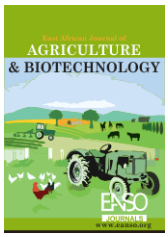

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Original Article

Determinants of Farmers Participation in Coffee Production: A Case of Boneya Boshe, Woreda, East Wollega Zone, Oromia - Ethiopia

Wakjira Aga Bulti[1], Badassa Wolteji[2] & Wondimu Sakata[3]*

[1] East Wollega Zone Administration Office, Addis Ababa-Addis, Ethiopia.
[2] Ambo University, P. O. Box 19, Ambo, Oromia, Ethiopia.
[3] Wollega University, P. O. Box 395, Nekemte, Oromia, Ethiopia.
* Author for Correspondence Email: amayuaga@gmail.com

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ABSTRACT

The objectives of the study were to identify the decisions to participate in coffee production and to examine factors affecting production intensity in the study area. Multi-stage sampling procedures were employed in order to draw a sample of 177 respondents of which 125 and 52 were participants and non-participant respectively; using simple random sampling, both primary and secondary data were employed. The data was collected using structured questionnaires. The findings of probit model revealed that fifteen variables were hypothesized to explain probability of participation decision; of which coefficients of seven variables were significant at less than 1% probability level, and two variables were significant at less than 5 % probability level. Out of these significant variables, the coefficients of seven variables indicated positive effects on the likelihood of producing coffee. In Tobit regression eight variables were entered the final estimation and out of which three variables were significant at less than 1 % probability level, and two variables were significant at less than 5 % probability level. Out of these significant variables, only the coefficient of one variable indicated negative effects on the intensity of coffee production. The major variables that affect coffee production and its intensity negatively are experience, and contract farming. It is recommended that while giving the overall extension service for participant and non- participant the extension agents must show marginal effect of producing coffee in the study area.

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INTRODUCTION

Coffee is produced in more than 70 countries of the world (ICO, 2013). The study by Tefera et. al. (2016) puts Ethiopia as the largest coffee producer and first in Africa followed by Ivory Coast and Uganda by its yearly production and also ranks fifth in the world after Brazil, Vietnam, Colombia, and Indonesia, accounting for about 4.5 % of global coffee production. Likely, the birth place of Arabica coffee has been believed to be Ethiopia. The data obtained from the CSA, 2017/18 revealed that, in Ethiopia the numbers of coffee producers are about 5,019,513.00, covering an area of 725,961.24 hectares, production also recorded as 4,492,298.08 Quintals and of 6.19 yields in Qt/Ha. Beside this, as it was reported by MOA (2014) coffee is accounting on average for about 4% of Ethiopia's gross domestic product (GDP), 10 % of Agricultural production, and about 37 % of total export earnings over the past decade. It is further estimated that coffee production is mostly in the hands of smallholders and that about 4.2 million smallholder farming households contribute to 93-95 % of national coffee production. Due to this in Ethiopia, coffee is seen as green gold for the country.

In Oromia region, East Wollega Zone is also one of the coffee production potential areas. The data collected by CSA, 2015/16 shows that, the number of coffee producer households reached 97,736.00 on an area of 9, 793.28 hectares with the total harvested production of 59, 772.93 Quintals and also, the average yield was 6.10 Qt/Ha. There is a lot of research conducted on determinants of farmers' participation on coffee production by smallholder farmers in different producing areas like the study by Gicuru (2011). However, there is a little information about the determinants of farmers participation on coffee production i.e., information on factors affecting a farmer's decision to produce coffee, factors that affect the intensity and the roles of stakeholders on coffee production.

Problem Statement

Ethiopia has great potential for increasing coffee production, and average per hectare yield remains very low at 0.71 tons per hectares. Many factors are responsible for less yield of coffee production among which high expansions of Khat (Catapults) at the expense of coffee farm, following to this, the country's coffee farm management system and the agronomic practices are traditional. The other factor is that, the government of Ethiopia does not have a specialized institution that provides extension support for coffee production (Abu, 2013). However, none of them paid attention to the factors that influence farmers' decision to participate in coffee production, factors affecting intensity of coffee production and role of stakeholders on farmers coffee production. Hence, the analysis focused on those influential factors and through this it can be possible to obtain the greatest amount of output from a fixed quantity of inputs.

Objectives of the Study

The overall objective of the study is to identify the determinants of farmers participation in coffee production. Specifically, the study aimed at (1) to identify factors that influence farmers' decision to participate in coffee production, (2) to examine factors affecting intensity of coffee production and (3) to assess the role of stakeholders on farmers coffee production.

RELATED LITERATURE REVIEWS

Theoretical Literature Reviews

Coffee is produced in more than 70 countries of the world (ICO, 2013). From those, as studied by (Indonesia Investment, 2014) Countries that dominate the world's coffee production are found in South America, Africa, and Southeast Asia. In Africa, also Coffee accounts for 30.6% of Uganda's export earnings (AfDB & OECD, 2014) in 2012. Similarly, according to the study by Taye

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(2013) more than 95% of the total coffee produced in

Ethiopia is accounted by smallholder farmers, but still now the farming system is traditional. In Ethiopia, coffee productions are categorized under four main production systems and thus are; cottage or garden coffee (50-57%), semi forest coffee (30-35), forest coffee (8-10%), and modern coffee plantation (5%). Because of suitable elevation, temperature, soil fertility, indigenous quality planting materials, and sufficient rainfall in coffee growing belts of the country. Likewise, Oromia is one of the largest coffees producing regions accounting for about 70% of total coffee production and it is the primary origin and centre of diversity of Arabica coffee. In addition, to this, coffee is an important crop in a social and economic wellbeing of Oromia farmers (Oromia BoA in, 2010/11).

Empirical Literature Reviews

Beyene (2008) used probit model to account for the simultaneity of participation decisions of both male and female members of farm households. The results showed that availability of credit and transfer income have a positive impact on the decision of male members to participate in off-farm activities. As studied by Sanusi and Adedeji (2010) on analysis of accessibility of small-scale farmers to source of credit in Ogbomoso zone, Nigeria, they used Probit model and output of the study becomes, contact with extension agent, level of education, membership of cooperative and present of collateral security positively and significantly determine the likelihood of farmers access to credit.

To investigate factors determining the intensity of cassava commercialization Martey*et al*. (2012) used Tobit model. They also found that, marital status, household heads age, extension access, distance to market places and access to market information affected cassava commercialization intensity negatively and significantly. However, number of adults in the household, farming experience, volume of cassava produced, farm size, cassava price and off farm income affected positively and significantly. The result of Tobit model showed that location difference, distance to cooperatives, distance to main market and transport cost to the main market, coffee produced by the farmer and land holding affects commercialization scale significantly.

Conceptual Frame Work of the Study

The analysis was grounded on the theory of utility maximization. It was conceptualized that if the utility derived from production is greater than that of non-producer because of we cannot observe internal decision-making processes of the farmer, what we will observe is producer or non-producer of a technology. This forms the basis used to choose probit models in the analysis. On the other hand, to mitigate the objective of the study identifying factors affecting intensity of production it was considered to choose Tobit model. Since the intensity of area under coffee over total farm size dependent variables was continuous and revolves in between censoring 0 to 1. Thirdly, analysing the role of stakeholders in determining coffee production as dependent variable was conceptualized through using correlation coefficient.

METHODOLOGY

Description of the Study Area

The study was conducted in Boneya Boshe Woreda of East Wollega Zone, Oromia National Regional State of Ethiopia. It is located at 301km West of Addis Ababa (Finfine) and 25km from main road of Finfine to Nekemte in South direction, and also 81km in South East direction from Nekemte Town. The Woreda is located at $08^{0}53.710$’ N and $36^{0}59.570$’ E. The Woreda is characterized mostly by flat and undulating land features with altitude ranging from 1200 up to 2900 meter above sea level (m.a.s.l)

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Figure 1: Conceptual frame work of farmers' participation in coffee production Source: Researcher conceptualization based on literature (2018)

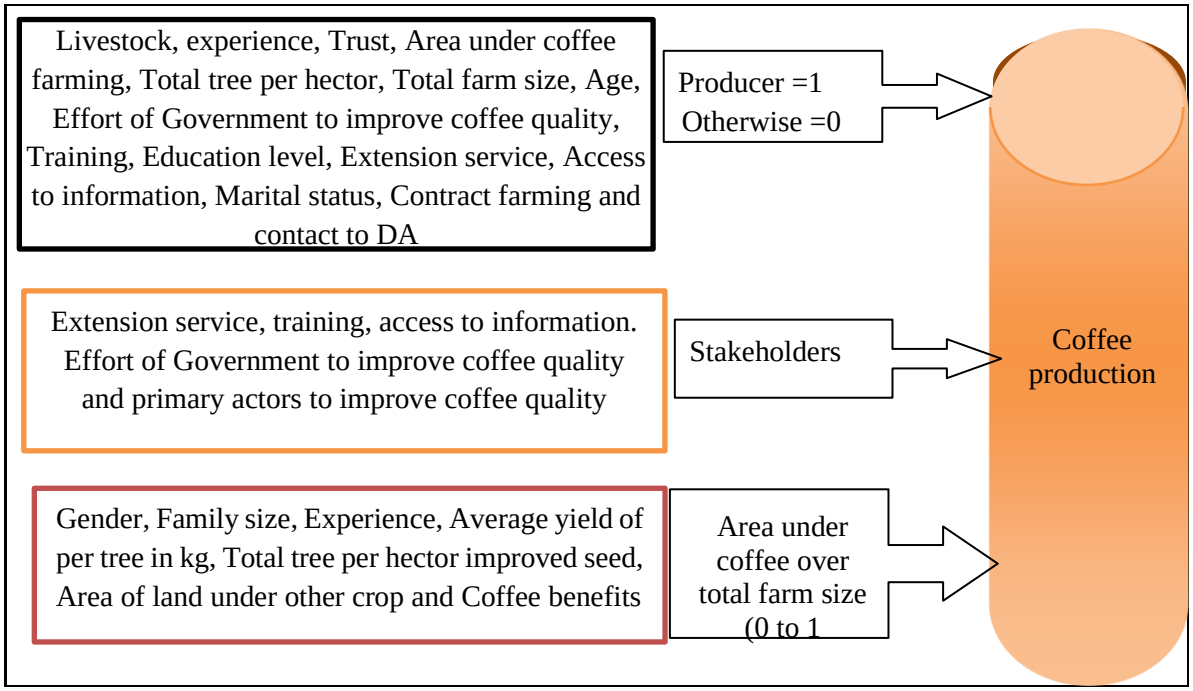
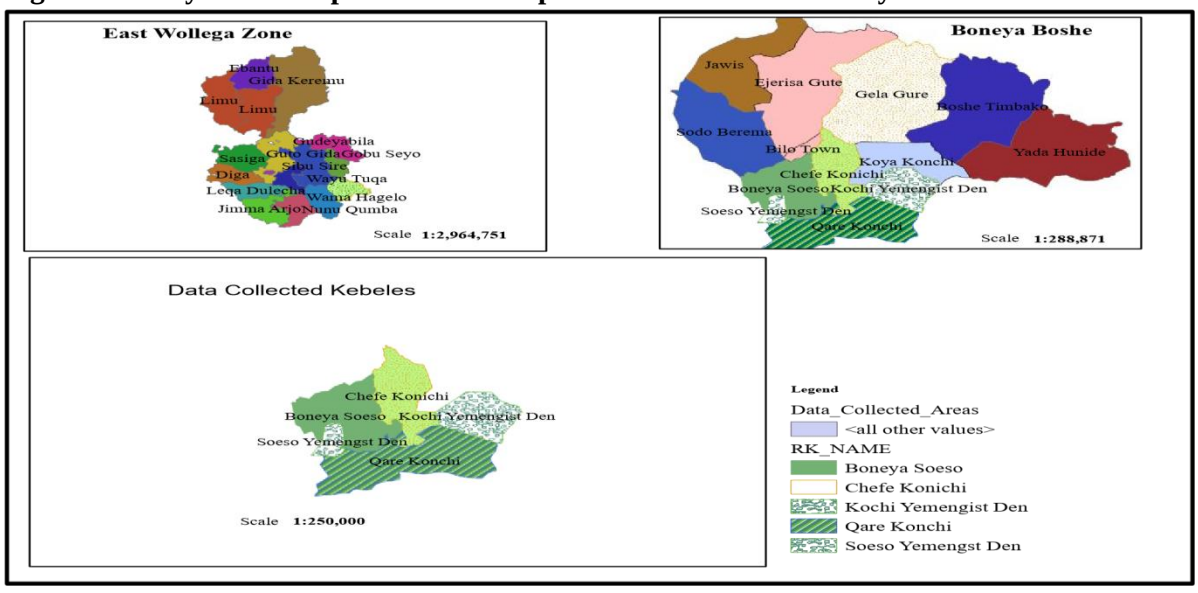


Figure 2: Study Area and potential Coffee production kebeles in Boneya Boshe Woreda



Source: Data from Google Map modified by the author, 2018

Research Design and Approach

The research design which guided this research is an explanatory design. Hence it helps to determine cause and effect relationship of dependent and independent variables. The study is also used cross-sectional data because of different education level of respondents; it is difficult to get time serious data. Thus, cross-sectional data were collected at one point in time.

Sampling

A multi-stage sampling procedure was employed in order to draw a sample from coffee producer and non-producer farmers. First the Woreda was selected purposively from 17 Woredas of East: Wollega Zone since it is a high potential are for coffee production

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Secondly, 3 potential coffee producers' kebeles were identified out of 10 kebeles in the Woreda. Thirdly, the target population composed of coffee producer and non- producers were identified out of 3 kebeles by using simple random sampling and the required sample size was selected. Yamane (1967) was used to is calculate sample size. The sample size of coffee producer and non- producer were estimated here under:

$$n = \frac{N}{1+N(e)^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where, n = sample size, N= Total population, e= precision level. Therefore, using formulas to

Calculate a sample size n = 177 Given from Yamane table with ±7% precision level then,

Total number of coffee producer from three kebeles= 1287

Total target population = 1823 $then,\ if$ 1823 = 177

Total sample size of the three kebeles

$$= \frac{1287x177}{1823} = 124.96 \approx 125$$

Total number of non – producer from three kebeles= 536

Total target population = 1823, then 1823 = 177Total sample size of the three kebeles = $\frac{536x177}{1823} = 52.042 \approx 52$

Therefore, based on this formula, the sample size for coffee producer and non-producer was 177.

Data Sources, Collection Techniques and Analysis

The sources of primary data include households of coffee producer and non- producer, development agents, and Woreda agriculture and Natural resource offices. Secondary data were collected from reports, documents, and periodicals. The data was collected using research questionnaires. This study used both qualitative and quantitative data collected using the survey techniques. To take care of assumptions of econometric modelling (Probit &Tobit) STATA was used.

Specification of Empirical Models

Collett (1991) and Agresti (1990) indicate that many response variables are binary by nature (yes/no), while others are measured ordinal rather than continuously (degree of severity). According to Holloway (2001) a farmer (i*)* will participate in cash crops like coffee if the utility derived from participation in coffee is greater than any other crops for example crop (j). Therefore, for utility maximization factors that influence the participation decision are important when a farmer has to choose between the two kinds of crops (e.g., crop i and m). Let y be the crop choice. Then x= 1 if the farmer desire for coffee production and x=0 if she/he chooses to grow other crops. In other way both the utility function in terms of farm characteristics and farmer characteristics is expressed as (Tij) and (Lij) respectively. Then after, the farmer will prefer to grow coffee if the utility to participate is greater than that of not participating. Defining y* is a latent variable which is a function of utility (U1i) expressing the utility that a farmer *i* prefers to participate in coffee production than participating in the production of other crops (U0i). Therefore:

$$y* = U1i - U0i > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Then, the probability of choosing the coffee production is:

$$Pi = P(Y = 1) = P(U1i > U0i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

$$= P((\delta 1)F(Lij, Tij) + \varepsilon 1i > (\delta 0)F(L0i, T0i) + \varepsilon 0i)$$

$$= P(\varepsilon 1i - \varepsilon 0i) > F(Li, Ti)(\delta 0 - \delta 1)$$

$$= P(\mu i) > -F(Li, Ti, \beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

$$= Fi(\beta Xi) or Yi(\beta Xi)$$

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Where: $P(\mu i)$= probability function, $\mu = \varepsilon 1i$,

$-\varepsilon 0i \; is \; a \; random \; disturbance \; term \; \ldots\ldots (3.5)$

$\beta = \delta 0 - \delta 1 \; is \; coefficient \; vector \; \ldots\ldots (3.6)$

$Fi(\beta Xi) = Cumulative \; distribution \; function \; f$

$or \mu i$ evaluated at βX

Therefore, this study assumes a normal distribution of μi which in turn influences the distribution for F. Hence, the probit model is as follows.

$$P(y = 1) = aLi, + bTji + \varepsilon ji \; \ldots\ldots\ldots\ldots\ldots (3.7)$$

Where, a and b are the unknown parameters to be estimated, P the probability of participation, and εji a random error distributed as with regard to decision of participation in order to maximize production. Therefore, the farmer maximizes his/her utility by participating in the coffee production. The function is, as follows: $Max.U(Y \mid Lji, Tji, Iji)$

$s.t.$

$yi \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)$

Taking the first order condition in equation (3.8) gives

$$= \sigma \; (Y \; ` \; Lji, Tji, Iji \;) \leq 0 \; \ldots (3.9)$$
$$with \; yi \geq 0$$

Where, yi is the produced coffee or production of coffee, Iji is the sets of socio-economic characteristics influencing the participation decision of the farmer

Then, coffee production given by

$$Yi = C0 + DLji + ETji + FIji + \mu ij \; \ldots (3.10)$$

Where, C, D, E, F are parameters to be estimated and μij is the error term

Therefore, Probit model specifies the functional relationship between the probability of participating in an activity or coffee production and the list of various explanatory variables to influence the participation decision. These factors can be either continuous or discrete explanatory variables and a list of explanatory variables for the empirical analysis of the current study can be specified as according to the following probit model specification:

$$4x4i + \beta 5x5i + \beta 6x6i + \beta 7x7i + \beta 8x8i$$
$$12x12i + \beta 13x13i + \beta 14x14i + \beta 15x15i$$
$$pr(for \; n \; pro = \beta 0 + \beta 1x1i + \beta 2x2i + \beta 3x3i + \beta$$
$$+ \beta 9x9i + \beta 10x10i + \beta 11x11i + \beta$$
$$+ \varepsilon i \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

where $\Pr -$ is the probability at which an individual household participate, $\text{fornpro} = 0$ for non-producer otherwise 1, βi s_ are the coefficients to be estimate, X1 Household heads having Livestock (Livstock), X2 = Household heads having experience of coffee farming (Expirnce) , X3 = Trust of Household heads in coffee farming (Trust), X4 = Area under coffee farming by Household heads (Aunrcof), X5 = Having total tree per hector by Household heads (Ttreha), X6 = Total farm size by Household heads (Tfarmsiz), X7 = Age of Household heads in coffee farming (Agehh), X8 = Effort of Government to improve coffee quality (Efctgov), X9 = Household heads having training on coffee production (Traing), X10 = Education level of Household heads (Education), X11 = Household heads getting extension service on coffee production (Extserv), X12 = Household heads getting information access on coffee production (Infaccs), X13 = Marital Status of Household heads (Marital), X14 = Household heads using contract farming (Contfrm), X15 = Household heads Contact to DA for coffee farming (Conttoda) , **Tobit Model**: The justification for using Tobit Model is that, area under coffee production and total farm size of the farm household had has continuous dependent variables and they are expected to take between

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zeros to one (0 to1) value. According to Issa (2009) Tobit regression model was chosen for the analysis and to determine factors associated with coffee production intensity. Hence, the regression equation is as follows:

$Yi = \alpha + \beta gender + \beta 2famlisiz + \beta 3expirance + \beta 4ttreha + \beta 5avytrekg + \beta 6impseed + \beta 7lanot\square er + \beta 8coffbenft + \epsilon i \ldots\ldots\ldots\ldots\ldots$ (3.12)

Where: Yi = The ratio of area under coffee over total farm size (Dependent variable); Ai = is the y –intercept of the regression line – parameter to be estimated; β1 = The slop the regression line-parameter to be estimated; Xi = Represents the various factors that affect area under coffee over total farm size; ϵi = Error term which occurs in sampling procedure, data collection and others

The role of stakeholder's correlation coefficient was employed for the purpose of discussion and comparison of some important variables /the association between coffee production and stakeholder/ of the sample.

RESULT AND DISCUSSIONS

The econometric results of the findings *Table 1* and *2*, show there is no serious multicollinearity problem in the model, since the multicollinearity results showed that, Variance Inflation Factors (VIF) range from 1.63 to 1.08 and a mean of 1.31, thus absence of multicollinearity. The correlation test showed high positive coefficient (r=0.2854) between coffee producers and non-producers and the other variables showed that positive and negative coefficient. Therefore, all of the proposed potential explanatory variables were included in the final probit regression.

Table 1: VIF test result for continuous explanatory variables (probit model)

Variable	VIF	1/VIF
Ttreha	1.63	0.612748
Farmsiz	1.58	0.633058
Agehh	1.50	0.664559
Expirnce	1.46	0.683256
Aunrcof	1.38	0.723136
Edcation	1.26	0.790549
Efctgov	1.17	0.858301
Livstock	1.16	0.864873
Contfrm	1.10	0.909030
Infaccs	1.08	0.925894
Martial	1.08	0.928046
Mean VIF	1.31	

Source: Survey result, 2018

Table 2: Contingency Coefficient test for discrete explanatory variables (probit)

	Traing	Trust	Extserv	Conttod
Traing	1.0000			
Trust	0.2246	1.0000		
Extserv	0.2854	0.1381	1.0000	
Conttoda	-0.0127	0.1404	-0.0593	1.0000

Source: Survey result, 2018

The probit model regression was carried out and the result obtained was, Log pseudo likelihood for the fitted model was -10.52165 and Pseudo R-square value of 83.49 which shows 83.49 percent of the model was explained by the included regressors all variables are jointly significant at 5%. The pseudo-R-squared value is 90.18 % indicating the fitness of the model. This means, the independent variables are explained the dependent variable, indicating fitness of the model. In addition, the estimated probability greater than chi-square value (Prob > chi-square = 0.0000), suggests that all the model parameters are jointly significant in explaining the dependent variable at less than 1% significance level.

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Table 3: Determinants of coffee production participations (Probit)

Dependent Variable: Product (=Yes)				
Independent Variables	**Coef.**	**Robust Std. Err**	**z**	**P>|z|**
Livstock	-.000916	.0432032	-0.02	0.983
Expirnce	-.1204089**	.0646276	-1.86	0.062
Trust	4.2314 ***	1.011702	4.18	0.000
Aunrcof	18.75101***	3.825489	4.90	0.000
Ttreha	6.923823***	2.607114	2.66	0.008
Farmsiz	-.2740674	.225968	-1.21	0.225
Agehh	.0648556***	.02249	2.88	0.004
Efctgov	-.437201	.4517714	-0.97	0.333
Traing	1.83299***	.5890569	3.11	0.002
Edcation	.148434**	.0776858	1.91	0.056
Extserv	-.764096	.5905928	-1.29	0.196
Infaccs	.5608256***	.1931262	2.90	0.004
Martial	-.8037005	.5373401	-1.50	0.135
Contfrm	-4.541011***	1.029676	-4.41	0.000
Conttoda	.6658837	.4549734	1.46	0.143
_Cons	-5.068309	2.248233	-2.25	0.024

Log pseudo likelihood = -10.52165; Pseudo R2 = 0.9018; Wald chi2 (15) = 83.49;Prob> chi2 = 0.0000; Number of obs = 177

****, **, * = significant at 1, 5 and 10 percent respectively Source: result of Survey data (2018)*

Influence of Experience

The probit regression result shows that, the number of years passed since the farmers started growing coffee significantly influences the probability decision to produce coffee and statistically significant at less than 5 % probability level when compared with non-producer. The estimated coefficient shows a negative correlation between experience of household heads' and the likelihood of producing coffee. This result suggests that farmers who have an experience in the coffee production are most likely to produce the other crops in significant amount. On the other hand, keeping the effects of other variables constant, experienced farmer actively participate in production of coffee than other crops, but in this study area; the experience of the farmers are negatively correlated to coffee production because most of the farmers have no more year experience. The other problems why experience negatively and significantly influenced decision of the farmer to participate in coffee farming in the study area is that, most of the farmers have no accumulated long year experience. And this implies that coffee plant starts bearing fruit after three years of planting. Therefore, most of the farmers in the area have not benefited for long year. These results are in consistent with the findings showed by Frank (1995) who argued that a farmer assesses the utility of new technology when she relates her perception of the technology to his/her experience.

Influence of Trust of the Farmer

Trust of household's head in coffee farming increases the probability of producing coffee and their association is statistically significant at less than 1 percent significance level when compared with non-producer. The estimated coefficient shows that there is a positive correlation between trust of households' and the likelihood of producing coffee. This indicates that households who have a high level of trust are more likely to participate in production of coffee, keeping the effects of all other variables at constant. This study is consistence with the study by Dakurah*et al*. (2005) even if the title of the study was different from this study i.e., its production participation in coffee cooperatives. Hence, similar in participation with coffee production, and they found that high trust levels by members are more likely to support their cooperative by participating in all cooperative's activities.

Influence of Area under Coffee Farming

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Influence of area under coffee farming significantly influences the likelihood of producing coffee. Consequently, their association is statistically significant at less than 1 % significance level when compared with non-producer. The estimated coefficient shows that, there is a positive correlation between area under coffee of household head and the likelihood of producing coffee. It indicates that, households who have area under coffee farming more likely to participate in production of coffee keeping the effects of all other variables at constant. This implies that, coffee farming is more advantageous than those who do not have coffee farming from their own total farm size. This study is consistent with the study by Gicuru K. Ithinji, (2011) and it says factors that positively affect productivity of coffee was increased specialization in coffee production income from dairy enterprise, and cash inputs per hectare of coffee.

Influence of Total Tree per Hector

It influences coffee production positively and significantly decision to participate in coffee farming, because of their association is statistically significant at 1 % significance level when compared with non-producer. The estimated coefficient shows that there is a positive correlation between Total tree per hector of household heads and the likelihood of producing coffee. Hence, households who have total tree per hector are more likely to participate in production of coffee, keeping the effects of all other variables at constant. This study is consistence with the study by (Gicuru K. Ithinji, 2011) which revealed that opportunity of planting more trees goes well together for farmers of bigger farm sizes than small farm holdings.

Influence of Age of Household

Influence of age of household heads influence coffee production positively and significantly decision to participate in coffee farming. Their association is statistically significant at 1 % significance level when compared with non-producer. The anticipated coefficient shows that there is a positive correlation between age of household heads and the likelihood of producing coffee. This result also indicates that, as the age of household's increase up to a certain limit the more likely to participate in production of coffee, keeping the effects of all other variables at constant. Similarly, this study is consistence with the study by Adesoji and Farinde (2006) they found that farmers older than 52 years had a tendency of getting less yields.

Influence of Training of Household Head

Influence of training of household head increases the probability of producing coffee and their association is statistically significant at 1 percent significance level when compared with non-producer. The anticipated coefficient shows that there is a positive correlation between training of household heads and the likelihood of producing coffee. This result indicates that household heads who have got training on coffee production are more likely to participate in production of coffee, keeping the effects of all other variables at constant. This finding is consistent with the study by (Mbowa, 1996) formal education and training in agriculture improves farmers' abilities to acquire accurate information, evaluate new production processes, and use new agricultural inputs and practices efficiently.

Influence of Education Level of Household Head

Influence of education level of household head influences significantly the probability decision to produce coffee and statistically significant at less than 5 % probability level when compared with non-producer. The estimated coefficient shows that there is a positive correlation between Education level of household heads and the likelihood of producing coffee. This implies that educated farmers show willingness to contact development agents in order to receive new agricultural technologies than those who do not have formal education because these who do not have formal education compromises in accepting new technology actively. These results are consistent with the study by (Faturoti*et al.*, 2006) on the expectation education provides farmers with more information pathways.

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Influence of Information Access Service of Household Heads

Influence of information access service of household heads significantly influences the likelihood of producing coffee. Hence, their association is statistically significant at 1 % significance level when compared with non-producer. The estimated coefficient shows that there is a positive correlation between information access of household heads and the likelihood of producing coffee. The estimate shows that, farmers who have access to information are more likely to produce coffee than their counterparts, ceteris paribus. These results are consistent with the findings by Dempsey (2006) who reported lack of agricultural programs through Medias has deterred to improve and gain better reward from agricultural production.

Influence of Contract Farming of House Hold Heads

Influence of contract farming of house hold heads in coffee farming decreases the probability of producing coffee and their association is statistically significant at less than 1 % significance level when compared with non-producer. The expected coefficient shows that there is a negative correlation between contract farming of household heads and the likelihood of producing coffee. This study is consistent with the study by (Arnold, 1997: 2720; Baumann (2000) which says an evaluation of tree contract farming as a development strategy would have to explore these dynamics and consider how and when farmers would benefit growing trees under contract.

Table 4: Marginal effects of the Probit model

Variable	Number of obs = 177 Model VCE: Robust			
	Delta-method dy/dx	Std. Err.	z	P>|z|
Expirnce	-0038042 *	.0025131	-1.51	0.130
Trust	.1336881***	0476598	2.81	0.005
Aunrcof	.5924249	.1298773	4.56	0.000
Ttreha	.2187533 **	.1007961	2.17	0.030
Agehh	.0020491 **	.0009586	2.14	0.033
Traing	.057912 ***	.0222242	2.61	0.033
Edcation	.0046897**	.0025497	1.84	0.066
Infaccs	.0177189 **	.0072859	2.43	0.015
Contfrm	-.14347 ***	.0445444	-3.22	0.001

Source: result of Survey data (2018)

The findings of marginal effect result showed that, a one percentage increase in experience of the household head will lead to a 13% decrease in the participation. Similarly, a unit changes in level of trust of the farmer will lead to a 0.5 % increase in the participation. As a one percentage increase in total tree per hectare will lead to a 3% increase in the participation decision of the farmer. As a one percentage increased in age of household head will lead to a 3.3% increase in the participation decision of the farmer. As a one percentage increased in training of the farmer will lead to a 0.9 % increase in the participation decision of the farmer in coffee production. As a one percentage increased in level of education of household head will lead to a 6.6 % increase in the participation decision of the farmer in coffee production. As a one percentage increased in access to information of household head will lead to a 1.5 % increase in the participation decision of the farmer in coffee production and as a one percentage increased in contract farming will lead to a 0.1 % decrease in the participation decision of the farmer in coffee production.

Factors Influencing Intensity Coffee of Production

The result of pre-data analysis for multicollinearity and correlation before running Tobit model showed that VIF range from 1.62 to 1.29 and a mean of 1.49 in (Table 6) and the CC test showed that improved seed (r= 0.1246) toward coffee intensity in (Table 7). However,

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Tobit regression results indicated log likelihood for the fitted model was 68.747034 and log likelihood chi-squared was 161.56 which indicated that all variables are jointly significant at 5%. Similarly, in Tobit model the LR Chi-squire 161.56 % indicting the fitness of the model.

Table 5: Factors influencing the intensity of coffee production

	Tobit regression			
aunt/farm	**Coefficients**	**Standard error**	**t**	**P>|t|**
Gender	.0068886	.0382561	0.18	0.857
Famlisiz	.0021135	.0047214	0.45	0.655
Expirnce	.0051261**	.0019943	2.57	0.011
Ttreha	.1051524**	.0608055	1.73	0.086
Aytrekg	.0872456***	.0107612	8.11	0.000
Impseed	-.0289786	.0269464	-1.08	0.284
Lanother	-.0543738***	.0089014	-6.11	0.000
Coffbenft	.0301181**	.0152075	1.98	0.049
_Cons	-.0749808	.048528	-1.55	0.124
sigma	.1208003	.0078812		
	LR Chi-squire	= 161.56	Observation= 177	

Log likelihood = 68.747034
*Legend: * p<0.1; ** p<0.05; *** p<0.001*

Source: result of Survey data (2018)

Influence of Household Heads Experience

Influence of household heads experience in farming of household was found to be significantly influence the intensity of coffee production. The result also shows that experience of household head on intensity coffee production increases the probability of expanding coffee production and their association is statistically significant at less than 5 % significance level. This shows that, experienced farmers of coffee producer have been observed that from year to year they have a plan to coffee plantation by allocating from their own total farm size. This study is consistent with the study on the impact of Participation in Cooperatives on the Success of Small farms by Mishra et al. (2004) who found out that, old farmers have more experience and can better allocate resources where they are needed and keep them fully utilized.

Influence Total Tree per Hectare of Household Heads

Influence total tree per hectare of household heads their association is statistically significant at less than 10 % significance level. This indicates that, coffee producer farmers which have been frequent contact with extension works have got training on coffee production and differ in application of their own coffee plantation in that, those untrained farmers observed that, they plant without keeping the required space and population of coffee on the given farm size. Unlikely these trained farmers use both their own endogenous and scientific knowledge and they have played vital role in increasing the intensity of area under coffee over the total farm size through proper plantation of total tree per hector. Likely, according to the study by Minai et.al. (2014) farmers, in Kirinyaga county Kenya the average area under coffee was 0.63 acres while the minimum and maximum acreage was 0.04 and 8.93 acres, respectively. The average number of coffee trees per farmer was 348 with the minimum number and maximum number being 35 and 4820 respectively.

Average Yield per Tree in Kg

Average yield per tree in kg influences insignificantly the likelihood of intensity coffee production. Hence, their association is statistically significant at less than 1 % significance level. This also shows that in expanding coffee production average yield of production has no great impact on it. Because once the coffee plantation is properly planted with the number and area it has no relation with the intensity of the production expansion. This study is in consistent with the

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studies by Minaiet.al. (2014) majority of the farmers, in Kirinyaga County, Kenya72.91% were producing 3 kg of cherry per tree or less. About 19.52% were producing between 3 and 5 kg, 6.37% between 5.01 and 10 kg and only 1.2% were producing over 10 kg.

Influence of Land under Other Crop

Influence of land under other crop in farming of households was found to be insignificantly influence the intensity of coffee production. The results imply that, land under other crops has no more impact on coffee intensity. Hence, their association is statistically significant at less than 1 % significance level. Because most of, the producer farmers in the study area allocated their own land for coffee production even if the proportion was dissimilar. This study is in consistence with the studies by Samuel et. al. (2016) when farmers characterized by large crop land size, they produce less coffee and farmers produced less coffee also supplies less coffee to the market.

Influence Coffee Benefit of Household Heads

Influence coffee benefit of household heads on intensity coffee production increases the probability of expanding coffee production and their association is statistically significant at less than 5 % significance level. For example, those who have been characterized by having more coffee plantation they can use for selling to market and house hold consumption. During this these households get two things at once that means gain of enough income and saving of their own other crops product from untimely selling. Similarly, as the study by (Gicuru, 2011), it constitutes an asset that can be passed to one is on offspring. In predominantly coffee production zones, increased productivity and reduced cost of production are the best strategies to enhance competitiveness of coffee farming in order to face international competitiveness and maintain the most important source of livelihood for the rural farming population.

Table 6: VIF test result for continuous explanatory variables (Tobit model)

Variable	VIF	1/VIF
Coffbenft	1.62	0.616035
Expirnce	1.60	0.625349
Aytrekg	1.56	0.639674
Ttreha	1.54	0.647431
Lanother	1.30	0.768979
Famlisiz	1.29	0.774256
Mean VIF	1.49	

Source: result of Survey data (2018)

Table 7: CC test for discrete explanatory variables (Tobit model)

	Gender	Improved seed
Gender	1.0000	
Improved seed	0.1246	1.0000

Source: result of Survey data (2018)

Table 8: Marginal effects of the Tobit model

Number of obs = 177 Model VCE : Robust				
Delta-method				
Variable	**dy/dx**	**Std. Err.**	**z**	**P>|z|**
Expirnce	.0051261	.0019943	2.57	0.010
Ttreha	.1051524	.0608055	1.73	0.084
Aytrekg	.0872456	.0107612	8.11	0.000
Lanother	-.0543738	.0089014	-6.11	0.000
Coffbenft	.0301181	.0152075	1.98	0.048

Source: result of Survey data (2018)

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Marginal effects of the Tobit Model

Marginal effects of the Tobit model results show that, a one unit increases in experience the intensity of coffee production will lead to 1% increase. A one unit increases in Total tree per hectare the intensity of coffee production will increase by 4.8%. Likewise, a one unit increases in coffee benefit intensity of coffee production will increase by 4.8%.

Table 9: Correlation Coefficients among Institutional Factors Influencing Coffee Production

Variables	Factor Score		
	Pearson Correlation	**Sig. (2 tailed)**	**n**
Extension service on coffee Production	0.1616*	0.0317	177
Training on coffee Production	0.2865*	0.0001	177
Information access on coffee Production	0.0871	0.2488	177
Effort of government to improve Coffee quality	0.3927*	0.0000	177
Effort of primary actors to improve	0.3999*	0.0000	177

N.B Correlation is significant at 0.01 levels (2-tailed).

Source: result of Survey data (2018)

Out of five institutional factors evaluated, it is only influence of training of the farmer, effort of government to improve coffee quality and effort of primary actors to improve coffee quality of the farmers which showed strong relationship with the average coffee production per tree at 0.01 level of significance. This interprets that, training of the farmer was associated with 28.65 % increase in yield per tree. Hence, the institutional factors training on coffee production was given by the concerned coffee production expert to the farmers. The effort of government to improve coffee quality of the farmer was associated with 39.27 % increase in yield per tree. This is also revealed that, currently because of the attention of government on coffee production, at the Woreda level by allocating government budget through supplying improved coffee seed and daily labour as the eye wittiness of personal observation of the researcher and data obtained from Woreda level during data collection. Similarly, the effort of primary actors to improve coffee quality of the farmer was associated with 39.99 % increase in yield per tree.

CONCLUSION AND RECOMMENDATIONS

Conclusions

Based on the findings for the first objective the coefficient of experience revealed that, as experience of the farmer negatively correlated with coffee production; the number of coffee tree per hectare was not proportional to the given land. As a result, the farmer has no capable to allocate his/her land with required spacing or it may be below the capacity or above the capacity of the given land and affects the production negatively; Simultaneously, when coefficient of experience shows positive sign towards area under coffee production there is a problem on coffee production and no problem on area under coffee. Because of this, it is possible to understand that, the greater number of trees per hectare beyond the capacity of the allocated land or under the capacity of the given land there is also a problem associated with coffee production but not on area under coffee, unless the coefficients of area under coffee were negatively correlated. Similarly, in the first and second objective the negative and positive sign of the coefficients of independent variable experience also reflects, making decision for participation is more than expansion. Hence, making or taking decision to participate on coffee production the experience of the farmer coefficient should be positive sign like coefficient of area under coffee production. This shows that in farmer participation of coffee production decision to participate needs more experience than expansion of area under coffee. Finally, the major factors of coffee production and its intensity problems in the study area are, lack of experience of household head and lack of available farm land (using contract farming).

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Recommendations

To increase the ratio of area under coffee over total farm size; the stakeholders together with the producer and non-producer should organize trainings on how to participate on coffee production. Through this the numbers of participant increase whereas the non-participant becomes decrease. Stakeholders should put strategies that will benefit and attract non-participant to engage on coffee production through proper allocation of their own land without affecting their own other crops. To solve lack of experiences, extension servants and stakeholder must focus on the way, how participants plant coffee seedlings through proper allocation of the area under coffee by following the standard spacing of coffee plantation or total tree per hectares. While giving the overall extension service for all farmers by government that means for participant and non- participant the extension agents must show marginal effect of producing coffee by comparison of those participant with non-participant and they can prepare a farmer's field day to teach the overall benefit of participating in coffee farming.

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