they face. About 32% of market participant sale their output in predetermined market price whereas, only 2.13% of non-participant have access to price information. This reveals the positive effect of availability of market information on small farmer crop market decision and the government and any other concerned body needed to capacitate the farmer in way of affording reliable market or price information.

Table 4.6 Accessibility of road and information to household

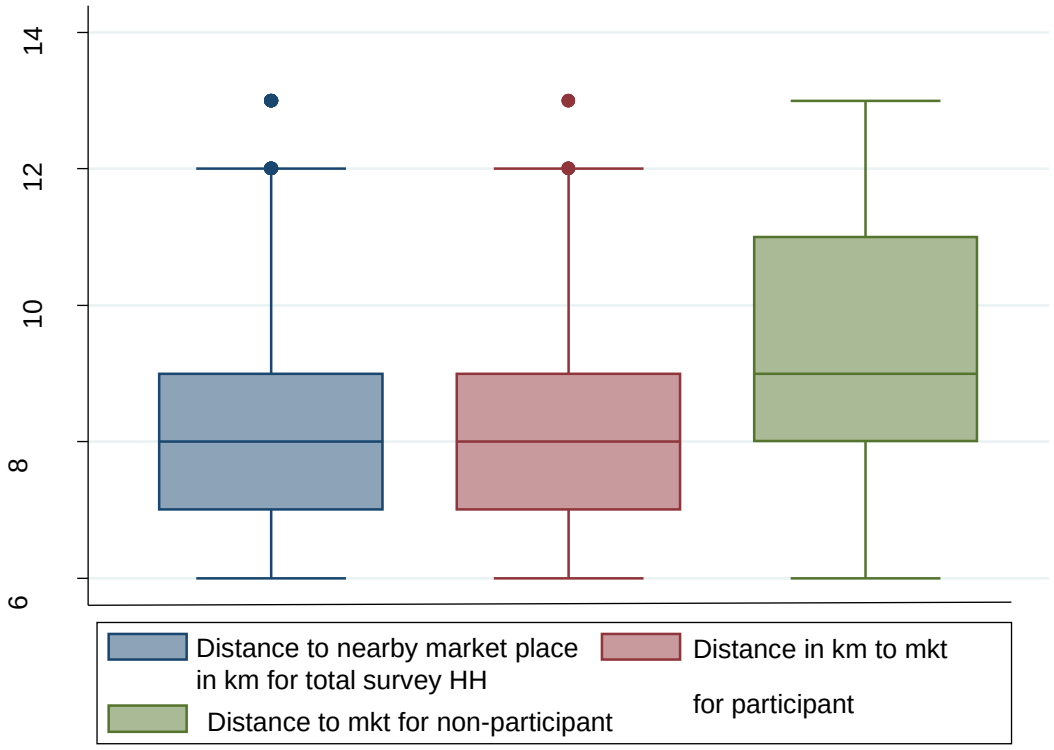
Variables		Participant (OBS=143)		non- participant (OBS=47)		total survey (OBS=190)	
		Frequency	Percent	Frequency	percent	frequency	percent
Have access to information	Yes	46	32.17	1	2.13	47	24.74
	No	97	67.83	46	97.87	143	75.26
Road access	Good	70	48.95	24	51.06	94	49.47
	Bad	73	51.05	23	48.94	96	50.53

Source: Own survey data (2018)

The variable access to road refers about the existing road conditions that serve the farm household. In this study roads that pass Cars across all seasons considered as a good road, whereas, if respondents who have no access to all season road nearby that taken as "bad" to mean no access to road infrastructure. Table 4.5 shows out of total interviewed, around 50% had no access to all weather road. In term of comparing market participant and non-participant; 51.05% of participant have no access to all season road, while 48.94% of non-participant lack access to road. From this data, there was slightly better accessibility of road to non-participant than participant.

Furthermore, the distance from farm gate to the nearest market place also determine framers performance to supply their surplus. There was a statistically significant difference between teff market participant and non-participant in traveling home to nearest market place at 1% level (P= 0.0038). Figure 4.3 shows the distance travelled by survey family member to reach the nearest market place.

Figure 4.3 Distance from farm gate to market place



Source: Own survey data (2018)

On the figure 4.3, the upper and lower tip point indicate the maximum and minimum distance travelled to get market place, whereas, the underline at mid-point show the mean distance traveled by survey family member. Accordingly, the survey household travel 8.68km in average and 6km/ 13km minimum/ maximum distance to market place respectively. On the other hand, the average distance from home to nearest market place travelled by market participant was 8.5km; whereas, non-participant expected to travel 9.25km for the same purpose.

4.2. An Econometric Estimation Results

In this sub-section, Heckman two stage selection analysis is executed to identify the household-level demographic, socio-economic and institutional factors that determine the decision of smallholder farmers to participate or not to participate in the teff market and the degree of their participation. In the first stage, the selection equation or the probit regression model was undertaken to find out determining factors of farm market participation decision. In the second stage the conditional estimation/OLS method was used to investigate factors that influence the level of their participation.

However, before running the regression analysis, the diagnostic tests, such that, the existence of multicollinearity, the problem of heteroscedasticity, and the normality distribution of variables are needed to be checked both for the continuous and discrete explanatory variables.

Multicollinearity: - The computed results of variance inflating factor (VIF) and Correlation matrix of coefficients are present in appendix-B table-B1. The test result suggests that, the absence of serious multicollinearity problem in our model, since there is no solid association among the hypothesized control variables.

According to Gujarat (2004), when the value of VIF approach to infinitive there is serious problem of multicollinearity, while if VIF is below 10 there is no much problem. In this study all the value of VIF for explanatory including IMR variable was blow five. Therefore, there is no evidence of multicollinearity problem in our model. In addition the problem of multicollinearity was tested using a Pearson correlation matrix. If the pair-wise correlation is more than 0.75, then the data has a serious problem of multicollinearity. From correlation matrix in Appendix- B table-B1., no variables had a pair wise correlation above 0.5, which shows that the data has no fear of multicollinearity problem.

Heteroscedasticity: - The data were tested for heteroskedasticity using the Breusch-Pagan test (Wooldridge, 2012). The Breusch-Pagan test evaluates the null hypothesis of a constant variance in the data. The Chi-square value results of STATA output was presented blow.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: ag fz sf hl dm sx ed pn rc mc ex cr ai qt lambda

chi2 (15) = 18.34

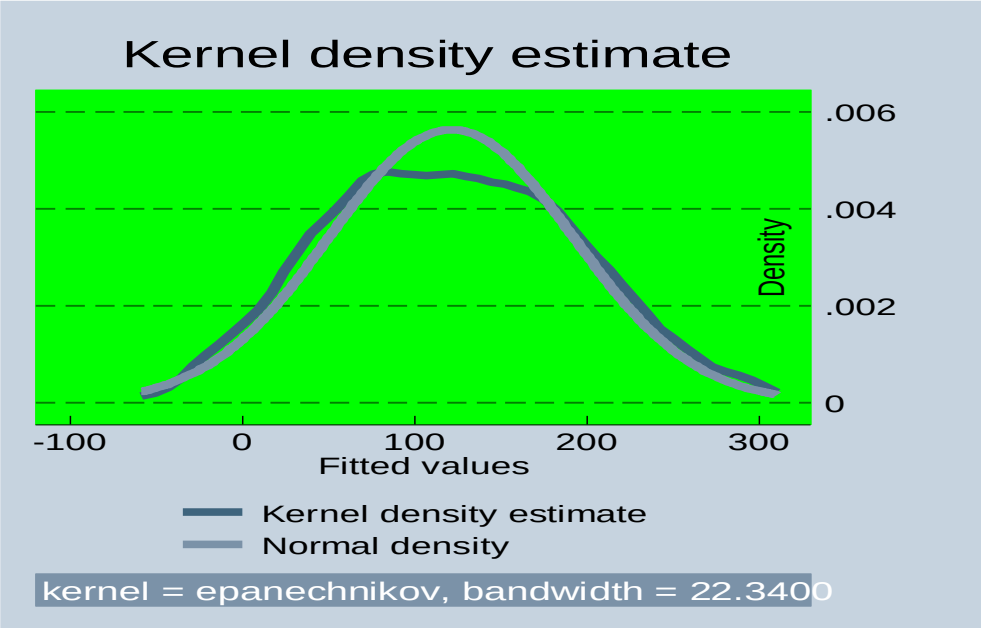
Prob > chi2 = 0.2454

Where: the variable ag, fz, sf, hl, dm, sx, ed, pn, rc, mc, ex, cr, ai, qt and lambda implies age of household head; size of farm land; size of family; size of family labor; distance to near market; sex of household head; education level of household head; participation in off-farm activity; condition of nearby road; membership to farm cooperative; access to extension; access to credit; access to market information; quantity of teff produced and inverse Mill's ratio respectively**.**

Thus, the null hypothesis of a constant variance was not rejected implying absence of heteroscedasticity in survey data. Furthermore, the Breusch-Pagan method was under taken for individual variable for further verification (see Appendix-C). Accordingly, there was no probability value below 10%. Hence, there was no evidence of heteroskedasticity in data set included in this study.

Test for Normality: - This test is concerned with whether the disturbances terms are normally distributed or not. Normality test can be conducted either Graphical plot or numerically through commands. According to Adriano Z. et al. (2012), the nonparametric density estimation is of great importance when to model the probabilistic or stochastic structure of a data set. The kernel density estimation is one of these nonparametric method, which plot the residuals, if the model is normally distributed. Figure 4.4 shows that kernel density plotted for the residuals. If the residuals are normally distributed, the kernel density plot should be bell-shaped and approach to normal density curve. The graph below shows that the data was almost normally distributed since the kernel density curve is almost approaching to normal density function.

Figure 4.4 Kernel Density distribution of survey data



Source: Survey data (2018)

4.2.1. Factors Determining Smallholder Teff Farmer's Market Participation Decision

Table 4.7 shows the probit regression and marginal effect of probit outcomes of factors that influence the likelihood of small teff farmers' market participation decision. The model was fitted with 14 explanatory variables and of which 8 variables are significantly determine the decision with hypothesized sign. These variables include size of farm land, availability of family labor force, education status of household head, accessibility of credit service ; access to market information; sex of house hold head, distance to near market place and size of family member significantly affect the teff output market decision while age of household head; participation in off-farm activity; nearby road condition; membership to farm cooperative; access to agricultural extension service and quantity of teff product insignificant to influence the market participation decision in this study.

Table 4.7; Factors that determine teff farmers' market participation decision – Probit model result

Variables	Parametric estimation			Marginal effect		
	Coefficient	**Std. Err.**	*z*	**Coefficient**/dF/dx	**Std. Err.**	**P>|z|**
Age of HH	.0000364	.0113028	0.00	5.5906	.0017378	0.997
Farm land size	.2918298	.1405528	.2918298	.0448644**	.0232863	0.038
Size of family	-.1701925	.0660268	-2.58	-.0261645***	.0115581	0.010
Family labor	.2643218	.1146528	2.31	.0406355 **	.0186844	0.021
Output	.0808075	.1588431	0.51	.0124229	.0245192	0.611
Distance to market	-.1807049	-.1807049	-2.25	-.0277807 **	.0136402	0.024
Sex of HH	-.5195766	.3044775	-1.71	-.0798771*	.0524763	0.088
Education of HH	.9535387	.3719291	2.56	.1465922***	.0584584	0.010
Participation in nonfarm	.1313255	.3248394	0.40	.0201893	.0502488	0.686
Road condition	-.3072448	.2880082	-1.07	-.0472343	.0455038	0.286
Membership to coop.	-.0908869	.3533219	-0.26	-.0139725	.0543936	0.797
Access to extension	.3705928	.3772999	0.98	.0569731	.0586533	0.326
Access to credit	.9269601	.3804224	2.44	.1425062**	.0628837	0.015
Access to market info.	1.530234	.6136256	2.49	.2352504**	.0797304	0.013
Constant	-1.923809	1.643934	-1.17	-	-	-

Number of observation = 190; LR chi2 (14) = 79.50; Probability > chi2 = 0.0000

Log likelihood = -66.5432; Pseudo R2 = 0.3740

***, ** and * imply statistically significant at 1, 5 and 10% respectively.

Source: Survey data (2018)

As indicated in table 4.7, the marginal effect report of the probit regression provides the probability that a farm household able to enter in output markets. Among explanatory variables farm land size, size of family labor force, education status of household head, accessibility of credit service and access to market price information positively and significantly influence farm market participation decision while size of family member, sex of house hold head being female and distance to market place have inverse significant effect on probability of teff farmer market participation decision.

The farm size was found to have a positive and significant upshot on teff farmers' possibility to participate in output market at 5% level of significance. The marginal result indicate that a one hector additional land farmers have, would increase the likelihood of teff market participation by 4.4 %(table 4.7). This is due to the fact that availability of more arable land enable farmers' to allocate more land to produce teff crop leading increment in output and the rise in output widen the chance of farmers' to supply more. This result is similar to the finding by Efa et al.(2016), which identified a farmer who has a large farm size would have high probability to allocate more land for production of teff as result the likelihood of market participation would increase. Similarly, Rehima et al. (2013), also found the positive effect of land on grain farm household market participation, i.e. since additional land increases both high valued grain (like teff or wheat) and non-grain farm output; this leads to a higher marketable surplus then increment in household income.

The size of family is negatively related with the probability of teff output market participation at 1% level of significance. The additional one person increase in family member results 2.6% decline in likelihood of household market participation. The large family is expected to consume the higher quantity of crop compared to small family, causing smaller amount of marketable surplus. This finding is different from that of study by Moono (2015), which emphasize the positive and significant influence of family size on rice farmer market participation in western province of Zambia.

On the other hand, the availability of family labor force have positive impact on likelihood of farm market participation significantly at 5% level. The marginal effect verify that the availability of one more person in family labor increase the probability of teff market participation by 4%, holding all other factors constant. Teff production and preparation for market is labor intensive activity. A household with more number of family labor force produce large quantity of teff and supply to

market relative to less labor house hold. This result was equivalent to Azeb et al. (2017), which reveals farmers' who have more access to family labor are more likely to participate in output market. It was also similar to analysis of Osmani et al. (2015), this reveals a positive effect of active household labor force on probability of farm output market participation decision in Bangladesh. Hence, this seems reasonable since household with large number of active labor force increase output and decrease cost of production, then result surplus market oriented production.

The sex of house hold head negative and statistically significant factor in determining teff farmers' market participation decision at 10% level of significance (table 4.7). The negative marginal effect shows the less likelihood of female headed household to produce and supply teff crops relative to its counterpart. The result show that if the household is female headed, the likelihood to participate in teff market decline by 7.98% compared to male headed one. This is may be due to vulnerability of females to constraints like lack of capital, labor, land and physical and social infrastructures such as education, health facility. This result is consistent with finding by Pender et al.(2007), to them teff and maize selling households are more likely male headed, and larger share of men labor force in family than female headed and female dominant family farm house hold.

As hypothesized, distance to the nearest market place negatively influence the likelihood of teff farm household market participation decision significantly at 5% level. Every additional distance per kilo meter household travel to get market place decrease the probability of household market decision by 2.7%. This is due to the heavy nature of teff, since in study area household bring cereals by donkey, horse or manpower it would be costly and tiredly to participate in market. As distance to market place increase the rent of donkey increase, that result's increased transaction cost to household. This finding was supported by work of Bultossa (2016), who considered distance to market as proxy to transaction cost and come up with negative effect of distance to nearest market on small dairy farm household market participation in West Showa. Therefore, teff farmers who located at remote site of study area had less probability to participate in output market relative to the nearby one.

Education of household head found the expected positive effect on a likelihood of teff farmers' market participation at 1% level of significance. The marginal effect result on the table 4.7 shows, if the teff farm household head acquire additional formal education, the probability of household decision to participate in output market rise by 14.7%. Farmer with formal education have better

ability to obtain new market information, and new technology of production which in turn increase the farmers chance to participate in market. Education also increase decision making ability of farmers based on identified market information and opportunity. This is in line with the finding of Sebatta et.al. (2014), which reported positive influence of education on smallholder farmer's decision to enter potato market in Uganda.

As hypothesized, access to credit service positively determine the probability of teff farmers' market decision at 5% level of significance (table 4.7). Having access to credit enhance the likelihood of household market participation by 14.25%, ceteris paribus. The reason is the accessibility of credit enables farmers to purchase inputs like improved seed, fertilizer, which increase output through productivity increment then by enable households to supply more to market. On the other hand, accessibility of credit solve farmers cash problem that make farmers to sale at early period of crop collection with low price. This finding was supported by Geremew(2012), who identified farmers who have access to credit are more likely to produce market- oriented crops specially sesame in study area. Randela et al. (2008), also found positive impact of loan on small farmers' production and market participation in South Africa. Therefore, farmers who have availability of credit service are more likely to enter teff output market than non-beneficiary.

The market information shown positive influence on likelihood of teff producer household market participation decision at 5% level. The marginal effect in the table 4.7 reveal that shift from inaccessibility to available market information enhance the probability of household market participation by 23.5%, holding other thing constant. Accessible market information increase farmers chance to participate in output market because it enable farmers to make right decision how to produce, and supply to market with minimum probability of risk. The same finding was done by Agete (2014), to him, availability of market information increase farmer market participation by enabling red bean farmers to plan effectively on time and produce based on market demand. To Randela et al. (2008), availability of market information reduce transaction cost and then increase motivation of farmer to participate in market.

4.2.2. Factors Determining the Level Teff Farm Household Market Participation

The Heckman's second stage estimation identifies the factors that influence the extent of teff output marketed using the OLS model. The intensity of market participation measured by level of output supplied to market. Table 4.8 shows the regression results of variables that affect the level of market participation among teff farmers in study area. Out of 14 control variables 7 variables and inverse Mill's ratio are statically significant. The control variables: educational status of house hold head, size of farm land, size of family member, the number of family labor force, quantity of teff produced, membership to cooperative and availability of market information significantly determine the extent of output marketed; whereas age of house hold head, access to agricultural extension service, the existing road condition, participation in off-farm activity, access to credit service, sex of household head and distance to the nearest market place insignificant to influence the level of participation.

The coefficient of inverse Mill's ratio /Lambda is significant at 5% level. The significance of Mill's ratio reveals the presence of selection bias and the effectiveness of applying Heckman two stage model due to its ability to handle the selection problem. The negative sign proposes that the error terms in the participation decision and outcome equations are negatively correlated. This shows that those unobserved factors that make the household participate in teff output markets are likely to be negatively associated with extent of teff marketed.

The 61.46% R-squared or 58.50% adjusted R-squared shows the fitness of OLS model. On the other hand, the results of Wald chi-square test indicates that the overall goodness of fit of the heckman selection model estimation as statistically significant at a probability of less than 1%. This illustrates that the independent variables included in the model regression jointly explain the extent of market participation.

Table 4.8: Results of the second-stage selection estimation

Variables	Coefficient	Std. Err.	*t*	P>| *t* |
Sex of HH	-23.0515	14.80179	-1.56	0.121
Education of HH	24.38654***	9.240999	2.64	0.009
Participation in nonfarm	4.247535	12.0438	0.35	0.725
Road condition	2.180177	10.09656	0.22	0.829
Membership to coop.	18.06802*	10.60397	1.70	0.090
Access to extension	21.01776	17.25932	1.22	0.225
Access to credit	10.8161	11.15861	0.97	0.334
Access to market info.	17.93066*	10.48184	1.71	0.089
Age of HH	-.3792668	.4238982	0.89	0.372
Farm land size	11.4827**	4.830867	2.38	0.019
Size of family	-7.996666***	2.603331	-3.07	0.002
Family labor	8.542236*	4.356089	1.96	0.051
Output	18.92944***	5.268679	3.59	0.000
Distance to market	-3.840515	3.104927	-1.24	0.218
Mills lambda	-42.73636**	19.73134	-2.17	0.032
Constant	16.52782	69.13398	0.24	0.811

Number of observation = 190; Censored observation = 47; Uncensored Observation = 143;

R-squared = 0. 0.6146; Adj R-squared = 0.5850; F (15, 174) = 31.79; Prob > F = 0.0000

Wald chi2 (12) = 79.78; Prob > chi2 = 0.0000

***, ** and * imply statistically significant at 1, 5 and 10% respectively.
Source: Survey data (2018)

As shown in table 4.8 , compared to the first stage result three variables, i.e. accessibility of credit service, Sex of household head and distance to the nearest market place are insignificantly determine the extent of market participation, while they are significant in influencing the house hold market participation decision. On the other hand, membership to farm cooperative and quantity of teff output produced significantly determine the level output marketed, while they are insignificant to determine the probability of house hold market participation decision. Moreover, size of farm land, availability of family labor, education status of household head and accessibility of market information positively determine both decision and intensity of market participation, whereas, size of family member inversely affect both farmers' decision to participate and extent of output marketed. Although, the extension service and availability off-farm income source are expected to influence the probability of farm market participation and its extent, both variables are insignificant in both case. This is may be due to the ineffective deliver of extension service and lack of other income option in study area. In addition, age of household head, was insignificant with expected sign, while the road condition is insignificant with unexpected sign in fist stage and shown expected sign in the second estimation.

Education level of household head have the expected positive effect on intensity of teff output sold at significance level of 1%. On an average, if farmers gets more formal education, the amount of teff supplied to market rise by 24.38 kilo gram (kg), ceteris paribus. It is due to the fact that educations upsurge the capability of farmers to get relevant market information which improve the managerial and marketing ability of households. This result is equivalent with finding of Tadele et al. (2016), which identified the positive effect of education on marketable output through acquiring farmers new idea of market information and production technology. Moreover, availability of market information positively influence the intensity of output marketed at 10%. After participation decision, shifts from non-market evidence to information network increase the amount of teff marketed by 17.93kg (table 4.8).

As was expected, the amount of teff produced has positive and significant influence on level of teff market participation at 1% level. Holding other things constant, a unit increase in the yield of teff output results 18.9kg increase in quantity of teff supplied to market, (table 4.8). The finding reveal that farmers with more teff output supply more to market and more market oriented than low producer. This result was fit in to the finding by Nuri et.al (2016), study on market

participation of kocho producer in Hadya zone found positive effect of kocho output on extent of market participation. D.B. Mignounaal et.al. (2015), also found the positive influence of Yam output on extent of market participation in Yam Growing Areas of Nigeria and Ghana.

The large family size supply less to market relative to their counterpart. However, family with large number of active labor force supply more to market. The size of family and household labor force determine the intensity of market participation by 1% and 10% significance level, respectively (table 4.8). One additional person in family decline the sale volume by 7.9 kg, while one more active labor to family enhance marketable teff output by 8.5 kg, holding all other things constant. Similar result was found by Wonduwossen(2004), to him the increase in family member increase the number of dependent which would in turn rise the number of mouth to be feed, contributing decline in marketable output.

As expected, land holding size found positive and significant influence on the level of teff output marketed at 5% level. A one hector increase in land holding enhance sales volume by 11.48 kg, ceteris paribus. This is equivalent to study by Efa et al. (2016), which identified the positive influence of farm land size on teff sale volume in study area.

As hypothesized, being member to producer group positively and significantly influence the marketed output level at 10%. Membership to cooperative enables farmers to obtain on time market information and production technology. It also minimize transaction costs both on production process and output marketing through creating group sharing of cost and benefits. Being member to producer group increase the level of marketable output by 18.06kg relative to non-member, ceteris paribus. This finding is similar with Sebatta et.al. (2014), they found positive influence of farmer's membership to cooperative on volumes of potato sold in Uganda. The authors' reason out that working in group creates collaboration among the farmers and enable them to access market information and sharing of best experiences together.

CHPTER FIVE

CONCLUSION AND POLICY IMPLICATION

5.1. Summary and Conclusion

In Ethiopia, crop production constituted on the average about `68% of agricultural GDP and smallholders generated about 95% of the total production of the main crops like cereals, pulses, oil seeds, vegetables, root crops, fruits and cash crops. Among cereals, teff, is the most valued staple crop, Cultivated over approximately 2.8 million hectares and accounts for 28.5 percent of land area under cereal cultivation, the largest share of all staple grains in Ethiopia. It is indigenous to Ethiopia and is a vital part of the culture, tradition, food security and second most commercial crop. Although, Output market participation has strong relationships with Poverty reduction and improving the livelihood of the rural smallholders, they are passive players in agricultural market in Ethiopia, due to their spatial dispersion ; weak asset base, lack of access to transport and weaker accessibility of information.

This study was conducted in Gena-Bossa district of Dawro zone, with the aim of investigating the factors determining teff farmers' market participation decision. The area was chosen due to low market participation of staple crop farmers, in spite of its high potential agro-ecology. The descriptive and heckman two stage econometric analysis was employed to identify factors responsible for their low market participation, using survey data from selected 190 household respondents. Out of sampled household, 75% participated in teff output market, while the remaining 25% not supplied teff output in survey time. According to data analysis result, the farming activity were the main source of income and livelihood in study area. Among interviewed, about 21.58% have off-farm activity option but the remaining 78.42% of respondent have no other alternative even in dry season, in which no agricultural bustle takes place.

The first stage finding of probit marginal effect estimation show that out of fourteen explanatory variable, eight variables significantly determine the probability of market participation decision of smallholder teff farmers. Among significant explanatory variables farm land size, availability of family labor force, education status of household head, access to credit service and access to market price information positively and significantly influence farm market participation decision

while size of family member, sex of house hold head being female and distance to market place have inverse significant effect on probability of teff farmer market participation decision.

The significance of coefficient of inverse Mill's ratio /Lambda indicates the presence of selection bias and the effectiveness of applying Heckman two stage model due to its ability to handle the selection problem. In the second stage estimation, 7 control variables and inverse Mill's ratio are statistically significant. Out of significant variables additional education status of house hold head, size of farm land, the number of family labor force; amount of teff produced, accessibility of teff market information and being member to farm cooperative increase the quantity of marketable output, whereas, having large number of family member decline the level of teff crops marketed.

5.2. Policy Implication

Based on the finding, the following policy recommendation were forwarded:-

- This study confirmed that more than 85% of market participant and non-participant have access to agricultural extension service, but other institutional services like accessibility of credit, available farmers' cooperative and affordable market information mechanism were not convenient to small farmer in study area. For instance, only 2.13% of non- market participant have access to timely price information. On the other hand, availability of credit service and market information have positive effect on encouraging small farmers to approach market. Thus, government and other responsible body should foster the institutional mechanism that support poor farmers in obtaining timely market information and create affordable credit service.

- The study found the positive influence of membership to producer group or cooperative in teff quantity supplied to market. However, the majority of farmers in study area were not member to any producer group. Hence, the cooperative organization should be strengthened on one side and the community mobilization and awareness creation should be conducted for those farmers who do not belong to any farmer organization

- More than 60% of the sampled household heads are found to be illiterate in study site. However, education have positive impact whether enabling farmer to participate in output market or in increasing the quantity supplied to market through equipping farmers with modern production technology and marketing skill. Hence, effort should be geared in manner that build farmers capacity through adult literacy program, formal education and strengthening self-help association.

- The study shown that the farm household being female discourage the probability of market participation. This is may be due to vulnerability of females to constraints like lack of capital, labor, land and physical and social infrastructures such as education, health facility and unfair family work load laid on female. Therefore, government and all responsible organization should exert efforts in capacitating the females socially and economically.

- Finally, throughout this study farmers who participate in output market were socially and economically active than non-participants. Even in off-farm activity, participant have better access relative to their counterpart. The government extension program give more attention to production side and as result their efforts in linking farmers to market were ineffective. Therefore, in agricultural and rural development strategy, joining smallholders to output market have to be given as much as equal priority with production side.

5.3. Suggestion for Further Research

This study was based on data collected only from sampled 190 household in Gena-Bossa district with common agro-ecological zone. But, as country, Ethiopia has a different agro-ecological zone with diverse cultural value; poverty index level and varied socio- economic standards, which may result variety of determinants of smallholder house hold staple market participation. That means the inferences made in this study may only apply to the study area and other with similar socio-economic and agro-ecological zone, but not for whole country. Thus, further Comprehensive studies should be undertaken using different data collection mechanism like panel data and time series data to capture the influence of time on household market participation and enable to widen sample size.

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Appendix-A

Survey Questionnaire

Goal of survey: - The main aim of this questioner was collecting grass-root data to identify the influencing factors of smallholder teff farm householder market participation decision and the intensity of participation. Although, the researcher's primary objective is for academic purpose, it could be expected to give analytical clue for decision makers. Therefore, the respondents kindly asked to provide his/her idea for the set of questions as it was organized.

Zone …….…….....
District …….…
Kebele …….……..
Date of interview …….
Name of field interviewer: ……..……

I Household demographic character

1. Your responsibility in family; A. Household head B. Other specify----------

2. Age of respondent ----------

3. Sex of respondent a) Male b) Female

4. Marital Status

a) Single c) Divorced

b) Married d) Separated

5. Sex of the Household Head

a) Male b) Female

6. Age of Household Head (if different from respondent) ----------

7. Level of education of Household head:-

A. Illiterate B. below grade 6 C. 7- 12 D. Diploma and above

8. Number of household members: A. Male---------- B. Female---- C. Total----------

9. Number of household members in working age (from 18-64 age) ----------

II Farm Characteristics

10. Do you have your own land?

a) Yes b) No

11. If your answer for above Q10 is ''Yes'', how large was the land you have in hectare_____.

12. How many hectares was the total size of land cultivated----------?

13. What was the size of land you planted for;-

- Teff……..
- Maize……
- Wheat……..

14. What was the size of land used for cattle rearing ……hectare.

15. What are the core activities of the Household Head engaged (give 1, 2, and 3 in priority order)?

Activity	Rank
Crop production	
Livestock rearing	
Mixed farming	
Non-farm activities	

16. Among the following livestock, which one do you owned?

a) Donkey in number ----------

b) horse/mule in number----------

III **Farm household market participation**

17. What was the output you collected for the year 2009E.C (in quintal) ……

18. Does you sold some amount of output to market?

a) Yes ------ b) No -----

19. If "Yes" What quantity did you sell for cash in quintal……

in birr----------

20. In Which season did the household sell crop……..

21. Who was the receiver of your output (you can tick all to whom you sell)

a) Local trader at home------- a) at nearby market place ------

c) Farm Cooperative--------- d) Broker ---------

e) others if any……

22. please tell the quantity you sold to each(if more than one) and clarify the amount of income you received, the price you sold and the place where you sold as it was asked in the table below;-

Type of crop	Quantity sold in kg	Price per kg	Income in birr	Place of marketing
Teff				
Maize				
Wheat				
Others				
Sum				

23. In the question-22 in the table you have respond the marketing center of crop. Based on that how far is the sale place from your house in km?

a) Place name---------- Distance in km----------

b) Place name ---------- Distance in km----------

c) Place name---------- Distance in km----------

24. How do you transport crops from farm house to market sale place?

- ✖ Head loading----------
- ✖ Pack animals----------
- ✖ Animal cart ----------
- ✖ Other----------

25. What type of marketing costs you incur when you take your crops to each market?

Market place	Types of cost incurred in birr					Sum of cost
	Transport cost	Sales tax	Loading and unloading	Packing	Others	

26. Do you sell the commodity at the same day you transported it to market?

a) Yes----- b) No -----

27. If your answer for question 26 is no how many days would it take to sell?

---------- day.

28. Did you have any storage;-

- At near town ; a) Yes---- b) No-----
- At house; a) Yes---- b) No----

29. If your answer for question 28 is no in both case how do you stay crops until sell (please tell if any payment made for storage)? ----------

30. How many kilometers you need to travel to get the following?

i. To the nearest Cooperatives…… km
ii. To the nearest market place……. km
iii. To the nearest all-whether road…….km
iv. To the nearest school……..…….. km
v. To the nearest health service……. km
vi. To the district market ……. km
vii. To the nearest FTC ……...km

IV About farm house hold income

31. Do the household sole some crop in this year?

a) Yes--- b) No ----

32. If your answer for Q-31 is "Yes" how much quantity had the household sole?

- Teff quantity in quintal ……..…. Kg and received birr……..
- Maize quantity in quintal ……. Kg and received birr……..
- Wheat quantity in quintal ……. Kg and received birr……..
- Others quantity in quintal ……. Kg and received birr……..
- From Sale of cattle in birr----------.

33. Do you have any other (off-farm) source of income?

a) yes---- b) no---

34. If your answer for Q-33 is “yes” please list the occupations below if any?

Name of HH member	Type of employment/occupation	Wage/salary per month	Annual income	Remark

V Access to Extension; credit and market information services

(Please thick in front of year answer)

1. Do the household receive any information about teff production and marketing in the last year (2009E.C)?

a) Yes------ b) No -------

2. If yes please indicate type of information received;

a) Field preparation ---- e) Farm conservation---------

b) Planting date -------- f) output marketing information-------

c) Water resource management ----- g) on time market price situation ---------

d) Fertilizer application ----------

3) Who was the provider of extension service?

a) Kebele’s agricultural expert or government-------- b) Cooperative----------

c) NGO---------- d) Media (Radio; TV etc.) ---------

4) How about the frequency of extension expert visit?

a) weekly------ b) monthly---------- c) Quarterly---------- d) twice a year-------- e) Annually-------

5. Did the household apply the information received?

a) Yes ---------- b) No ---------

6. If yes, after using the extension service did the yield and status of marketing improved?

a) Yes ---------- b) No----------

7. If no what could be the cause of not improving, specify if any:-

……

……

8. Did the household have access to credit service when needed?

a) Yes------ b) No-------

9. If yes, do the household received credit in the last cultivation period?

a) Yes------ b) No-------

10. Who provided it…….

11. In what form was the credit provided?

a) Inputs --- b) Cash--

12. If received credit in form of inputs, please specify the quantity for each

- Seed ……. (kgs)
- Fertilizer…….. (kgs)

13. If in cash how much in birr ……

14. Do you know the price per kg of each crop (fill "yes" or "no");-

a) In weldhane ---------- b) In Tarcha----------

c) Cooperative----------d)Wolaita Sodo----------

e) Karawo----------

15. Do you believe as you have sold your teff at fair market price?

a) Yes--- b) No ----

16. Do you have any access to market information? a) Yes ---- b) No ----

17. From which source did you get information about your teff markets situation?

a) Other farmers--- b) Broker---- c) Personal observation ----

d) Radio--- e) Tele --- f) Extension agents----

g) Cooperative ---- h) Other ----------

18. Do anyone in the household own a cell phone; a) Yes--- b) No ----

19. Have you used a cell phone to get information on prices for crops;

a) Yes ---- b) No ----

20. Is there network around you? a) Yes ---- b) No----

21. Do you have Tv/Radio ; a) Yes---- b) No ---

22. Do you listen to agriculture programs on Radio/TV a) Yes --- b) No----

VI Others

23. What type of the nearest road access the farm households have?

a) Good---- b) Bad-----

24. Do the car enter the farm area? a) Yes--- b) No----

25. If "No" how much km it takes to reach the nearest all weather road----------

26. Do you have any farm cooperative that you are a member?

a) Yes--- b) No ----

27. If your answer is "yes" specify the name of you cooperative----------.

28. If your answer is "no" for above question, do you have any information about the function of farm cooperative? a) Yes---- b) No------

29. If you say "yes" why not be the member of the organization (use the space below)?

---

30. Please, could you tell the major problems encountering you in away when you try to sale teff (tick highest, medium and least in its priority order)?

Influencing factors	Ranks			Remark
	Highest	medium	Least	
Distance to market				
Access to price information				
Weak coordination among marketing actors				
Teff Price fluctuation				
Absence of demand for teff				
Lack of access to credit				
Lack of transport service				
Shortage of teff output				
Shortage of farmland				
Poor road facility				
Shortage of labor force				
Less return from selling				
Others				

//Thanks very much for expressing your experiences to me and taking your precious time! //

Appendix-B

Test for Multicollinearity

Table .B1 VIF test result for explanatory variables

Variable	VIF	1/VIF
Family labor	1.78	0.561296
Education of HH	1.76	0.567999
Size of family	1.71	0.583794
Farm land size	1.81	0.553734
Teff output	1.63	0.613477
Age of HH	1.26	0.790863
Road condition	1.29	0.772667
Access to market info	1.49	0.672997
Membership to coop.	1.27	0.785355
Sex of HH	1.58	0.633760
Access to credit	1.50	0.668214
Distance to market	1.39	0.721010
Access to extension	1.15	0.871157
Participation in nonfarm	1.12	0.892840
Lambda	4.30	0.232373
Mean VIF	1.67	

★ If VIF greater than 10, there is serious multicollinearity problem.

Table .B2 Correlation matrix of coefficients of regress model

e(V)	ag	fz	sf	hl	dm	qt	sx	ed	pn	rc	mc	ex	cr	ai	λ
ag	1.0000														
fz	-0.1930	1.0000													
sf	-0.0611	-0.0218	1.0000												
hl	0.1131	-0.0190	-0.6203	1.0000											
dm	-0.0193	-0.1768	0.1918	-0.0899	1.0000										
qt	-0.1061	-0.3880	0.1295	-0.2339	0.1485	1.0000									
sx	-0.1900	-0.0260	0.4086	-0.2653	0.2574	0.1032	1.0000								
ed	0.4395	0.0431	-0.1486	0.2152	-0.0606	-0.2084	-0.1256	1.0000							
pn	0.1252	-0.0158	0.0874	-0.1247	-0.1929	0.0787	0.0180	0.0606	1.0000						
rc	-0.0459	0.2741	0.2477	-0.3090	0.2929	-0.0500	0.0569	-0.2071	-0.1031	1.0000					
mc	-0.0005	-0.2367	0.1093	-0.2333	-0.0406	-0.0764	0.0820	-0.2520	0.0119	-0.0903	1.0000				
ex	0.1366	-0.3019	0.0182	0.0095	0.0933	0.0214	0.0236	-0.0032	0.2640	-0.1015	0.1743	1.0000			
cr	0.1444	0.1553	-0.3481	0.3561	-0.1268	-0.2360	-0.2880	-0.0170	-0.1144	0.0828	-0.0797	0.1135	1.0000		
ai	0.1703	0.1306	0.0753	-0.0111	-0.0365	-0.1130	-0.0751	-0.0059	-0.1171	0.0119	-0.0612	-0.0784	0.2300	1.0000	
λ	0.2776	0.2484	-0.3697	0.3459	-0.4258	-0.0552	-0.6419	0.3868	0.1003	-0.2059	-0.0925	-0.0288	0.4480	0.3429	1.0000
_cons	-0.4489	0.0693	-0.2945	0.0571	-0.4418	-0.0630	-0.2489	-0.2003	-0.2655	-0.2444	-0.1008	-0.5885	-0.2248	-0.2533	-0.0630

e(V)	_cons
_cons	1.0000

Where; ag= age of HH; fz= size of farm land; qt = quantity of teff produced; sf= size of family; hl= size of family labor; dm= distance to near market; sx= sex of HH; ed= education level of HH; pn= participation in off-farm activity; rc= condition of nearby road; mc= membership to farm cooperative; ex= access to extension; cr= access to credit; ai= access to market information; **λ = inverse Mill's ratio.**

★ Presence of cross entry value greater than 75 percent indicates presence of Multicollinearity on the data set.

Appendix-C Test for heteroskedasticity

Breusch-Pagan/estat hettest command on STATA /test result of heteroskedasticity for individual variables included in regression.

Variables	***Breusch-Pagan** Probability value / Prob > chi2/*
Age of HH	*0.5178*
Size of family	*0.1423*
Family labor	*0.7349*
Farm land size	*0.4554*
Distance to market	*0.76*
Teff output	*0.5637*
Education of HH	*0.3202*
Road condition	*0.7709*
Access to market information	*0.2721*
Membership to cooperative	*0.5348*
Sex of HH	*0.2371*
Access to credit	*0.1543*
Access to extension	*0.3931*
Participation in nonfarm	*0.1384*
Lambda	*0.6900*
Fitted value/normally predicted residual/	*0.4924*

**The probability value less or equal to 10% point out the presence of heteroskedasticity in the data set*

Appendix-D First and second stage regression result

Table-D1 probit model result for factors that determine teff farmers' market participation decision and marginal effect

```
Probit regression                                 Number of obs   =        190
                                                  LR chi2(14)     =      79.50
                                                  Prob > chi2     =     0.0000
Log likelihood = -66.543252                       Pseudo R2       =     0.3740
```

fm	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ag	.0000364	.0113028	0.00	0.997	-.0221168	.0221895
fz	.2918298	.1405528	2.08	0.038	.0163515	.5673082
sf	-.1701925	.0660268	-2.58	0.010	-.2996026	-.0407824
hl	.2643218	.1146528	2.31	0.021	.0396065	.4890372
dm	-.1807049	.0802381	-2.25	0.024	-.3379687	-.0234411
qt	.0808075	.1588431	0.51	0.611	-.2305193	.3921342
sx	-.5195766	.3044775	-1.71	0.088	-1.116342	.0771883
ed	.9535387	.3719291	2.56	0.010	.2245711	1.682506
pn	.1313255	.3248394	0.40	0.686	-.505348	.767999
rc	-.3072448	.2880082	-1.07	0.286	-.8717306	.257241
mc	-.0908869	.3533219	-0.26	0.797	-.7833851	.6016113
ex	.3705928	.3772999	0.98	0.326	-.3689015	1.110087
cr	.9269601	.3804224	2.44	0.015	.1813458	1.672574
ai	1.530234	.6136256	2.49	0.013	.3275495	2.732918
_cons	-1.923809	1.643934	-1.17	0.242	-5.145861	1.298243

```
Note: 0 failures and 1 success completely determined.
```

Probit regression, reporting marginal effects; Number of obs = 190

LR chi2(14) = 79.50

Prob > chi2 = 0.0000

Log likelihood = -66.543252 Pseudo R2 = 0.3740

fm	dF/dx	Std. Err.	z	P>|z|	x-bar	[95% C.I.]	
ag	5.59e-06	.0017378	0.00	0.997	47.2105	-.0034	.003412
fz	.0448644	.0232863	2.08	0.038	2.82579	-.000776	.090505
sf	-.0261645	.0115581	-2.58	0.010	7.45263	-.048818	-.003511
hl	.0406355	.0186844	2.31	0.021	3.4	.004015	.077256
dm	-.0277807	.0136402	-2.25	0.024	8.68947	-.054515	-.001046
qt	.0124229	.0245192	0.51	0.611	2.95505	-.035634	.06048
sx	-.0798771	.0524763	-1.71	0.088	1.18421	-.182729	.022975
ed	.1465922	.0584584	2.56	0.010	1.46316	.032016	.261169
pn	.0201893	.0502488	0.40	0.686	1.21579	-.078296	.118675
rc	-.0472343	.0455038	-1.07	0.286	1.49474	-.13642	.041951
mc	-.0139725	.0543936	-0.26	0.797	1.28421	-.120582	.092637
ex	.0569731	.0586533	0.98	0.326	1.89474	-.057985	.171931
cr	.1425062	.0628837	2.44	0.015	1.3	.019256	.265756
ai	.2352504	.0797304	2.49	0.013	1.24737	.078982	.391519
obs. P	.7526316						
pred. P	.9163612	(at x-bar)					

z and P>|z| correspond to the test of the underlying coefficient being 0

Table-D2 Results of the second-stage estimation (OLS) for factors that determine the intensity of farmers' participation in teff output market:

Linear regression — Number of obs = 190; F(15, 174) = 31.79; Prob > F = 0.0000; R-squared = 0.6146; Root MSE = 58.508

yt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ag	-.3792668	.4238982	-0.89	0.372	-1.215911	.4573773
fz	11.4827	4.830867	2.38	0.019	1.948061	21.01734
sf	-7.996666	2.603331	-3.07	0.002	-13.13484	-2.858493
hl	8.542236	4.356089	1.96	0.051	-.0553391	17.13981
dm	-3.840515	3.104927	-1.24	0.218	-9.968683	2.287654
qt	18.92944	5.268679	3.59	0.000	8.530693	29.32818
sx	-23.0515	14.80179	-1.56	0.121	-52.26566	6.162655
ed	24.38654	9.240999	2.64	0.009	6.147658	42.62542
pn	4.247535	12.0438	0.35	0.725	-19.5232	28.01827
rc	2.180177	10.09656	0.22	0.829	-17.74732	22.10767
mc	18.06802	10.60397	1.70	0.090	-2.860936	38.99698
ex	21.01776	17.25932	1.22	0.225	-13.04682	55.08233
cr	10.8161	11.15861	0.97	0.334	-11.20755	32.83976
ai	17.93066	10.48184	1.71	0.089	-2.757252	38.61858
lambda	-42.73636	19.73134	-2.17	0.032	-81.67994	-3.792778
_cons	16.52782	69.13398	0.24	0.811	-119.9213	152.977

Where; ym = market participation decision of HH; yt = amount of teff output marketed; ag= age of HH; fz= size of farm land; qt = quantity of teff produced; sf= size of family; hl= size of family labor; dm= distance to near market; sx= sex of HH; ed= education level of HH; pn= participation in off-farm activity; rc= condition of nearby road; mc= membership to farm cooperative; ex= access to extension; cr= access to credit; ai= access to market information; λ = inverse Mill's ratio.