

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

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ABSTRACT

Increasing market participation among smallholder farmers have a big potential to uplift living standards of poor through increasing production and consumption pattern. 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 analyzing factors determining smallholder Teff farmer decision to participate in output market and level of marketed output. The study used data from 190 respondents from four selected Teff dominant kebeles of Gena-Bossa districts in Dawro Zone, through structured questioner. This investigation was imperative because no adequate research has been done in study area in examining the hindering factors of farmers' market participation. Moreover, in the prior study, different authors come up with varied outcomes in diverse country and geographic location concerning poor farmers' market participation decision.

The descriptive statistics and Heckman two stage econometric methods were employed to analyze data collected from sampled household. 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: *Teff, Smallholder, market participation, Heckman two stages, Gena-Bossa.*

I. INTRODUCTION

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 and changing markets, rising fuel and fertilizer prices, and climate change (Bioversity *et al.*, 2012).

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, is 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 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 especially 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 was 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. The study analyzed the influence of demographic, socio-economic and institutional factor on household decision to participate in output market through theoretically and analytically by supporting essential literature review and econometric modeling specially using Heckman two stage selection model due to its ability to handle self-selection bias.

1.1. 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 marketing (Heimen, 2002). In most part of rural Ethiopia, even farmers who produce surplus remain in poverty trap due to lack 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 address the problems of smallholder farmers some research has 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 Shawa zone, all analyzed factors determining market supply of smallholder Teff farmers in different way. Thus, these were 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 has been done concerning the hindering factors on marketing process of small farmers in area. Hence, it need empirical analysis to verify the measure 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 their level of participation in output market.

1.2. The Objectives of Study

The general objective of this study were analyzing 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 and socio-economic factors that determine market participation decision among smallholder Teff producers;
- (ii) To investigate the institutional factors that hinder market participation among smallholder Teff producers;
- (iii) To examine the demographic, socio-economic and institutional factors that influence the level of marketed output among smallholder Teffsupplier;

II. LITERATURE REVIEW

About 2.5 billion people live directly from 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 report, 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 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).

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

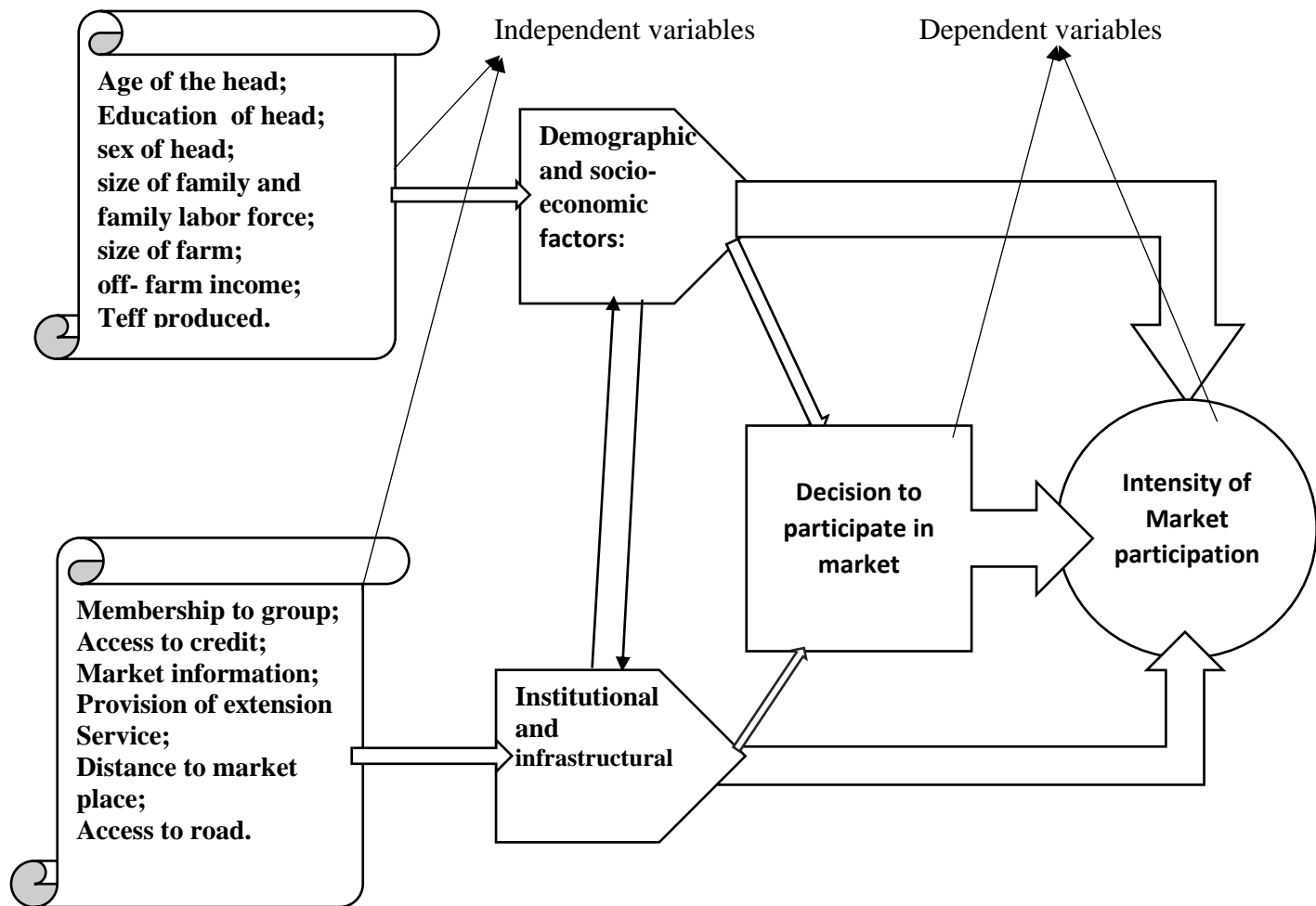
the market was positively determined by; use of fertilizer, age of household head, ownership and price, while in Mozambique total area planted, total assets owned, ownership of animal and distance to fertilizer dealer. On the other hand, in Zambia it was positively influenced by; size of land owned, 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.

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.

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 2.1. The conceptual framework of the study



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.

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 2.2. Marketing channel for Cereals and Pulses



Grain**Flour**

Source: Japan International Cooperation Agency (JICA, 2012)

III. MATERIALS AND METHODS OF DATA ANALYSIS

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).

To select sample respondents for this study, two stage stratified sampling technique is 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 190sample households from four sample kebele.

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

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

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:-

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

Hence, 193 respondents rounded off to 190 to enable the distribution of the sample in to five selected kebele.

Methods of Data Analysis

3.2.1. Econometric Analysis of Determinants of Farm Market Participation and Its Intensity

It was assumed that smallholder farmers who cultivate Teff may or may not participate in output marketing, i.e., 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:

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

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 household participate in Teff market and zero otherwise.

This can be shown mathematically:-

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

Where; $i = 1, 2, 3, \dots, n$

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

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 $\text{corr}(\varepsilon_i, v_i)$,

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, $\phi(\cdot)$ denotes the standard normal probability density function and $\Phi(\cdot)$ 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:-

$$\hat{\lambda}_i = \frac{\phi(\hat{\beta}_0 + \hat{\beta}_{1i}X_{1i})}{\Phi(\hat{\beta}_0 + \hat{\beta}_{1i}X_{1i})} \text{-----} (3.7)$$

IV. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

Demographic Characteristics of Teff Producer Household

This study was Proceed on total sample size of 190 Teff producer farm households 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.

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)

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%. 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 Education status of the household 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.

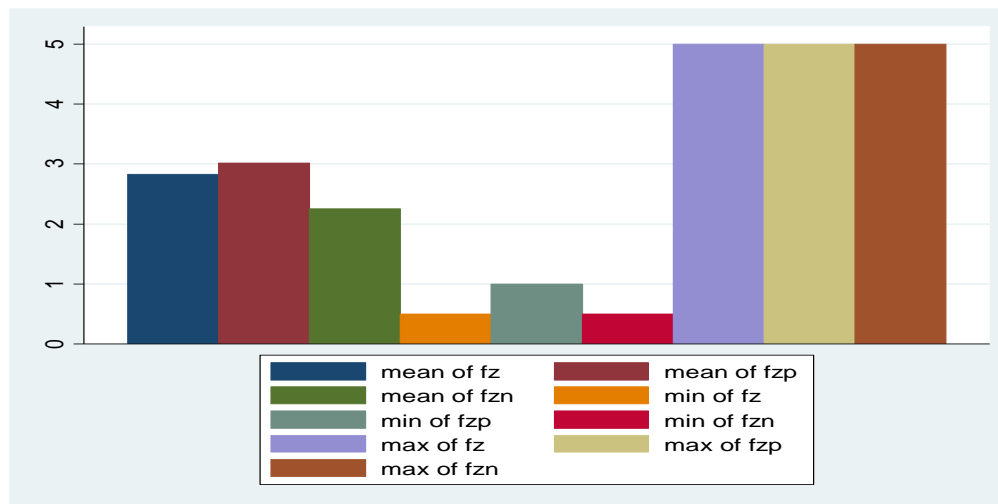
Source: Own survey data (2018)

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 Land Holdings of Survey Household

The survey data reveals that almost all of the respondents 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 survey 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 hectares respectively. The minimum and maximum land size owned by participant was 1 and 5 hectares; whereas non-participants have 0.5 and 5 hectares 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 Survey 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.

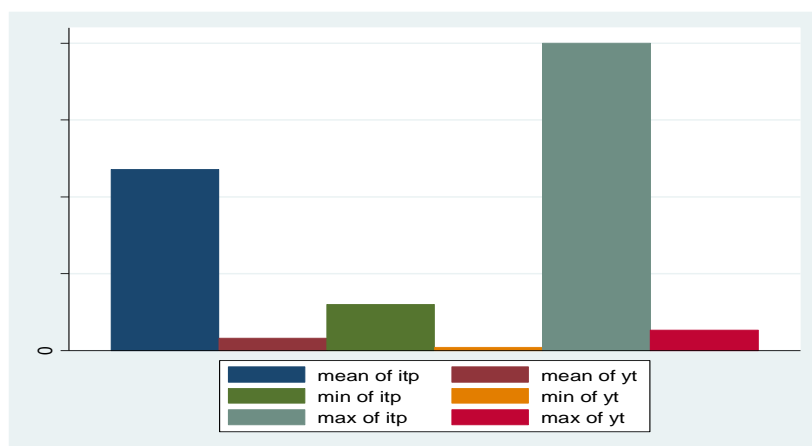
Table 4.4 Off- farm activity participation in sampled household

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.

Furthermore, the distance from farm gate to the nearest market place, also determines 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).

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 Factors Determining Smallholder Teff farmer's Market Participation Decision and Level of Marketing: An Econometric Analysis

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	.26432z18	.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.

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 household 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.

Table 4.8: Factors that determine the intensity of farmers' participation in Teff output market: 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	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

Source: Survey data (2018)

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

R-squared = 0.06146; 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.

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. 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.

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.

V. CONCLUSION AND POLICY IMPLICATION

The first stage finding of probit marginal effect estimation shows that out of fourteen explanatory variables, 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 λ 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.

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

- This study show 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 on time 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
- The study showed 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 in capacitating the females socially and economically.

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