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# Rural Farm Households' Income Diversification: The Case of Wolaita Zone, Southern Ethiopia

**Yishak Gecho**

Rural Development and Agricultural Extension Department, Wolaita Sodo University, Ethiopia

**Email address:**

yishakgecho@yahoo.com

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**Abstract:** Despite the economic dominance of agriculture in the study area, farm households widely practice diverse income generating activities as livelihood strategies to overcome diverse challenges and risks. The existing capacity of agriculture to attain food and livelihood security is tremendously declining from time to time. The main aim of this study was to identify the determinants of farmers' participation in income diversification in the study area. The study involved primary data which were collected from randomly selected 300 households in four districts of the zone. For selection of study units probability proportional to the size was applied and respondents were selected through systematic sampling technique. In addition, key informant interview and focus group discussion were used to supplement the survey with qualitative information. Secondary data were also collected from various relevant sources. Descriptive statistics were applied to characterize the sample households' social, economic, demographic and institutional factors. The findings of the study indicates that rural households in the study area practice diversified income sources, in that about 57.7% of the households combine agriculture with other activities (non/off-farm). Some farmers were pursuing non-farm and off-farm activities as the primary income sources rather than agriculture. Considering the wealth status, the poor households derive almost half (50%) of their income from non-agricultural activities whereas the latter accounts for only 6.4% of the income of the better-off households'. Binary logit model was applied to investigate factors influencing the households' participation in income diversification. In this regard, out of total explanatory variables included in the model, 8 were significant. The results confirm that factors such as sex, farm size, livestock ownership, oxen ownership, education, leadership, annual cash income and market distance were key determinants of farmers' participation in income diversification. Further, the study identifies income diversification as a cumulative effects of several factors, and therefore urges policy makers to give due attention to them with a view to overcoming the challenging bottlenecks.

**Keywords:** Income Diversification, Rural Households, Binary Logit Model, Wolaita, Ethiopia

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## 1. Introduction

Agriculture is the basis of Ethiopian economy. It contributes over 50 percent of the GDP and 90 percent of raw material requirements of the country's small and medium-sized industries. It is also estimated that agriculture provides employment for about 85% of labour force [1, 2]. However, Ethiopian agriculture is characterized by low productivity. Over the last two decades, it has not been able to produce sufficient food to feed the country's rapidly growing population. A close look at the country's declining agricultural outputs and at the same time, ever increasing population growth begs for a search of alternatives [3].

Recent studies in Sub-Saharan Africa (SSA) indicate that rural households are increasingly diversifying their income sources by combining farm and non-farm activities to sustain their livelihoods [4, 5, 6, 7, 8]. That asset, activity and income diversification characterize the livelihood strategies of rural households in rural Africa [9]. Incomes from non-farm sources have grown in importance and account for between 35–50% of rural household incomes in SSA [10, 11], with reliance on non-farm income sources higher in some areas (e.g. as high as 80–90% in southern Africa [12].

Other experts aver that diversification can be represented as

a failure of agriculture as means of providing livelihood for a substantial proportion of rural inhabitants in SSA. They express diversification in Africa as an active process of "de-agrarianization" whereby farming becomes a part-time, residual, or fall-back activity and livelihoods become increasingly oriented to non-farm and non-rural activities [13].

Diversification has been analyzed as a rational response by households to lack of opportunities for specialization, and was initially considered not the most desirable option. However, recent studies indicate that rather than promoting specialization within existing portfolios, upgrading them to augmenting income could be more realistic and relevant for poverty reduction [14].

There are numerous factors that determine rural households' ability to diversify their livelihood strategies away from crop and livestock production into off- and non-farm economic activities. Several studies have reported a substantial and increasing share of non/off-farm income in total household income among rural households in most developing countries [15]. Reasons for this observed income diversification include declining farm income and the desire to insure against agricultural production and market risks [16, 17, 15]. That is, when farming becomes less profitable and more risky as a result of population growth and crop and market failures, households are pushed into non/off-farm activities, leading to "distress-push" diversification. In other case, however, households are rather pulled into the off-farm sector, especially when returns to off-farm employment are higher or less risky than in agriculture, resulting in "demand-pull" diversification [18].

The increasing population growth in rural Ethiopia obliged households to cultivate and make their living on extremely small size of land. For instance, 29% of grain farmers in 2006/7 had cultivated a land less than 0.5 ha per household [19]. According to recent Federal Democratic Republic of Ethiopia [20] evidence, nearly 55 percent of all smallholder farmers operate on one hectare or less. Moreover, CIDA [21] indicates the declining average per capita farmland holdings - 36 per cent of households cultivate land below half a hectare, 59.8 per cent below one hectare, and 83.8 per cent below two hectares. Due to the smaller farm size and low return from farming activities, majority of rural households are engaged in diversified income sources.

It is increasingly becoming clear that the agricultural sector alone cannot be relied upon as the core activity for rural households as a means of improving livelihood and reducing poverty. One phenomenon that is gaining prominence in the rural development literature is the promotion and support for nonfarm diversification opportunities [22]. Non/off-farm economic activities include seasonal migration, off-farm to engage in wage employment, handicraft production, trading and processing of agricultural produce, provision of agricultural services, etc. Such non-farm activities provide a way of off-setting the diverse forms of risks and uncertainties (relating to climate, finance, markets, etc) associated with agriculture and create a way of smoothing income over years and seasons [11, 8].

Like other Sub-Saharan Africa countries, Ethiopia is characterized by a complex, diverse and risk-prone agricultural production environment [23, 24]. Natural disaster (drought) forced people into alternative livelihood such as the collection and sale of firewood and grasses [25]. The agricultural production has been deteriorating over time, and has forced people to look for alternative employment option other than agriculture. That means, households engage in diverse livelihood strategies away from purely crop and livestock production towards farm, non-farm and off-farm activities that are undertaken to broaden and generate additional income for survival and livelihood improvement.

Regarding the rural economy in Ethiopia, policy makers give almost full attention to agricultural sector. Nevertheless, there is a growing evidence that rural sector is much more than just farming [26]. This implies that, multiple employments are also potential livelihood strategies on part of the rural people when the farm does not provide an adequate amount of income to the peasant families [27]. For instance, about 25% of the households in rural Ethiopia own one or more nonfarm activities. It profits on average account for approximately 38% of total household income for those households who run it [28].

Similarly, outside agriculture the rural households in Wolaita zone generate income from non/off-farm wage, trading and remittance from migrants. Distant migration as a way to maximize income across seasons and cope with food shortage has been a long history. However, the majority (more than 50%) of the population lives on subsistence margin with little or no land and livestock and dependent on marginal non-farm income sources (i.e., casual labor, petty trade). The very poor are often without working labor, with no assets (i.e., land, livestock) and dependent on income transfers [29]. The most recent evidence indicates that about 57 percent of households in the study area are possessing less than 0.25 hectare of land which could not help to attain adequately hand to mouth subsistence farming [30]. If there are no alternative means of livelihoods substituting this situation the newly born generation will face serious challenges than existing.

Even if there is economic centrality of agriculture in the study area, many households engage and pursue diverse off/non-farm livelihood activities to maintain and improve their livelihood/wellbeing. Therefore, comprehending the driving factors of each livelihood strategy is crucial to improve the response mechanisms related to poverty, food security and livelihoods improvement in the study area. However, research work on household income diversification under a condition of resource scarcity in study area is limited. The factors that determine farmers participation in diversified income activities are not well identified. The diverse income sources pursued by rural people in the study area are not assessed in detail. This study therefore aims to assess the existing income sources adopted by the different socio-economic groups; and identify the determinants that influence farmers' participation in income diversification.

## 2. Research Methodology

### 2.1. Description of the Study Area

This study was conducted in Wolaita Zone of southern Ethiopia. It is located at 390 km to southwest from the capital city of the country, Addis Ababa. The Zone is roughly located between 6.4° - 7.1° N and 37.4° - 38.2° E, latitude and longitude respectively. It covers a total area of 4,511km<sup>2</sup> and is composed of 12 administrative woredas (districts) and 3 registered towns.

### 2.2. Sampling Techniques

Multi-stage sampling procedure was employed to select sample households. In the first stage, out of the 12 woredas in the zone, four woredas (districts) (Humbo, Damot Woyde, Sodo Zuria and Damot Gale) were selected purposively to capture different agro-ecological zones existing in the area. In the second stage, the kebeles (peasant associations) in each woreda were listed based on their agro-ecological characteristics and grouped/stratified into three ecological zones highland, midland and low land. Based on this, 16 sample kebeles were selected by using simple random sampling techniques. In the third stage, sampling frame (complete village household lists) was obtained from each kebele's administrative office. Then, wealth ranking exercise was conducted with the help of participatory rural appraisal (PRA) tools. In the fourth stage, the probability proportional to sample size method was applied to draw the sample household from each wealth category according to the number of households in different category. Finally, a total sample of 300 households were selected by using systematic random sampling techniques, of which 145, 105 and 50 were poor, medium (less poor) and better-off households respectively. This study applied a simplified formula provided Yamane [31] to determine the required sample size at 95% confidence level, degree of variability = 0.5 and level of precision = 5.7% (0.057).

### 2.3. Types and Methods of Data Collection

Both primary and secondary data were used which were qualitative and quantitative in nature. Primary data were collected from sample households using structured interview schedules. Secondary data were obtained from different sources. In addition to this, focus group discussion, key informant interview and wealth ranking were conducted to supplement the research findings with qualitative information.

### 2.4. Methods of Data Analysis

Two types of data analysis, namely descriptive statistics and econometric models were used to analyze the data collected from sample households. According to descriptive statistical methods, quantitative categorical types of data were analyzed using percentage, frequency and chi-square test. While quantitative continuous types of variables were analyzed using t-test, minimum, maximum, mean and standard deviation. After computing the descriptive statistics,

binary logistic regression [32] was used to identify factors affecting households' participation in income diversification where the dependent variable was found to be dichotomous (for example, 1 if household participate in income diversification and 0 otherwise. STATA 11 and SPSS 16 for WINDOWS were used for the econometric analysis.

Both probit and logit analysis are well-established approaches in the literature to estimate dummy dependent variables [33]. The cumulative probability functions of the probit and logit models are quite similar, so they usually generate predicted probabilities that are almost identical. Logit, however, has the advantage that these predicted probabilities can be arrived at by hand calculator. Further, when there are many observations at the extremes of the distribution then logit is preferred over probit [34]. Also, Sharma [35] reported that the logit model is computationally easier to use than the other type.

The logit model was applied in this study to assist in estimating the probability of farmers' participation in income diversification activities that can take one of the two values, participated or not participated. According to Gujarati [36], the functional form of the logit model is presented as follows:

$$P_i = E\left(\frac{Y_i}{X_i}\right) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \quad (6)$$

$$P_i = E\left(\frac{Y_i}{X_i}\right) = \frac{1}{1 + e^{-Z_i}}$$

Where  $P_i$  is a probability that a  $i^{th}$  household participated in income diversification and ranges from 0 to 1;  $Z_i$  is a functional form of  $m$  explanatory variables ( $X$ ) which is expressed as:

$$Z_i = \beta_0 + \sum_{i=1}^m \beta_i X_i, \quad i=1, 2, 3, \dots, m \quad (7)$$

Where;  $\beta_0$  is the intercept and  $\beta_i$  are the slope parameters in the model. The slope tells how the log-odds in favor of a given household participating in income diversification change as independent variables change. If  $P_i$  is the probability of a household being in income diversification, then  $1 - P_i$  indicates the probability that a given household did not participate in income diversification, which can be given as:

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad (8)$$

Dividing equation (6) by equation (8) and simplifying gives

$$e^{Z_i} = \frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} \quad (9)$$

Equation (9) indicates the odds ratio in favor/in terms of a given household participating in income diversification. It is

the ratio of the probability that a household will participate in income diversification to the probability he will not participate. Lastly, the logit model is obtained by taking the natural logarithm of equation (9) as follows:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_i \quad (10)$$

Where;  $P_i$  =the probability that  $Y=1$  (that a given household is participating in income diversification);

$1-P_i$  =the probability that  $Y=0$  (that a given household does not participate in income diversification);

$L$  =the natural log of the odds ratio or logit;

$\beta_i$  =the slope, measures the change in  $L$  (logit) for a unit change in explanatory variables ( $X$ );

$\beta_0$  =the intercept. It is the value of the log odd ratio,  $\frac{P_i}{1+P_i}$ ,

when  $X$  or explanatory variable is zero.

Thus, if the stochastic disturbance term ( $U_i$ ) is taken into consideration the logit model becomes

$$L_i = \beta_0 + \beta_1 X_i + U_i$$

Description of Variables Used in binary Logit Model and their Hypotheses

Dependent variable: The dependent variable in this study was participation of households in income diversification. Household income diversification is a dichotomous variable representing the status of household income diversification taking value of 1 if a household diversified and 0 otherwise. Income diversification situation of a household is identified by assessing the main income sources undertaken by respondents. Households who generated their income from only agriculture were considered as non diversified, while farmers' who derived additional income from non-farm or off-farm activities were considered as participating in income diversification.

Review of literatures and author's knowledge of the income diversification situation of the study area were used to identify the potential determinants of household income diversification. Therefore, assigning the household participation in income diversification as the dependent variable, the following variables were selected to analyze whether they explain household's participation in income diversification or not. Definitions and measurement of the independent variables and their working hypothesis are described in Table 1.

**Table 1.** Definition and units of measurement of explanatory variables used in binary logit model.

Variables	Description and measurement	Expected sign
SEX	is a dummy variable taking value 1 if the household head is male, 0 otherwise	-
AGE	Age of household head (years).	+
EXPERIENCE	Farm experience of household head (years)	+
EDUCTN	Formal education of household head (grades or number of years in school).	+
FAMLSZ	Family size of household in number	+
FARMSZ	Total farm size of household (hectare).	-
LABOUR	Active labour force (number)	+
SOILFERT	Soil fertility status takes value 1 if the soil is fertile and 0 otherwise	-
TRLU	Total livestock owned by the farm household (TLU).	-
OXEN	The number of oxen owned (number).	+
FERTLZR	It is a dummy variable that takes value 1 if a household use fertilizer and 0 otherwise.	-
IMSEED	It is a dummy variable takes 1 if a household use improved seed, 0 otherwise.	-
EXTCNT	Number of time extension agent visited/advised farmer (number).	-
TRAIN	Farmer attended formal agricultural training, dummy variable (= 1, if yes; =0, otherwise).	+
CREDIT	Farmers access to formal credit, dummy variable (=1, if yes; =0, otherwise)	+
MKTDISTN	Distance of the respondents' house from input and output market (km).	-
COOP	Households membership in cooperative organization, dummy variable (=1, if yes; =0, otherwise)	+
LEADER	Households participation in local social organization leadership, dummy variable takes value of 1 if a household participated, 0 otherwise	+
PSNP	It takes value 1, if a household is beneficiary of safety net program, 0 if not involving in it.	+
INCOM	Total annual cash income of households (Birr)	+

### 3. Results and discussion

#### 3.1. Descriptive Statistical Results

The results show that 56.7% of sampled households have participated in non/off-farm activities (i.e. engaged in diversification) while 42.3% did not engage in any form of non/off-farm employment and their sole employment was only farming (Table 4). Of the total sampled households, about 81.9% were male and 18.1% were female headed households (Table 3).

According to descriptive analysis, some variations/differences were observed between those farmers

who are participating in income diversification and non-participants in terms of demographic, socio-economic and institutional factors (Tables 2 and 3). The two groups differ to some extent in their farm experience, age, farm size, livestock possession, family size, active labour, ownership of oxen, extension contact, use of fertilizer and improved seed, participation in agricultural training, membership of cooperative, community leadership role, benefiting from safety net aid and farm income. The study revealed that the mean age of farmers who engaged in income diversification was less than non-diversified households. In terms of farming experience, average farming experience of diversified household was about 20.56 years while non-diversified

households (engaged on farm activity only) had a mean farming experience of 25 years. Average farm size of diversified households was less than non-diversified households. Livestock ownership was another important household's characteristic. Average livestock owned by the total sampled households was four TLU. Proportionally,

farmers who not engaged in income diversification owned almost twice greater livestock than those households who participate in income diversification. Variations were also observed in other socio-economic and institutional factors (see Table 2).

**Table 2.** Mean value of continuous variables.

Variables	Household Category		HH that participated in income diversification (173)		Total (300)		T-test
	HH that did not participate in income diversification (127)		Mean	STD	Mean	STD	
	Mean	STD					
Age	45.94	11.12	41.37	9.98	43.31	10.70	-3.736***
Education	3.98	3.74	4.29	3.87	4.16	3.81	.491
Farming experience	24.91	11.03	20.56	9.95	22.40	10.62	-3.569***
family size	7.09	2.23	6.18	1.98	6.56	2.14	-3.713***
Active labour	3.74	1.95	2.93	1.64	3.27	1.82	-3.927***
Dependency ratio	.93	.85	1.14	.89	1.05	.87	2.002**
Farm size	1.19	1.15	.45	.31	.76	.87	-8.167***
Tropical Livestock unit	5.47	3.37	2.32	1.92	3.66	3.06	-10.203***
Oxen	1.38	.96	.48	.63	.86	.91	-9.834***
Extension contact	13.64	9.33	7.12	8.02	9.88	9.17	-6.497***
Market distance	8.23	4.52	7.07	4.46	7.56	4.49	-2.229**
Total income	7384.53	6018.04	4273.53	3262.9	5590.52	4874.1	-5.747***

Source: Field Survey, 2014/2015.

\*\* and \*\*\* represent significance at 5% and 1% levels respectively.

T- tests and Chi-Square tests (Tables 2 and 3) were used to examine presence or absence of difference between the two groups of farmers. The mean values of the continuous variables in both categories were compared using t-test. According to the t-values, out of 12 continuous variables, the two categories were found to differ significantly in 11 of them. The computed t-values indicate the mean differences for eleven variables, namely family size, farm size, number of tropical livestock units, number of oxen owned, total annual income, extension visit, market distance, age, farming experience, dependency ratio and active labor. Similarly, the mean differences for farming

experience and age of household head were found to be significant at 1% probability level (Table 2).

On the other hand, the Chi-Square test was used to examine the existence of statistically significant differences between the discrete variables of the two categories. Accordingly, discrete variables were considered and the two categories were found to be significantly different in terms of six of the nine discrete variables. More specifically, the chi-square test reveals that use of fertilizer, improved seed use, training, participation in cooperative, local leadership and safety net aid were statistically significant at 1% probability level (Table 3).

**Table 3.** Categorization of Households on some hypothesized dummy variables.

Variables	Category	Respondents category		Diversify (173)57.7%		Total		Chi-square
		No diversification Farm only (127) 42.3%		N	%	n	%	
		N	%					
Sex	Male	104	81.9	145	83.8	249	83.0	.192
	Female	23	18.1	28	16.2	51	17.0	
Soil fertility	Fertile	110	86.6	157	90.8	267	89.0	1.280
	Otherwise	17	13.4	16	9.2	33	11.0	
Fertilizer use	No	23	18.1	81	46.8	104	34.7	26.65***
	Yes	104	81.9	92	53.2	196	65.3	
Improved seed	No	48	37.8	121	69.9	169	56.3	30.76***
	Yes	79	62.2	52	30.1	131	43.7	
Training	No	39	30.7	104	60.1	143	47.7	25.38***
	Yes	88	69.3	69	39.9	157	52.3	
Credit use	No	91	71.7	109	63.0	200	66.7	2.465
	Yes	36	28.3	64	37.0	100	33.3	
Cooperative	Yes	63	49.6	122	70.5	185	61.7	13.55***
	No	64	50.4	51	29.5	115	38.3	
Leadership	Yes	77	60.6	144	83.2	221	73.7	19.29***
	No	50	39.4	29	16.8	79	26.3	
Safety net aid	Yes	109	85.8	135	78.0	244	81.3	2.92*
	No	18	14.2	38	22.0	56	18.7	

Source: Own survey, 2014/2015.

\* and \*\*\*, represent significant at 10% and 1% probability significance level, respectively.

### 3.2. Household Income Diversification

As observed from the survey result about 42.3% of the total sampled households depend solely on agriculture (crop and animal production) for their income. The remaining respondents (57.7%) combine agriculture with non-farm and off-farm activities. The non-farm and off-farm activities help farmers to fill income and food gap that agriculture is unable to provide. About 37% of the total sampled households derived their income from farming plus non-farming activities. The various types of non-farm activities pursued by the respondents include petty trade, handcrafts, weaving/spinning, sale of local drink, rent of pack animal like donkey for transportation and remittance. About 13.3% of the sampled respondents derived their income by combining farming with off-farm activities, while about 7.3% of the sampled households diversified livelihood activities by engaging in farming plus non-farming as well as off-farm activities. Findings also revealed that very few households in the study area combined the three livelihood strategies (Table 4). The chi-square test shows the existence of significant difference between the three wealth groups regarding income diversification at 1% level. This difference in income diversification implies the existence of significant entry barriers for the most remunerative livelihood strategies especially engaging in non-farm activities which require high investments.

Eighty four percent of better-off households engaged solely on farming, while only 23.4% and about 48.6% of poor and medium households respectively pursue the same activities. Non-farm activities play a crucial role in income of the poor and medium households, with 39% of the poor and 43.8% of the medium households deriving income from non-farm activities. Only 16% of better-off households derived their income from farming and non-farming activities. As the survey data indicates, combining farming with off-farm activities is a main income source for 24.8% of the poor households and 3.8% of medium households. None of the better-off households diversified their income into a combination of farm and non-farm activities. From the three wealth groups, very low percentage (7.3%) of respondents generate income from a combination of farming, non-farm and off-farm sources (Table 4). The finding of this study depicts that large number of poor households generate income from non-farm and off-farm activities in addition to agriculture. Similarly, many scholars [37, 38, 18] found out that poor households tend to have a more diversified portfolio of livelihood activities than the better-off households. According to them, it is a last resort rather than an attractive alternative livelihood.

Table 4. Distribution of sampled household by livelihood strategies and wealth category.

Livelihood strategies	Wealth category of Household							
	Poor		Medium		Better-off		Total	
	n	%	N	%	n	%	N	%
Farming	34	23.4	51	48.6	42	84	127	42.3
Farming and non-farming	57	39.3	46	43.8	8	16	111	37
Farming and off-farming	36	24.8	4	3.8	0	00	40	13.3
Farming, non-farming and off-farming	18	12.4	4	3.8	0	00	22	7.3
$\chi^2$							79.896	
P-value							.000	

Source: survey result, 2014/2015

The survey result also shows that out of the total sample households (300), about 246 households (82%) pursued agriculture as a primary income source. About 51 respondents (17.3%) reported that agriculture was their second alternative giving first priority to either non-farm or off-farm activities while only three respondents (1%) put agriculture in the third place (Table 5). On the other hand, 37 respondents (12.3%) reported that non-farm activity was their primary income source. Within the non-farm category about 90 respondents (30%) claimed non-farm is the 2<sup>nd</sup> income source, next to farm. Out of the total sample respondents, about 134 sample households (44.6%) pursue non-farm activities beside agriculture. Off-farming is a source of income for poor households on which they mainly depend for their livelihood due to low resource endowment, especially farm land. Out of total sampled households, about 17, 33, and 12 respondents ranked off-farm activity as first, second and third in that order (Table 5).

Table 5. Ranking respondents' choice of various livelihood strategies.

Category	Ranks						Total	
	1 <sup>st</sup>		2 <sup>nd</sup>		3 <sup>rd</sup>		n	%
	n	%	N	%	n	%		
Poor (n=145)								
On-farm	99	68.3	44	30.3	2	1.4	145	100
Non-farm	31	21.4	39	26.9	5	3.4	75	51.7
Off-farm	15	10.3	28	19.3	11	7.6	54	37.2
Medium (n=105)								
On-farm	97	92.4	7	6.6	1	1	105	100
Non-farm	6	5.7	42	40	2	1.9	50	47.6
Off-farm	2	1.9	5	4.7	1	1	8	7.6
Better-off (n=50)								
On-farm	50	100	0	0	0	0	50	100
Non-farm	0	0	9	18	0	0	9	18
Off-farm	0	0	0	0	0	0	0	0
Total (n=300)								
On-farm	246	82	51	17.3	3	1	300	100
Non-farm	37	12.3	90	30	7	2.3	134	44.6
Off-farm	17	5.6	33	11	12	4	62	20.6

Source: survey result, 2014/15

### 3.3. Income Share and Activities

Considering the income share of three main income sources, the high share is taken by agriculture which accounts for about 78.1%, while non-farm and off-farm activities only account for about 16.5% and 5.4% respectively. The combined share of non-agricultural activities (non/off-farm) in the income of sampled household was about 22%. The result approximates that of the national level, in which the share of non-agricultural sector accounts for 25% [28]. This finding suggests that off-farm activities are survival mechanisms pursued mainly by the poor and medium income groups but not viewed as an opportunity that financially strong farmers engaged in as confirmed in Table 6. Thus, off-farming activities seem more of a coping mechanism for the rural population than a way to accumulate wealth and reduce poverty. The poor tend to concentrate on off-farm activities with low entry constraints. This result calls for the understanding of the challenges which prevent the poor and less poor from engaging widely in agricultural activities as better-off households.

On average, the sampled households in the research area earned a total income of around 1.6 million Ethiopian Birr deriving from a wide variety of activities with agriculture being the most important source (Table 6). Agricultural activities contributed 78% to total household income with the remaining 22% coming from non-farm activities i.e. non/off farm activities. The most important income source is crop production, which accounts for about 39.3% of the income, followed by income from livestock and their products (38.8%), and non-farm activities (like petty trade, handcrafts, weaving/spinning, remittance, local drink sale, and rent pack animal) helped to generate about 16.5%. Non-farm income accounts for almost one-third of the total household income for poor households. Among non and off farm activities, petty trade and handcrafts are the most important activities for the poor households, which share 24% of their total income.

Table 6 shows the contribution of each livelihood activities to income of the three wealth groups. Accordingly, the income composition of the poor in increasing order is livestock income (30.2%), crop income (21.7), wage income from local, urban and other regions (17.9%), petty trade (13.8%), handcrafts (10.3%), weaving (2.4%) and remittance (1.2%). In other words, the poor households generate nearly 50% of their cash income from of-farm and non-farm activities. Contrary to this, the income of the better off households' is composed of crop (50.1%), livestock (43.6%), remittance (4.2%) and petty trade (2.1%). This means that the better off households' income is mainly from crop and livestock. Like the better-off households, on-farm (crop and animal production) activities share high percentage of medium households' income source. The possible justification for the medium and better off households' high share of on-farm income is that their endowment of better

productive land and other resources unlike their poor counterpart. Berry [39] and Mujib *et al.* [38] also found that poor farmers who are increasingly engaged in off-farm activities may rather be doing so as a long-term adaptation to stress, shocks and poverty – these farmers are trying simply to survive in a poorer, riskier world, rather than to improve livelihoods and invest in production.

**Table 6.** Proportion of total annual cash income composition generated from different livelihood activities.

Cash income composition	Wealth category of HH (%)			
	Poor	Medium	Better-off	Total
Non-farm	29.6	18.9	6.4	16.5
Petty trade	13.8	10.4	2.1	8
Handcrafts	10.3	3.4	00	3.7
Weaving/spinning	2.4	0.7	00	0.8
Remittance	1.5	2.8	4.2	3.1
Local drink sale	1.5	1.4	00	0.9
Rent pack animal	0.2	0.2	00	0.11
Off-farm	18.4	3	00	5.4
Daily labor in local area	9.5	1.2	00	2.7
Daily labor near urban	5.7	0.5	00	1.5
Wage labor in other area	2.7	1.2	00	1.1
Fire wood/grass sale	0.6	0.1	00	0.2
On-farm	52	78.1	93.6	78.1
Crop	21.7	39	50.1	39.3
Livestock and their product	30.2	39.1	43.6	38.8
Total sum of cash income	392075.5	627087	656746	1675908.5
Mean	2702.4	5990.4	13126.3	5590.5

Source: survey result, 2014/15

### 3.4. Binary Logit Model Result

In this section, selected explanatory variables were used to estimate the logistic regression model to analyze the determinants of households' income diversification behavior. A logit model was fitted to estimate the effects of the hypothesized explanatory variables on the probabilities of households' participation in income diversification.

Finally, a set of 20 explanatory variables (11 continuous and 9 discrete) were included in the logistic analysis. These variables were selected on the basis of theoretical explanations, personal observations and the results of the survey studies. To determine the best subset of explanatory variables that are good predictors of the dependent variable, the logistic regression was estimated using the method of maximum likelihood estimation, which is available in statistical software program (SPSS version 16). All the above-mentioned variables were entered in a single step. The definition and unit of measurement of the variables used in the model are presented in Table 1.

*Table 7. Logit model estimates for factors affecting farmers' participation in income diversification.*

Variables	Coefficient	S.E.	Wald	Sig	Exp(B)
Sex	-.980	.506	3.743	.053	2.664
Agee	.044	.032	1.914	.167	.957
Education	.213	.063	11.407	.001	.808
Family Siz	-.132	.119	1.222	.269	1.141
Labor Active AE	.075	.147	.257	.612	.928
FRMSZ	-2.245	.653	11.819	.001	9.444
Fertility Other	-.294	.630	.218	.640	.745
TLU	-.335	.131	6.507	.011	1.398
Oxen Numbe	-.702	.356	3.883	.049	2.018
Fertilizer2	-.658	.446	2.176	.140	1.931
ImproveSeed2	-.434	.448	.935	.333	1.543
ExtesConFrequcy2	-.013	.029	.195	.659	1.013
Training2	.065	.459	.020	.887	1.067
Creditmodel	.286	.378	.574	.449	.751
Marketdista	-.082	.038	4.685	.030	1.086
Coop2	-.224	.415	.291	.589	1.251
Leader2	-.843	.450	3.510	.061	2.324
SafetAid	-.340	.434	.612	.434	1.405
Income2	.971	.268	13.118	.000	.379
FarExp	.018	.031	.322	.571	1.018
Constant	-2.593	1.758	2.175	.140	.075
-2 Log likelihood Ratio				244.880	
Chi-square ( $\chi^2$ )				163.927***	
Correctly predicted overall sample				82.3	
Correctly predicted adopters (%)				75.6	
Correctly predicted non-adopters (%)				87.3	
Sample size				300	

Source: computed from survey data, 2014/15. Note: \*=significant at  $p < 0.1$ ; \*\*=significant at  $p < 0.05$ ; \*\*\*=significant at  $p < 0.001$

The logit model results used to study factors influencing farmers' participation in income diversification are shown in Table 7. Among the 20 variables used in the model, eight were significant with respect to income diversification with less than 10% of the probability level. These variables include sex (SEX), education (EDUC), oxen ownership (OXEN), tropical livestock (TLUs), farm size (FARMSZ), distance to market (DISTNCE), participation in local leadership and annual farm income, whereas the rest 12 explanatory variables were found to have no significant influence on farmers' participation in income diversification. The effect of the significant explanatory variables on income diversification in study area is discussed below:

**Sex (SEX):** It was found that sex has a negative and significant effect on the probability of income diversification at less than 10% probability level. This result implies that the households headed by female are less likely to participate in off-farm activities. The possible reason is households headed by female have more responsibilities in home management. Opposite to this, male household heads have more tendency of engaging in different activities and then this improves their income. As observed in the tradition of the study area, gender disparity reduces the ability of female-headed households to participate in off-farm income generation activities. For instance, women mobility and travel to urban area in search of off-farm activities is not culturally perceived as positive. Other things kept constant, the likelihood of a household diversifying into off-farm activities decrease by 4% when a household is headed by a female. This result agrees with the prior findings by Amare and Belaineh [40] and Ellis [41].

**Farm size (FRMSZ):** It was found that farm size had negatively and significantly influenced the probability of farmers' participation in income diversification into non-farm and off-farm activities at less than 1% significant level. This result implies that farmers with large farm size are less likely to diversify their livelihood into non-farm and/or off-farm than those farmers who have small land size. Large farm size helps farmers to cultivate and produce more, which in turn increases farm income and improves livelihood of a household. On the other hand, declining land sizes under population pressure may encourage rural households to diversify their sources of income. That means, farmers having more land size rely on crop production than to go for non farm and off-farm in order to satisfy basic needs. The odds ratio of 9.444 for farm size indicates that, other things being constant, the odds ratio in favor of farmers' participation in income diversification increases by a factor of 9.444 as the farm size increases by one hectare. The result of this study confirms the earlier findings of Dilruba Khatun and Roy [42] Reardon, Delgado and Matlon [43].

**Education (EDUCT):** As the model result indicates, the variable education had positively and significantly influenced the households' participation in income diversification at 1% level of significance. This finding indicates that those farmers with high educational level are more likely to diversify livelihood strategies into non-farming and/or off-farming activities than those who less educated. This is due to most probably educated person gain better skill, experience, knowledge and this again help them to engage in diversified livelihood strategies. Literate individuals are very ambitious



to get information and use it. And it also determines the capability of finding a job. The odd ratio reveals that, holding other variables constant, a change in household head education level by one unit will increase a probability of participating in income diversification by a factor of 0.808. Thus, education is a fundamental instrument in equipping farmers with necessary skills which enables them to diversify income sources than uneducated ones. This finding is in line with the finding of various authors [42, 18, 40]. Valdivia and Quiroz [44] in their research found education as essential in increasing off/non-farm earnings and time allocation of rural families and to diversify the rural economy away from agriculture.

**Tropical livestock unit (TLUs):** The model result indicates that number of tropical livestock unit affected negatively and significantly the probability of diversifying household income into non/off farm activities at  $P < 0.1$ . This result shows that those farmers with large number of tropical livestock units are less likely to participate in income diversification than those who own small number of TLUs. The negative association between livelihood diversification and number of TLU indicates that herd size creates better opportunity to earn more income from livestock production. On the other hand, households with less number of livestock try to diversify their income portfolio by participating in non-farm and off-farm activities and this accelerates the rate of diversification. Other things held constant, the odds ratio 1.398 for number of TLU shows that, as the number livestock units increases by one TLU, the odds ratio in favor of adopting improved maize technology increases by a factor of 1.398. Different studies support this idea (for instance, Dercon and Krishnan [45] and BARRETT *et al.* [9]).

**The number of oxen owned (OXEN):** Oxen ownership negatively and significantly influenced the probability of diversifying income into non/off farm activities at less than 10% significance level. This result suggests that, those farmers who owned more oxen were less likely to engage in income diversification than those who owned small number of oxen. Other things being held the same, the odds ratio of 2.018 for the number of oxen owned indicates that, the odds ratio in favor of participating in income diversification decreases by a factor of 2.018 as the number of oxen increases by one unit. Similar result was found by Kaija Darlison [46] and Idowu *et al.* [47]

**Market distance (DISTNCE):** Market distance to input and output center negatively and significantly associated with the probability of household's participation in income diversification activities at less than 5% significance level. The negative association suggests that the likelihood of participating in diversified income activities declines as the distance from market center increases. The implication of this negative relationship is that if the distance between farmers' living home and the market area is longer, the farmers will be discouraged from engaging in non/off farm income generating activities. The odds ratio of 1.086 for market distance reveals that, other things being constant, the odds ratio in favor of participating in diversified income sources

decreases by a factor of 1.086 as the market distance increases by one kilometer. This result is in consistence with the finding of LANJOUW *et al.* [48] and SMITH *et al.* [49]. Studies by LANJOUW *et al.* [48] in Tanzania and SMITH *et al.* [49] in Uganda show that a better physical access to markets increases non-farm earnings.

**Leadership (LEADER):** This variable was found to be positive and of significant influence on income diversification into non/off-farm activities at less than 10% probability level. This implies that those farmers who participate in social leadership in local area have more likelihood to diversify income into non/off-farm activities than those farmers who have no leadership role in their community. The possible reason may be farmers' participation in local leadership can help to have more access for information, share more experience with others in social environment, creating more social network with outside societies, get more access to formal as well as informal credits. With regard to credit access, local leaders are more trusted and accepted by formal and informal financial institutions. Access to credit can help to adopt production enhancing technology, and this in turn help to generate more income. Sometimes, credit helps them to invest directly in non-farming activities. Further, the positive relationship shows better leaders' education which equips them with necessary knowledge to engage in non-farming activities. The result indicates that, other factor kept constant, odd ratio showed that the probability of participating in diversified income activities is increased by 2.324% as a household gets access to involve in local leadership. The study by Dilruba and Roy [42] and Awoniyi *et al.* [50] found similar result.

**Total annual cash income (INCOM):** this variable was found to have positive and significant influence of income diversification into non/off farm activities at 1% probability level. This result implies that households having large cash income are more likely to diversify the income generating activities into non/off farm activities. This result shows that those farmers with low income are less likely to participate in income diversifying income activities than those who have high income. The possible reason is that those farmers who have adequate income sources can overcome financial constraints to engage in alternative income-generating activities. Hence, higher income can encourage them to invest in other income-generating (especially non-farm) activities. From the model result, other things being constant, odd ratio reveals that the probability of a household diversifying into non-farm and off-farm activities increased by 0.379% for those farmers with higher level of income. Stefan Schwarze and Manfred Zeller [51] and Isaac [52] show that income is one of the most important determinants of livelihood diversification into non-farm and/or off-farm activities.

#### 4. Conclusion and Recommendation

Agricultural production has been declining from time to time due to frequent land fragmentation, uncontrolled population growth and recurrent drought, and this has forced

people to look for alternative income options other than agriculture. A significant number of rural households engage in diverse income generating activities away from purely crop and livestock production. According to the study, it is increasingly becoming clear that the agricultural sector alone cannot be relied upon as the main activity for rural households as a means of improving livelihood, achieving food security and reducing poverty in the study area. Income diversification is gaining prominent role in rural households' income and food security. Even though, regarding the rural economy in Ethiopia, policy makers give more attention to agricultural sector. Nevertheless, there is growing evidence that the rural sector is much more than just farming.

The Binary logistic regression model was used to answer the questions why rural households pursue diverse income generating activities. The model results suggest that farmers' participation in income diversification is influenced by various factors. The result indicated that out of the 20 hypothesized variables eight were found to significantly influence household's participation in diversified income activities at different probability levels. These variables include education sex, farm size, livestock ownership, oxen ownership, local leadership, annual cash income and market distance. The model result indicated that the education of household head, farm income and participation in local leadership influenced positively and significantly farmers participation in income diversification activities, while the ownership of livestock in TLU, sex, total farm size oxen ownership and market distance negatively and significantly affected the diversification of income into non-farm, off-farm and combining non-farm and off-farm activities.

The finding of the study came up with possible policy recommendations in the area of income diversifications. Sex had significant and negative influence on household income diversification, and this considers government and other responsible bodies to design necessary strategies so as to create awareness among the community to participate women equally with man in all development activities. The negative and significant influence of farm size on income diversification suggests concerned bodies to develop appropriate strategies and policies especially for land resource-poor farmers. The presence of very small size of land also calls for giving emphasis in agricultural intensification to enhance the productivity of the land so that generate adequate income and food. The positive and significant influence of education on income diversification suggests to give due attention in promoting farmers' education through strengthening and establishing both formal and informal type of education and expanding literacy. The negative and significant impact of livestock and oxen ownership in income diversification suggests to design development strategy for livestock sector through improving livestock breeds, veterinary services, forage development, marketing, access to credit and overall management of livestock production. The strong significant association of total annual cash income on diversification calls for policy measures in order to pave the way to solve financial

problems through developing and strengthening financial institution, creating credit access and promoting better income generating options. The significant and positive effect of households' local leadership participation on the diversification points the direction to create access to information and other necessary services like credit for people in the same community. This also considers government and other responsible bodies in building capacity through education and training so as to participate actively in social activities and leadership.

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