

*Full Length Research Paper*

# Determinants and Patterns of Income Diversification among Smallholder Farmers in Akaki District, Ethiopia

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## Abstract

This research was initiated to find out the different factors affecting income diversification and assess patterns of income diversification in Akaki district of Ethiopia. Two stage random sampling with Proportionate Probability Sampling (PPS) was used to collect cross-sectional data from 155 farm households using structured questionnaire. The data were also supported with documents from agricultural and rural development office and farmers cooperatives in the study area. The Tobit model was used to analyze the factors determining the income diversification. From the descriptive statistics, sales of homemade farm implements and drinks, and non-farm employment was found to be the most important sources of off-farm income in the study area. The results from Tobit model indicate that, family size; number of extension visit per year and education level has a positive significant effect over income diversification. On the other hand, age of the household head; land size and average distance from market have negative and significant influence on the household's decision towards diversification.

**Keywords:** Income diversification; off-farm income; farm income, Tobit; Ethiopia.

## INTRODUCTION

Ethiopia has a population of 79.5 million, out of which two-third of the population live on less than US\$ two a day (CSA, 2010). Ethiopia's economy, predominantly based on rain-fed agriculture, has always been extremely dependent on annual rainfall. Agriculture still accounts for about 46% of GDP (2006-2007), 80% of exports and 85% of employment. Subsistence farmers cultivate approximately 90% of the country's land. The fertile but drought sensitive highlands produce grains while in the east amongst the Somali and Afar people pastoralism predominates. Although in recent years the share of industry in GDP has steadily improved to 13% (manufacturing stood at 5.1% of GDP in 2006-2007) it is still low compared to other developing countries. The service sector accounts for about 41% of GDP (Stiftung, 2010).

Empirical research has shown that non-farm sources contribute 40–50 percent to average rural household

incomes across the developing world (World Bank 2008). In Ethiopia, according to Davis (2004) and Deininger et al. (2003), some 20 percent of rural income originates from non-farm sources. In some parts of Ethiopia, off-farm or nonfarm labor income accounts for up to 35 percent of total farm household income (Woldehanna and Oskam, 2001).

Farm level income diversification involves adding income generating activities at far household level including livestock, crop, non-farm and off-farm activities. The activities generate a set of income portfolios with different degrees of risk, expected returns, liquidity and seasonality. The process involves allocation of household productive assets among different income generating activities (Japhether et al., 2007).

According to Woldenhanna and Oskam (2001), a study done in Ethiopia, increasing the availability of off-farm activities and improving the wage rate received by farm households can expand the economic activity of the Tigray Regional State. Hence the underlying factors that hinder participation in non-farm activities such as credit constraints and lack of skill may have to be addressed through the provision of credit and technical training for

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the poor.

The study done in Mail indicate that households in remote areas are less likely to participate in the non-cropping sector than their counterparts closer to local markets, while households with educated heads are more likely to participate in the non-farm sector than those with illiterate heads. The significance of constraints in explaining portfolio diversification suggests that the role of government in making assets as well as improved infrastructure available to poorer households is still essential in promoting income diversification (Abdulai and Crole Rees, 2001)

Despite of a vast potential for non-farm activities in the study area, there are problems such as negative perception of the community, out-dated methods of production, lack of improved technology and skill, and lack of business start-up budget. There is also lack of pertinent research to study the effect of non-farm activities on farm production and to identify the major problems that hamper the non-farm sector. Therefore, this study is useful for development of projects that address local people economic, demographic, institutional and technical factors. Based on this rationale this paper tries to answer: i) what factors determine income diversification in the study area? ii) What types of on-farm and off-farm activities do rural households in the study area engage in? iii) What are the diversified activities? and finally to forward policy implication of the results.

### The Data: Survey design, Sample size and Method of Analysis

Both primary and secondary data were used in this study. The primary data were collected through structured questionnaires supported by interviews in the field survey. It focused on data on different off farm activities and opportunities, agricultural inputs use, socio-economic characteristics of households and agricultural activities. The secondary data, that consisted of relevant information for this study was collected from concerned organizations including agricultural and rural development office and farmers' cooperatives in the area.

Multi stage random sampling with proportional probability sampling was used, first 10 farmers' associations were selected randomly from a total of 25 farmers' association in the area and proportional probability sampling was employed to select sample farmers from each randomly selected farmers association. The total sample size was determined based on sample size for models (a sample size has to be at least ten times the number of explanatory variables in the model). Since the independent variables in the model are fourteen, the sample size was found to be about 140. By considering 10% for non respondents and clustering implicit error the total sample size for the survey was 155

households.

### The Tobit Model

The Tobit model is also known as a censored regression model. Some authors call such models limited dependent variable regression models because of the restriction put on the values taken by the regressand. Since there is more information in the Tobit model, the estimates of the  $\beta$  should be more efficient. Let  $y$  be a variable that is essentially continuous over strictly positive values but that takes on zero with positive probability. Nothing prevents us from using a linear model for  $y$ . In fact, a linear model might be a good approximation to  $E(Y|X_1, X_2, \dots, X_k)$ , especially for  $x_j$  near the mean values. But we would possibly obtain negative fitted values, which leads to negative predictions for  $y$ ; this is analogous to the problems with the LPM for binary outcomes. Further, it is often useful to have an estimate of the entire distribution of  $y$  given the explanatory variables. The Tobit model is most easily defined as a latent variable model:

$$Y_i^* = X_i'\beta + \varepsilon_i \dots \dots \dots (1)$$

$$Y_i = \max(0, y^*) \dots \dots \dots (2)$$

$$Y_i = 0 \text{ if } Y^* \leq 0 \text{ and } Y_i = Y^* \text{ if } Y^* > 0$$

The latent variable  $y^*$  satisfies the classical linear model assumptions; in particular, it has a normal, homoskedastic distribution with a linear conditional mean. Equation 2 implies that the observed variable,  $y_i$  equals  $y^*$  when  $y^* > 0$ , but  $y = 0$  when  $y^* \leq 0$ . Because  $y^*$  is normally distributed,  $y$  has a continuous distribution over strictly positive values. In particular, the density of  $y$  given  $\mathbf{x}$  is the same as the density of  $y^*$  given  $\mathbf{x}$  for positive values. Furthermore,

$$\begin{aligned} P(y = 0|x) &= P(y^* < 0|x) = P(u < -x\beta) = P(u/\sigma < -x\beta/\sigma) = \Phi(-x\beta/\sigma) \\ &= 1 - \Phi(x\beta/\sigma) \end{aligned}$$

Because  $u/\sigma$  has a standard normal distribution and is independent of  $\mathbf{x}$ ; we have absorbed the intercept into  $\mathbf{x}$  for notational simplicity. Notice how this depends on  $\sigma$ ,

the standard deviation of  $u$ , as well as on the  $\beta$ . The log likelihood for a random sample of size  $n$  is obtained by summing across all the observations. The maximum likelihood estimates of  $\beta$  and  $\sigma$  are obtained by maximizing the log likelihood (Wooldridge, 2000).

The estimated coefficients in the Tobit model cannot be interpreted in the same way as in a linear regression model but marginal effects have to be considered. To assess the impact of the regressors on the dependent variable, it is necessary to analyze their marginal effects.

For discrete categorical variables, the marginal effects are used to calculate percentage changes in

dependent variables when the variable shifts from 0 to 1, while for continuous variables, the marginal effects are used to calculate elasticity at complete means.

$$\frac{\partial E[Y^*]}{\partial x_k} = \beta_k$$

The generic model is specified as follows:

$y = f(\text{land size, age, education, sex, distance from market, number of extension visit, farm income, credit taken, livestock holding, input use and family size}) + \varepsilon \dots \dots \dots (3)$

$$Y^* = \beta_0 + \beta_1 \text{LANDSIZE} + \beta_2 \text{AGE} + \beta_3 \text{EDUCA} + \beta_4 \text{SEX} + \beta_5 \text{DMARKET} + \beta_6 \text{NEXTCONT} + \beta_7 \text{FARMINC} + \beta_8 \text{CREDIT} + \beta_9 \text{LIVEOWN} + \beta_{10} \text{INPUTUSE} + \beta_{11} \text{FAMSIZ} + \varepsilon \dots \dots \dots (4)$$

Where,

$Y^* = 0$  if the household does not diversify or the share of income from diversifying to off farm is 5% and less than 5% and  $Y^* = Y$  for which the income share from off-farm is greater than 5% where  $Y$  is the share of income from off-farm activities

LANDSIZ = Land holding of the respondent (ha)

AGE = Age of the respondent (Years)

EDUCA = Education level of the respondent (0=illiterate, 1= read and write, 2= primary, 3=secondary, 4=above secondary)

NEXTCONT = Number of contacts with extension officers during the previous year

DMARKET = Distance of farm from main market (walking hours)

SEX = Sex of the head of household (1=male, 0=female)

FARMINC = income from farm activities (ETB<sup>1</sup>)

CREDIT = credit use by the farmer (1=yes, 0=no)

LIVEOWN = ownership of livestock by the farmer (TLU)

INPUTUSE = use of improved farm inputs by the farmer (1= yes, 0= no)

FAMSIZ = family size (number)

$\beta_0$  = Intercept to be estimated

$\beta_1 - \beta_{11}$  = Coefficients to be estimated

$\varepsilon$  = Error term

## RESULT AND DISCUSSION

The variables which influence income diversification in the farming society were also operationalized, specified and their expected signs were also determined. Therefore, before embarking on interpretation of results from the model, it is very important to examine the nature of the data and describe the variables to come up with interlinked interpretation and conclusion in subsequent sections.

### Description of Socioeconomic Variables that influence Income Diversification

The overall mean age of the sampled households is found to be 44 years with a standard error of 0.93. The

minimum age is 22 and the maximum is 75. The maximum family size is 12 and the minimum is two with mean of about 6 family members; which is almost equivalent to the national estimate. The following table gives us the descriptive statistics of all the variables included in the model.

From table 1, we can easily observe that the maximum income from agriculture is by far larger than the mean income of the total sampled households. Though the maximum value is very far from the mean, the standard error is not very large in relation to the mean. The minimum value of income diversified (0) is simply the value given for those farmers who did not diversify their income by more than 5% of their total income.

The maximum value indicates the income level in which a household earns from nonfarm activities. More details about households who diversified or not are presented in subsequent tables. The sample is dominated by male headed households which is actually true in any part of Ethiopia. The data comprises 83% of male headed households and about 17% is female are headed. In fact it is very unlikely to find a female headed family being the husband is alive or she is not divorced. Being female headed or male headed is a crucial factor for income diversification in such a way that women can easily involve in nonfarm activities because such activities require less effort compare to agricultural activities. Moreover, it is quite obvious in countries where farming is primitive like Ethiopia; agricultural activities are laborious and time taking. This is also a probable reason for women to involve in off-farm activities.

Table 2 depicts the above fact, which means out of 26 households who are female headed in the sample only 10 of them did not diversify their income. In other words about 61% of female headed households diversify their income by more than 5% of their total income. The percentage of male and female headed households who did not diversify is 86.3 and 13.7%, respectively. But the percentage share of female headed households in the diversified group is higher as compared to the share of male headed families in the same group. Table 2

Generally being female headed has influence over income diversification. We will discuss this issue with empirical evidence later on. Table 3 depicts age groups for diversified and non diversified households. Above 60% of the data set is composed of age groups ranging from 30 to 50 years. Out of which about 53% of households have diversified their income. Out of which more than 50% of households are in the age group of 30 – 40 years. Moreover, only 3% of diversified households are above 60 years of age. Households who did not diversify their income comprise about 47% of the sample. This implies that the numbers of households who diversified their income are greater than households who did not diversify their income. About 7% of households who did not diversify their income are above 60 years old.

**Table 1.** Descriptive statistics

Variable	Observation	Mean	Std. Err.	Min	Max
Age (years)	155	43.93	0.93	22	75
Family size (number)	155	5.89	0.17	2	12
Land size (hectares)	155	2.11	0.08	0.25	5.5
Livestock holding (TLU)	155	5.77	0.28	0	16.8
Average distance from market(Hr)	155	2.71	0.09	0.5	4.5
No of extension visit per year	155	32.59	0.92	12	48
Income from agriculture (ETB/year)	155	28014.90	2337.61	1000	165600
Income diversified (ETB/Year)	155	3333.81	456.86	0	38000

Source: Researcher's Computation (NB: 1ETB= 0.058824USD)

**Table 2.** Percentage of diversified and non diversified by sex of the household

Sex	Not Diversified HH (% age)	Diversified HH (%age)	Proportion difference test (p-value)
Female	13.7 (n=10)	19.51 (n=16)	0.3515
Male	86.3 (n=63)	80.49 (n=66)	0.8119
(p- value)	0.000	0.000	
<b>Total</b>	100 (n=73)	100 (n=82)	

Source: Researcher's computation

**Table 3.** Summary of household age for diversified and not diversified

Age of the household head in years	Percent of total Observation	Percent of Households who diversified	Percent of households did not diversify	Proportion difference test (P-value)
22-30	11.63	6.45	5.16	0.5546
31-35	14.86	9.03	5.81	0.6108
36-40	20.65	9.68	10.97	0.4525
41-45	14.85	8.39	6.45	0.5693
46-50	12.26	6.45	5.81	0.5231
51-55	7.75	4.52	3.23	0.5449
56-60	8.39	4.52	3.87	0.5232
61-65	7.11	2.58	4.52	0.4358
70-75	2.58	1.29	1.29	0.500
<b>Total</b>	<b>100</b>	<b>52.90</b>	<b>47.10</b>	

Source: Researcher's Computation

The interesting part of this statistics is that, within the age 22-40 range, as age increases the number of households who diversify their income increased. The same is true for those who did not diversify; but the relative figure is lower than their counterparts.

From table 3, we can clearly see that as age increases the tendency of diversification decreases. On the other hand, there is no clear pattern of diversification vis-à-vis age for households who did not diversify their income. Generally, age group between 30 to 50 is found to be the influential group for income diversification.

As shown in table 4, out of the total sampled households, 82 (53%) of them have diversified their

income by more than 5% of their total income. The mean age of this group is not significantly different from the overall mean age of the data set. Average family size is about 7, which is larger than the overall mean family size. In fact, in a limited area of land it is difficult to involve every member of the family in agricultural activities, since the tendency of searching for other income sources is the option for survival. In addition to this, the minimum family size for this group is three, which is also larger than the minimum value of the sample. **Table 4**

Land holding ranges between 0.25 and five hectares with mean of 1.9 and standard error of 0.11. Average land size is also lower than the overall mean. This shows,

**Table 4.** Summary of variables for households who diversified their income and who did not

Variable	Households who diversify their income		Households who do not diversify their income		Mean comparison
	Mean	Std. Err.	Mean	Std. Err.	P- value
Age	43.55	1.25	44.36	1.41	0.3340
Family size	7.09	0.21	4.55	0.19	0.0000*
Land size (Ha)	1.90	0.11	2.34	0.12	0.0039*
Livestock holding (TLU)	5.57	0.36	5.99	0.44	0.2298
Average distance from market (Hr)	2.27	0.10	3.21	0.14	0.000*
No of extension visit (per year)	32.05	1.22	33.21	1.40	0.2664
Income from agricultural activities	24630.79	2530.72	31816.23	4042.73	0.0672*
Amount of diversified income	6301.71	720.56	0	0	-

Source: Researcher's computation (NB: 1ETB= 0.058824US and the Star \*, indicates significance at  $\alpha=0.05$ )

on average those households who diversified their income, have got small area of land to cultivate. The average livestock holding is found to be 5.57 TLU with a standard error of 0.44 and it ranges from no livestock at all to 16.8 TLU. Average distance from market was found to be 3.21 hours. The minimum and maximum time required to arrive at the nearby market is 1 hour and 4.5 hours respectively. Extension services are out of the major strategies emphasized by Ethiopian government to increase production and productivity in the rural society. Having this in mind, this study incorporates this variable as one of the factors which affect income diversification. According to the household survey conducted, the average number of extension visit was found to be about 33 times per year. The wide range which is 12 and 48 minimum and maximum visit per year is due to a limited number of extension workers augmented by long distance from one PA to another.

According to the survey, income was categorized as income from farming (agricultural) activities and income from off-farm activities. Farming activities include crop production and livestock rearing while off-farm activities refers to handicraft, petty works, trade and employment. The descriptive statistics indicates that the mean income from agricultural activities is about ETB 24,630.00 (US\$1448.8) with minimum and maximum value of ETB 3,000.00 (US\$ 176.5) and ETB 165,600.00 (US\$ 9741). The wide gap between these values is due to an uneven distribution of land holding and the varying fertility statuses of the soil. The mean amount of income which is considered as diversified income by this study is found to be ETB 6,301.00 (US\$ 370.6). This means on average households who diversified their activities earned this amount of income per year from off-farm activities. In a similar pattern with income from agriculture, there is also a wide gap between the minimum and maximum value of diversified income which ranges from ETB 300 (US\$17.6) to ETB 38,000 (US\$2,235). The reason for this range will be extracted when we discuss the econometric model.

The abovementioned paragraphs were trying to explain the description of explanatory variables for

households who diversified their income. Let us look at how different or similar are these variables for households who did not diversify their income. There is no significant difference between the mean age and livestock holding of the two groups while the mean family size is found to be larger for those households who diversified their income. The average land size is found to be 2.34 which are also larger for this group which implies that farmers who have small area of land to cultivate tend to diversify their income. Average distance from market is also found to be 3.21 hr which is relatively larger than the average distance for households who diversified their income. This implies that those households who are closer to a market have a better opportunity to diversify their income. Although it is difficult to conclude about the significance of a variable by looking at this descriptive figure, the value gives us a clue about the possible influence of the independent variable.

The average time that an extension worker visits those farmers who did not diversify their income is about 33 times per year which is significantly different from the same value of their counter parts at 1% significance level. The average income from agriculture is found to be ETB 31,816.23 (US\$ 1871.5) and it ranges from ETB 1,000 (US\$ 58.8) to ETB 130,650 (US\$7685.3).

### Major Off-Farm Activities and Their Contribution to Income Diversification

The household survey tried to capture the major sources of off-farm activities which the farmers engaged in to diversify their income. Accordingly, handicraft, employment, sale of farm homemade farm implements, business, sale of different types of drinks, sale of grass and/or hay, house rent and sale of fire wood/charcoal, were found to be the alternative sources of income in the study area. The following table shows the average share of each activity out of the diversified income, as well as total income of the households, **Table 5.**

According to the figures indicated in the above table,

**Table 5.** Average percentage contribution of off-farm activities

Activity (off farm source of income)	Average contribution to total off farm income (%)	Average contribution from total income (%)
Business	17.34	1.83
Handicraft	1.42	0.15
Employment	22.36	2.36
Sale of drinks	15.42	1.63
House rent	3.05	0.32
Sales of grass and hay	6.73	0.71
Sale of homemade farm implements	25.21	2.66
Sales of fire wood and charcoal	8.48	0.89

Source: Researchers' computation from household survey (2011)

employment takes the larger share of diversified income, about 22% of total off-farm income and 2.36% of total income. This is because the area in which this study was undertaken is very closer to the capital city of the country; on top of that, it is located very closer to industrial zone. Because of this reason, farmers can easily find employment opportunities as casual laborer in the construction of newly emerging industries around the locality. Moreover, farming activity in this area is based on rain-fed agriculture. As a result, farmers are disguisedly unemployed during dry seasons. Therefore, during this period they look for employment opportunities to increase their income. The cumulative effect i.e. being very closer to industrial zones and disguisedly unemployed, leads to a larger figure for employment income in the study area.

About 25% of off-farm income is originated from sale of homemade farm implements. This is due to that fact that the study area is center for the surrounding PAs and closer to the larger market in the district which is Dukem. Another significant source of off-farm income in this study area is business. According to this study, business refers to trade activities which are formally established within the area or outside by sampled households. According to the survey result, about 17% of off farm income is composed of this source. Sales of fire wood/charcoal, grass/hay, house rent and handicraft contribute on average about 8%, 7%, 3% and 1.5% of total off farm income, respectively.

The average share of off-farm activities to total income is found to be about 11%. Meaning that, on average, off farm activities comprise 11% of the total income earned by a household in a year. But when we look at average percentage share of each activity, only employment and sale of homemade farm implements exceed 2% average share. As we have discussed earlier, despite the potential of study area towards income diversification, the average contribution of each diversified activities to total income quite small. The following figure depicts the contribution of off-farm and

farming activities to the total income of the household. (Appendix, Figure 1)

### Major Sources of Farm Income

The household survey witnessed that, all the sampled households in the study area are engaged in agricultural activities. More specifically, almost all of them are involved in crop production and more than 50% of them engaged in both crop and livestock production. This is consistent with national estimate of the country, where more than 80% of the population is engaged in agriculture, Central Statistical Agency of Ethiopia (2010). The major crops produced in the study area include Teff which is a staple food in Ethiopia, wheat, maize, and other cereals. Poultry rearing, fattening, sheep and goat production are the major livestock production activities in the study area. The following pie chart shows the average percentage share of major agricultural activities in the study area [Appendix, Figure 2].

The average income earned from crop production was found to be ETB 18,422.00 (US\$ 1083.6) per year which is about 66% of the income earned from agriculture and 60% of the total income earned by the sampled households.

Though vegetable production is one part of crop production, it is better to look at how farmers diversify their crop production. To this end, the study tried to look at vegetable production separately. Consequently, the average income from vegetable production was found to be ETB 431.00 (US\$ 25.4) per year; which is about 2% of the total income from agriculture. This implies that farmers in the study area mainly produce cereals. This is because they are dependent on rain-fed agriculture which is not suitable for vegetable production in the locality.

Livestock production is the major income source next to crop production. It comprises about 32% of the total income from agriculture and about 29% of the total income earned by the farmers in a year. The average

income per year from this activity was found to be ETB 9,162.00 (US\$ 538.9).

### Econometric Results

Despite the fact that the descriptive statistics from the household survey gave us the overall picture of the data set, it is so difficult to make inference about the population without appropriate econometric estimation. Therefore, left censored Tobit regression model was applied to look at the effect of each explanatory variable on the dependant variable (income diversification). From econometric result (Table 6), nine variables out of fourteen were found to be significant. In subsequent paragraphs, we will discuss which variables are significant or not and why.

Sex of the household is found to be negative and insignificant. The negative sign of this variable indicates that being male headed household has a negative impact with income diversification but not significant. In other words, female headed households tend to involve in off-farm activities compared to the male headed households. This is because agricultural activities are laborious and most of the activities such as plowing, harrowing, sowing and harvesting are meant for male. Therefore, even if they do have enough area of land to cultivate female headed households prefer to hire a daily laborer for such activities and in the mean time they involve in different off-farm activities. On the other hand, male headed households tend to involve in the farming activity as long as they have the required area of land. Since there are a few female headed households in the study area, the econometric result shows that being male headed or female headed does not have significant effect on income diversification. Livestock holding, credit taken and input use are amongst insignificant variables in the model. As we have seen in the descriptive part of this paper average livestock holding for households who diversified their income and who did not is almost similar.

Therefore it does not have any significant influence on the diversified income. The credit facility in the study area is not well developed. As a result, more than 50% of the sampled households do not have credit access. Therefore the econometric result confirms that this variable has no influence over income diversification in the study area.

In line with a research by Nega (2003) in Ethiopia, age of the household head has negative and significant influence over income diversification at 1% significance level. Risk aversion behavior of household heads as they become older and older their working potential at old age could be a probable reason for the significance of this variable. As the farmers' age increases their risk aversion also increases. As a result older farmers hesitate to invest their money in a new business to diversify their income. The older the farmer is the higher will be his/her

vulnerability to various limiting factors of income diversification. The econometric result clearly depicts this fact. For instance, a one year increment in the age of the household head decreases the income earned from off farm activities by ETB 303.5 (US\$ 17.8). Another probable reason for this inverse relationship could be, as age of the farmer increases, he/she can't be able travel long distance to find employment opportunities thereby unable to participate in laborious construction works which is one of the major sources of off farm income in the locality. Generally, the econometric analysis says that, as the age of the household head increases the income from off farm activities for that particular household tend to decrease significantly. **Table 6**

Family size is also found to be among the most influential variables in the model. It has a positive significant effect on income diversification at 1% significance level. Unquestionably, land is a fixed input for all the farmers in the study area. Therefore, it is unproductive to involve all the family members in a certain plot of land. As a result, household members try to find other alternatives to generate income. Thanks to the "agricultural transformation and industrialization" policy of the country, there is an opportunity to the farmers to get employed in construction projects around the locality. As a result of this, the larger the family size is the more the income from off-farm activities. In addition to this, as family size increases members of the family who are capable of working, would participate in one or more off-farm activities stated earlier, which also increase income of the household in question. Nut in shell, this study found that family size as a major factor which affects income diversification in the study area. This result is actually consistent with studies done by Raphael, et al. (2007), Agata et al. (2009) and Oluwatayo (2009).

Land size is found to affect income diversification negatively at 5% significance level. The possible reason for this is that; as farmers land holding increases they require more time and labor to cultivate their land. As a result those farmers with relatively larger area of land tend to involve more in farming activities than those farmers who have smaller area of land to cultivate. In general, the econometric result of this household survey indicates that, households with smaller area of land for cultivation tend to diversify their income and earn more than 5% of their total income from off farm activities. On the other hand, those farmers with larger area of land to cultivate were earning less than 5% of their total income from off farm activities.

The output of the analysis suggests that, the distant the market, the lower is the income from off-farm activities. It is obvious that, if farmers are unable to reach the market to sell their outputs from off farm activities, they could be discouraged to involve in such activities. Moreover, the common off farm activities in the locality such as petty works, selling of local drinks and handicraft require immediate market in order to produce more. A

**Table 6.** Tobit Regression Results

<b>Factors affecting intensity of income diversification</b>	<b>Coefficient</b>	<b>Standard error</b>	<b>p-value</b>	<b>Mean</b>
Sex	-2243.928	1623.473	0.169	-
Age	-303.4993 ***	85.81526	0.001	43.92903
Family size of the household	2619.459 ***	481.2966	0.000	5.890323
Land size in hectares	-1494.559 **	738.2279	0.045	2.105806
Livestock holding	-88.93325	267.4478	0.740	5.771355
Input use	-679.0243	2080.236	0.745	-
Average distance from market in hours	-2800.991 **	899.9871	0.002	2.709677
Credit taken	-789.6593	1422.345	0.580	-
Number of extension visit per year	165.4809 **	67.72769	0.016	32.59355
Income from agriculture	.0541667*	0.0327445	0.100	28014.9
Education level (illiterate)	-9256.433**	3654.645	0.012	-
Education level (read and write)	-8088.169**	3688.287	0.030	-
Education level (primary)	-7183.2	3576.624	0.047	-
Education level (secondary)	-2368.726	3976.047	0.552	-
Constant	11536.06**	5649.217	0.043	-
<i>Number of Obs = 155</i>				
<i>LR chi2(14) = 109.06</i>				
<i>Prob &gt; chi<sup>2</sup> = 0.0000</i>				
<i>Log likelihood = -859.41318</i>				

The stars \*\*\*, \*\* and \* shows significance of variables at 1%, 5% and 10% significance level respectively.

research on income diversification by Matin (2009) and Raphael et al, (2007) was also found similar result. Generally, distance from market affect income diversification negatively at 5% significance level. Extension is one of the major strategies which have been followed by Ethiopian government in order to increase production and productivity of small holder farmers. Though various Extension services have been delivered to farmers in the study area, the study emphasizes in agricultural extension service. Almost all of the sampled farmers are beneficiaries from this service. I have got an opportunity to discuss with extension workers of the research site about the kind of service they deliver to the farmers. Consequently, in addition to agricultural production techniques, usefulness of new high yielding varieties and usage of yield increasing inputs, the farmers have been given an eye opener about the opportunities and possible sources of off-farm income around the locality. The result of the household survey also indicates that those farmers who have got intensive contact with extension workers tend to diversify their income. More specifically, number of extension visit per year has a positive and significant effect on income diversification at 5% significance level. Various researchers also include this variable in their model and their result is consistent with the aforementioned discussion.

The major source of income, agriculture, has got a positive and significant effect on income diversification at 10% significance level. From the qualitative response of households in the study area, we can conclude that households who earn much more income from agriculture want to invest their income in off-farm activities within and outside their district. As we have discussed earlier, households who earn more of their income from agriculture have excess income to invest in other activities. The survey result implies that after a certain level of income farmers want to establish an additional source of income to improve their livelihood. That means that we can't say any household who generate more of his/her income from agriculture can diversify; rather those households who can generate agricultural income which is higher than their subsistence, could diversify their income.

It is common to find literatures analyzing education level as one variable by giving a serious of numbers for each education level. But it is difficult to interpret the output of education level of such analysis. For instance, if the coefficient for education is significant, how can we infer about each education level? In order to alleviate this confusion, we have analyzed each level as an independent variable given education level above secondary as a control. The coefficients of all levels are negative but the magnitude increases as education level



increases. This implies that being illiterate has a negative significant effect on income diversification. More specifically, the off-farm income for illiterate household head be reduced by 9256.43 as compared to the one who is above secondary. In a similar fashion, household head who can read and write is in a better position of off-farm income than the illiterate one but worse than primary and above. Generally, as education level increases income from off-farm activities also improves. This is because educated farmers have better intellectual ability to look at the existing opportunities and they also have superior chance to get employed.

## CONCLUSION AND RECOMMENDATION

### Conclusion

Based on the research questions and the objectives, we have seen the dominant socio-economic variables affecting income diversification and the pattern of diversification among stallholder farmers in rural Ethiopia, "Akaki" district. According to the researchers' observation and econometric analysis of the survey, income diversification is not well developed among farmers. In spite of the fact that off-farm activities are essentially supplements farm household income and, therefore, are ancillary to the farming component, only 11% of total income is generated from off-farm activities while there is a huge potential for diversification in the locality. Most of the farmers earn their off-farm income from employment, business and sales of homemade farm implements although handicraft, petty works and sales of grass, hay and fire wood contribute very little. The estimation results show that different socio-economic factors may influence the household's access to alternative income sources. The most significant general conclusion of this research is that, age, land size and average distance from market have negative and significant influence on the household's decision towards diversification, while family size, number of extension visit per year and education are variables which boost income diversification among small scale farmers.

### RECOMMENDATION

In a rain-fed agriculture, where farmers are employed only during rainy season, finding alternative source of income is irreplaceable option to improve rural livelihood. This has an economic implication towards employment reduction and improved living standard in rural households. Based on the research findings the following recommendations are put forward.

Though households need to be involved in off-farm activities, financial constraint is one of the obstacles to do so. This is because; there is no well developed and

evenly distributed provision of credit in the study area. Moreover, the existing credit providing institutions require collateral to lend money. Therefore, improvement in financial services in such a way that farmers can easily access credit service without frustrating process would encourage them to think of alternative income sources. For instance, group lending will help both the lenders and borrowers to have control over each other.

Infrastructure development is a back bone for any development. To the contrary, the infrastructure development of the study area is below average. For instance, it is difficult to reach market place due to poor road network. This negatively affects the tendency of diversification among small scale farmers. Therefore, road construction, electricity and telephone services should be developed in order to facilitate income diversification both through farm and off-farm activities.

Though education level is of the significant variables affecting income diversification, Education coverage in the study area is very low. For instance, there are only two elementary schools in each Kebele. Consequently, about 32% of the households are unable to read and write, 35% attend only primary school and only 10% proceeded to secondary school. As witnessed by the econometric result of this study, educated farmers are in a better position to diversify their income thereby increase their livelihood. Therefore, expansion of education coverage will enhance income diversification of households. Generally the concerned body has to work more to increase the access to education in the study area in order to explore the existing opportunity of income diversification via off-farm activities.

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## REFERENCE

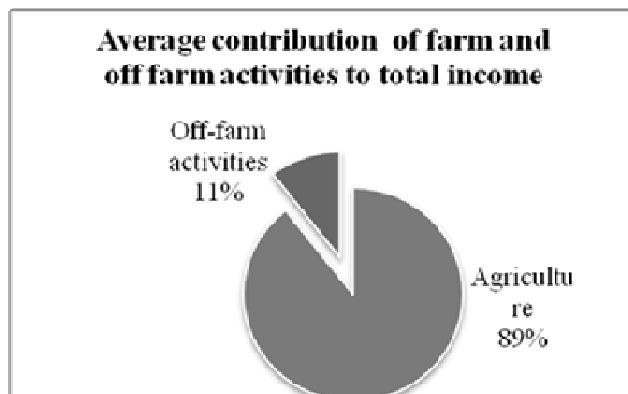
- Abdulai A and CroleRees A (2001). Determinants of income diversification amongst rural households in Southern Mali, Food Policy, 26(4), pp. 437-452.
- Agata P, Swetlana R, Christoph R, Thomas G, Jens-Peter L (2009). *Income Diversification of Farm Households: Relevance and Determinants in Germany*, Department of Agricultural Economics, University of Kiel Olshausenstrasse, Germany.
- Bryceson DF and Jamal V (1997). *Farewell to Farms: De-Agrarianisation and Employment in Africa*, Aldershot, UK: Ashgate.
- Central Statistics Agency of Ethiopia (CSA). (2010). *Summary report of Ethiopia and Various Statistical Abstract*, Addis Ababa, Ethiopia.
- Davis JR (2004). *The Rural Non-Farm Economy, Livelihoods, and Their Diversification: Issues and Options*. Report prepared for Natural Resources Institute, Department for International Development, and World Bank. Chatham Maritime, Kent, UK.

- Deininger K, Jin S, Adenew B, Gebre-Selassie S, Nega B (2003). *Tenure Security and Land-Related Investment: Evidence from Ethiopia*. World Bank Policy Research paper 2991. Washington, DC: World Bank.
- Ethiopia, <http://www.bertelsmann-transformation-index.de/en/> accessed on March 2011.
- [http://siteresources.worldbank.org/INTAFRICA/Resources/Ethiopia\\_Country\\_NotePdf](http://siteresources.worldbank.org/INTAFRICA/Resources/Ethiopia_Country_NotePdf) Accessed July 2010.
- Japhether MW, Hugo D, Martis O, James OO, George O, Lutta M, Obale LM (2007). *Labor allocation determinants of income diversification amongst rural households in maize based farming systems of Kenya*, African Crop science conference proceedings, Vol. 8, pp. 1409-1415 El-Minia, Egypt
- Matin Q (2009). *Off-Farm Income Diversification Among Rural Households In Nigeria: Impact on Income, Food Security and Nutrition*, University of Hohenheim.
- Nega DB (2003). *Non-Farm Employment And Farm Production Of Smallholder Farmers: A Study in Edja District of Ethiopia*, Haramaya University, Ethiopia.
- Nigeria.
- Nigeria: A Gender Analysis Of Livelihood Patterns*, University of Ado-Ekiti,
- Nigeria: Driving forces and household access*, University of Gottingen, Germany.
- Oluwatayo IB (2009). *Poverty and Income Diversification Among Households In Rural*
- Raphael OB and Matin Q (2007). *The role of off-farm income diversification in rural*
- Stiftung B (2010). *Strategies of development and transformation*, country report
- Woldenhanna T and Oskam A (2001). *Income Diversification and Entry Barriers: Evidence from the Tigray Region of Northern Ethiopia*. Food Policy, 26(4), pp.351-365.
- Wooldridge J (2000). *Introductory Econometrics, Modern approach*. 2<sup>nd</sup> ed. New York South western publishers.
- World Bank (2008). *Ethiopia: Climate Factsheet*. Draft. Washington DC: World Bank,

## Notes

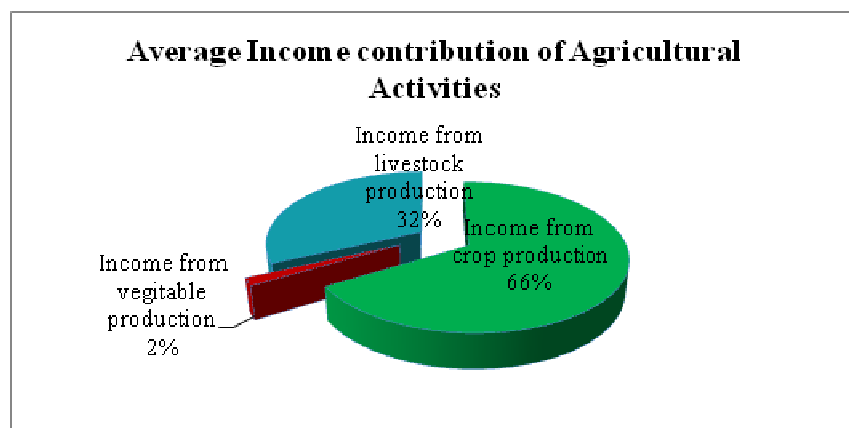
1. Birr is Ethiopian currency divided in to 1,5,10, 50 and 100 paper notes and 1,5,10, 25, and 50 coins. The exchange rate by the time when this study was undertaken was about 0.058824 (ETB 1 = US\$0.059 or US\$1 = ETB 17)
2. Mean comparison test is a test to know whether there is a significant difference between the two means or not. Meaning, that we are testing the null hypothesis: 'there is no difference between the two mean values'.
3. Farmers are disguisedly employed means that they look employed but not working efficiently. This is because in a rain-fed agriculture farmers are busy of farming activities only during cropping seasons (rainy seasons). In Ethiopia the rainy season is during the month of May to September.

Appendix



Source: Researcher's computation from household survey (2011)

**Figure 1.** Average contribution of farm and off-farm activities to total income



Source: Researcher's computation from household survey (2011)

**Figure 2.** Average income contribution of agricultural activities