Innovations

Determinants of livelihood diversification strategies in the Ale District, Southwestern Ethiopia

Mamush Masha, Mengie Belayneh*and Hordofa Belay

Department of Geography and Environmental Studies, Mettu University, Mettu, Ethiopia

*Corresponding author: **Mamush Masha, Mengie Belayneh**

Abstract

Diversifying the sources of livelihood for households beyond agriculture plays a significant role in reducing poverty and foodinsecurity. However, identification of the causes that determine households' choice of livelihood strategies of rural households have received little attention in Ethiopia in general and the study area in particular. Therefore, the aim of this study was to explore the determinants of livelihood diversification strategies in Ale district of southwest Ethiopia.A cross-sectional survey research design was employed to examine the factors that determinelivelihood diversification strategies.Stratifiedrandom sampling technique was applied to select 378sample sizes from three selected kebeles. Descriptive statistics expressed in mean and percentages andone way analysis of variancewas applied to investigate the mean differences of continuous variables. Multinomial logistic regression model was employed to identify factors that determine livelihood diversification strategies.The income portfolio analysis revealed that onfarm activity has a prominent contribution to the total income of sample households.The regression model result showed that sex,age of household head, farm size, family size, year of education, location of market, cooperative work and owned cattle size were the main determinants of livelihood diversification strategies (p < 0.05).Our findings suggests that the household livelihoods are highly diverse and needstrong local institution to the household-level characteristics. Inthis aspect, local governmentshould pay more attention to education, gender, cooperative work, provision of credit access andincentive programs to reach all household membersthrough developing effective platform that allow all rural households to be involved and share experience ondiversification of livelihood strategies.

Keywords: 1.Determinants, 2.Livelihood diversification, 3.multinomial logistic regression, 4.Damota area.

1. Introduction

It has been claimed that agriculture as a primary source of income become failed to guarantee sufficient livelihood for most farming households in sub-Sahara African countries (Babatunde 2013). Some studies witnessed that the agricultural sector in the sub-Saharan African countries is highly characterized by decreasing farm sizes, low levels of output per farm, and a high degree of subsistence farming (Jirstrom et al. 2011). Therefore, in situations of such high-risk agriculture and poverty, poorer small-holders without the necessary assets may be pushed to seek alternative incomes by engaging in low-return and sometimes risky nonfarm activities (Barrett et al. 2001).Accordingly,diversification is associated with both livelihood survival and distress under deteriorating conditions, as well as with livelihood enhancement under improving

economic conditions (Niehof 2004).In this case, it isclaimed that rural people establish their livelihoods through three main strategies namely agricultural intensification, livelihood diversification, and migration (Barrett et al. 2001).

This is due to the fact thatreducing poverty and enhancing food security in rural Ethiopia is very important to overcomethe vulnerability of the poor through diversification of the sources of their livelihoods (Deverux 2000).Inthis aspect, the probability that realizing the goal of reducing poverty andenhancing food security only through increasing agricultural productivity and redressing the issues of access to agricultural resources without non/off-farm livelihood diversification could not be effective in the sub-Sahara African countries (Emanuel 2011).Besides, Reta and Ali (2012) indicated that in rural Ethiopia if there had not been other sources of income apart from agricultural production, the land scarcity by the farmers coupled with agricultural risks could not generate enough income to feed household members and they cannot fulfill household needs.This suggests that the necessity of on farm plus non/off-farm and all combined diversification in rural Ethiopia. Nevertheless, supportive policy which identifies different determinant factors that hinder rural people livelihood diversification strategies to secure their livelihoods still remain low in Ethiopia(Eyenew and Wogayehu 2012).

In the study area, population pressure, institutional failure, climate variability and environmental degradation collectively causes shrinkage of land holdings that led to farm fragmentation and landlessness.Subsequently,due to the insufficient land and other resource to absorb alarmingly increasingpopulation, the rural households of the study areaare unable to meet the annual family food requirements, which in turn resulted in persistence of food insecurity andpoverty. Even if some of the rural farm households are involved in diverse livelihood activities, their access to different income sources beyond agriculture and identifying the factors that hinder the choice of their strategies were not adequately investigated. Besides, the major factors inhibiting the choice of livelihood diversification strategies have notbeen studied adequately and empirical studies on this issue are limited.Therefore, rigorous new empirical study is needed in view of bridging and filling the existing knowledge and information gap.

2. Materials and Methods

2.1. The study area

The study was conducted in Alle district, Ilu Abba Bor zone, Oromia Reginal state, which is situated in the southwestern part of Ethiopia. It is one of the 14 districts of Ilu Abba Bor zone of Oromia Regional State. It is astronomically located between 7°56'40'' - 8°16'45''N latitude and 35°22'10''-35°52'40''E longitude (Figure 1). The altitude varies from 649 - 2442 meters above sea level, with an average annual rainfall of approximately 2000mm. The annual average temperature in the zone varies between 16^{0}c and 24^{0}c and the climax vegetation is tropical montane rainforest.
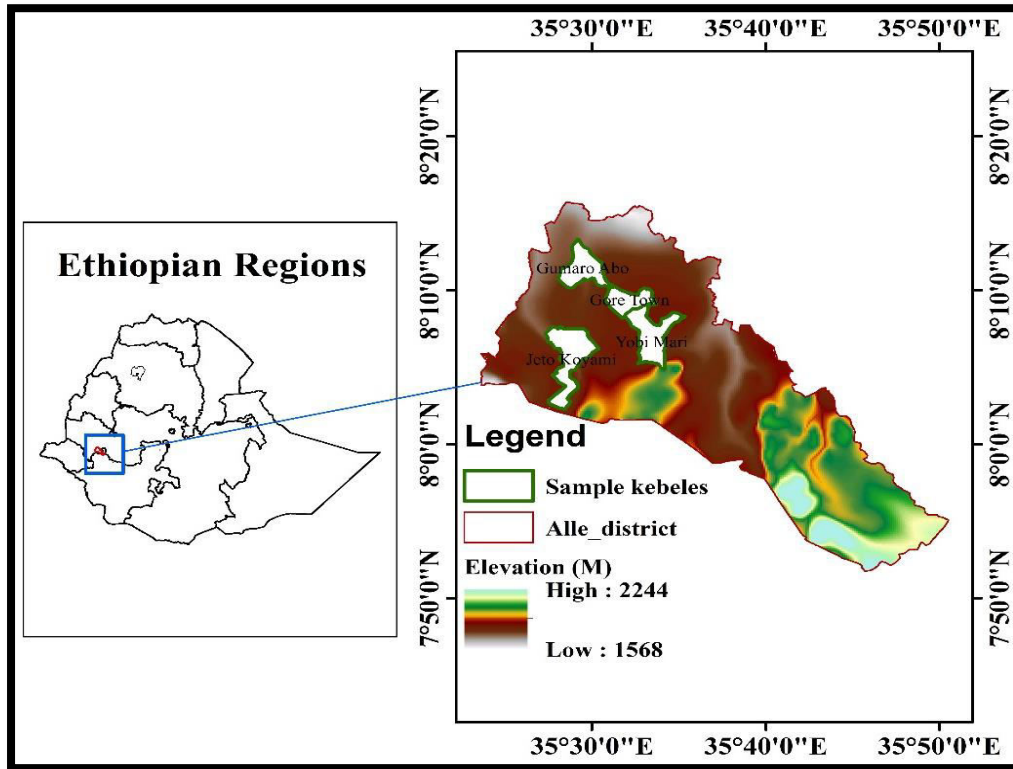
Figure 1.Locational map of the study area.

2.2. Research design and approach

A cross-sectional survey research design has been employed to examine the factors which determinelivelihood diversification strategies. The motive for employing this survey design in current study was that it is helpful to collect the data at a single point in time which the pattern of association between variables are examined so as to detect association of causal effects.The mixed research approach wherein both quantitative and qualitative research methods are used in combination to identify socioeconomic, demographic, institutional and biophysical factors which influence the choice of livelihoods diversification. This research method is vital to triangulate the results and highly recognized for its reliable data collected at available time and resources so as to achieve the purpose of the study (Tsegaye 2012).The primary data required for the study were collected from a farm households by using survey questionnaire, key informant interview (KII), focus group discussion (FGD) and field observation (November 2019 to May 2021). Secondary sources of data from taken from the written documents.

2.3. Sampling techniques and sample size determination

From Ale woreda, three kebeles namely Gumaro Abbo, Jeetoo and Yuubii Maariiwere purposively selected based on agroecology. Kothari formula with 95% confidence interval and 0.05 margin of error were used to determine sample size.

No= $\frac{p(1-p)z^2}{e^2}$, where, No = sample size, p= estimated proportions of respondents which is: 0.5, z= the number of standard error corresponding to 95% confidence interval which is 1.96, e= margin of error which is: 0.05 were selected.No= $\frac{0.5(1-0.5)1.96^2}{0.05^2}$ = 384. Therefore, using infinite population sample size determination formula, the total numbers of sample size included in the study was =384. Finally, using finite population

sample size determination formula:$n = \frac{no}{1+\frac{(n-1)}{N}}$ = $n = \frac{384}{1+\frac{(384-1)}{25,086}}$ = 378. Subsequently, 378 sampled households were selected considering their heterogeneity in agroecology and livelihoods diversification.

2.4. Method of data analysis

To analyze the data, descriptive, inferential statistics and multinomiallogistic regression modelwere used. While Descriptive statistics included mean and percentages, from parametric tests, one way analysis of variance was used to explore whether there are significant mean differences among the livelihood diversification strategies in relation to continuous variables.Multinomial logistic regression model was employed to identify factors that determine the choice of rural households' livelihoods diversification.

2.4.1. Econometric model specifications

Wassie et al. (2008)stated multinomial logit model is an important model to examine the determinants of householdlivelihood choices among the alternative livelihood strategies. (Green, 2003), also supposes for the ith respondent faced with j choices, we specify the utility choice j as:Uij = Zij β + εij .... (1)

If the respondent makes choice j in particular, then we assume that Uij is the maximum among the j utilities. So the model is derived by the likelihood of the choice of j is made, which is:

Prob (Uij >Uik) for all other K ≠ j .... (2)

Where; Uij= is the utility to the ith respondent form livelihood strategy j ,Uik= is the utility to the ith respondent from livelihood strategy, K= If the household maximizes its utility defined over income realizations, then the household's choice is simply an optimal allocation of its asset endowment to choose livelihood that maximizes its utility (Brown et al. 2006).

Thus, the ith household's decision can, therefore, be modelled as maximizing the expected utility by choosing the jth livelihood strategy among J discrete livelihood strategies,

Maxj= E (Uij) = f j (xi) +Ɛij, j=0 3

In general, for an outcome variable with J categories, let the jth livelihood strategy that the ith household chooses to maximize its utility could take the value 1 if the ith household choose jth livelihood strategy and 0 otherwise. A convenient normalization that removes indeterminacy in the model is to assume that β1 = 0 (Greene, 2003). So that exp (Xiβj) = 1, implying that the generalized equation (4) is equivalent to:

$P_{j=} \frac{\partial p_j}{\partial x_i}= \quad p_j\left[\beta_j - \sum_{k=0}^{j} pk\beta k\right]=p_j(\beta_j\text{-}\bar\beta)$... (4)Where;$P_{j=}$ = probability representing the i th respondent's chance of falling into category j; Xi = Predictors of response probabilities; and βj = Covariate effects specific to jth response category with the first category as the reference.Based on the above theoretical justification, the researchers specify the multinomial logic model for ruralhouseholds' choice strategies (HCS) as follows:

$\text{HCS}_i = x_i\beta_j + u_i$.. (5)
Where HCS_i is reported as household choice thestrategies used by the surveyed households,x_i = is regression parameters,β_j= is vector of the explanatory variable andu_i= is the error term

2.4.2. Definition of variables

Table1.Statistics of key variables used in the estimations.

Dependent variables	Descriptions of livelihoods strategies		
Y=0	Onfarm alone		
Y=1	Onfarm and nonfarm combination		
Y=2	Onfarm and off-farm combination		
Y=3	Onfarm, off farm and non-farm		
Explanatory variables	**Descriptions of variables**	**Variable types**	**Expected Sign**
Sex	1 for male,0 otherwise	Dummy	+
Age	Age of respondents in years	Continuous	+
Education	Education of family in years	Continuous	+
Family size	Size of family in numbers	Continuous	+
Remittances	1 for Yes,0 otherwise	Dummy	+
Farming size	Size of farmland in hectares	Continuous	+
Number of livestock	Live stocks hold in TLU	Continuous	+
Cooperative work	1 if they do in a group,0 otherwise	Dummy	+
Distance of market	Market distance from home in kilometer	Continuous	+
Use of inputs	1 if they use input,0 otherwise	Dummy	-
Crop risk	1 if there was crop risk ,0 otherwise	Dummy	+
Credit access	1 if there is credit,0 otherwise	Dummy	+
Extension contact	1 if there is extension,0 otherwise	Dummy	-

3. Result and Discussion

3.1. Description of rural livelihood strategies

Inthis study, four livelihood strategies were identified which include the onfarm onlystrategy, on-farm plus non-farm, on-farm plus off-farm and a combination of on-farm plus non-farm and offfarm activities.It has been done by grouping households who have followed similar strategies among the choices of on farm,on farm plus non-farm, on-farm plus off farm and all combinations. In this regard, a significant number (45%) of the households entirely depend on the on-farm only livelihood strategy, some (25.4%) households depends on on-farm plus non-farm, about (19%) of the respondents depends on onfarm plus off-farm, and the

rest(10.6%) of sample respondents depend on on-farm plus off-farm plus nonfarm livelihood diversification strategy.

There are different methods of identifying livelihood strategies; but the most commonlyused method was, economists group households' livelihood identification strategies by shares of income earned from different sectors of the rural economy (Brown et al. 2006).Similarly, our study considered the income shares of each livelihood activity to determine livelihood strategies.Besides,itis known thatthe local people have their own wealth ranking criteria to say poor, less poor and better income.Accordingly, the income portfolio analysis has been done for each household to measure the income from different livelihood options (Table 2).This was becauseincome earned from on-farming only is not sufficient to cover all households'expenditures.

Therefore, it is supplemented by non-farm and off farm derived from petty trade, rural craft, and daily labor wage and renting. Inthis aspect,the percentage share of livelihood activities in our study indicates that onlythe agriculture covers about 68.5%, nonfarm 23.3% and off-farm 8.2% respectively. This indicates that in the study area crop-livestock production was the main sources of income followed by non-farm and off farm. The mean income received by better off, less poor and poor households was 19223, 1235 and 703 ETB respectively.

This indicates that the highest income was derived from on farm activities whereas the lowest income was derived from off farm income. Relatively better-off households in rural areas would have a more diversified income base than the poor. This might be due to limited access in terms of financial availability.Similarily, (Asfaw et al. 2017; Ersado 2003) reported that wealthy families tend to participate more in non-farm activities than the poor.Besides, key informant interviews and focus group discussion result revealed thaton farm strategy was the main sources of income for better off households where as off-farm activities like daily wage, renting and environmental gathering are survival mechanisms pursued mainly by the lower-income groups. Similarily, (Molla 2018) reported that offfarm livelihood strategies are survival mechanisms pursued mainly by the lower-income groups which is substantiated by different socioeconomic characteristics of the household. Also, the study of (Eyenew and Wagayehu 2012) reported that the contribution made by off farm agricultural sector to rural households is significant for the poor, although these activities are survival oriented and have little to do with accumulation.

Table 2. Income composition of sample households. Source: own survey, 2020

Cash income composition	Better off Less poor	Poor	Percent
On farm (crop and livestock)	92 88	79	68.5%
Nonfarm(pettytrade&rural craft)	60 16	12	23.3%
Off-farm(gather,wage & rent)	5 6	20	8.2%
Total(378)	157 110	111	100%
Mean annual income per a year	19223 1235	703	
F value			19. 13
P value			0.001***

*** implies it is significant at 0.001.

3.2.Results of multinomial logit model

Results of multinomial logistic regression model was used to identify determinants of farmers' choice on the practice of livelihood diversification possibilities.In order to measure factors' relative importance on the farmers' choice of livelihood diversification, SPSS version 20 software was used to generate the parameter estimates.In this case, predictor variables were selected to explain mutually exclusive the dependent variable.To identify the problem of multi-colinearity or association among the potential explanatory variables, variable inflation factors (VIF) (for continuous variables) and contingency coefficients (for the categorical) variables were checked and it shows good result.Accordingly, 13 variables, assumed to have an association with the diversification of rural households' livelihood strategies were selected and tested in the model (Table 3).Inthis aspect, the base category(a reference category) is the household who select on-farm only as a livelihood strategy.Among those variables, 10 of them were found to be a statistically significant (p<0.05).

The likelihood ratio test showed that the estimated model and the set of explanatory variable fit the data better compared with the model containing the constant only. This implies a better relationship between odds ratio (log of odds), the probability of factors influencing livelihood diversification and the explanatory variables included in the model collectively contribute significantly to the explanation of rural households influence in livelihood diversification.Although on an individual basis, some coefficients were not significant, the pseudo-R2 value (Cox and Snell's of 0.77 and Nagelkerke of 0.84), with highly significant chi-square result suggested that the estimated model has outstanding explanatory power.

Thelikelihood ratio test statistics is used to test the whole significance of the model. The value of Pearson Chi-square showed the appropriateness of model fitting information. Theoverall likelihood test ratio statistics showed by the Chi-square statistics is highly significant at 0.001 proposing that strong explanatory power of the model. Parameter estimates of multinomial logit model offer only the directional effect of independent variables on dependent variables, and it denotes neither actual magnitude of change nor probability levels. However, RRR (the odds ratio) measures the expected change in probability of a particular choice being made with respect to a unit change in an independent variable. The estimated coefficients of the logistic model together with odd ratios are presented here under (Table 3).

3.3. Determinants of livelihood diversification strategies in Alle Woreda

Sex of respondents is an important factor in the discourse of diversification of families in on farm plus non-farm economic activities. It was found to be negatively and significantly affecting households' decision choice of diversification of onfarm plus non-farm activitiesat 0.05.The negative coefficientindicates that male headed households are more probably engaged in on-farm only livelihood strategy and less probably engaged in onfarm plus non-farm livelihood diversification strategy.

In this study, female-headed households, comparison with those who use only on farm options as their livelihood means (base case), were (12.8%)more likely to participate in on farm plus non-farm activities than their counterparts. This could be due to the fact that female headed households do not plough their landand they aremore likely to be engaged in non-farm activities. As result, they arranged their land for sharecropping and involved in non-farm activities like selling local drinks, spinning and poetry work, petty trading like grain and fruits and selling of firewood. Similarly, evidence from several countries suggested that within the rural non-farm sector, women are significantly more likely to be engaged in low-productivity and low-return activities (Malek and Usami 2009).On the contrary to our result, Amare and Belayneh (2013) reported that male headed households found to have a significant and positive relation with non/off-farm activities.

Table 3 .Determinants of livelihood diversification strategies.

Explanatory Variables	On farm plus Non-farm		Onfarm plus Off farm		All combinations	
	Coeff.	(RRR)P	Coeff.	(RRR)P	Coeff	(RRR)P
Sex	-2.053	0.128(0.02)*	0.261	1.298(0.63)	-1.417	0.243(0.156)
Age	-0.074	0.928(0.017)**	-0.104	0.902(0.006)**	0.025	1.026(0.61)
Education	0.247	1.281(0.001)***	0.133	1.143(0.11)	0.480	1.616(0.001)***
Family size	0.145	1.156(0.10)	0.340	1.405(0.003)**	0.731	2.078(0.001)***
Farm size	-0.638	0.528(0.04)*	-0.280	0.756(0.39)	-0.172	0.842(0.71)
Number of livestock	-0.337	0.714(0.001)***	-0.371	0.690(0.001)***	-0.521	0.594(0.001)***
Market Distance	-0.709	0.492(0.03)*	-2.142	0.117(0.001)***	-1.657	0.191(0.001)***
Extension Services	-0.360	0.698(0.52)	0.262	1.299(0.66)	-1.217	0.296(0.14)
Credits Access	1.110	1.138(0.027)*	1.498	4.474(0.01)**	-1.947	0.143 (0.01)**
Cooperatives	1.703	2.225(0.16)	-0.025	0.975(0.96)	1.703	5.492(0.04)*
Inputs use	0.136	1.145(0.78)	-0.061	0.941(0.91)	0.569	1.767(0.43)
Remittances	-2.499	0.082(0.56)	0.317	1.317(0.001)***	0.430	1.537(0.53)
Crop risks	-0.239	0.787(0.605)	-0.927	0.396(0.08)	-2.607	0.074(0.001)***

On farm alone is used as a base case, ***, ** and * indicate significance at 1%, 10% and 5%, respectively.
No of observations= 378
Wald chi-square 562.518***
- Log likelihood 389.399

Age structure of household heads was found to be negatively and significantly affecting households' choice of diversification of on farm plus non-farm and off-farm activitiesat 0.01.This negative relationship shows that older households are less likely to diversify on farm plus nonfarm or off-farm activities.This implies that the propensity of younger heads in taking part of on farm plus non-farm livelihoods is more than their counterparts.During field work, we had got the opportunity to interview one young and one old household heads (between 30and 55 years old) depending on non-farm activities of rural craft. Accordingly the old aged respondent indicated that as the work is challenging and his interest on this activity decreases as his age increases.This implies that in comparison with those who use only on farm options as their livelihood means (base case), a year increase in age of household heads were less likely move selections of households' livelihood option to on farm plus off-farm and nonfarm activities by the likelihood of0.902 and 0.928 units. The studyof Akaakohol and Aye (2014), andShehu and Abubakar (2015) revealed that the likelihood of participating in nonfarm activities in rural areas decreases with increasing the age of the household head.

The education of the household head has positivelyand significantly affected households' choice of diversification of on farm plus non-farm activities/ all combinations at0.001. This implies that household heads with a higher level of education are more likely to engage in on farm plus non-farm sources of incomes in rural areas than their counterparts. In our study, educated households, comparison with those who use only on farm options as their livelihood means (base case),wereexhibited that one extra year of schooling could increase the probability of smallholder farmers' involvement in on farm plus non-farm economic activities by 12.8 %.Similarily, the research findings by Chang and Mishra (2008); suggests that the more educated the household head is, the more likely the household will participate in nonfarm work possibly because they are qualified and can better process information more rapidly than otherwise.

Size of household is found to be positively associatedwith households' on farm plus non-farm/off farmand all combinations work decision.This implies that as the number of household member increases, likelihoodof diversifying on farm plus off farm/ non-farm and all combinationsincreases and which is consistent with the previous expectations.Inthis regard, comparison with those who use only on farm choices as their livelihood means (base case), as the number of family in the household increases by one unit, the odds of a household's diversification in to on farm plus non-farm/ off farm and combined activities increases by 11.5% , 14% and 20.7% respectively . This implies that larger households had better opportunities to be involved in rural livelihoods diversification strategies.

It was found that farm size had negatively and significantly influenced the probability of livelihood diversification into on farm plus non-farm activities at 0.05. The negative coefficient indicates that farmers with large farm size are less likely to diversify the livelihood strategies into on farm plus non-farm income sources. In our study,comparison with those who use only on farm options as their livelihood means (base case),a unit increment in farm size could result in decreasing the probability of smallholder farmers' engagement in on farm plus non-farm economic activities by about 52%.Similarily, Fabusoro et al. (2010) claimed that whenever farming activities provide sufficient income for the household, their tendency of diversifying into non-farm livelihoods will be diminished.

Livestock holding (cattle size in TLU) is negatively influenced the household's choice of on farm plus non-farm and on farm plus off-farm livelihood strategy at 0.001. The negative coefficient indicates thatthe probability of households who diversify their livelihoods toward on farm plus nonfarmand on farm plus off-farm activity is decreasing as the size of livestock holding increases. In our study,comparison with those who use only on farm options as their livelihood means (base case),as the livestock numbers in TLU increases by one unit, the likelihood of smallholder rural farm households' choice of combining on-farm plus non-farm, on farm plus off-farm and all combinations livelihood diversification strategies decreases by 7.1%, 6.9% and 5.2 % respectively. Similarly, Adugna (2008), Amare and Belaineh (2013) and Yisehak et al. (2014) found

livestock holding has negative and significant relation with onfarm plus non/off-farm livelihood diversification strategies.

The market distance of the residents had negativeand significantly relatedwith the choice of individuals to enter into on farm plus non-farm/ off farm and all combination diversification activities (p <0.05). In our study, comparison with those who use only on farm options as their livelihood means (base case), as the market distance increases by 1 km, the likelihood of households participation on on-farm plus non-farm, on-farm plus off-farm, and a combination of on-farm, non-farm, and off-farm livelihood diversification strategies decrease by 5%, 1% and 2% respectively. Similarily, (Asfaw et al 2018) reported that farmers who live further away from the market centers are less likely to be involved in beyond agricultural activities.

Creditaccess has a positive and statistically significant contribution for farmers to participate in on farm plus non-farm/ off farm or all combinations.Similar to our expectation, it found a statistically significant effect (p < 0.05)and the coefficient is positive. Thisimplies that having credit access has significantly increased the probability of participating in on farm plus non-farm/ off farm and all combinations. Inthis regard, households who have access of credit are 1.138 times more likely to diversify on farm plus non-farm,4.47 on farm plus off-farm and 0.143all combinations activitiesthan those whose livelihood is dependent on farm activities alone. A similar study by Sallawu et al. (2016) and (Molla 2018). had found that availability of credit institution and accessibility of adequate loan were important factors for the participation of household in livelihoods diversifications strategies.

Membership to cooperatives such as religious meetings and self-help groups were found to be the most important social assets in the study area. It has a positive and significant influence on the combination of the three (on-farm plus non-farm plus off farm) livelihood diversification strategies at 0.05. The positive coefficient indicates that the household who participate in cooperatives will diversify livelihoods to combinethe three (on-farm plus non-farm plus off farm) livelihood strategies as it promotes access to social capital.In this study, comparison with those who use only on farm options as their livelihood means (base case), as membership to cooperatives could increase the probability of rural households' involvement in on farm plus non-farm economic activities by 22.5% and the combination of the three (on-farm plus non-farm plus off farm) livelihood diversification strategies by 54.9%.This was similar with the study of Eyenew and Wogayehu (2012).

4. Conclusion

Livelihood diversification strategies play a key role in development process. Nevertheless,the attention given for the strategies as part of development plan in institutionalized way and its implementation process is very low. Therefore, the livelihood diversification strategies need to be incorporated in the rural development policiesthrough developing effective platform that allow all rural households to be involved and share experience. Besides, institutions like incorporation office, microfinance and agricultural extension packages need to be integrated in rural development strategies so as to improve the capacity of rural households to participate in livelihood diversification strategies.Moreover,the local government, and otherstakeholders that are working to improve households' role in the decision-making process of a community in general and household in particular should create awareness.In this regard, it was strongly recommended that participatory program which integrates all people regardless of sex, age and education has to be designed so as to encourage households' massive involvement inonfarm plus non-farm/off farm activities.Incentive programshave to be designed to reach all household members to have a significant positive contribution forlivelihood diversification strategies.Besides, particular attention should be given to strengthen the diversification of households'activities by providing credit access,infrastructure development, entrepreneurial training and skill development through formaland informal education.

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Corresponding Email: mengie1980@yahool.com