Determinants of Red Bean Commercialization by Smallholder Farmers in Shalla Districts, Oromia Regional State, Ethiopia

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Abstract: Smallholder farmers face many constraints that impede them to derive benefits from market participation. This study assessed factors that influence output side commercialization decision and level of commercialization of red bean crop in Shalla Districts, Oromia Regional State, Ethiopia. In this study multi stage sampling techniques were employed to select 150 bean producers from five sample kebeles in the study area. Both descriptive and econometric methods were used to analyze the data. Heckman's two step sample selection model was applied to analyze factors determining commercialization decision and level of commercialization in the bean market. The first-stage probit model estimation results revealed that age of household head, years of schooling, membership cooperative, family size, off-farm activities and active labor affected probability of market participation. Second-stage Heckman selection estimation indicated that age of household head, family size, farm size and years of schooling significantly determined volume of red bean supply. The results also showed that most of the factors determining decision of participation in red bean farm also determine level of participation, suggesting that the two decisions were made simultaneously by red bean producers. Finally, stakeholders should be designing appropriate policies, creating better credit services and agricultural extension services to households, advancing market infrastructure and delivering of marketing incentives to smallholder farmers which would encourage the farmers to participate in the food market.

Keywords: Heckman's Two Step, Red Bean, Smallholder, Commercialization, Market Participation

1. Introduction

The agriculture sector is the most imperative and strategic sector in Ethiopian economy. Therefore, the agricultural sector is vital for bringing about economic growth and development; accelerate poverty reduction, enhancing food security and nutrition security [9]. However, the agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with or no access to market facilities resulting in low participation of the smallholder farmers in value chain or value addition of their produces [35]. Moreover, sector is dominated by subsistence oriented, natural resource intensive, low input, low output; rain-fed farming system [12] and an ever-increasing

population pressure, the land holding per household is declining leading to low level of production to meet the consumption requirement of the households [35].

One of the key strategies to reduce poverty in rural area is transforming substance-oriented production to commercialization-oriented production among smallholder farmers. The importance of market participation to economic growth and poverty reduction arises from the fact that market participation leads to market-oriented production where the household specializes in the production of those goods for which it holds comparative advantage [34].

Grain crop like pulses are served as major food crops for the majority of the country's population, source of income at household level and generating foreign currency for agrarian

countries. According to [6] report, pulses grown in 2017/18 covered 12.61% (1,598,806.51 hectares) of the grain crop area and 9.73% (29,785,880.89 quintals) of the grain production. Faba beans, white beans, red beans and chick peas were planted to 3.45% (437,106.04 hectares), 0.71% (89,382.68 hectares), 1.71% (216,803.91 hectares) and 1.91% (242,703.73 hectares) of the grain crop area. The production obtained from faba beans, white beans, red beans and chick peas was 3.01% (9,217,615.35 quintals), 0.48% (1,482,128.42 quintals), 1.22% (3,727,664.85 quintals) and 1.63% (4,994,255.50 quintals) of the grain production [6], respectively.

Common bean is the most commonly consumed legume worldwide, and it is the most important for direct human consumption, with a commercial value exceeding that of all other legume crops combined [21, 33]. The country earned 19 million USD and 95.3million USD in 2005 and 2012 respectively from common beans export market [8]. In terms of economic importance, red bean is used as source of foreign currency, food crop, means of employment, source of cash, and plays great role in diversifying the farming system [6, 8]. Based on Shalla agricultural office, 2018 the households in the district were red bean producers and about 57% of households producing the commodity offer part of the produce for sale. However, red bean production is increasing, whereas farmers' market participation is limited. This limited indicates that farmers' participation in red bean market is not matching increasing production and Smallholders farmers in rural areas hindered by market imperfect, high transaction costs, few buyer competitions, poor infrastructure, less market integration, limited market linkage (institutionalization) and lack of properly coordination with that of agricultural development agents limited their market participation [14].

2. Methodology

2.1. Geographic Description of Study Area

The study was conducted in Shalla districts, west Arsi zone, Oromia regional state, Ethiopia. The administrative center of

this Woreda is Aje, which approximately 282 km south of Addis Ababa. The district is located in the rift valley depression of east Africa characterized by flat land with very gentile sloping ground surface surrounded by ridges, hills, and gullies. It is bordered on the south by Siraro district, on the west by the Southern Nations, Nationalities and Peoples' Region, on the north by Shalla Lake, and on the east by Shashamane, its western boundary is defined by the course of the Bilate River. As per the 2007 population census, Ajje has a total population size of 149,804 (74,874 women) with 5.13% of them are urban dwellers. It comprises 38 kebeles and 2 sub-cities. The majority of the district's population of about over 90% follows the religion of Islam, and over 95% of the population is rural. The landscape of the zone is flat and short indigenous shrubs, eucalyptus and acacia trees dominate the vegetation of the livelihood zone. The area is sparsely populated and, as a result, households own relatively large areas of land. Mixed farming is the main livelihood pattern. The cultivation of cash crops, common beans (red) and food crops, as well as animal rearing, are the main sources of both food and cash income for the majority of households. The main food crop is maize and other crops include wheat, sorghum, teff and millet. The sale of pepper is the most important source of income for all wealth groups. The main livestock types reared are cattle, goats, sheep and donkeys [31].

2.2. Sampling Procedure and Sample Size

In this study three stage sampling technique were employed. Both purposive and random sampling techniques were used to draw a representative sample. In the first stage, from the 37 rural Kebeles administrations in Shalla distinct, 19 potential red bean producing Kebeles were purposively selected (Table 1). In the second stage, five Kebeles were randomly selected from potential red bean producing Kebeles. Finally, using the household list of the sampled Kebeles 150 sample farmers were selected by using systematic random sampling. The total sample size was distributed to each Kebeles based on the probability proportional to size sampling technique [7].

Table 1. Sample determination of smallholder red bean farmers.

Name of selected *Kebele*	Total households of the kebeles	Red bean producer households	Proportion of Sampled households (%)	Number of sampled Households
Awara Gama	671	603	19	28
Bekele Daya	765	688	22	33
Arjo	812	730	23	34
Cafaha Qerensa	695	625	20	30
Lenca Laman	587	528	16	25
Total	3530	3174	100	150

Source: column 2 and 3 from agricultural office districts, (2018).

The sample size was determined by using the formula given that is:

$$n = \frac{z^2 pq}{e^2} \qquad (1)$$

Where;

Z=is the selected critical value of desired confidence level at 95%=1.96, n=is the sample size=150, e=is the level of precision=5% and p=is the estimated proportion of red bean producers present in the population=89%, q=(1-p)=(100%-89%)=11%, is the estimated proportion of not red bean

producers present in the population.

$$n = \frac{1.96^2 * 0.89 * 0.11}{0.05^2} = 150.4 \approx 150 \qquad (2)$$

2.3. Source of Data and Method of Data Collection

Both primary and secondary data were collected from different sources to identify important variable that affect commercialization decision and level of commercialization of red bean crop. Primary data was gathered from sample respondents using structured questionnaire interview schedule. The questions prepared by English and translated into local language (Afan Oromo) to make questions clear for the respondents and to facilitate data collection during household survey. Whereas the secondary data for this study were gathered from relevant published and unpublished materials from the Woreda agriculture office, books, journals about agricultural output market participation.

3. Method of Data Analysis

Data were entered into computer software for analysis. Both SPSS version 16 and STATA version 14 computer programs were used to process the data. Two types of analysis, namely: descriptive and econometric analyses were used for analyzing the collected data.

Descriptive analysis: Descriptive statistics such as percentage, frequency, mean and standard deviations were used to describe characteristics of households by market participation. T-test and chi-square was used for continuous and dummy variables respectively.

Econometric model: Econometric model was used to identify the factors that affect farmer's participation decision in red bean marketing in one hand and extent of participation in red bean marketing in the other hand. Most recent literatures adopt Tobit, Heckman's two stage and double hurdle models to examine crop market participation [7, 11, 35]. The choice of Heckman two stage models is related with the advantages compared to Tobit model and it allows the determinant factors to vary for participation and level of participation. So that to determine the factors influencing participation and extent of participation in red beans marketing, the Heckman two-stage selection models were used. The decisions to either participate in the market or not and level of participation were dependent variables and were estimated simultaneously. Heckman two-step model involved estimation of two equations: first, is market output participation decision and second is amount of output supplied to output market. The level of red bean sales is conditional on the decision to participate in the output market. Heckman procedure is a relatively simple procedure for correcting sample selection bias with the popular usage. The specifications for Heckman's two stage selection models are as follows:

(i) The participation Equation: The Probit model is specified as:

$$y_i = \beta_i X_i + \varepsilon_i$$

$$y_i{}^* = \begin{cases} 1 \; if \, y^* > 0 \\ 0 \; if \, y^* \leq 0 \end{cases} i = 1,2,3 \dots 150 \qquad (3)$$

Where, Y_i^* is the latent dependent variable which is not observed and Y_i is binary variables that assumes 1 if small scale red beans farmers i, that participate in the marketing and 0 other wise.

X_i =is a vector of independent variables hypothesized to affect household decision to participate in onion market.

ε_i =is normally distributed disturbance with mean (0) and standard deviation of 1, and captures all unmeasured variables.

According to [28, 35], in this study the market participation decision is estimated as Y=1 if the household participates in output markets and Y=0 otherwise. Following to [28, 35, 37], the researcher can compute household crop output market participation in annual crops as the proportion of the value of crop sales to total value of crop production, which can be computed as follows:

$$MPI_i = \frac{P_i S_i}{P_i Q_i} \; i \dots, 150 \qquad (4)$$

Where MPI_i =is market participation index, $P_i S_i$ =is total value of red bean sales and $P_i Q_i$ =is total value of red beans produce for individual i.

Given the nature of market participation level, the farmers are said to be market participant if their proportion of value sold is more than 75% [15, 27, 28, 39]. Thus, the researcher defined the binary response variable as Y=1 if the farmer's red bean sales exceed a threshold or critical level of Y*(75%) and Y=0 if Y ≤ Y*. Here, the proportion of red beans sold (say, above 75%) out of the total production by the smallholder farmers in the production year used as the proxy of market participation during data collection period [36, 35].

(ii) Regression (OLS): Selection model is specified as:

$$Q_i = \beta_i Z_i + \gamma \lambda_i + \mu_i \qquad (5)$$

Where, Q_i = is the proportion of red bean supplied to market; Z_i =is vector of explanatory variables determining the quantity supplied; γ =is parameter that helps to test if there is a self-selection bias in market participation; μ_i =is the error term.

Lambda, which is related to the conditional probability that an individual household decide to participate (given a set of independent variables), is determined by the formula

$$\lambda_i = \frac{f(x\beta)}{1 - f(x\beta)} \qquad (6)$$

Where, $f(x\beta)$ = is density function and $1 - f(x\beta)$ = is distribution function.

Before fitting important variables in the models, it is necessary to test multicollinearity, heteroscedasticity and normality problem among the variables which seriously affects the parameter estimates. Several methods of detecting the problem of multicollinearity have been used in various studies. Two measures are often suggested in the discussion of multicollinearity which is the variance –inflation factor (VIF) for continuous variables and contingency coefficient

for dummy variables (Table 6 and Table 7) respectively.

4. Results and Discussion

4.1. Descriptive Characteristics of Households by Market Participation

The mean characteristics of households by market participation who sold red bean to market outlets available in the study area are given in Table 2. For the descriptive statistics, sampled households were divided into participants and non-participants of onion marketing. The objective is to assess the differences and similarities among participant and non-participants of red bean producers in terms of their demographic and socioeconomic, farm, institutional and market characteristics. Out of 150 households, 60% of households were market participant households, as they sold red bean products to market outlets available in the study

area at the time of survey; while the remaining 40% of households did not participate in selling red bean in output market. Descriptive statistics (mean and t-test) indicated that Market participants and non-market participants had statistical significant differences with regards to land size, Age of household, family size, years of schooling, frequency of visits by extension agents, market experience, quantity sold, active labor, beans productivity (yield), and farm size allotted to red bean. Results as seen in Table 2 indicate that, the average red bean producer's years of schooling of market participants per season was found to be 1.64 years while that for non-market participant was found to be 0.79 year. Education also enables the person with ability to do basic communications for business purpose and decision making. The key features of the variables used in the current research are shown in the Table 2.

Table 2. *Mean characteristics of household by market participation status.*

Name of variables	Mean value of variable for			
	Market participants	Not participants	Over all	T-test
Age of household	49.68	34	43.41	10.43***
Family size	6.34	7.3	6.73	1.87*
Years of schooling	1.6	0.79	2.77	-8.64***
Farm size allotted	1.6	0.79	2.54	-9.51***
Frequency of extension visit	2.87	2.91	2.89	0.114
Beans productivity (yield)	9.01	6.53	8.02	-4.02***
Active labor	4.68	3.46	4.2	-3.16***
Quantity sold	15.87	0.61	9.77	- 10.43***
Market experience	6.26	3.23	5.05	-5.88***

Note. n=150, ***, ** denotes significance at α=1% and α=5% respectively
Source: Survey data (2018).

Table 3 presents the proportion characteristics of the sample respondents. The total sample size of farm respondents handled during the survey was 150. Of the total sample respondents, 80% were male-headed households of which 39% were market participants, while 14% of male were non participant. On the other hand, 70% were female-headed of which 26% of nonmarket participants were female, while 21% were market participant. The same interpretation was used for all variables. The chi-square result showed that

gender, access to credit, membership of cooperative, market information and off-farm activities were statistically significant at 1%. Statistically, indicating that the male households who participate in the bean market, household access to credit, access to market information, were more than those who did not participate. However, in addition to the farming activities, some respondents (58%) have also engaged in non/off-farm activities like in small trading activities.

Table 3. *Proportions characteristics of household by market participation status.*

Variable	category	Market Participants (%)	No-participants (%)	Over all	Chi-square value
Market participation		90 (60)	60 (40)	150 (100)	
Sex of the household head	female	31 (21)	39 (26)	70 (47)	13.50***
	Male	59 (39)	21 (14)	80 (53)	
Access to credit	Yes	18 (12)	11 (7)	29 (9)	0.060
	No	72 (48)	49 (33)	121 (81)	
Organization group	Yes	64 (43)	9 (6)	73 (49)	45.37***
	No	26 (17)	23 (15)	49 (32)	
Market information	Yes	67 (45)	16 (11)	83 (56)	33.24***
	No	23 (15)	44 (29)	67 (44)	
Off-farm activity	Yes	17 (11)	41 (27)	58 (38)	37.11***
	No	73 (49)	19 (13)	91 (62)	

Note. n=150, *** denotes significance at α=1%.
Source: Survey data (2018).

4.2. Econometric Model Results Proportion

In this study, those factors that influence the decision to participant as well as volume of red bean supplied to market are to be determined. About 13 variables were hypothesized to determine household level decision to participate in red bean market and the volume of marketed surplus. The Probit and Heckman selection model results are depicted in Table 4.

4.2.1. Factors Affecting Market Participation Decision and Volume Supply in Shalla District

Heckman two-step procedure was used to determine the factors influencing participation and extent of participation in red bean marketing. The variables included in the model were sex of household head, age of household head, family size, years of schooling, land allotted, frequency of extension visit, market experience, access to credit, membership of cooperative, access to market information, number of active labor, off-farm activities and yields (productivity). The data were analyzed and post estimation of the selection equation results was done to obtain the marginal effects. The marginal effects were used for interpretation, since the coefficients of selection equation have no direct interpretation. The reason that, based on maximum likelihood function, marginal effects have a direct interpretation [17].

4.2.2. Estimation Results of First Stage Heckman Selection Model

To determine the factors influencing market participation of red bean in Shalla district, a probit model was estimated in the first step of the Heckman selection equation. Results of first-stage probit model estimation of the determinants of the probabilities of the farmer's participation in red bean market are given in Table 4. Table 4 also contains the values of marginal effects which are evaluated at the means of all other independent variables. The overall goodness of fit for the probit model parameter estimates was assessed based on several criteria. First, the log likelihood ratio test was applied to assess the overall joint significance of the independent variables in explaining the variations in the red bean farmer's likelihood to participate in the red bean market. The null hypothesis for the log likelihood ratio test is that all coefficients are jointly zero. The model chi-square tests applying appropriate degrees of freedom indicated that the overall goodness of fit of the probit model was statistically significant at a probability of less than 1%. This showed that jointly the independent variables included in the probit model regression explain the variations in the farmer's probability to red bean market. Second, the McFadden's Pseudo R2 was calculated and the obtained values indicate that the independent variables included in the regression explain significant proportion of the variations in the red bean farmer's likelihood to participate in red bean market.

Table 4. *First-stage probit estimation results for factors influencing market participation.*

Variables	Coefficient	Robust-Std. Err	Marginal effect (dy/dx)	Z	P-value
Sex of household head	-.1682089	.7068111	-.0057924	-0.24	0.812
Age of household head	.2274392	.0582492	.0078934	3.90	0.000***
Family size	-.7302697	.1983846	-.0253445	-3.68	0.000***
Years of schooling	.2514595	.1121766	.0087271	2.24	0.025**
Land allotted	.7316974	.6594914	.025394	1.11	0.267
Frequency of Extension visit	.0118055	.1520535	.0004097	0.08	0.938
Market experience	.5327632	.1436453	.0184899	3.71	0.000***
Access to credit	3.496227	1.472962	.0625144	2.37	0.018**
Organization member	2.549008	.8099348	.1659504	3.15	0.002***
Market information	1.034813	.4064189	.0470112	2.55	0.011**
Number of active labor	.0783859	.2031002	.0027204	0.39	0.700
Off-farm activities	-1.901736	.9864054	-.1467356	-1.93	0.054*
Yield (productivity)	-.0332396	.2059132	-.0011536	-0.16	0.872
_cons	-8.839817	2.267077		-3.90	0.000
Number of obs=150					
Wald chi2 (13)=56.02					
Prob > chi2=0.0000					
Log pseudolikelihood=-12.930					
Pseudo R2=0.8719					

Note. ***=1%, **=5% and *=10% significance level.
Source: Model results of survey data (2018).

Age of household head: Age was significant and positively related to the probability of market participation at 1% significance level. Age of the household head was taken as an indicator for experience in farming. According to [6] implied that households' aged are believed to be wise in resource allocation, risk management and have more contact which allows trading partners be find out at lower cost than younger households due to the experience they developed. This may be due to the fact that older people are more risk hating due to more experienced than younger people, open to adopt technology and they are mentally fit to reduce transportation cost to the market. The decision to sell or not to sell was based in households on position in the order of hierarchy in headship of the family. An increase in household age by the

year indicated an increase in the probability of red bean market participation by 0.7%. As discussed [20, 25, 32], in their study, the age of households positively and significantly raised the probability of market participation for potential selling households.

Family size: It was significant and negatively associated with the probability to sell red bean at 1% level of significance. This meant that as the number of persons in the household increases, the probability of farmers' orientation towards commercialization decision reduced. The implication is that households' participation decision in red bean market could depend on family size or the per capita consumption requirement that could be satisfied from own production. The households can participate in the market after satisfies their needs through consumption (they sold outputs in market after meet their consumption need). Thus, the marginal effect result indicates that a unit increase in family size decreases the probability of participation in red bean market by 2.53%, other factors remain constant. This thesis is in lined with finding of [25, 32] that households with larger family size have a habit of to fail to produce marketable surplus beyond their consumption needs.

Years of schooling: It significantly and positively influenced market participation. This implies that, education empowers the farmer to access more information, to get new existing opportunities from various markets and to be more informed on market requirements in terms of price, quality, and right volume of red bean needed by buyers. This makes a farmer becomes very likely to participate in the marketing activities. The marginal effect confirmed that, for each additional year in education, the respondents were 0.87% more likely to participate in red bean markets, keeping other factors constant. These finds are consistence to those of [23, 30, 39], argued that, smallholder farmers with high level of education were more involved in selling their produce to market.

Market experience: Market experience has showed positive effect on red bean market participation with significance level at 1%. The result indicated that, as households have more marketing experiences, it becomes more likely to participate and thereby sell large quantities of red bean to the market. The reason that, more experienced household are more informed about market requirements, linked to social network with each other and incurred to low fixed transportation cost than less experienced one. Therefore older farmers have higher probability of participating in the market because they have more market information and more social networks established by a farmer. Marginal effect showed that, on average as farmers stay in marketing increases by one year, the propensity to participate in the market increases by 0.84 percent. This result is consistent with [20] that market experience influences significantly and positively the likelihood of market Participation of Smallholder Bean Farmers in Nyanza District of Southern Province, Rwanda.

Access to credit: The result indicated that access to credit positively and significantly influenced the market participation. The reason that, access to credit helps farmers to purchase the improved agricultural inputs such as fertilizers, seeds and other production technologies which in order to boost volume of agricultural production and thus the marketable surplus. Marginal effect conveys that, the shift from lack of credit accessibility to credit access would increase the probability of market participation by 6.25 percent. This finding is consistent with [20, 26], examined that the access to credit had positive impact on the probability of household's decisions to participate in the market.

Membership of organization: Being a member to a farmer organization was significant and had a positive influence on the decision to participate in the market at 1% significance level. Membership to group is important for information access on available market and this reduces fixed transaction costs [23] and collective action has many benefits ranging from production to marketing decisions because of enhanced bargaining power and information access [30]. This implied that as being a member to a farmer organization increase, the probability of participate it to red bean market increase by 16.6%. This result consistent with [26, 30], found that membership of organization has positive and significant effect on commercialization decisions.

Market information: Access to market information has a positive and significant impact on the households' market participation decision at 5% significance level. Those farmers with better market information are in a better position to supply their surplus production to the market as compare to farmers who do not get information. In household food marketing, market information may be raised the probability of market participation for potential selling households in output market. The marginal effect also confirms that, if probability access to market information increases, the farmers' propensity to participate in the red bean market increases by 0.04%. This result is constant with [39].

Off-farm activities: Access to off-farm activities had a negative significant impact on the farmers' decisions to participate in the output market at 10% significance level. This means that if farmers participate in alternative activities to farm-income source, they are less likely to involve in agricultural food production thereby reducing the household's position in agricultural crop market. This finding indicated that households with high off-farm income are inclined to be non-participants in crop market because they tend to generate cash from off-farm activities rather than agricultural commodities the study area. The marginal effects suggest that if a household involves in generating cash from off-farm activities, the probability of market participation decreases by 0.1 percent, other factors remain constant. This is consistent with the findings of [20, 30], who found that the increase in access to off-farm activities, reduce the likelihood of households' market participation in the market.

Factors Affecting the Level of commercialization by second stage Heckman selection model Heckman's two step model was used to analyze the factors affecting smallholder's volume of supply to market (Table 5). The null hypothesis for

the test assumed that all coefficients are jointly zero. The model chi-square tests applying appropriate degrees of freedom indicate that the overall goodness of fit for the Heckman selection model is statistically significant at a probability of less than 1% level of significance. This showed that jointly the independent variables included in the selection model regression explain the level of market participation. In the second stage selection model, nine explanatory variables: Sex of household head, age of household head, family size, years of schooling, land allotted, frequency of extension visit, market experience, yield (productivity) are significantly affect volume of red bean supply.

Table 5. *Second-stage Heckman selection for determining factors affecting volume of supply.*

Variables	Coefficient	Std. Err	Z	P-value
Sex of household head	2.630425	1.477811	1.78	0.075*
Age of household head	.3226583	.0854972	3.77	0.000 ***
Family size	-.8900072	.3114535	-2.86	0.004***
Years of schooling	.7226183	.2324044	3.11	0.002 ***
Land allotted	6.368377	1.592683	4.00	0.000***
Frequency of Extension visit	.7146562	.3354346	2.13	0.033**
Market experience	. 6967402	.2049124	3.40	0.001***
Access to credit	.4178383	1.566991	0.27	0.790
Organization member	-.6997244	1.48802	-0.47	0.638
Market information	-.5290947	1.400129	-0.38	0.706
Number of active labor	-.0498324	.3854548	-0.13	0.897
Off-farm activities	-2.093315	1.699902	-1.23	0.218
Yield (productivity)	.4443083	.1868621	2.38	0.017**
mills lambda	5.421035	2.215421	2.45	0.014**
_cons	-19.0374	4.27912	-4.45	0.000
Number of obs=150				
Censored obs=60				
Uncensored obs=90				
Wald chi2 (13)=225.99				
Prob > chi2=0.0000				
rho |=0.96359				
sigma |=5.6258585				

Note. ***=1%, **=5% and *=10% significance level.
Source: Model results of survey data (2018).

Age of household head: Age of household head had a positive influence on intensity of commercialization at 1% significance level. Aged households' are believed to be wise in resource use. As an individual stays long, he will have better knowledge and will decide to allocate more size of land, produce more and supply more. As household head's age increases by one year, the extent of supplies increased by 0.32 qt in the red bean market. This result is similar with [16] declared that age has positive and significant impact on volume of supplied in the output market.

Family size: As postulated the coefficient of family size was negatively and significantly effect on the extent of market participation. This inverse relationship between farm size and levels of market participation suggests that households with relatively large farm size were consumed more farm output that leads to low levels of market participation. The similar findings were observed by [20, 29] who found the negative relationship between the farm size and level of market participation.

Years of schooling: Education level of household showed positive effect on level of red bean commercialization with significance level at 1%. The possible explanation is more educated households are knowledgeable to improve the producing household ability to acquire through easily adapt agricultural technologies and hereby increased marketable supply of red bean. Another implication that, farmers with formal education are more market-oriented, knowledgeable about the prevailing market situations and therefore produce to take advantage of the market environment [2]. A unit increase in years of schooling would lead to a significant increase in quantity of sale by 0.72 qt in the level of market participation. This study is in lined with [2, 35, 39] reported that education status is positive and significant effect on level of commercialization.

Land allotted: As expected, it was positively associated with the market supply in red bean market with statistical significant level of 1%. Farmers having large size land plot for red bean can produce more beans by adopting of improved new agricultural technology packages for increasing productivity (yields) and also encouraging level of market supply. This means more land allotted to red bean growing, more quantity would be supplied to the market. As farm size increases by one unit (hectare), the volume supplied of red bean in the market increases by 6.37 qt. This result is consistent with [23, 35] who studied that land holding is directly linked to the ability to produce a marketable surplus.

Frequency of Extension visit: It also found that frequency of contact with extension agents was positively and significantly influenced the probability of selling red bean (at 5% significance level). The roles of extension agents were to increase improved of agricultural technology adoption among smallholder farmers in order to boost the volume of production. Being more contact with extension specialists increases the volume of red bean sale by 0.71 qt. This finding was consistent with the finding of [3] who found that the coefficient of extension services was positive and significantly influenced the extent of market participation among the rice farmers. Another finding by [12] discovered that the expansion of the agricultural extension services had significant impact on the intensity of banana market participation of Ethiopian smallholder farmers.

Market experience: It has positive significant effect on level of commercialization at 1% significance level. A possible explanation is that more experienced farm households tend to have more personal contacts with their traders and social networking, permitting further discovery of trading opportunities at lower costs. Also, marketing experience helps farmers in order to create marketing network and farm agreement with other traders. This means that the farmers with more years in marketing have higher ability to sell more bean output in the market. An increase in a farmer's marketing experience by one year increases the level of quantity red bean sold by 0.69 qt (quintal). This result is in line with [20]; they found that market experience has positive significant relationship with the volume of beans

supplied in the market. [11] Found that marketing experience positively and significantly influences the extent of market participation.

Yield (productivity): As hypothesized, result shows that marketed surplus was significantly affected by red bean yield at less than 5%. The positive coefficient indicated that a unit increase in red bean yield produced will increase the marketable supply of farmers. The result also implied that, a unit increase in the red yield produced can cause an increase of 0.44 qt (quintal) of marketable red bean. This denotes farmers' with higher productivity (yield), are willing to supply more farm output in market. This is in line [35] who illustrated an increase of onion yield, increased marketable supply of the commodities significantly.

Sex of household head: The gender of the household head positively influences the level of commercialization in the red bean output market, that is male headed households are more likely to participate in red bean markets than female headed households and by more supply red bean it to market.

Male households have been observed to have a better tendency than female household in fruit production and supply of fruit due to obstacles such as lack of capital, and access to credit and extension services. This study is similar with [36].

Inverse Mill's Ratio: It was significant and positively related to the level of red bean commercialization at less than 5% significance level, which implies that there are unobserved factors that might affect both probability of red bean farm household market participation decision and marketed surplus. This confess that, there is sample selection bias; which implies the existence of some unobserved factors responsible for red bean growers' likelihood to participate in market and thereby the level of market participation. The positive sign of lambda shows that there are unobserved factors that are positively affecting both participation decision and marketed surplus of red. The sign of rho was positive, indicating that unobserved factors were positively correlated with one another. Sigma=5.6258585 represents the adjusted standard error for the level of market participation equation regression; and the correlation coefficient between the unobserved factors that affecting decision in to market participation and unobservable that affecting participation level is given by rho=0.96359.

5. Conclusion and Recommendations

Transforming agriculture from the subsistence-oriented production to market-oriented is one of the pillar strategies in the policy of Ethiopia to increase farmers' income, promote economic growth and development and accelerate poverty reduction. Hence, smallholder commercialization of crops production is an important part of agricultural transformation to increase household food security, generate stable income, reduce rural poverty, and contribute to agricultural development and economy wide growth. Shalla district is one of the potential red bean cultivator districts found in western Arsi among of the Oromia regional national state. However,

the productivity and market participation of red bean is limited among smallholder farmers in the study area. This study was conducted at Shalla district to analysis factor affecting commercialization decision and the level of commercialization in red bean crop market. Similarly, this study used primary data collected from 150 by using simple random sampling technique among red bean producer households from purposively selected five *kebeles* through semi-structured questionnaire, Focus Group Discussions and key informant interview in the study area. For data analysis purpose both descriptive and econometric model were used. The result from first stage of heckman two stage models or probit model shows that age of household head, years of schooling, market experience, access to credit, membership of organization, market information significantly and positively affect household red bean commercialization decision while off-farm activities and family size negatively and significantly affect household red bean commercialization decision in the study area. The heckman second stage model shows that sex of household head, age of household head, years of schooling, land allotted, market experience, frequency of extension visit, yield (productivity), Inverse Mill's Ratio (LAMDA) affect positively and significantly the level of commercialization in red bean crop while family size affect negatively and significantly the level of commercialization in red bean crop market. From the study results the following conceivable recommendations are strained: first, generating awareness on family planning among farmers by health extension workers at kebele level in order to improve smallholder farmers' red bean market participation and creating rural employment opportunities. Second, strengthen and expand market information services though link farmer with farmers' cooperatives/groups with proper sources of market information. Third, government should build capacity of farmers through adult literacy programmed and to formulate appropriate policies that would mobilize and encourage the farmers to go to school. Fourth, by increasing production and productivity of red bean through the adoption of improved agricultural technology package be promoted to increase red bean market participation. Finally, stakeholders should be designing appropriate policies, creating better credit services and agricultural extension services to households, advancing market infrastructure and provision of marketing incentives to smallholder farmers which would encourage the farmers to participate in the food market.

Appendix

Table 6. Multi-collinearity test with VIF.

Variable	VIF	1/VIF
SFAR	3.04	0.329367
AOHH	2.31	0.433784
EDLV	2.18	0.458240
NAFL	1.79	0.558843
YIELD	1.76	0.567597
FASZ	1.53	0.652727

Variable	VIF	1/VIF
MATEP	1.41	0.711567
NOEV	1.05	0.956653
Mean VIF	1.88	

Source: Computed based on model output.

Table 7. *Contingency coefficient.*

varables	Mpn	GNDE	AOC	MICO	MINFO	OFFA
Mpn	1.0000					
GNDE	0.3000	1.0000				
AOC	0.0207	0.0519	1.0000			
MICO	0.5500	0.2691	0.0299	1.0000		
MINFO	0.4708	0.2079	-0.0355	0.3114	1.0000	
OFFA	-0.4974	-0.1628	0.1313	-0.3349	-0.3055	1.0000

Source: Computed based on model output.

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