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Determinant of Rural Household Participation in Non-Farm and Level of Generated Household Income from the Activities: The Case of Haramaya Woreda, East Hararghe Zone, Ethiopia

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Abstract
This study analyzed the determinant of rural household participation in non-farm and level of generated household income from the activities in Haramaya district, Ethiopia using cross-section data. Both primary and secondary data were collected for this study. Primary data were collected from 196 sample respondents using stratified random sampling. In this study both descriptive and econometric analysis was carried out. Descriptive statistics were applied to characterize the sample households in terms of economic, demographic and institutional factors. Heckman two stages selection model was used for estimation of determinant participation of rural households in non-farm activities and determinant level of income from non-farm activities. The result of factors affecting participation of rural households in non-farm activities indicated landholding size, use of irrigation, livestock holding and distance to nearest market negatively and significantly influenced participation while education, household size and non-farm training significant and positively affects participation of rural household in non-farm activities. In the result of determinant level of non-farm income shows that landholding size, use of irrigation, livestock holding and distance to the nearest market were significant and negatively affects level of non-farm income while household size and education status were significant and positively influenced level of non-farm income. In generally the study identified the determinant of rural household participation in non-farm activities and determinant level of income from non-farm activities. Therefore, Policy makers should integrate the promotion of non-farm activities in the framework of rural development policies and strategies.
Keywords: participation, non-farm activities, household income, heckman two steps selection model
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1. INTRODUCTION

In most developing countries, agriculture is the mainstay and the largest economic sector for both its contribution to the GDP and generation of employment. In sub-Saharan African countries, agriculture is the major economic activity accounting for the highest share of the GDP and creates a large proportion of employment opportunities (MoARD, 2010; FAO, 2016).

Despite that agriculture is being major source of income and employment in most rural areas in developing countries, it has not been able to produce sufficient food to feed their population due to small ratio of cultivated land to population (Eshetu and Mekonnen , 2016). As a result, rural households are increasingly earning their income from non-farm activities for their livelihood. Haggblade *et al.,* (2010) found that non-farm activities contributed 35-50 percent of rural household income across sub-Saharan African countries. This indicates one possible pathway to get out of food insecurity problem in developing countries is the promotion and establishments of nonfarm employments.

In Ethiopia, about 83.9 % of total populations' inhabitants live in rural areas and the main source of their livelihood is agriculture. Agriculture become the second most dominant next to service sector of the country's economy, by providing employment for 80 % of the total labors force and contributes 42.7 % to Gross Domestic Product and 70 percent of foreign exchange earnings (CSA, 2013; NBE, 2013).

However, agriculture in the Ethiopia remains largely subsistence, production has not kept pace with population growth, food self-sufficiency has declined, the household income required to afford bought-in food has not been fulfilled. According to Abebe (2014) agricultural production in Ethiopia is dominated by subsistence-based smallholder farmers, whose production and incomes from the sector are constrained by socio-economic, institutional, resource and environmental factors. These factors generally attribute for lower productivity of the sector, which in turn forces farmers to engage in non-farm activities in order to improve their income for survive.

Non-farm activities have become an important component of livelihood strategies among rural households in Ethiopia. Evidence from study by Beyene (2008) suggested that non-farm activities can play an important role in improving the well-being of the rural population. Moreover, since agricultural income is vulnerable to different shocks, getting income outside of agriculture is important for farm households (Yizengaw, 2014). For this reason, the share of non-farm income was increasing in Ethiopia. According to the study of Gagabo (2014) the share of

non-farm income reported was 33 percent in 2009 in Ethiopia. Ethiopian development strategic plan such as growth and transformation plan I and growth and transformation plan II was understood that increasing agricultural product alone cannot reduce poverty and achieve available food security (MOFED, 2010; FDRE, 2015). These plans considered encouraging non-agricultural income generating activities in addition to agricultural activities play an enormous role in breaking vicious cycle of food insecurity and poverty.

Non-farm activities are common among people who live in Eastern hararghe Zone. According to Tefera *et al.,* (2005) 60% proportion of household participated in non-farm activities in highland of eastern hararghe. At the same time there are also constraints (lack of capital, lack of skill, infrastructure problem and etc) and different factors that tackle households from engaging in non-farm activities in this area. Therefore, identifying the factors affecting participation of rural households in NFA and level of income generated from it is the main issues of this paper.

Ethiopia faces severe land scarcity in part of highlands where population densities have become very high and farm sizes have become very small. More than half of household in Ethiopia cultivate less than one hectare of land while average household size is approximately five members (CSA, 2012) as well as according to MoARD (2010) nearly 55 percent of all smallholder farmers operate less than one hectare. Thus, scarcity of land is a critical bottleneck in Ethiopia and particularly in the study area.

In spite of Agriculture is a predominance of Ethiopian economy, a rapidly growing human population, recurrent droughts and periodic floods, complicated by climate change that has been accompanied by severe soil and landscape degradation in some regions contributed to a situation of national food insecurity (FAO, 2011). This makes rural labour household not to be employed throughout a year in their own farm. As a result, a number of rural households engage in income generating activities away from purely crop and livestock production since its gaining prominent role in rural households' income and food security (Assefa, 2011; Gecho, 2016).

Agricultural sector alone could not be serving as a means of improving livelihood, achieving food security and reducing poverty in the rural area. For this reason, overall participation rate of households in non-farm/off-farm was increasing from 2004 to 2008 in Ethiopia (Sisay, 2010).

Rural households increasingly motivated in non-farm employment in order to increase household income and insure against scarcity of cultivated land as well as agricultural production risks (Zerai and Gebreegziabher, 2011). Thus, non-farm activities in addition to farm activities are an alternative source of productive employment to alleviate rural poverty (van den Berg and Kumbi, 2006). However, there were different factors and constraints that affect participation of rural household in nonfarm enterprise in Ethiopia (Loening *et al.,* 2009).

Even though prior some related works have been done on the determinant of rural household participation in non-farm at country level, still there are no empirical findings that are available on the determinant participation in non-farm and level of income from it in Haramaya district. This motivates the study to be conducted on factors affects participation of rural household in non-farm and level of income from it. Therefore, this study was aimed to analyze the determinants of rural household participation in non-farm and level income generated from non-farm activities in the study area. The study would broaden rural households' understanding of non-farming activities and motivate the rural non-participant farmers to actively participate in non-farm activities to improve way of their living standards.

3. RESEARCH METHEDOLOGY

3.1. Description of Study Area

The study was conducted in Haramaya district. It is one of the 18 woredas of the east Hararghe zone located at the distance of 508 km from Addis Ababa and 18 km from Harar town in the west direction. It is bordered on the south by Kurfa Chele district, on the west by Kersa district, on the north by Dire Dawa administration council, on the east by Kombolcha district, and on the southeast by the Harari National Regional State. The woreda has 33 rural kebeles (HADARD, 2016). According CSA (2011) Haramaya district has a total population 271, 394 of which 138,376 are male and 133, 018 are female.

The altitude of this district ranges from 1400 to 2340 meters above sea level. The total cultivated land is 38,497 Ha. The rainfall of the District is bimodal, erratic and uneven distribution, the short rain occurring between the months of February to May and the long rain occurring between the months of June to September. The mean annual rain fall is 492 mm ranging from 118-866 mm and located at 420 30'E, 90 26'N. The mean maximum and minimum temperatures are 24 and 9 degree Celsius respectively (HADARD, 2016).

The economic activity of the woreda includes sorghum, maize, and haricot bean, wheat, barley, potato, onion, Khat and other vegetable crops. The most common cash crops for the district are vegetables and Khat (HADARD, 2016).

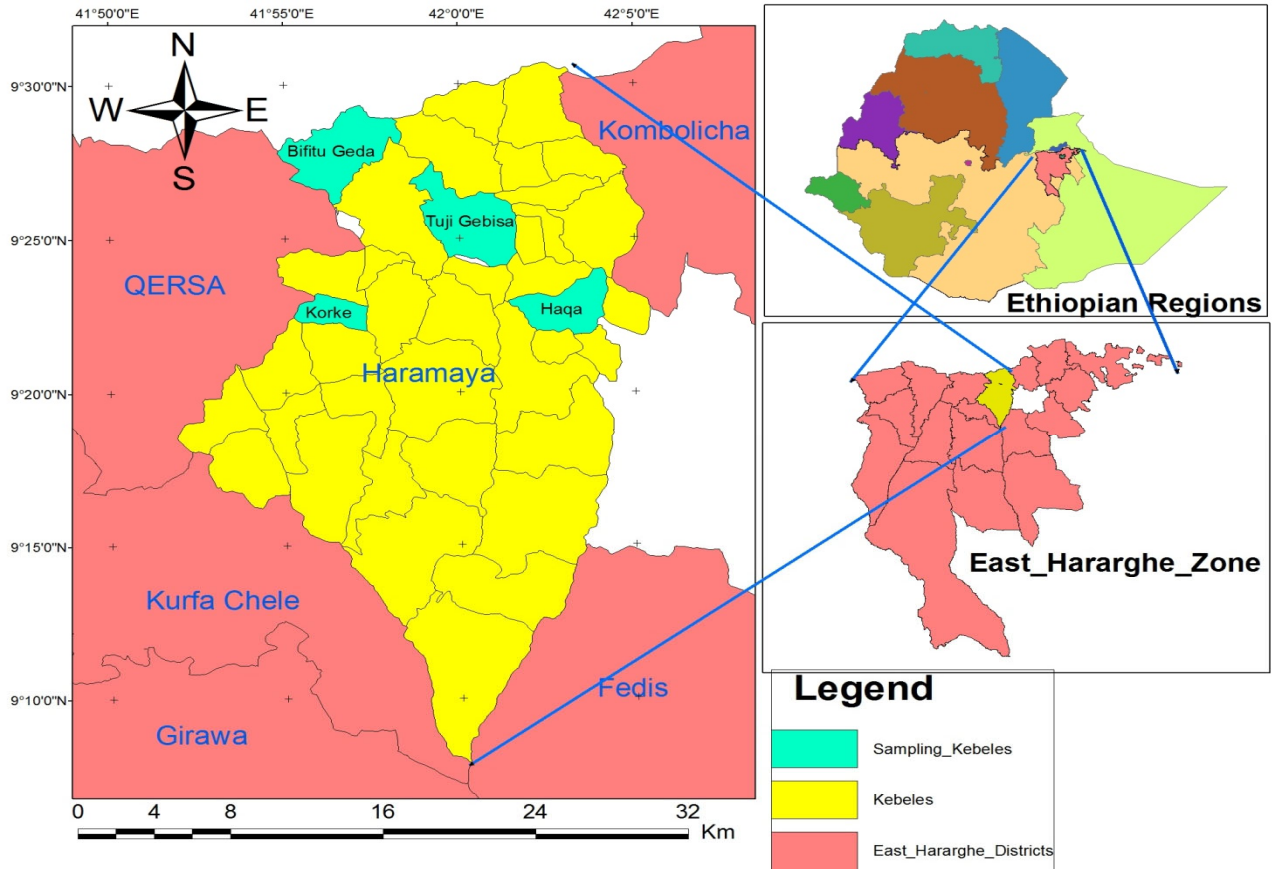

FIGURE1: MAP OF EAST HARARGHE ZONE OF ETHIOPIAN REGION AND SAMPLING KEBELES OF HARAMAYA DISTRICT.

3.2. Sources, Types and Method of Data Collection

The main data collection instruments to collect primary data were used key informant interview, group discussion and the semi-structured questionnaires. The researcher was used enumerators to collect primary data from rural household by providing training on how to conduct the interview. Before actual data collection had undertaken, a pre-testing questionnaire was conducted in order to revise and adjust those questionnaires. Next, the required data were collected from sample household using semi-structured questionnaire about demographic, economic and institutional factors. The interview was conducting the subject matter of the questionnaire at a given time. Secondary data were gathered from various sources like Agricultural Development Offices of Haramaya Districts, Books, from different published materials about farm and non-farm activities, articles, Journals and the like.

3.3. Sampling Techniques and Sample Size determination

In this study, multi-stage sampling procedure was employed. In the first stage, Haramaya district was selected purposively due to the existence of different non-farm activities which rural household could be participated. In the second stage four kebeles were selected randomly from the 33 kebeles. In third stage, households were stratified in to two groups in each kebeles, that is non-farm participant and non-participant, then sample household were selected randomly in each stratum. Equal participant and non-participant were collected in each kebele after using proportional to sample size was used to determine sample size in each kebeles.

In this study the Cochran's formula (1977) were used to determine sample size that is $n = \frac{z^2 pq}{e^2}$, q=1-p, where

p= the proportion of household participating on non-farm activity in Haramaya district.

According to Cochran (1977) if the degree of variability is not known, you can assume the maximum variability, which is equal to 50% (p =0.5) and taking 95% confidence level. Macfarlane (1997) also suggested that if there was doubt about the value of P, it is best to take 50% as it would lead to a larger sample size. In this study, there was no exact number (percent) of farm household who participate in non-farm activities in this district. Therefore, in this study arbitrary maximum variance 0.5 is employed

$$n=\frac{(1.96)^2*0.5(1-0.5)}{(0.07)^2}=196$$

3.4. Method of Data Analysis

3.4.1. Descriptive statistics

Descriptive statistics such as mean, standard deviation, frequency and percentage were used. For a comparison chi-square for dummy variables and t-test for continuous variables were used. And result was presented using tables.

3.4.2. Econometric analysis

Heckman selection model (two-step) was employed for analyzing the determinant of participation in non-farm activities and level of non-farm income. The most common version of the Heckman procedure is to estimate in two stages. In the first stage, a probit is estimated the determinant participation in non-farm work with data from both participants and non-participants, using the estimation result inverse mills ratio is then calculated. In the second stage estimation Heckman selection model procedure is used to identify factor affecting level of income from non-farm activities. In the second stage estimation OLS model can be used on the factor affect level of non-farm income using data from the participant households only while including inverse mills ratio to account selection bias is then undertaken. For the issue of sample selection bias, initially Heckman's two stage estimation technique was employed to estimate both the selection and outcome equations were employed. From the Heckman two-stage estimation, significant of the selectivity variable (mills lambda) confirms the existence of selectivity bias. Therefore, Heckman two-stage model was used because of its advantage over the Tobit model in eliminating sample selection bias (Gebremedhin *et al.,* 2009; Ouma *et al.,* 2010).

Probit model was employed to determine the factors influencing rural households' participation in nonfarm activity. The probability of participation in nonfarm activities given the explanatory variables is captured by running a probit regression model. In this model, the response variable is binary, taking only two values, 1 if the household participate in nonfarm activity, 0 if not. The participation in nonfarm activities is determined by different explanatory variables. This is expressed by

$$h_i = X_i\beta_i + u_i \quad (1)$$

Where; Household participation h_i is dependent variable, X_i is explanatory variable, u_i is denotes error term.

As before, let h_i =1 if the household participate in nonfarm activities and h_i =0 if it does not. Now it is reasonable to assume that there is a critical or threshold level of the index, call it h*, such that if h_i exceeds h_i^*, the household participate, otherwise it did not. The threshold h^*, like h_i, is not observable, but if we assume that it is normally distributed with the same mean and variance, it is possible not only to estimate the parameters of the index but also to get some information about the unobservable index itself. This calculation is as follows; given the assumption of normality, the probability that h^* is less than or equal to h can be computed from the standardized normal CDF.

$$p_i = p(h_i = 1 \mid X_i = p(h_i^* \le h_i) = p(Z_i \le \beta_1 X_i) = F(\beta_1 X_i) \quad (2)$$

X_i denotes explanatory variables in equation one, Where $P(h_i = 1|X_i)$ means the probability that an event occurs given the value(s) of the X_i, or explanatory variable(s) and where Z_i is the standard normal variable, i.e., $Z \sim N(0, \sigma^2)$. F is the standard normal CDF, which is written as follows (Green 2005).

$$p_i^* = F(h_i) = \frac{1}{2\pi}\int_{-\infty}^{X_i} e^{-\frac{Z^2}{2}}\, dZ \quad (3)$$

P_i* cannot be observed; it can only be observed if the farmer works nonfarm or not. Then $p_i = 1$ if $p^* > 0$, $p_i = 0$ otherwise. For the probit estimation models, marginal effects are reported, instead of the raw coefficient, to make interpretation of the coefficients easier.

Heckman selection model estimate level of non-farm income

Estimate determinant level of non-farm income using OLS method may lead to biased result. According to Green (2003) Heckman selection model is appropriate to estimate determinant of non-farm income because it corrects for sample selection bias. The equation is non-farm income present as:

$$Y_i = \beta_i X_{1i}^{'} + \varepsilon_{1i} \quad (4)$$

'Y_i' implies non-farm employment income of each household. It is observable for the participants. Yet it is unobservable for the non-participant households. $X_{1i}^{'}$ Is a vector of observable factors that affect the level of non-

farm income and ε_{1i} is error term. Let the selection model for household's participation in some non-farm work be explained by the equation stated below. Here, the equation indicates that household's participation depends on some value hi* of a latent variable.

$$h_i^* = Z_{1i}\alpha + u_{1i} \quad (5)$$

Thus, we can determine the participation and level of income from non-farm from the selection equation as stated below.

$$h_i = \begin{cases} 1 if\ h_i^* \geq 0 \\ \\ 0 if\ h_i^* \end{cases} \quad (6)$$

With the decision to participate in non-farm work given by h_i =1 if individuals participated and h_i =0 otherwise, where h_i is a variable indicates participation in NFA, Z is a vector of variables that influence household participation in non-farm activities and ui the corresponding error term. And the outcome equation (intensity of non-farm income equation) is explained as:

$$Y_i = \begin{cases} \beta_i X_{1i} + \varepsilon_{1i}\ if\ h_i^* > 0 \\ \\ Unobserved\ if\ h_i^* \leq 0 \end{cases} \quad (7)$$

$$u_i \approx N(0, \delta^2)$$

Assuming $\varepsilon_{1i} \approx N(0,1)$

$$corr(u_i, \varepsilon_{1i}) = \rho$$

The conditional expected income of individual households who participate in non-farm activities becomes,

$$E\{y_i | h_i = 1\} = X_{1i}^{'}\beta_1 + E\{\varepsilon_{1i} | h_i = 1\}$$

$$= X_{1i}^{'}\beta_1 + \rho\phi(Z_{1i}^{'}\alpha_1 \big/ \Phi(Z_{1i}^{'}\alpha_1 \quad (8)$$

$$= X_{1i}^{'}\beta_1 + \rho\lambda$$

If the correlation coefficient ρ =0, estimating the model using OLS gives unbiased result. The term $\rho\phi(Z_{1i}^{'}\alpha_1 \big/ \Phi(Z_{1i}^{'}\alpha_i$ is known as inverse Mill's ratio; usually represents by lambda, λ and reflects for the selection variable that captures for selection bias.

Before estimation of the model the different tests were employed. The problem of multi-collinearity among the selected explanatory variables was tested using Variance Inflation Factor (VIF).

$VIF = (\hat{\beta}) = \frac{1}{1 - R_j^2}$ Where, R_j^2 is the squared multiple correlation coefficient between X_i and the other explanatory variables. Thus, variance inflation factor (VIF) is necessary to check multicollinearity between continuous variable. As R^2 increase towards 1, it is a collinearity of explanatory variables. The larger the value of VIF, the more troublesome or collinear is the variable X_i. As a rule of thumb if the VIF greater than 10 the variable is said to be highly collinear (Gujarati, 2004).

Contingency coefficient is used to check multi-collinearity of dummy variables and its value ranges between 0-1, 0 indicate that there is no association between variables, their decision criterion is computed as $C = \sqrt{\frac{X^2}{N + X^2}}$

Where C= stands for coefficient of contingency, X^2=is the chi-square random variable and N= is total sample size of the study. If the value of C is greater than 0.75, the variable are said to be collinear.

3.5. Definition of Variable and Hypothesis

TABLE 1: SUMMARY OF VARIABLES DEFINITION AND HYPOTHESIS

NO	Independent Variables Description	Variables Code	Dependent Variable= Dummy Non-farm Activity Participation (1), 0 otherwise	Dependent Variable= Income Generated from non-farm income activities
1	Age of the household head in years	AgeHH	_	_
2	Sex of household head (1=male; otherwise '0')	SexHH	-/+	-/+
3	Education of the household head (1= if attended formal education; otherwise '0')	EDUC	+	+
4	Household size in number	HH Size	+	+
5	Farm experience in years	FRMEXP	_	_
6	Landholding size in hectare	LH Size	_	_
7	Number of livestock in TLU	TLU	_	_
8	Access to Credit services (1= access to credit; otherwise '0')	ACC Credit	+	+
9	Dependency ratio in dividing productive age members by non-productive age members	DEPDRatio	_	_
10	Received remittance (1= if household received remittance; otherwise '0')	REMIT	+	+/_
11	Use of irrigation (1= if household used; otherwise '0')	USIRRG	_	_
12	Distance to the nearest market in hours	DNMRKT	_	_
13	Non-farm training (1= if any members of household participated; otherwise '0')	NFT	+	+

4. RESULTS AND DISCUSSION

Under subsequent chapter results of descriptive statistics and econometric results was presented and discussed.

4.1. Descriptive Statistics

Socio-economic and demographic characteristics of the respondents

The total number of respondents that were interviewed is 196, comprising of 98 participants in non-farm activities and 98 non-participants. According to descriptive statistics, some variations/differences were observed between those rural households who were participating in non-farm activities and non-participants in terms of demographic, economic and institutional factors. The two groups differ to some extent in sex, education, remittance, irrigation, credit, non-farm training, age, landholding size, livestock owned, household size, dependency ratio, farm experience, distance to nearest market and access to improved agricultural input.

Table 4.1 presents the description of categorical variables through chi-square test; where education, access to credit, remittance, irrigation, improved agricultural inputs and training showed significant difference between non-farm activities participants and non-participants. Table 4.2 also presents descriptive differences of continuous variables through t-tests between non-farm activity participants and non-participants; where age of household head, landholding size, farm experience, tropical livestock, distance to nearest market and consumption expenditure were found as sources of significant differences.

Table 4.3 and 4.4 presents the type of non-farm activities and reason for not participating on those non-farm activities for the non-participants. The major non-farm activities in the study area were petty trade, daily labor, masonry, and carpenter. The major reason for not participating in non-farm activities were lack of initial capital, poor infrastructure, lack of skill and employment opportunity.

TABLE 4.1: DESCRIPTIVE RESULT FOR CATEGORICAL/DUMMY VARIABLES ON COMPARISON BETWEEN PARTICIPANT AND NON-PARTICIPANT

Variables dummy	Non-participant		participant		Total		
	N	%	N	%	n	%	Chi-square
Sex Male=1	85	43.37	80	40.82	165	84.18	0.92 13
Female=0	6.63		18	9.18	31	15.82	
Attended formal education Yes=1	18	9.18	58	29.6	76	38.78	34.386***
Otherwise=0	80	40.82	40	20.4	120	61.22	
Getting remittance Yes=1	32	16.33	44	22.45	76	38.78	3.095*
No=0	66	33.67	54	27.45	120	61.22	
Use of irrigation Yes=1	61	31.12	32	16.33	93	47.45	17.2***
No =0	37	18.12	66	33.67	103	52.55	
Access to credit Yes =1	23	11.73	39	19.9	62	31.63	6.04**
No=0	75	38.27	59	30.10	134	68.37	
Non-farm training Yes=1	31	15.82	53	27.04	84	42.86	10.08***
No=0	67	34.18	45	22.96	112	57.14	
Improved agricultural input Yes=1	87	44.39	79	40.31	166	84.69	2.52*
No=0	11	5.61	19	9.69	30	15.31	

Note: ***, **and* significant at 1%, 5% and 10% respectively. Source own survey, (2018).

TABLE 4.2: DESCRIPTIVE RESULT FOR CONTINUOUS VARIABLES ON COMPARISON BETWEEN PARTICIPANT AND NON-PARTICIPANT

Variables	Non-participant		participant		Combined	Difference	
	Mean	Std Dev	Mean	Std Dev	Mean	Mean	T-value
Age of HH head	41.357	9.607	35.357	6.914	38.4	6	5.0183***
Household size	6.184	2.542	6.337	2.35	6.26	-0.153	-0.537
Dependency ratio	0.3825	0.284	0.448	0.342	0.4151	-0.0653	1.46
Landholding size	0.806	0.435	0.537	0.388	0.672	0.2686	4.562**
Farm experience	20.2	8.53	10.51	7.74	15.34	9.653	8.299***
Tropical livestock	1.857	1.371	0.794	1.099	1.33	1.0633	5.99***
Distance to NMKT	0.626	0.483	0.357	0.273	0.491	0.268	4.79**
Consumption per equivalent adult	4706.7	3564.95	6334.23	5997.65	5520.2	-1628.1	-2.31**

Note: ***, **and* significant at 1%, 5% and 10%
Source: own survey, (2018)

TABLE 2.3: TYPES OF NON-FARM ACTIVITIES

Types of non-farm activities	Number of household	Percent
Petty trade	49	
	42.24%	
Broker	5	
4.31%		
Daily labor	16	13.793%
Masonry	18	
	15.52%	
Carpentry	15	
	12.93%	
Others	13	
	11.21%	
Total	116	
	100%	

Source: own survey, (2018)

TABLE 4.4: REASON FOR NOT PARTICIPATED IN NFA

	Number of household	Percent
Poor rural infrastructure	20	32.79%
Lack of employment opportunities	15	24.59%`
Did not have skill or knowledge	18	29.51%
Did not have initial capital	27	44.26%
Low level of demand for labor	7	11.48%
Others (age, healthy problem, fears and etc)	11	18.03%

Source: own survey, (2018)

4.2. Econometric results

Based on heckman selection model, the first step of this econometric result is about the determinants of participation decision analysis while the second step focuses on the determinants level participation measured in amount of non-farm income. The estimation result of Heckman two-stage selection econometric model suggested that there is sample selectivity bias since the inverse mills ratio is statistically significant. The result shows, participation in nonfarm activities has effect on the level of generated income from non-farm activities. And also the negative sign and significance of the IMR shows that there are unobserved factors that are negatively affecting both participation decision and level of non-farm income. Moreover, rho is positive, indicates that unobservable factors are positively correlated with one another

4.2.1. Determinant for decision of rural household to participate in non-farm activities

A marginal effect of determinants to participate in non-farm income generating activities is presented in Table 4.5. Household size has positive effect on the probability of participation in non-farm activities; where having one extra person in the household increases participation decision by 5 percent. This might suggest that households with more household size may have the labor power to participate in the nonfarm activities as agricultural activity is seasonal and not sufficient to meet their needs. This is from the fact that higher household size in a limited land that leads to greater surplus of the labor resource and, hence farmers try to seek extra activities out of agriculture for different purpose. This finding is in line with that of Tafesse *et al.,* (2015), Zerai and Gebreegziabher (2011).

Comparing household head attended formal education with others, household head who attended formal education has more (27%) probability of participation in non-farm activities than the non-literate household heads family. Thus, non-attended formal education household head may push the household to concentrate only on subsistence and on-farm agricultural activities. This finding is in line with that of Tafesse *et al.,* (2015) and Gecho (2016).

Landholding size has a significant and negative effect on the likelihood of participation in nonfarm activity. That is, as the landholding size of a farm household increase by one hectare, the probability of participating in non-farm activities decrease by 41 percent at 1% level of significance. The result is consistent with the results reported by Abebe, (2012); Ababbo, and Sawore (2015). The plausible reason for this is that households who have large land size are busy with working on their plot of land. Thus, they are less likely to participate in non-farm activities owing to shortage of time.

Use of irrigation is important factor affecting decision to choose non-farm activities. The probability of participating in non-farm activities for households who used irrigation decreased by 25 percent compared to other households which did not use irrigation at 1% significance level. Households who use irrigation are less likely to

engage in nonfarm activities than those are not using it. The reason behind is that irrigation user can produce crops two or more times per year instead of once which would create employment opportunities on their agricultural land. Similar studies suggest that households with access to irrigation are less likely to participate in nonfarm employment (Zerai and Gebreegziabher, 2011; Demie and Zeray, 2015).

Livestock holding were found to behave negative effect on the probability of participation in non-farm activity. The probability of participation in nonfarm activity decreases by 9 percent for a one unit increase of tropical livestock holding at 5 percent probability level. The plausible reason for this result is that livestock enables the farm households to have better chance to earn more income from selling livestock and livestock's product which enables them by increasing purchasing power food during food shortage and relieving liquidity constraint which can able in ensuring household food security. This is similar to the finding of Tefera *et al., (*2005) and Gecho, (2016) in Ethiopia.

The distance from the nearest market indicated a negative effect on the probability of participate in the non-farm activities, as the distance from the market increased by 1hours, the probability of non-farm participation of the household declined by 34 percent at 5% significance level. This indicates households engaged in nonfarm activities have a better access to the nearby market and has an employment opportunity to engage in non-farm. Therefore, households closer to the market were able to participate in nonfarm activities. This finding is in line with that of Assefa (2011) and Tafesse *et al.,* (2015). Travel time required to the nearest main market negatively and significantly influences the household's decision to participate in non-farm activity.

TABLE 4.5: MARGINAL EFFECT ESTIMATES FOR PARTICIPATION IN NON-FARM ACTIVITIES

variable	dy/dx	Std. Err.	z	P>|z|
SexHH	0.08	0.13	0.6	0.549
AgeHH	-0.01	0.01	-1.00	0.128
HH size	0.05**	0.02	2.5	0.012
EDUC	0.27***	0.10	2.7	0.009
REMIT	0.02	0.10	0.2	0.814
LH size	-0.41***	0.12	-3.42	0.001
USIRRG	-0.25***	0.09	-2.8	0.004
TLU	-0.09**	0.04	-2.25	0.029
ACC credit	0.09	0.07	1.29	0.219
DNMRKT	-0.34**	0.14	-2.43	0.016
NFT	0.18*	0.09	2	0.058

***, **, and * significant at the 1%, 5%, and 10% level, respectively
(*) dy/dx is for discrete change of dummy variable from 0 to 1

4.2.2. Determinant for the level of income from non-farm activities

Table 4.6 presents the result of Heckman second stage model, where determinants for the level of income generated from non-farm activities were identified. Household size has significantly and positively influenced the level of non-farm income at 1% significance level. The coefficient shows that the level of non-farm income generated by rural household increases by 134.55Birr with increase in household size by one extra persons. The presence of large number of economically active members in the household improves the capacity and ability of household to increase level of non-farm income. This enables to generate high non-farm income than those households constrained by availability household members. This is in line with the results reported by Sisay (2010). Household with large number of individuals increases the level of income from nonfarm activities.

Education status of household heads affects level of non-farm income positively and significantly. The coefficients of non-farm income increase by Birr 914.01 as household head being attended formal education, all other factors remain constant. Education improves the ability of searching out information about income generating activities and educated household head also has better skill, experience, knowledge than the non-educated households. It determines the capability of finding a job. Thus, education is a fundamental instrument in providing necessary skills to the farmers which enable them to increase an alternative income generating sources than illiterate ones. This finding is in line with that of Weldegebriel (2015).

Landholding size is an important variable having significantly negative effect on level of nonfarm income in the study area. It was significant at 1%. The coefficient implies that with all other factors kept constant, the level of non-farm income generated by rural household decreases by 108.62 Birr with increase in size of landholding by one hectare. Increase in size of cultivated land increases the amount of production to be harvested. Therefore, those farmers who cultivated more become in a better position than those who cultivated less which leads household with small landholding/cultivated land to be generated more income from non-farm activities than households with large land size. This is consistent with the results reported by Lemi (2009).

The effect of irrigation use on the level of non-farm income is negative and significant at 1% significance

levels. The coefficients of non-farm income decrease by Birr 510.35 as households become user of irrigation, *citrus paribus*. This result indicates that using irrigation increases the vegetable and non-vegetable farm income rather than non-farm income among the sample households. This might be because of the fact that participation in irrigation would improve agricultural production and productivity. There is also no spare time to engage in non-farm income as the irrigation user households are occupied the whole year in agricultural activities.

TABLE 4.6: HECKMAN SELECTION MODEL (TWO-STEP) ESTIMATES LEVEL OF NON-FARM INCOME

Variables	Coef	Std. Err.	T	P>|z|
nonfarm income				
sexHH	43.40	63.13	0.69	0.493
ageHH	-176.52	320.08	-0.55	0.582
HH size	134.55***	45.13	2.98	0.003
EDUC	914.01***	260.56	3.51	0.001
REMIT	44.00	45.34	0.97	0.333
LH size	-108.62***	29.32	-3.71	0.000
USIRRG	-510.35**	232.11	-2.2	0.029
TLU	-242.25**	105.36	-2.3	0.023
ACC credit	136.86	321.69	0.43	0.671
DNMRKT	-100.26***	37.06	-2.71	0.007
_cons	512.61	428.13	1.2	0.233
Mills lambda	-800.56***	225.91	-3.54	0.000

***, **, * significant at the 1%, 5%, and 10% level, respectively

Livestock holding found to have significant and negatively influence on the level of non-farm income. The coefficient of the variable shows that as the household gets one more TLU the level of income from non-farm activities decreases by Birr 242.25. This indicates that households with larger livestock holding may have the opportunity to plough at any time with minimum labor cost, especially for oxen this may lead to improved income from household farm crop production rather than non-farm income. On the other hand, it can serve as a critical input in farm operations as it enhances production and is also an important source of capital through which considerable income is generated.

Distance to the nearest market has a negative and significant effect on level of non-farm income. The coefficient of the variable shows that as the distance to the nearest market increases by one hour the level of income from non-farm activities decreases by 100.26 Birr. Households residing in places far from nearest markets could get less income from non-farm work because of higher transaction costs. This is in line with the result reported by Demissie and Legesse (2013).

5. CONCLUSIONS AND RECOMMENDATIONS

An econometrics analysis, Heckman two-stage model identified the determinants of participation in non-farm activity and level of income from it in the study area. The probability of rural households participation decision in non-farm activity were influenced by household size, education, irrigation, landholding size, livestock holding, distance to nearest market and non-farm training. Whereas household size, education status, landholding size, irrigation, livestock holding and distance to nearest market influenced intensity of income from non-farm activities.

Based on the findings of this research, the following major policy implications can be extracted that can help to design appropriate intervention mechanisms:

Landholding size has negative and significant effect of on the probability of participation in non-farm activities and level of income from it. This indicates rural household who has large land size have enough income from farm activities and they did not want to engage in non-farm activities. Hence, extension services and improved agricultural input provision to such households should be promoted to enhance their farm income.

Educational status of household head significantly and positively influenced participation and level of income from non-farm activities. This implies education may expand probability to employ in non-farm activity and enhances high income earning capacity of farmers from non-farm activities. Therefore, rural households should be equipped with basic formal education as it improves skill and knowledge of farmers to diversify their household income.

Distance to nearest market affects probability of participation in non-farm activities and level of income from it negatively. Therefore, Local market should expand in the study area in order to reduce the entry barriers and

facilitate easier access to nonfarm activities.

Entrepreneurial training on non-farm activities is one of the factors that significantly and positively affect the probability of rural household participation in nonfarm activities. As a result, provision of such training for rural household is vital be it by government or NGO and even by cooperatives organization.

Finally, there should be policy and program intervention to facilitate and stimulate participation of rural household in non-farm activities due to non-farm activities has play a great potential role for increasing rural employment and improving wellbeing since the agricultural sector alone cannot have a position to create additional employment opportunities and provide adequate income to sustain the livelihood of the rural household.

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