Determinants of Income Diversification and Its Share to Total Household Income in South, Nations, Nationalities and People Region, Ethiopia

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Abstract

This paper examines determinants of income diversification and its share to total household income among rural farm households using cross sectional data collected from South, Nations, Nationalities and People Region, Ethiopia. The data were collected through using well-structured questioners. The study employed a combination of multistage and purposive sampling techniques in the selection of 420 rural farm households. Both descriptive statistics and rigorous econometric models were used to analyze the data. In regards to this, censored Tobit model was used to analyze the determinants of level of income diversification while Multinomial logit model was used to pinpoint factors influencing households' decision to participate in various off-farm income diversification sources. The descriptive statistic result revealed that farm income sources are the most important income source for rural farm households in the study area, contributing 66% of total household income with the remaining 34% originating from off-farm income sources. The level of income diversification and household head participation in off-farm income diversification sources are found to be influenced by human capital related variables (sex and age of rural farm household head, education level of household head, family size, number of economically active family members and wealth status farm household head), livelihood assets (livestock holding size, size of total and cultivated land, farm and total household income, asset ownership and type of agro ecologic zone), institution related variables (household head access to credit, membership in farmers' cooperative and experience on agricultural extension service) and infrastructure related variables (distance from market center and main road). Based on the findings, it is recommended that the policy makers need to consider these factors in the planning of farm and non-farm initiatives in the study area.

Key Words: Determinants, Income diversification, Multinomial Logit, Participation, Rural farm household, Tobit regression

1. Introduction

In Ethiopia, the government policy focus is to increase productivity of agriculture and to raise farm income so as to meet the basic food self-sufficiency at household, regional and national level for those whose livelihood seriously depends on agriculture and related activities. In regards to agricultural productivity there should have been substantial resources spent on research an extension to alleviate the problem related to food shortage in the nation while there were not done adequately on the issues related to off-farm income source employment.

In spite of this fact, and with the view to feed and sustain themselves and their families;' the poor rural farm households during crop failure; are engaged in variety of off-farm activities to diversify their income source which smoothen their consumption and reduce liquidity constraints. The one basic and important question and concerns of policy makers in the region as well as in the country is to make sure wheather or not it is possible to support rural farmers to engage in off-farm activities without sacrificing the productivity of farm and basic food meeting objectives. As Tassew (2000) pointed out that before policy measures are taken to promote off-farm income generating activities; it is better to looking in to link between farm income generating activities and off-farm income activities and their determinants. In regards to these, outstanding issues, different empirical evidences have pinpointed the socio-economic rationale of rural farm household's livelihoods for pursuing differentiated and contextual livelihood strategies (Ellis, 1998).

According to (Ellis, 2000; Readon et al. 2001 and Barrett et al. 2001) being a member in multiple income generating activities by farm families is not solely limited to rural sectors of less developed countries. It is true that most rural farm families have multiple income generating sources which may indeed include off-farm wage employment, petty trade, transfer payments, migration remittance from the urban areas and from abroad.

There was disparity between the poor and the rich because of differences in initial asset endowments, both diversify differently; as indicated in studies carried out by Barrett et al. (2005) and Readon et al. (2001) in assessing diversification strategies of rural farm households. The poor rural farm households confined to labour intensive which is highly challenged roles with limited entry barrier and low returns. While the rich typically engaged in more profitable off-farm and capital intensive activities. Risk minimization, consumption smoothening and income stabilization is the rational for poor rural farm income diversification but for rich profit

maximization and as an alternative means. The poorer rural farm households have a low capacity even they have high incentives to diversify successfully, however, in some cases poor rely more on off-farm income generating activities in percentage than rich.

As it was argued by Hoogeveen (2001) and Submerge et al. (2004) mostly off-farm employment opportunities have the highest barriers for the poor, since they have fewer buffer stocks, less access to formal credit and greater interest in risk management, often it is impossible to access the smooth and most rewarding opportunities for income as the result of entry barriers. The people who are opposite to poorer have greater freedom to join wider range of off-farm options than do the poor. In this regard the poor have little choice in diversifying income source out of farming; as the result go in to low paid and unskilled off-farm labour activities with low barriers and limited returns.

Evidences in various case studies in Africa, by (Barrett and Readon, 2000) showed that the average share of off-farm income into total rural farm household income is about 45 percent with off-farm wage labor income exceeding self-employment income; and off-farm earnings are substantially greater than farm wage employment earnings or migration earnings. Similarly, in other continents (Latin America) especially the case study in Colombia by (Dinger and Olinto, 2001) who found that off-farm income contributes between 30 percent and 40 percent of total household income which is highly consistent with the present research finding that accounts 34 percent of off-farm income contribution to total household income. In contrary to this findings, the study carried out by Escobal (2001) in Peruvian rural farmers found that the contribution of off- farm income to total household is greater than farm income sources which accounts 51 percent while there should have equal or 50 percent off-farm contribution to total rural farm households income in Mexico.

Even though, the fact that in Ethiopia agriculture is the main source of livelihood in rural farm households, farmers to diversify their income sources, to enable them and cope risks during crop failure and production shortfalls, they engaged in various off-farm income activities. As stated by Barrett and Readon (2000) 36 percent of the rural total income earned from off-farm income activities which is also more similar to the present finding while Reardon et al. (2006) found the lowest share of off-farm income to the total income among the rural farm households in Ethiopia particularly in 1999 fiscal year. Despite the differences were registered in the percentage of income share derived from off-farm income source, the contribution of off-farm income in total rural farm households income is significant. In congruent to the present research finding different studies (Woldehanna and Oskam, 2001; and Yunze and Taylor, 2001) devoted special attention to focus on significance and determinates of off-farm income generating activities. Further, Sara (2007) found that about three fourth of the rural farm households engaged in off-farm income generating activities and approximately 31 percent of livelihood income is obtained from off-farm income source indicating income from farm alone is not sufficient to support the household economy. In Africa studies (Lanjouw et al. 2001 and Reardon et al. 2001) indicated that off-farm activities play a great role to help countries get out of poverty. Hence, income diversification among rural farm household is therefore seen as a way to secure or smooth income, consumption and to raise welfare of the farm households.

Thus, the present study tries to examine the determinants of income diversification and its share to total household income among rural farm households in South Nations, Nationalities and People Region, Ethiopia. This study attempts to address the following basic questions. What are the main types of income diversification sources and their share to total rural farm household income? What contributes to the variation in the level of income diversification among the rural farm households in the study area? What are the determinants of rural farm household participation decision on off-farm income activities?

2. OBJECTIVES

The overall objective of the present study is to examine the determinants of income diversification and its share to total household income among rural farm households in South Nation, Nationalities and People Region, Ethiopia.

More specifically, the aim;

- To identify the main types of income diversification sources and their respective share to total rural farm household income,
- To examine the determinants of level of income diversification among rural farm households,
- To analyze the determinants of rural farm households participation decision on off-farm income sources in the study area.

3. MATERIALS AND METHODS

3.1 Descriptions of the study area

Southern Nations, Nationalities, and Peoples Region (SNNPR) is one of the nine ethnically based regional states of Ethiopia. The region formed from the merger of five Kililoch called regions seven to eleven, following the regional council election on 1992 E.C. currently, the region has 14 zones, which divided on basis of ethnic lines consisting of 125 woredas and include 7 autonomous woredas. There are 3561 rural kebeles and 90 towns. Hawassa is the capital of its region. The region is located in the south and southwestern parts of Ethiopia, 4.43°– 8. 58°N latitude and 34.88°– 39.14°E, bordering Kenya to the south and South Sudan to the west and southwest, and the Oromia region of Ethiopia to the north and east. This study was mainly conducted in the three administrative zones of SNNPR, namely Hadiya, Kembata-Tembaro and Silite Zones; and one special Woreda namely Halaba special Woreda (CSA, 2007).

3.2 Sample size and Sampling design

The simplified formula provided by either Cochran (1963) or Yamane (1967) is employed to determine the required sample size. Primary data for the study was collected from 420 sampled households residing in 14 farmers' associations (*'kebeles')* using structured questionnaire after a preliminary survey was carried out to determine the specific location of the farming communities in the selected areas. Sample households were selected using a four-step multi- stage and purposive sampling technique. Thus, a total of four hundred and twenty (420) rural farm households were used as the sample size for the study. Meanwhile, the sample frame for the present study was determined by ADP list of all the registered farming households in the region that were sampled. The head of household (male-headed or female-headed) households would have provided data.

4. METHOD OF DATA ANALYSIS

4.1 Econometric Model Specifications

Tobit Regression Model

Tobit regression employed in this study to achieve the second (**II)** objective of this paper. The model expressed here as stated by Tobin. The dependent variable (activity income) can take the value of zero or positive values as follows: Let Y be a variable that is essentially continuous over strictly positive but takes on zero with positive probability. The empirical Tobit model is specified as follow:

$$y_t = y_t^* = x_t\beta + ui \quad \text{---------- (1)}$$

$$y_t = 0 \text{ if } y_t^* \leq 0 \quad \text{---------- (2)}$$

$$y_t = yt^* \text{ if } y_t^* > 0 \quad \text{---------- (3)}$$

i = 1, 2, 3….n or the observed value of yi would be defined as:

$$yi = \begin{cases} yi^* = Bxi + ui & \text{if } yi^* > 0 \\ 0 & \text{if } yi^* \leq 0 \end{cases} \quad \text{---------- (4)}$$

Where Yi* is a latent dependent variable which captures the i[th] rural farm household level of income diversification on a various income source (invers of Herfindahl index) which satisfies the linearity assumption of normality of the mean and homoscedasticity of the variance and , Xi, is a matrix of variables such as household asset endowments, household characteristics, institutions and location characteristics, which describe the potential benefits of participating in various activities, β* is a parameter vector to be estimated, Ui, is a random disturbance term and Ui ~ *IIDN (0,* δ^2) or normally distributed zero mean and constant variance. The marginal effects are used to calculate percentage elasticity at complete means.

$$\frac{\text{Change in } (Y^*)}{\text{Change in Xk}} = Bk \quad \text{……..……..…….(5)}$$

Multinomial Logistic Regression Model

Multinomial logit model (Madalla, 1992) were applied in this chapter to achieve the third (III) objective.

Instead of having two dichotomous alternatives (0, 1) as in the multivariate logit or Probit models, the multinomial logit has ***S*** possible states or categories – that is ***s*** *= 1, 2, 3..., S.* – that are exclusive and exhaustive (Cramer, 1991).

In the analysis part of this study, the dependent categories can be participation of rural households on different off-farm income generating activities or engaged only on farm income source. Which indicates s = 0 (reference category); if the household head participate on off-farm wage employment income source, s = 1; if the household head participate on Off-farm self-employment income source, s = 2; if the household head participate on (off-farm wage + self-employment income source), s = 3; if the household head participate on (Migration and transfer off-farm income sources and others), s = 4; and if the household head participate on multiple income sources, s = 5.

Multinomial logit model is different from ordered or sequential Logit/Probit models. Because the model does not treat categories in any continuous order (Amemiya, 1981). If there is a random sample of farmers, i =1, 2, 3..., N. Given five choice categories, *s = 1, 2, 3, 4,* 5 the multinomial logit model assigns probabilities *P is* to events characterized as i[th] households in s[th] category. The vector of the characteristics of the households` denoted by **z.** To estimate this model there is need to normalize on one category, which referred to as the reference state. In this analysis, the first category of the household head does not participate on off-farm income

source/ participate on farm income source alone is the reference category. Our multinomial logit model for choice across ***S*** states (s = 1, 2, 3, 4, 5) can be specified as:

$$\mathbf{P(Y = S)} = \frac{e^{\beta j^{z}}}{\sum_{j=2}^{S} e^{\beta j^{z}}} \quad \text{For } S \neq 1 \text{ ---------- (6)}$$

$$\mathbf{P(Y = S)} = \frac{1}{\sum_{j=2}^{S} e^{\beta j^{z}}} \text{ ---------- (7)}$$

The parameters $\boldsymbol{\beta_j}$ are estimated using Econometrics software. An iterative maximum likelihood algorithm were applied to estimate the empirical models in order to obtain asymptotically efficient parameter estimates. According to Greene (2003) the log-likelihood function for the multinomial logit model is-

$$\mathbf{InL} = \sum_i \sum_j \mathbf{dij\ InPij} \text{ ---------- (8)}$$

Where Pij is the probability of individual I in state `f` dij = 1 if yi = j, 0 otherwise, s = 0….j

The first derivatives are: $\mathbf{dInL/d\beta} = \sum_i (\mathbf{dij} - \mathbf{Pij})\mathbf{Xi}$ ---------- **(9)**

The Hessian is the second derivative i.e. $\frac{\mathbf{d^2 InL}}{\mathbf{d^2 \beta}} = -\lfloor \mathbf{1(1 = m)p, -p, p} \rfloor \mathbf{X`X}$ ---------- **(10)**

5. Findings and Discussions

As employed in various studies like Barret and Readon (2000), Davis et al., (2010) and Escobal, (2001) here also income diversification can be analyzed by examining the composition of household incomes in terms of different income generating activities and can also analyzed in a way that the vector of income shares associated with different income sources.

5.1 Main Income Diversification Sources and Income Composition

Table 5.1: Income sources, composition and shares to total income in ETB (N = 420)

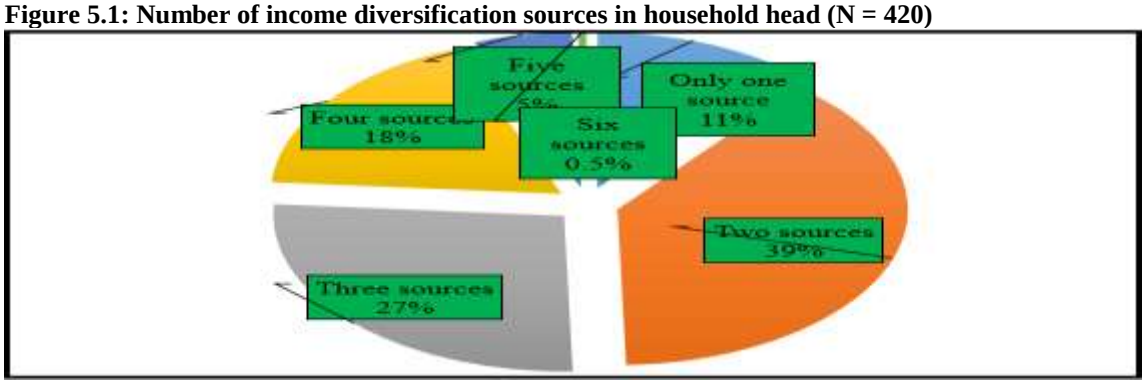
Income sources	Total income	Average income	Share of total income	t-value
Crop income	1,420,000.00	3380.96	0.32 (32%)	20.62**
Livestock income	1,210,000.00	2891.95	0.27(27%)	14.32**
Farm process income	154,000.00	366.67	0.03 (3%)	6.89**
Argic/al wage emp`t income	123,000.00	292.85	0.03 (3%)	8.42**
Total farm income (Sum 1-4)	**2,907,000.00**	**6,932.43**	**0.66 (66%)**	
Off-farm wage emp`t income	190,000.00	452.38	0.04 (4%)	4.64**
Self-employment income	87,800.00	209.05	0.02 (2%)	4.45**
Migration remittance income	578,000.00	1376.19	0.13 (13%)	14.07**
Transfer payments income	568,000.00	1352.38	0.13 (13%)	5.19**
Rental income	96,400.00	229.52	0.02 (2%)	4.57**
10. Other sources of income	3750.00	8.93	0.00 (0%)	1.87***
Total off-farm income (Sum 5-10)	**1,521,550.00**	**3628.45**	**0.34 (34%)**	
Overall (Farm + Off-farm) income	**4,428,550.00**	**10,560.88**	**1(100%)**	

Source: Survey results, 2017 - 2018, **, * indicates 5 and 10 % significance level

Basically, rural farm household's income sources were categorized into two, viz. farm and off-farm which were depicted in table 5.1 and indicates the share of household income from various income diversification sources in the study area. The results indicated that vast majority of rural farm households in the study area engaged in agriculture and the share of income received from those activities in many cases higher than that of off-farm activities. Among those agricultural activities income from crop and livestock productions are very dominant and together accounts over fifty percent of the total income. And the overall total farm income sources contribute about 2,907,000.00 (66 percent) of total income. This is highly consistent with the works of (Ibekwe *et al*., 2010; Yisihake, 2016; Muhdin, 2015; Amanze, 2011; and Yisihake and Abebe, 2016). But, this finding is highly inconsistence with works of Croppenstedt (2006) and Awoniyi and Salman (2011). On the other hand, the yearly share of income from off-farm activities represent on average, 1,521,550.00 (34 percent) of total income. This share fits reasonably into the available recent literature from other countries (Ibekwe *et al*., 2010, Deininger and Olinto, 2001; Woldenhanna and Oskam, 2001). This low off-farm income confirms the less share of income from off-farm activities which may aggravates level of poverty among the rural households. The

t-value in each income sources indicates that there is significantly different contribution of each sources to total income at 5% level of significance.

Figure 5.1: Number of income diversification sources in household head (N = 420)

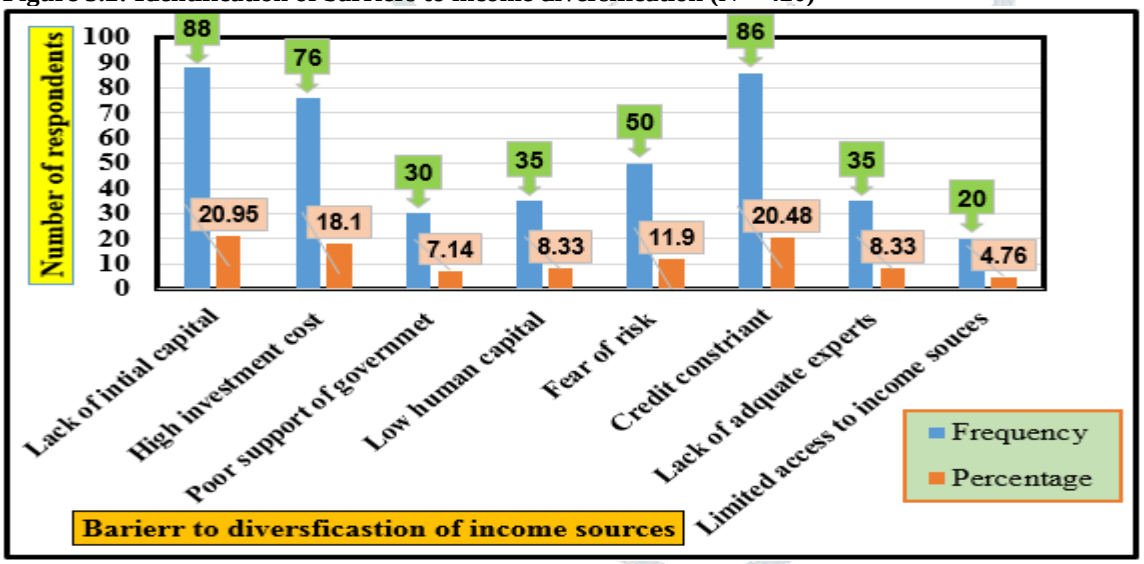


Source: Survey results, 2017 - 2018

It is true that the results of the present study in the figure 5.1 revealed that majority of rural farm households in the study area obtain their income at least from two sources 163(39 percent) followed by three sources 112(27 percent). The average household income sources was 2.7 with the minimum 1 and maximum 6 out of the total 10 income sources discussed in this paper.

5.2 Entry Barriers in to Income Source Diversification

Figure 5.2: Identification of barriers to income diversification (N = 420)



Source: Survey results, 2017 - 2018

As shown in the figure 5.2, as the majority of the respondents responds that out of the total 88(20.95 percent) respondents responds that the most of the barrier was comes from lack of initial capital, 86(20.48 percent) from credit constraints, 76(18.1 percent) from high investment costs. Here, it is observed that the highest barriers for income diversification mainly comes from lack of initial capital to run off- farm activities beyond farm activities and credit constraints both takes almost nearly equal and highest percentages followed by fear of risk which accounts 50(11.9 percent). This is in line with the works of Woldehanna and Oskam (2001) evidences from Tigray region in Ethiopia and Amanze, et al., (2015) entry barrier on income diversification in an Ambra state in Nigeria.

5.4 Regression Results

5.4.1 Determinants of Rural Household Level of Income Diversification

Table 5.2: Tobit regression results of determinants of income diversification (IHI)

Explanatory Variables	Coefficients	Standard error	t-Value	P > |z|
Constant	0.254	0.054	4.696	0.000***
Sex of rural farm household head	0.030	0.020	1.496	0.135
Age of the household head	-0.002	0.001	-3.118	0.002***

Marital status of the household head	**-0.007**	**0.008**	**-0.857**	**0.392**
Dependency ratio	**-0.028**	**0.048**	**-0.582**	**0.561**
Adult equivalence	**0.022**	**0.007**	**3.175**	**0.002*** **
Education level of the respondents	**0.061**	**0.020**	**3.082**	**0.002*** **
Household head years of schooling	**-0.010**	**0.006**	**-2.480**	**0.014** **
Family size	**-0.017**	**0.007**	**-2.410**	**0.016** **
Family size category	**-0.025**	**0.018**	**-1.386**	**0.166**
Religion of rural farm household head	**-0.002**	**0.008**	**-0.286**	**0.776**
Economically active age members	**0.010**	**0.006**	**1.675**	**0.095***
Wealth conditions of the respondents	**0.035**	**0.016**	**2.240**	**0.026** **
Farm income (in ETB)	**-6.015E-6**	**0.000**	**-6.274**	**0.000*** **
Total income (farm + off-farm) in ETB	**4.816E-6**	**0.000**	**6.793**	**0.000*** **
Household head access to electric city	**0.012**	**0.010**	**1.178**	**0.239**
Household head access to tractor	**-0.018**	**0.017**	**-1.074**	**0.284**
Household access to animal plough	**-0.100**	**0.010**	**-10.048**	**0.000*** **
Distance from the market (in Km^2)	**-0.002**	**0.001**	**-2.161**	**0.031** **
Distance from main road (in Km^2)	**-0.006**	**0.002**	**-2.482**	**0.013** **
Distance from near town (in Km^2)	**0.000**	**0.000**	**-0.817**	**0.414**
Access to transport all the year	**0.055**	**0.009**	**6.250**	**0.000*** **
Access to transport some months	**0.035**	**0.008**	**4.470**	**0.000*** **
Difficult to access transport over year	**0.015**	**0.010**	**1.579**	**0.115**
Household head has saving account	**-0.007**	**0.009**	**-0.817**	**0.415**
Household head has credit access	**0.037**	**0.010**	**3.729**	**0.000*** **
Membership in farmers cooperatives	**-0.004**	**0.011**	**-0.375**	**0.708**
Participation on migration remittance	**0.065**	**0.015**	**4.333**	**0.000*** **
Experience on extension service	**-1.538E-5**	**0.001**	**-0.023**	**0.982**
Total land size (in hectares)	**0.044**	**0.022**	**2.000**	**0.046** **
Cultivated land size (in hectares)	**-0.046**	**0.027**	**-1.714**	**0.087***
Agro ecologic zone of the respondents	**-0.024**	**0.008**	**-2.950**	**0.003*** **
Asset ownership	**-0.008**	**0.011**	**-0.747**	**0.455**
Livestock holding (in TLU)	**0.003**	**0.004**	**0.744**	**0.457**
Number of observation: 420; Log likelihood: -45.65; Pseudo R^2: 70.45; Ch^2 : 46.20* Invers of Herfindahl index ≤ 1 and Prob. > Chi = 0.0000**				

Source: Own analysis using survey data, 2017 - 2018; ***, **, ***,*** indicates, statistical significance at 10% ($P \leq 0.1$), 5% ($P \leq 0.05$) and 1($P \leq 0.01$) % level of significance respectively.

In realizing the objective on the estimation of the factors influencing the level of income diversification among rural farm households, the result of Tobit regression model is well fit as confirmed by the Pseudo R^2 of 70.45%. Moreover, the sample value of the log likelihood ratio of 46.20 is significant at 1 % ($P \leq 0.01$) level of significance; suggests that the regression analysis indicates that the factors determine the likelihood of rural farmers' diversification of their income sources. On the other hand, the overall likelihood ratio statistics as indicated by chi^2 statistics (46.20) was significant at 1 percent ($P \leq 0.01$) probability level, (prob. > chi = 0.0000) suggesting that the given regression model had a strong explanatory power.

As expected the age of the household head has a negative relationship with level of income diversification and significantly influence at 1 % ($P \leq 0.01$) level of significance, indicating that as the age of the respondents increases the level of income diversification declines. This results implies that younger heads of households could diversifies their income sources to obtain more income from various sources when we compared to their older fellow farmers. This results congruent with the results on the other studies from diversification behaviour in African countries (Mohammed, 2008; Sosina, et al, 2008; Winters et al, 2009; and Idowu, et al., 2011).

Adult-equivalence, as expected the result of the regression revealed that adult- equivalence have a positive and significant influence on the level of income diversification among rural farm households at 1% ($P \leq 0.01$) level of significance. This result implies that the variation on age based on gender difference among the family members probably lead to high level of income diversification. The result is consistent with the works Adugna (2006) found that the adult-equivalence was positive and significant influence on both participation on various income diversification sources.

As the result of regression revealed that, out of the human asset related explanatory variables economically active age (number of potentially active members in the household aged between 15 and 64 years) have a positive and significant influence on the level of income diversification in all its forms at 10% ($P \leq 0.1$) significance level; which is consistent with the prior expectations and with the works of (Amare and Belaineh, 2013; Alobo, 2015; and Idowu, et al., 2011).

As expected, from the human capital related variables, the results show that level of education among rural farm household is higher on those who are either completing secondary school or tertiary had a positive and significant effect on the level of income diversification among rural farm households in the study area at 1 % ($P \leq 0.01$) level of significance. The positive sign here indicates that when the level of education increases the level of income diversification increases. This result is highly consistent with the works of (Alobo, 2015; Barrett, et al, 2001; Winters et al., 2009; De Janvry and Sadoulet, 2001; Abdulai and Delgado, 1999; Readon, 1997; Ellis, 1998; and Idowu, et al. 2011) where the level of education was found to be the important determinant factor of the level of income diversification.

Access to animal plough was negative and significant at 1 % ($P \leq 0.01$). This implies that rural farm households have an access to animal plough initiates farm households to engage on farm activities rather than other off-farm income generating activities. Moreover, distance from the market and main road were also negative and significant influence on the level of income diversification at 5% ($P \leq 0.05$) significance level. The negative relation between the dependent and explanatory variables indicates that rural farm households far away from the market center and main road results on less income diversification. This is in consonant with the finding of (Schwarze and Zeller, 2005). On the other hand, household head those who have an access to transport all the year and access to transport in some months are positive and significant at 1% ($P \leq 0.01$) significance level respectively. Therefore, rural farm households with easy access to transport through the year and even some months of the year had significantly influence level of income diversification. This is highly consistent with works of (Winters et al .2001; Barrett et al. 2001; and Asmah, 2011) that showed better access to market, local community markets and public transports were significant in promoting off- farm income generating activities and helps households to diversify more and make them to enjoy higher welfare of the result.

Farm income, as expected the result revealed that farm income has negative and significant influence on the level of income diversification at 1% ($P \leq 0.01$) level of significance. This result implies that the amount of farm income increases the level of income diversification decrease. The reason is obvious. Agriculture (farm income source) are the only possible sources in remote areas because outside self-employment there are no income diversification possibilities. As an alternative options, rural farm households look for another income sources when the income from farm activities are lower or felt into risk. This result is consonant with works of Schwarze and Zeller, 2005; and Oyakhilomen, 2016). However, in the present study as expected, the total income from both farm and off-farm activities have positive relation with level of income diversification and significant at 1% ($P \leq 0.01$) level of significance. In this case, the positive relation indicates that the rural farm household total income increases the level of income diversification. The result is congruent with the works of (Muhdin, 2015; Yisihake, 2012; Yisihake and Abebe, 2015).

The result of the regression revealed that household head access to credit has positive and significant relation with level of income diversification at 1% ($P \leq 0.01$) significance level. This implies that those rural farm households who have an access to credit would have a possibility to diversify their income sources. The argument for this result in one hand is that when rural farmers accumulate their income from various financial institutions leads them to spend more money on investment outside their usual farm income. This is in line with the works of (Ellis, 2000), it is always true that financial capital constrains often prevent the poor rural farm households to engage in high - value off-farm activities. Therefore, the result is not surprising, if the rural farm households have an access to credit it reduces the liquidity constraint and give an opportunities to the rural farm households to start their own off-farm business. This is in line with the findings of (Babatunde and Qaim, 2009; and FAO, 2015) who reported that access to credit has positive and significant influence on income diversification but, not consistent with the negative findings of (Dimova and Sen, 2010; Amanze et al, 2015).

As prior expectation, the natural asset variables such as overall land size rural farm households have is positive and the cultivated land size which have negative relation and were found to be significant in determining level of income diversification at 5 % ($P \leq 0.05$) and 10 %($P \leq 0.1$) level of significance respectively. The possible reason for this is rural farm households with larger cultivated land size more likely to have less diversified sources of income, suggesting that such rural farm households give due attention to farm activities than off-farm counter parts. On the other hand, households with larger farm sizes were more likely to have diversified sources of income. As an indicator of wealth, the larger farm size suggests that wealthier households were more likely to have higher income sources of diversification. As argued by some researchers like (Barrett et al. 2001) stated that there is a positive relationship between the share of rural household income obtained from off-farm sources for those households lack such assets. This result is congruent with findings of (Idowu, et al. 2001; Readon 1997; Anderson, 2012; and Winters, et al. 2009) they stated that larger land holdings have mainly linked to increase income diversification.

Household members' participation on either rural to main cities or abroad migration have a positive and strongly significant correlation with the level of income diversification at 1% ($P \leq 0.01$) level of significance in the study area. For south nations and nationalities people, migration abroad is a significant income diversification strategy in every zones the present study is focused. The variable here used as proxies for the level of social capital of the rural farm household, in view that it promotes income diversification. However, having migrants in the household does not imply having remittance. But, the existence of migrants in the household as mainly social assets for networks and co-operation. In regards to this, migration either abroad or to capital cities is mainly in search of better opportunities to have more income in turn to improve their economic level. This implies that there should pull factors being higher wages in the destination, which provide households incentives to diversify their income sources. Similar to the argument made by (Barrett, 2001; Readon et al. 2001) as show on the Tobit regression result above agro ecology revealed unexpected, negative and significant relation with the level of income diversification at 1 % ($P \leq 0.01$) level of significance. The negative relation implies that when the rural farm household settled in the Dega or high land type of agro ecology the level of

income diversification decreased. This is the opposite of the prior expectation, when there is variation in agro ecology i.e. if we move from Dega or high land type of agroecology to Kolla or low land the level of income diversification reduced. This is in agreement with the works of (Yisihake, 2012; and Yisihake and Abebe, 2015).

As Multinomial regression result revealed in Table 5.4 below the overall results of the pseudo R^2 value for the outcome variables of household participation on different off-farm income diversification sources such as: - household head participation on off-farm wage employment income source, self-employment income source, on both off-farm wage and self-employment income source, migration remittance and transfer payment off-farm income source and multiple income diversification sources were 0.1125, 0.2566, 0.4088, 0.388 and 0.4047 respectively, which represents relatively reasonable explanatory power. Unlike natural science research, in social science research, pseudo R^2 value ranging from 0.10 to 0.20 is considered to be acceptable (Kultar, 2007). Therefore, in the present study pseudo R^2 value for all given dependent variables were significant and acceptable.

Education level of the rural farm household head had a positive and significant relation with the sole off-farm self-employment income generating source participation at 1% ($P \leq 0.01$) level of significance. The positive relation indicates if rural farm household head improved their level of education the participation on off-farm self-employment rises. It is not surprising, because it is presumed that household heads with formal education are better in their perceptive values, knowledge, skill, and decision making ability to participate in to lucrative and rewarding off-farm self-employment income sources and earn better income than households with low level of education or illiterate once. This is consistent with the findings of (Amare and Belaineh, 2013) who pointed that participation in off-farm self-employment were influenced positively by human capital related variable i.e. education. Furthermore, family size had a negative and significant influence on households' participation in (off-farm wage + self-employment) at 1% ($P \leq 0.01$) significance level. The probable reason is that the large family size could impress the household income through participating on other income generating activities due to the existence of large number of labour force spent their time on farm activities rather than participating on other else. This could be explained by the fact that less number of family size depresses household income from (off-farm wage + self-employment) tends to push rural farm households to diversify their income in to the other sources. This result confirms the finding of (Minot, 2006). But, contrary to (Readon et al. 1998) (See Table, 5.4)

5.6 Determinants of Rural Farm Households' Participation Decision on Off-Farm Income Sources

Table 5.4: Multinomial Logit parameter estimates result of participation on off-farm income sources

Dependent Variables	Off-farm wage Employment income		Off-farm self-employment income		Off-farm wage and Self-emp`t income		Migration and Transfer payment income sources		Multip incon
Explanatory Variables	Coefficients	t- ratios	Coefficients	t- ratios	Coefficients	t- ratios	Coefficients	t- ratios	Coefficients
Intercept	.15887	0.99	.1203	0.83	-.1349	-1.16	.0676	0.70	-.0856
Sex of the household head	.06432	1.39	.0585	1.39	.0181	0.54	-.0530	-1.90**	.0462
Age of household head	-.0039	-1.90**	.0027	1.45	-.0004	-0.30	-.0522	-2.33**	.0011
HH head education level	.00262	0.12	.0500	2.58***	-.009	-0.58	-.0031	-0.24	.0098
Family size	-.01258	-0.63	.0046	0.26	-.0392	-2.71***	-.0067	-0.57	-.0045
Adult-Equivalence	.00599	0.27	-.0062	-0.31	.0160	0.99	.0148	1.11	.0140
Economically active age	-.0002	-0.01	.0343	2.01 **	.0341	2.49***	-.0066	-0.59	.0098
Dependency ratio	-.0438	-0.58	-.0277	-0.40	-.0192	-0.35	.0084	0.19	.0704
Wealth conditions of HH	.0266	0.48	-.0704	-1.40	-.0052	-0.13	.0394	1.18	.0783
Access to credit	-.0255	-0.59	-.046	-1.19	.0823	2.65***	-.0431	-1.67*	.0262
Access to asset ownership	-.0312	-0.74	-.006	-0.16	-.009	-0.29	.0528	2.07**	.0229
Access to saving	.0205	0.54	-.014	-0.41	-.0122	-0.44	.0040	0.18	.0360
Distance from the market	.0019	1.25	-.0018	-0.13	-.0029	2.63***	-.00202	2.15 **	-0.0026
Farm income(EBB)	-.0001	-2.74 ***	-.0001	-3.51***	-.0002	-8.04***	7.72e-06	-3.35***	-.0002
Total HH income (ETB)	7.83e-	2.63 ***	8.58e-	3.19***	.0002	9.56***	9.83e-06	5.49***	.0002
Cultivated land (hectare)	-.0831	1.74*	.0045	0.09	.0091	0.23	.01998	0.62	.0164
Total land holding size	.0476	1.14	-.064	-1.69*	.1221	4.02***	.0075	0.30	-.0428
Experience on extension	-.0041	-1.64*	-.0111	-4.55**	.0019	1.00	-.00344	-2.12**	-.0044
Membership cooperatives	.0145	0.37	-.016	-0.46	-.025	-0.87	-.042772	-1.79 *	-.0815
Tropical livestock (TLU)	-.0094	-0.46	-.011	-0.60	.0264	1.79*	-.007444	-0.61	-.0085
Agro-ecology	-.0081	-0.22	-.0312	-0.93	.0051	0.19	-.052232	-2.33 **	-.0364
Log likelihood	-146.36		-111.19		-168.14		-165.64		-79.96
Pseudo R2	0.1125		0.2556		0.4088		0.388		0.4047
Prob > chi2	0.0011		0.0000		0.0000		0.000		0.0000
LR chi2 (20)	37.12		76.13		205.06		210.04		108.73
Number of observations = 420; Dependent variable = Participation on off-farm income sources									

Source: Survey results, 2017 – 2018; ****, **,* indicates statistical significance at, 1% ($P \leq 0.01$); 5 % ($P \leq 0.05$); and 10 % ($P \leq 0.1$) probability levels, respectively.*

In agreement with the prior expectation the existence of large number of economically active age members of the household have a significant and positive influence on participation in self-employment off-farm income source and (off-farm wage employment + off-farm self-employment) income source at 5% ($P \leq 0.05$) and 1 % ($P \leq 0.01$) significance level respectively. This is consistent with the works of (Amare and Belaineh, 2013; Yisihake, 2012; Yisihake and Abebe, 2016) who founds that the presence of large number of economically active age members correlated positively and significantly on the over participation of the household in off-farm income generating activities.

In line with the prior expectation the coefficient of wealth status of the rural farm household head was positive and statistically significant at 10% ($P \leq 0.1$) significance level. The possible justification is that so as to increase the purchasing power of themselves poor rural farm households will probably need to participate in multiple income diversification sources to generate more income, to smoothen their consumption and helps them to come out from respective poverty. This result is consonance with the findings of (Awoniyi and Salman, 2012; Oluwatayo, 2009; and Sallawu et al. 2016) who found that the poor people in the rural areas had more chance to participate on income diversification sources more than non-poor as a means of survival in risky situations.

As the regression result revealed that access to credit had a positive and significant influence on rural farm households' participation on (off-farm wage + self-employment) income source option at 1 % ($P \leq 0.01$) significance level. While negative and statistically significant influence on the participation of households on migration remittance and transfer off-farm income source option, at 10% ($P \leq 0.1$) significance level. This implies that access and utilization of rural farm households' credit facility probably could encourage to earn income from off-farm transfer payments and other sources to improve their living standards but discourage household participation on migration off-farm income and transfer source to earn income. This is in line with the findings of (Sallawu et al. 2016 and Demissie, 2003). Likewise, access to physical asset endowment are found to influence participation on migration remittance, transfer payments and other off- farm income source option positively and significantly at 5% ($P \leq 0.05$) level of significance. The probable reason for this is that households who own large asset may paved the way or provides an opportunity to migrate other regions or country in order to generate more income and accumulate capital than households with low asset owned. This is common when the households are in need to diversify their income sources for pull reasons than push. Therefore, being owner of large assets encourage the participation of households in migration off-farm income sources to enjoy income from this option. This is congruent with the finding of (Amare and Belaineh, 2013) who pointed that access to livelihood asset endowment such as suitable land for cultivated and livestock holding are found to affect rural farm households' involvement in off-farm sectors.

Distance from market center is found to have a negative and significant influence on rural farm households' access to obtain income from (off-farm wage + self-employment) at 1 % ($P \leq 0.01$), in the case of migration remittance and transfer payment income and multiple off- income sources at 5% ($P \leq 0.05$) level of significance. This implies that the rural farm household dwelling in area far from the market center the low tendency of households' access to receive income from multiple off-farm income sources including (off-farm wage + self-employment). This could be attributed that the fact that rural farm households dwelling in the village far from the market centers have no access and opportunity to participate on both off-farm wage and self-employment income sources. This finding is highly consistent with works of (Amare and Belaineh, 2013; Adugna, 2005; and Minot *et al*., 2006) who found that the probability of the household to participate in and generate income from off-farm multiple income sources are decrease as the homestead of the household far away from the market. But, disagreement with that of (Ibrahim, 2009 and Omamo, 1998).

Farm income of the rural farm households was negative signed and statistically significant correlation with households' participation on overall off-farm income diversification sources at 1% ($P \leq 0.01$) level of significance. Confirmation to the prior expectation this result provide negative relationship with all of the given dependent variables. This is because, when the rural household farm income increases, the households' participation on off-farm income generating activities were reduced. This is inconsistent with the findings of (Sallawu et al. 2016) who found out that coefficient of farm income was signed positively which indicates there should be higher tendency of farm households access to participate on diversifying income sources in to various off-farm income generating activities. While total household income was positive and significant influence on participation of the rural farm households across the given off-farm income diversification sources at 1% ($P \leq 0.01$) level of significance. This is because, the total income of the household can be a source of investment for both farm and off-farm income activities and further support and enable households to diversify their sources of income through increasing the capacity so as to increase the standard of living of rural farm household. The finding ascertained by Adebayo (2012) was consistent with this finding and agreed with priori expectation.

The cultivated land holding size of the rural farm household was a negative and statistically significant influence on off-farm wage income source participation at 10% ($P \leq 0.1$) level of significance. This implies that rural farm households who had more cultivated land size would have the capacity to generate more income and interested to spend more time on production of crop which might enables them to increase their farm income share to satisfy consumption needs and smoothen liquidity constraints. Therefore, particularly they have no an opportunity to participate on lucrative off-farm wage employment income sources since they focused on farm. This is consistent with findings of (Yisihake, 2012) but, contrary to the Amare and Belaineh, 2013) who pointed out cultivated land size was positive and significant influence on off-farm wage employment income sources.

As the result indicates that experience on agricultural extension service was negative and significant influence with rural farm household participation on off-farm income diversification sources (self-employment, (off-farm wage + self-employment) and multiple income sources) in line with prior expectation at 5% ($P \leq 0.05$) while off-farm wage employment income source is significant at 10% ($P \leq 0.1$) level of significance. This indicates that rural farm households who are unable to diversify income in

to off-farm income sources, therefore, households rely only on farming to sustain their livelihoods. This is in agreement with (Jirstrom et al. 2012; and 2018).

Total land holding size was negative and significant influence on self-employment off-farm income source participation at 10 % ($P \leq 0.1$) level of significance. The implication of this result was that the availability of large land holding size influence the household participation on self-employment off-farm income sources in opposite direction. This indicates that when the size of land increased rural farm household concentrated on farm income sources especially in crop production and livestock raring rather than diversifying in self-employment off-farm income sources. On the other hand land holding size influence the households' participation on the transfer income sources in the same direction at 1% ($P \leq 0.01$) level of significance. To scale up the farm production the government probably may increase the transfer payments among rural farm households who have large land size. Even, farmer's sale part of their land to send their family members either South Africa or Saudi Arabian countries to receive private transfers in the form of support this may open the way respondents to participate on off-farm transfer payments.

The participation of rural farm household in a mixed income source, on migration and transfer off-farm income sources were affected negatively and significantly by household membership in farmers' cooperatives at 1% ($P \leq 0.01$) and 10% ($P \leq 0.1$) probability level of significance respectively in agreement to priori expectation. This implies as the membership in farmers' cooperative increases, the resultant participation in any off-farm income source decreased. The probable reason is that most cooperative organizations provides service for rural farm households by supplying input in credit to purchase agricultural input to increase the income form farm activities which give the opportunities to improve total household farm income. Hence, they are interested to expand farm activities rather than participating in off-farm activities. This result is in agreement with (Olale, 2011; Yisihake, 2012; Yisihake and Abebe, 2016) who found that the probability to participate on off-farm income generating activity is negative and significant relation with household membership in farmers' cooperative organizations.

Tropical livestock holding unit was found to affect households' access to involve on (off-farm wage + self-employment) income sources positively and statistically significant at 10% ($P \leq 0.1$) significance level. This implying that households with more livestock holding had the capacity to participate and share income from (off-farm wage + self-employment) sources than households with no or limited number of livestock holding. In the region livestock holding is the key asset next to crop production to raise total farm household income. Apart from these, livestock are important as a food like animal product and by products, which enables farm households to smoothen risks through disposal and play a great role in livelihood diversification as an alternative way of living. This is highly consistent with the findings of (Amare and Belaineh, 2013; Yisihake, 2012) who pointed out that livestock holding provide positive and significant influence on household participation on off-farm income generating activities. Finally, agro ecologic zone determine the participation of rural farm household on off-farm migration remittance and remittance income diversification sources negatively and significantly at 5% ($P \leq 0.05$) level of significance. This implies that the available wheather conditions which are rain fall, temperature and humidity highly determine either the settlement or mobility of rural farm households from one area to another. Therefore, in the present case the negative sign implicates that the attractive condition of the agro ecology retained households from migration one region to another region with in the country or outside the country.

6. SUMMARY, CONCLUSION AND RECOMMENDATIONS

The descriptive statistical analysis in the present study indicates that basically, rural farm household's income sources were categorized into two, viz. farm and off-farm income sources and their respective share to total household income was 66 percent and 34 percent respectively. The lion share of farm income which accounts, 52 percent was generated from both crop production and livestock raring while the major share of off-farm income accounts, 26 percent comes from both migration remittance and transfer payments. The mean annual income diversification source of rural farm households in the study area was 2.7. Therefore, one can draw the following conclusion that having a single income source or specializing in a single activity among rural farm households is almost null, but having multiple income source is a norm. Similarly, the result also revealed that the most common barrier of income diversifications comes from lack of initial capital, credit access, high investment cost; highest income diversification registered in mid land agroecology, in the case of gender male household diversify their income sources more than female counterpart; diversification in the case of education is high in secondary and tertiary level, households with large family and low land holding size has high level of income diversifications.

The econometric results obtained go with somewhat towards establishing and clarifying relations between various explaining variables and income diversification options. The following concluding remarks were made based on the regression result. Human capital related variables (age, sex, education level, family size, number of economically active age family members and wealth status) institutional, physical and infrastructure related variables (access to credit, distance from market center and main road, farm and total income, land size, experience, tropical livestock unit, agroecology and membership in cooperative organizations) are found to be strongly associated with level of income diversification and rural farm households participation on various off-farm income generating activities at statistically significant level. Based on this conclusion the following policy directions were recommended.

Since, the illiterate households are mostly pushed to the less attractive off-farm income sources. There should be efforts made on improving skill and knowledge of farmers through provision of training. Also government should have to open the way for rural farm household heads to access credit from governmental financial organizations and facilitate the way NGOs to provide fund for households in order to diversify income sources to smoothen their respective income constraints and consumption. Similarly, it is

recommended to limit time and effort of rural farm households to spend in participation on cooperatives which initiates households to engage on a single farm sectors. Moreover, it is also recommended that government and other stake holders should have to develop an alternative income generating sources, climate change adoption and coping mechanisms to restrain the movement of people from their homestead.

The policy environment shall aim to provide support for the asset endowment sector development and shall aim at supporting the livestock raring sub sectors, in this study area. And also stake holders should have to provide support to improve the farm production and total income of the farmers, yield enhancing inputs should be a possible area of intervention to support rural households produce beyond the subsistence level and help to resist during risk.

Finally, there should have to create awareness for farm households to save their time to participate on off-farm income generating activities parallel to farm activities and it is also recommended that the government should have to create an opportunity to access transport and establish road in remote parts of the region to develop link between the market and main road where most poor farmers reside and where market integration is very weak.

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