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The Contribution of Livelihood Diversification Activities to Poverty Mitigation in Dodota Woreda, Arsi Zone, Central Ethiopia

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Abstract
Diversifying livelihoods has over the last two decades been identified as an important theme in the development work, particularly for poverty reduction agenda. In the developing world, farm households, urged on by their survival instinct, diversify away from traditional subsistence agriculture to the production of high-value crops and at other times engage in off-farm and non-farm activities. The contribution of non-agricultural activities to household income in the developing world in general and Sub-Saharan Africa in particular is substantial. This study was conducted in Dodota Woreda of East Arsi Zone, Oromiya Region with a general objective of assessing the contribution of livelihood diversification activities to poverty mitigation of rural householders in Dodota Woreda. By using two stage sampling procedure 294 sample respondents were selected from four Kebeles. The result of the logit regression showed that most of the variables tested for the probability of farmer's participation in livelihood diversification activities had expected sign. Thus; educational status, access to infrastructure, training and participation in safety net had positive sign and significantly affects the probability of farmers' participation in livelihood diversification activities. Whereas; land size owned, agricultural activity, participation in irrigation, access to credit and perceived level of poverty had negative sign and significantly affect the probability of farmers' participation in livelihood diversification activities. Thus, improving rural householder knowledge through formal educational and training, expanding availability of accessible infrastructure, and enhancing participation of smallholder farmers in safety net were recommended as possible policy intervention to improve farmers' participation in livelihood diversification activities so as to mitigate the level of poverty in the study area.
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I. INTRODUCTION

In Ethiopia about 85% of populations live in rural areas and most of them mainly depend on agriculture for their livelihood. The undiversified livelihood activities and complete dependency on agricultural production is the main problem which exacerbates poverty in rural areas of the country (Tesfaye, 2003). The ability to diversify at all is often critical to the food security and poverty reduction of the most vulnerable rural populations. In many rural areas, agriculture alone cannot provide sufficient livelihood opportunities. Rural people's livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture as previously assumed (Ellis, 2004), as cited in Titay, 2013). According to Asmamaw (2005), the limited opportunity for livelihood diversification, due to absence of supplementary income from other non-farm and off-farm activities has made the Ethiopian rural poor more vulnerable. The inability of most Ethiopian smallholders to make a living from agriculture, because of resource constraints and recurrent shocks of drought, increasing policy attention has turned to supporting alternative livelihood activities (Devereux et al, 2005).

In Ethiopia, the policy focus is to increase agricultural productivity and farm income so as to attain food self-sufficiency and poverty reduction at national, regional and household levels. While substantial resources have been spent on agricultural research and extension to alleviate poverty in the country, research has not been done adequately on the issues related to non-farm and off-farm activities.

Despite the fact that agriculture is the main source of livelihood in rural Ethiopia, farmers are engaged in a variety of off-farm and non-farm activities to diversify their income and enable them cope with the risk of crop failures. However, there is a wide difference between literatures regarding the share of non-farm and off-farm income in total household income in Ethiopia. Barrett and Reardon (2000), as cited in Befekadu, 2011) reported that the share of non-farm and off-farm income in rural Ethiopia averaged about 36% in 1989/90. On the other hand, (Befekadu,2011) found that non-farm and off-farm share of total income in rural Ethiopia was about 20% in 1999. The differences in the percentage of income share derived from non-farm activities, the role of non-farm income in total household income is significant. Befekadu, (2011) found that about 75% of rural households engage in off-farm activities and approximately 31% of their livelihood income is generated from off-farm activities indicating that income from farming is not sufficient to support the household economy.

The aim of rural livelihood diversification is to reduce risk which is related to agricultural activity and to

supplement farm income. Although livelihoods are predominantly agriculture based, labor productivity is low and most Ethiopians are net cereal buyers. Because of the primary dependence on subsistence crop production in the country, harvest failure leads to household food deficits, which in the absence of off and non-farm income opportunities leads to asset depletion and, increasing levels of destitution at the household level (FDRE, 2002).

Livelihood diversification strategies, including crop, labor and income diversification, are important in this context, although the motivations and outcomes may vary significantly. For the poorest, who have the least capacity to effectively manage risk; diversification may be a response to constraints imposed upon them by increasing climate risk. In this sense they are pushed into diversification by lack of alternatives for risk coping, (Awotide et al., 2010).

Hanazaki et al. (2012) confirm the general claim that livelihood diversification improves food security and poverty reduction at the household level. Besides, that the literature that seeks to examine the linkage between food security and livelihood diversification in sub-Sahara are existed. But only a limited number of studies exist on livelihood diversification in Ethiopia. Some of the existing studies on this theme have focused on figuring out the factors that enable households to diversify and types of diversification which is take place in the country (Clement Mensah 2014, Meseret, 2014; cited in Nigatu, 2016). These studies there by inform input for policies that would foster enabling environments for diversification. Although these issues are crucial, key issues regarding to what extent and in what socio-economic conditions diversification activities enhances poverty reduction are missing.

This study attempts to fill this gap by measuring the impact of off-farm and non-farm activities on household well-being, identifying the socio-economic conditions in which diversification functions the best to mitigate the prevalence of poverty in the study area. This study therefore sought to critically examine how livelihood diversification activities contributes to household poverty mitigation in the study area and subsequently validates its effect on male and female-headed farm households in the Dodota district of the Arsi zone.

II. MATERIALS AND METHODS

2.1 Brief Description of the Study Area

The study area is found in the East Arsi zone of Oromia regional state, south East of Addis Ababa at a distance of 125 km and to the North of Assela, the capital city of the zone, at a distance of 50 km. Dodota is one of the 26 districts of Arsi zone. The historical name of the district is derived from trees name mostly found in the rift valley named as “Dodoti”. Dodota has 14 kebeles of which 12 are peasant association and 2 urban administrations in Dera town. The town is fairly well served by the tarmac road running from Addis Ababa to Assela.

Astronomically, the District is located between $8^{0}12'$N to $8^{o}24'$N Latitude and $39^{o}5'$E to $39^{0}25'$E Longitude. Relatively; Dodota District found:-North- west of Lode Hetossa district, West of Sire district, South of East showa Zone (Adama district divided the Dodota in to two), North of Hetosaa District and East Zuway Dugda district. The total area of the District is 445.6 Km^2.

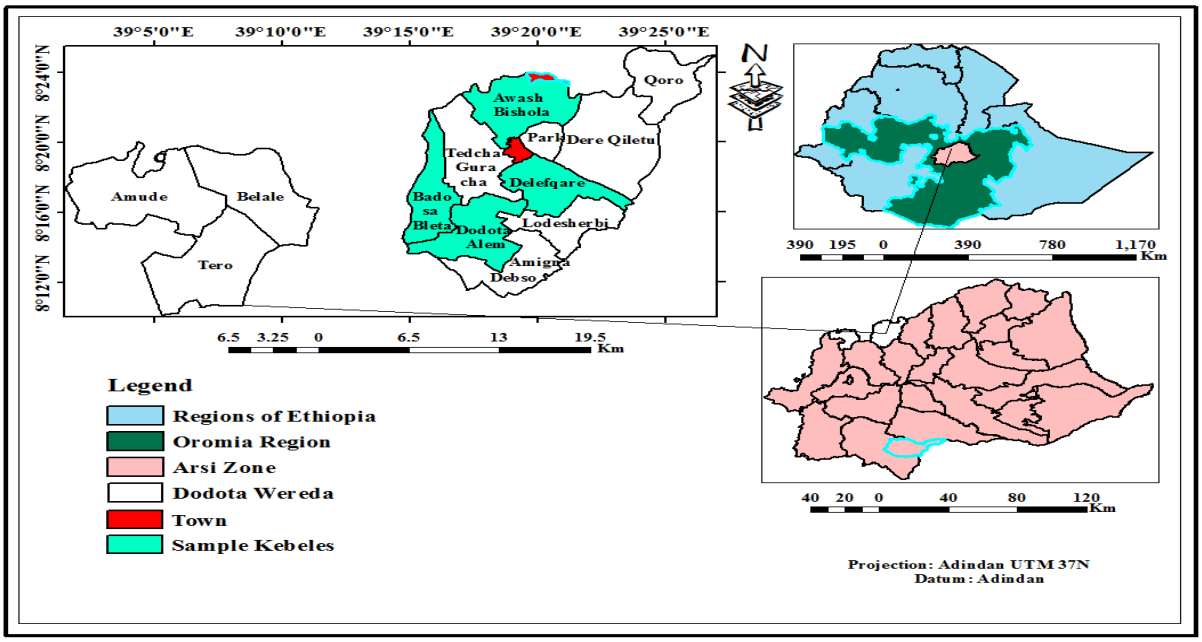

Figure 1: Map of the Study Area

The study area is dominated by *kola (tropical)* climate, with altitude ranging from 500m-2050 masl. The lowest and the highest place are found in Awash Bishola (500m) and Amignia-Dabaso (2050m) respectively. The

rainfall pattern is bi-modal, which are short rainy season spring (*Belg* from April to March) and summer or long rainy season (*Meher* from July to September). The annual average rainfall is range between 500mm-900mm notably in the main rainy season of summer (June to August), with temperature range between 17°C-33°C (ADOD,2010).

The major types of soil in the district are: sandy loam (24%), sand (64%), and silt (12 %) covered the area of the districts. From this we conclude the highest number of soil type is sand it indicates 64%. According to the District Agricultural Development Office, the soils in the district are characterized as fertile a sandy soil which is more productive with irrigation but there are shortage of rain & water in the area. Due to its rift valley location and desertification, the district has low network of river systems. However; there are two major permanent rivers crossing in the district, these two rivers are Awash River and Kalata River. The district has high potential for both traditional and modern irrigation system mostly from Awash River for production of sugar cane, fruits and vegetables (ADOD, 2016).

The government protected/public forests/ in the district are Dilfakar Forest (parts of Arsi mountain parks) which is found behind to Dera town in the east direction which is covered the area by mountain 5.6 % (2500 hec.), and Dabaso forest 0.8% (400 hec.) covered the area of the district. In other way the wild life found in the district, includes Agazen, Hyena and Hipp puts, fox, tortoise and tigers.

2.2 Research Methods

2.2.1 Research Design

Research needs a strong design or structure before beginning of data collection and general research process. This study used survey design based on the objectives of the research and using the cross-sectional data collection due to collect data from different householders at once by using the same questioners. In this study mixed research approaches was used. Because of the nature of data collection tools which help to gather quantitative and qualitative data, and data that quantitatively organized, required qualitative explanation. Research designs that apply more than one method are sometimes called mixed methods or methodological triangulation. The purpose of triangulation is a powerful technique that facilitates validation of data through cross verification from two or more sources (Risjord et al., 2002).

2.2.2. Study Population

The study population 1540 are both male and females' householders of the four sample selected kebeles from twelve rural kebeles of the district. The total householders of the four kebeles (Dilfekar, Awash Bishola, Badosa Batalla and Dodota-alem kebeles) are 405, 386, 456 and 293 respectively,(ADOD,2016). Most of them are engaged by agricultural and non-agricultural activity (on-farms, non-farms) as their ways of life.

2.2.3. Data Types and Data Sources

The data collected for this study mainly quantitative while qualitative data will be collected separately. The quantitative data that collect for this study are the amount and types of diversification by the household, data on the household demographic characteristics, the ways of poverty mitigation by the household, resource endowment especially type of house and livestock ownership, access to credit, and so on. The qualitative data collected is intended to find out the extent to which contribution of diversification on poverty mitigation.

The primary data sources are obviously come from the sample respondent of both male and female households' heads were selected randomly following stratifying Kebeles. On the other hand, the secondary data sources are those published and unpublished documents, which are collect from the district office and Agricultural Coordination offices of the woreda.

2.2.4 Sampling Technique and Sample Size Determination

Among 12 kebeles in the Dodota Woreda, four kebeles selected by using two stage sampling method to select the sample households. First, the rural Kebeles are stratified in the district from 12 rural kebeles, only four were selected with the total householders of 1540. Secondly, proportional probability sampling (PPS) technique was used to select sample households from selected four rural Kebeles. Determinations of households sample size are based on a formula developed by (Yamane, 1969). The required sample sizes were determined at 91% confidence level and a 9% level of precision using the formula as following:

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

Where: n is the sample size.

N= the total number of households in the four selected RKAs

e, is the level of precision. (0.05)

The total numbers of households of the sample study area is 1540. Accordingly, the total sample size for the study are $\frac{1540}{1+1540(.05)^2} =$ 318 sample size.

Based on the above equation, the minimum numbers of sample households selected are 318 households. The sample size from each sample kebeles was proportionally determined from the total householders of the four kebeles using the stratified random sampling technique. The total households of the four kebeles (Dilfekar, Awash Bishola, Badosa Batala and Dodota-alem kebeles) was 405, 386, 456 and 293 respectively,(ADOD,2016).

Table 1. Sample: Households from each kebele

SN	Name of Sample kebeles	Nº of householder in the kebeles	Nº of Sample householders
1	Dilfekar kebele	405 x 0.206(318/1540)	84
2	Awsh Bishola kebele	386 x 0.206	80
3	Badosa Batala kebele	456x 0.206	94
4	Dodota-alem kebele	293 x 0.206	60
Total		1540	318

Source: Computed based on the data obtained from kebeles in (2018)

To select respondents, the list of household of each sample kebele was used as target population of the study. Finally, proportionate sample assigned were selected by systematic sampling technique by using the total listings of selected kebele population. To select sample size 'n' first find 'k' this is: K=N/n so 1540/318= 5, then the researcher took 5 as the starting point and then every 5th members i.e. the 5th member, the 10th, the15th members was applied for all the sample kebeles.

2.3. Empirical model Specification

The logistic regression also known as the logit model can be used for predicting the probability of occurrence of an event by fitting data to a logistic curve (Hororwitz and Savin, 2001). It is a generalized linear model used for binomial regression. Like many forms of regression analysis, it makes use of several predictor variables that may be either numerical or categorical. For example, the probability that a person has a heart attack within a specified time period might be predicted from knowledge of the person's age, sex and body mass index (Zellner and Rossi, 1984). Logistic regression is used extensively in the medical and social sciences fields, as well as marketing applications such as prediction of a customer's propensity to purchase a product or cease a subscription.

The logistic regression model has several advantages over other models which are; it is more robust meaning the independent variable don't have to be normally distributed or have equal variables in each group; it does not assume a linear relationship between independent variables and the depended variable; it may handle non-linear effects; one can add explicit interaction and power terms; there is no homogeneity of variable assumption; normally distributed error terms are not assumed; it does not require the independent variables to be unbounded. The ease with which the logistic model can handle qualitative dependent variables makes it more preferable over the other techniques. However, there are some cons of using the logistic regression. According to Zellner and Rossi (1984), the logistic regression requires more data to achieve stable, meaningful results. They further argue that for logistic regression, at least 50 data points per predictor are necessary to achieve stable results.

Hosmer and Lemshew (1989) pointed out that a logistic regression has got advantage over others in the analysis of dichotomous outcome variables. There are two primary reasons for choosing the logistic distribution. These are 1) from a mechanical point of view, it is an extremely flexible and easily used function, and 2) it lends itself to a meaningful interpretation. The logit model is simpler in estimation than the probit model (Pindyck and Rubinfeld, 1981). Therefore, in this study a binary logistic regression model was used for the analysis.

In order to identify factors affecting livelihood diversification activities of farm households sampled for this study, a logit regression was carried out. The model was chosen because of the dichotomous dependent variables and because the technique has no restrictive distribution assumptions.

The binary logit model was used to analyze the factors affecting livelihood diversification activities. In this model the dependent variable is participation in livelihood diversification activities that is dictomous taking a value of 1 if the household is participate, 0 otherwise. The cumulative logistic probability model is econometrically specified in the following equation (GUJIARATI, 2005):

The logistic (logit) probability function is given as

$Pi = 1/1+e^{-zi} = f(Z\,i)$ ----------(1)

Where Pi is the probability that a household i (i = 1, 2 … n) be participant in livelihood diversification activities. Index Zi is a random variable which predicts the probability of a household participation in livelihood diversification activities. The probability Pi in equation 1 is further transformed to give equation 2.

$Pi = e^{zi} / 1+ e^{zi}$ ---------- (2) Therefore for the ith observation, a household will be

$Zi = \ln Pi / 1-Pi = \beta o + \Sigma \beta o\, X$ ---------- (3)

Therefore, ln (P/1-P) = 1, if the household is owner while ln (P/1-P) = 0, if otherwise i.e non-owner. Implicitly, the model is empirically estimated as

$$Y = \beta o + \beta i\, Xi + \beta 2\, X2 + \beta 3\, X3 + \beta 4\, X4 \ldots\ldots \beta 12\, X12 + \varepsilon \text{ --- (4)}$$

2.4. Methods of Analysis

Both descriptive and econometric method analysis of data was employed by using STATA (17) statistical software. Descriptive statistics such as mean, percentage, frequency, chi-square test was used to present demographic features of the finding. Moreover; Pearson's chi-squared test ($\chi 2$) was applied to test sets of categorical data to evaluate how likely it is that any observed difference between the sets arose by chance. The econometric analysis was done by using the logit regression model which helped us to see the direction of the effect and hidden characteristics of the data.

III. RESULTS AND DISCUSSIONS

3.1. Descriptive Results

The demographic features of 294 sampled small holders' farmers' were found to be of great help in terms of clearly depicting the diverse background of the respondents on farmer's participation in livelihood diversification activities and the impact this diversity has had on the descriptive and statistical results. The Pearson chi2 test result showed that age, family size and educational level had significant outcome on farmers' participation in livelihood diversification activities; whereas participant kebele, sex and marital status had insignificant outcome on farmers' participation in livelihood diversification activities.

Table: 2. Demographic Characteristics of the Respondents

SN	Variable		Participant in Livelihood Diversification		Non-Participant in Livelihood Diversification		Pearson chi2	Pr
			Freq.	Percent	Freq.	Percent		
1	Kebele	Dilifekar	59	20.07%	17	5.78%	0.6307	0.889
		Awash Bis	60	20.41%	13	4.42%		
		Badosa Be	72	24.49%	16	5.44%		
		Dodota Al	46	15.65%	11	3.74%		
2	Sex	Male	188	63.95%	47	15.99%	0.28	0.60
		Female	49	16.67%	10	3.40%		
3	Age	20-30year	80	27.21%	19	6.46%	5.90	0.09
		31-40	90	30.61%	21	7.14%		
		41-50	54	18.37%	16	5.44%		
		above 51	13	4.42%	1	0.34%		
4	Marital Status	married	189	64.29%	49	16.67%	1.5464	0.67
		Single	17	5.78%	2	0.68%		
		Divorced	18	6.12%	4	1.36%		
		Widowed	13	4.42%	2	0.68%		
5	Family Size	1 to 3	17	5.78%	4	1.36%	5.0693	0.10
		4 to 6	45	15.31%	15	5.10%		
		7 to 10	147	50.00%	30	10.20%		
		above 11	28	9.52%	8	2.72%		
6	Educational Status	not read&	106	36.05%	32	10.88%	7.2133	0.04
		only read	60	20.41%	10	3.40%		
		1 to 4	42	14.29%	8	2.72%		
		primary	24	8.16%	7	2.38%		
		Secondary	5	1.70%	0	0.00%		

The finding of this study showed that Dilifekar, Awash Bis, Badosa Be and Dodota Al were sampled kebeles and from each 59(20%), 60(20.4%), 72(24.5%) and 46(15.7%) householders had participated in the survey. Moreover, the result showed that male householders had more participation than female in diversification. Thus, from 235 sample male householders 134 were participated in diversification and from 59 female householders only 15 of them were participated. As FGDs only male house holders have more advantages of participation in non-farming and off-farming activities than female house holders due to culturally the responsibility of house work or family caring responsibility was found in their hands in the study area.

Regarding the age of participants in the study area 111(37.8%) of respondents were between 31-40 years. Other significant proportions 99(33.7%) respondents were found between 20 and 30 years. There were also 70 respondents (23.8%) between 41 and 50. Again 14(4.8%) were above 51 years with mean age of 40.35. Out of 99, 111, 70 & 14 householders 75, 62, 10 & 2 of them had diversified their livelihood respectively.

Regarding marital status, the majority of sample respondents were married 238(80.9%). The finding also

depicted 22(7.5%) and 15(5%) are divorced and widowed respectively. The single respondents were 19(6.5%) with low age groups. The higher proportion of married group indicated that the existence of large family size due to absence of family planning in the study areas. From 59 female sample householders about 22 and 15 of them were divorced and widowed respectively who take house responsibility for their family.

The maximum family size for the sampled respondents was 7 to 9 family members 177(60.2%) and a large family size comprising 4 to 6 family member was 60(20.4%). Moreover, the minimum was 1 to 3 family members 21(7.1%).

Thus, survey result indicated that 138(46.9%) of the respondent household heads who cannot read and write and whereas, 70(23.8%) of respondent can read and write. Moreover, 50(17%) respondent attended from grade 1-6 and 31(10.5%) respondent attended from grade 7-8. From the total sampled households 5(1.7%) attended from grade 9-12.

3.2. Poverty Mitigation Outcome of Livelihood Diversification Activities

The Pearson chi2 test result in the table 3 showed that respondents' livelihood diversification activities tend to have significant effect on farmers perceived level of poverty.

Table: 3. Poverty Mitigation Outcome of Livelihood Diversification Activities of Sample Respondents

SN	Variable		Participant in Livelihood Diversification		Non-Participant in Livelihood Diversification		Pearson chi2	Pr
			Freq.	Percent	Freq.	Percent		
1	Perceived Level of Poverty	Low	89	30.27%	24	8.16%	152.2629	0.000
		High	148	50.34%	33	11.22%		

The effectiveness of market-oriented livelihood strategies such as business and self-employed rural enterprises to stabilize rural households' income and food security in developing countries has been also highlighted by several previous studies (Soltani et al, 2012; Brown et al, 2006; Babulo et al, 2008). Market-oriented strategies either based on farm or non-farm strategies have greater likelihood of earning higher income and have the potential to alleviate poverty in our study areas. Since the significantly lower percentage of households belonging to these strategies lie under the international poverty line, it additionally reflects the effectiveness of business/enterprise and commercial farming strategies to overcome rural poverty. Respondents reported that the diversification of livelihood activity to market oriented business/enterprises and commercial farming has increase villagers' income earning and has improved their purchasing power which is crucial for alleviating absolute poverty.

Despite evidence of a positive relation between household welfare and livelihood diversification to non-farm strategies (Barrett et al, 2001 and Ellis, 2001), this study indicates that pure non-farm based strategies returns good income but are not as effective as self-employed business/enterprise and market-oriented farming. It could be because of the unmanaged and low paid labor market in non-farm sector in Nepal.

Similarly, out-migrants who have migrated for unskilled foreign jobs and seasonal migrants are uneducated and involved in low paid jobs. The ineffectiveness of remittance to reduce poverty in the long run in Nepal is due to its adverse socio-economic and environmental impacts, which have been discussed in studies related to outmigration (Maharjan et al, 2013; Gartaula et al, 2012 and Massey et al, 2010).

However, generating higher income is perhaps the most effective solution for reducing poverty and increasing a poor household's resilience capacity (Daw et al, 2011). As indicated by the result, higher income can be generated via connecting poor people to the higher income market through promotion of high value agriculture and non-farm activities for commercial purposes. Though, both of these options may not be long term solutions for rural poverty in Nepal unless essential measures are taken. As a mountainous country, the agricultural sector in Nepal is highly vulnerable to the direct impacts of global climate change where commercial farming may be catastrophic for poor farmers in the long run, until climate change adaptation technologies are adopted in farming systems as suggested by Castells-Quintana's studies (Castells et al, 2015 and Castells et al, 2017). Moreover, due to a poor infrastructure and fragile socio-economic and political environment, promoting sustainable business and micro-enterprises among rural poor in Nepal also entails a great challenge if the situation is not improved.

3.3. Econometric Model Result from Logit Estimation for Factors Influencing the Implementation of Livelihood Diversification Activities

The likelihood ratio statistics as indicated by chi2 statistics are highly significant (P <0.0000), suggesting the model has a strong explanatory power. The Pseudo R2 is 0.64, indicating the specification fits the data well the variables included in the model explain 64% of the variation in the respondent farmers participation in livelihood diversification activities. The maximum likelihood estimate for the logistic regression for the probability of farmers' participation in livelihood diversification activities is presented in Table 4.

The result of the logit regression showed that most of the variables tested for the probability of respondent

farmer's participation in livelihood diversification activities had expected sign. Thus; educational status, access to infrastructure, training and participation in safety net had positive sign and significantly affects the probability farmers' participation in livelihood diversification activities. Whereas; land size owned, agricultural activity, participation in irrigation, access credit and level of poverty had negative sign and significantly affect the probability farmers' participation in livelihood diversification activities.

Nevertheless; kebele, sex, marital status and family size had positive sign, but they are statistically insignificant while age, livestock owned and distance to market had negative sign and have statistically insignificant effect on the probability of farmers' participation in livelihood diversification activities.

Table: 4. Logit Estimates of Farmers' Participation in livelihood diversification activities

Logistic regression					Number of obs = 294	
					Wald chi2(16) = 206.92	
					Prob > chi2 = 0.0000	
Log pseudolikelihood = -118.717785					Pseudo R2 = 0.64	
Participation in Diversification	Coef.	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Kebele	0.0834004	0.1404747	0.59	0.553	-0.1919249	0.358726
Sex	0.0127979	0.4302698	0.03	0.976	-0.8305154	0.856111
Age	-0.2063191	0.1479835	-1.39	0.163	-0.4963615	0.083723
Marital Status	0.1306712	0.2209605	0.59	0.554	-0.3024034	0.563746
Family Size	0.0089697	0.1929507	0.05	0.963	-0.3692069	0.387146
Educational Status	0.2909842	0.1112532	2.62	0.009	0.0729319	0.509037
Livestock Owned	-0.0184597	0.2603218	-0.07	0.943	-0.5286811	0.491762
Land Size	-0.3161174	0.1265716	-2.5	0.013	-0.5641932	-0.06804
Agricultural Activity	-0.4082716	0.1906364	-2.14	0.032	-0.7819121	-0.03463
Participation in Irrigation	-1.440794	0.3243243	-4.44	0.0000	-2.076458	-0.80513
Access to Infrastructure	0.2778516	0.0975363	2.85	0.004	0.0866839	0.469019
Training	0.5756291	0.2425068	2.37	0.018	0.1003244	1.050934
Distance to Market	-0.0497541	0.0938211	-0.53	0.596	-0.23364	0.134132
Access Credit	-0.3821731	0.24264	-1.58	0.115	-0.8577388	0.093393
Participation in Safety Net	1.856553	0.402724	4.61	0.0000	1.067228	2.645877
Perceived Level of Poverty	-3.772768	0.6487591	-5.82	0.0000	-5.044313	-2.50122
_cons	4.8357195	0.8860545	2.73	0.0000	6.198168	13.14471

As indicated earlier, the parameter estimates of the Logit model provide only the direction of the effect of the independent variables on the dependent variable and estimates represent only the direction of the effect do not represent actual magnitude of change or probabilities. Thus, the marginal effects from the Logit, which measure the expected change in probability of a particular category with respect to a unit change in an independent variable, are reported and discussed.

Table: 5. Marginal effects of the explanatory variables on the probability of farmers' participation in livelihood diversification activities

Marginal effects after logit							
y= Pr(Participation in Diversification) (predict)							
0.9352814							
variable	dy/dx	Std. Err.	z	P>z	[95%	C.I.]	X
Kebele	0.005048	0.008570	0.590000	0.556000	-0.011741	0.021837	2.901960
Sex	0.000775	0.026060	0.030000	0.976000	-0.050306	0.051855	1.183470
Age	-0.012489	0.009680	-1.290000	0.197000	-0.031467	0.006490	1.963590
Marital Status	0.007910	0.013610	0.580000	0.561000	-0.018763	0.034582	1.320730
Family Size	0.000543	0.011680	0.050000	0.963000	-0.022345	0.023431	2.803920
Educational Status	0.017613***	0.006770	2.600000	0.009000	0.004337	0.030890	2.124650
Livestock Owned	-0.001117	0.015750	-0.070000	0.943000	-0.031979	0.029744	1.572830
Land Size	-0.019135	0.008650	-2.210000	0.027000	-0.036088	-0.002182	2.935570
Agricultural Activity	-0.024713	0.011740	-2.110000	0.035000	-0.047716	-0.001709	2.596640
Participation in Irrigation	-0.087211***	0.028330	-3.080000	0.002000	-0.142741	-0.031681	1.826330
Access to Infrastructure	0.016818***	0.006180	2.720000	0.007000	0.004698	0.028939	2.253500
Training	0.034843**	0.014440	2.410000	0.016000	0.006541	0.063145	1.511200
Distance to Market	-0.003012	0.005610	-0.540000	0.591000	-0.014001	0.007978	2.955180
Access Credit	-0.023133*	0.014610	-1.580000	0.113000	-0.051764	0.005498	1.553220
Participation in Safety Net	0.112377***	0.023690	4.740000	0.000000	0.065953	0.158801	1.373950
Perceived Level of Poverty	-0.228366***	0.031580	-7.230000	0.000000	-0.290259	-0.166473	1.619050

The result indicated that respondents' educational status of respondents increases the probability of farmers'

participation in livelihood diversification activities at 1% of significance level. Thus; educational status increases the probability of farmers' participation in livelihood diversification activities by 0.018. Consistent with the finding from Demissie and Legesse, 2013; Gecho, 2017; Debele and Desta, 2016; Tamerat 2016; Aababbo and Sawore, 2016; Mentamo and Geda, (2016) education level influenced positively the households' livelihood diversification. This is due to probability of educated person ability to gain better skill, experience, knowledge and capability to find a job (Demissie and Legesse, 2013; Gecho, 2017). In lined with these, educated person had better ability to diversify livelihood strategies since they may have better skill, experience and knowledge (Debele and Desta, 2016). Nevertheless, Tamerat (2016) lacks detail information why education level had positive effect on farmers livelihood diversification. According to Kassie et al. (2017), educational level of farm household had found a negative impact on livelihood diversification since educated farmers may be better specialized in on-farm activities by employing better farm technologies. Moreover, Geda, (2016) stated that education level influenced positively the households' livelihood diversification. This is due to probability of educated person ability to gain better skill, experience, knowledge and capability to find a job (Demissie and Legesse, 2013; Gecho, 2017).

Land size owned decreases the probability of farmers' participation in livelihood diversification activities. A unit change in land size decreases the probability of farmers' participation in livelihood diversification activities by 0.019. Consistent with study conducted by different authors (Tamerat, 2016; Ofolsha and Mansingh, 2015; Idris, 2014; Degefa, 2005; Gecho, 2017; Anshiso and Shiferaw, 2016; Aababbo and Sawore, 2016; Mentamo and Geda, 2016; Yizengaw et al., 2015) farmland size had negative impact on livelihood diversification strategies Hence, the probability of engaging in various livelihood strategies decreases when land holding size of household increases because farmers with larger farm land size were encouraged to involve more on farming activities (Tamerat, 2016; Gecho, 2017; Aababbo and Sawore, 2016). In addition, the farm households having more land size were forced to follow agricultural intensification rather than diversification (Anshiso and Shiferaw, 2016; Yizengaw et al., 2015).

According to Ofolsha and Mansingh (2015), female-headed households (FHH) having large land size have probability of increasing product through farming to improve their livelihood, consequently they reduce livelihood diversification strategies. Similarly, studies conducted by Idris (2014) and Tolossa (2005) revealed that farmers having large plot of land have less livelihood diversifier. However, finding of Kebede et al. (2014) indicated that farmland size had positive effect on livelihood diversification since households with better holding have additional income in casual laborer works to smoothen their farm operations. Area of the study (agro-ecology) has direct relationship with livelihood diversification. Drier and fragile environment push household to low return and high-risk activities (Ofolsha and Mansingh, 2015). According to the Asfir (2016), households‟ nature of settlement influenced livelihood diversification strategy positively since farmers‟ land fragmentation and small size of holding; force them to diversify their livelihood.

As it is expected respondents' agricultural activity in only crop farming decreases the probability of farmers' participation in livelihood diversification activities. A unit change in agricultural activity in crop farming decreases the probability of farmers' participation in livelihood diversification activities by 0.025. In line with Webb and Block (2001) study on diversification in Ethiopia concluded that mixed faming is positively and significantly associated with income diversification, even controlling for level of income.

Participation in irrigation decreases the probability of farmers' participation in livelihood diversification activities. Being participant in irrigation decreases the probability of farmers' participation in livelihood diversification activities by 0.087. In line with Asfir, (2016) participation in irrigation negatively influenced livelihood diversification because participation in irrigation may increase production and productivity of farm household to access more food and generate more income to satisfy their family requirements. Contrary to this, participation in irrigation was found to have a positive and significant impact on households livelihood diversification (Tamerat, 2016).

Access to infrastructure has a significant positive effect on the probability of farmers' participation in livelihood diversification activities. Thus better access to infrastructure increases the probability of farmers' participation in livelihood diversification activities by 0.016. Ellis (2005) explained that different opportunities and pressures make households to diversify their livelihood activities. Hence even though those households with larger farm land have the opportunities to diversify more than those with smaller farm land, small farm holders in the study area straggle to diversify their activities in order to improve their livelihood.

Participation in training increases the probability of farmers' participation in livelihood diversification activities. Being participant in training increases the probability of farmers' participation in livelihood diversification activities by 0.035. In lined with these, educated person had better ability to diversify livelihood strategies since they may have better skill, experience and knowledge (Debele and Desta, 2016). On the other hand, it was found out that to have a negative effect on livelihood diversification since trained farmers have better skills, knowledge and experiences to improve agricultural production and productivity for fulfilling their family requirements (Yishak et al., 2014; Asfir, 2016).

Access to credit service significantly increases the probability of farmers' participation in livelihood

diversification activities. The probability farmers' participation in livelihood diversification activities increases by 0.023 for farmers who do have access to credit. Several studies (Debele and Desta, 2016; Anshiso and Shiferaw, 2016; Mentamo and Geda, 2016) have shown that access to credit service to have a positive effect on livelihood diversification. Hence, providing credit for resource poor farmer will enhance livelihood diversification. According to Hagos and Demeke cited in Pender et al. (2004), the availability of credit appears to have had important positive effects on agricultural diversification in central Kenya.

On the other hand, access to credit service had negative impact on livelihood diversification because farmers having access to credit may inclined to purchase fertilizer to improve their agricultural production and productivity rather than diversifying their livelihoods (Asfir, 2016).

Also the reason behind refusal of credit was because high interest rate and Islamic religion forbidden interest majority of farmers cover cost of production by selling livestock and other crops. Although credit was accessible and available for poor farmers to build asset and food secured by purchasing the different packages designed by the regional government. The most common sources of loan are Oromia Micro Finance Institutions and relatives/friends, since they do not require collateral. From this it is concluded as the households in the study area shortage of land, lack of access to credit, lack of enough income from crop production and shortage of farm animals are factors that determine households to engage in agricultural diversification activities

Participation in safety net increases the probability of farmers' participation in livelihood diversification activities. Being participant in safety net increases the probability of farmers' participation in livelihood diversification activities by 0.11. According to Anshiso and Shiferaw (2016), remittance receiving positively determined livelihood diversification. Food for work (safety net) also positively determined the livelihood diversification (Mentamo and Geda, 2016).

As it is expected respondents perceived level of poverty decreases the probability of farmers' participation in livelihood diversification activities. A lower perceived level of poverty decreases the probability of farmers' participation in livelihood diversification activities by 0.23. Consistent with several researchers (Tamerat, 2016; Ofolsha and Mansingh, 2015; Idris, 2014; Degefa, 2005; Gecho, 2017; Anshiso and Shiferaw, 2016; Aababbo and Sawore, 2016; Mentamo and Geda, 2016; Yizengaw et al., 2015) livelihood diversification activities negatively affect perceived level of poverty.

3.4. Conclusion

Accordingly, the study showed as the majority of households in Dodota diversification from the production of agriculture is not enough; they are pursuing subsistence level of living. The study emphasized the need to involve in various income generating activities to improve the livelihood of the households, i.e. diversification. The majority of households in the study area are still dependent on specific subsistence agricultural activities but agriculture is frequently affected by climate variability and traditional ways of production.

Moreover, the study identified that the involvement of households in diversification influenced by households' income and poverty reduction in the study area. The majority of households are small farm holders and don't have the ability to involve in non-farm activities. Only few are employed on the farm of the others as off-farms, as a wage labors since the wage is very small. Therefore it is possible to conclude that households in the study area are eager to involve in the income diversification by involving in various income generating activities if the income from agriculture is not able to satisfy the need of the majority of households. It should be taken to promote various incomes generating activities, so as to improve their livelihoods rather than depending entirely on low productive activities such as traditional agricultural activities and limited farm land. Hence it is concluded that due to low participation in the other diversification and low income from off farming and livestock production the contribution of diversification on poverty reduction is quite low.

Although the study pinpointed that diversification is an important livelihood strategy for the area of Dodota Woreda, it was found that various factors affect the involvement of household in diversification activities like on farming and off farming. However, besides the formal education lack of awareness and information about the various diversification activities constrain the households from involving in the activities. Credit is another major factor that affects the involvement of households in diversification activities in the study area. Therefore, since the demand for credit service could not be met by the available micro finance institutions it is better to find other alternatives.

LIST OF ACRONYMS

ADOD:	Agricultural Development Office of Dodota
ADLI:	Agricultural Development Led Industrialization
AIDS:	Acquired Immune Deficiency Syndrome
GDP:	Gross Domestic Product
GTP:	Growth and Transformation Plan
HEC:	Hectare
HHs:	Householders
HIV:	Human Immunodeficiency Virus
PASDEP:	Plan for Accelerated and Sustained Development to End Poverty
PPS:	Proportional Probability Sampling
PPP:	Purchasing Power Parity
PRS:	Poverty Reduction Strategy
RKAs:	Rural Kebele Administrations
SLF	sustainable livelihood framework
UNDP:	United Nations Development Program

CCONFLICT OF INTEREST

The authors have declared that that there are no competing interests.

AUTHOR PREVIOUS CONTRIBUTIONS

Demeke, L. and Haji, J., 2014. Econometric analysis of factors affecting market participation of smallholder farming in Central Ethiopia.

Demeke, L. and Haji, J., 2017. Child Nutrition Outcomes of Market Participation of Smallholder Farmers in Central Ethiopia.

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DEDICATION

To my mother Etalemahu Telila Bedadaa (Amorka), May God fills the rest of your life with love and laughter. Amorka, you are the one who taught me the true meaning of kindness, and resilience. Amorka, you are my hero.

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