

AN EMPIRICAL STUDY OF LIVELIHOODS DIVERSIFICATION STRATEGIES AMONG RURAL FARM HOUSEHOLDS IN AGARFA DISTRICT, ETHIOPIA

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ABSTRACT

Smallholder rural households seek different sources of income to secure and sustain their livelihoods. Nevertheless, diversification of livelihood is influenced by various and still empirically unidentified influences in Agarfa district. Therefore, the study examined livelihood diversification strategies and identified factors responsible for rural household's selection of livelihood diversification strategies in the study area. The finding of multinomial regression indicate that the choice of farm and non-farm strategy were influenced by education level, family size, remittance, agricultural inputs, irrigation and distance from road. The choice of farm and off-farm were affected by irrigation and access to non-farm training. Finally, the choice of a combination of farm, nonfarm and off-farm strategies was influenced by the distance from market. Therefore, rural development strategy should design diverse strategies to address factors influencing smallholder farmers' engagement in non-farm and off-farm activities to improve well-being of the rural societies.

Keywords: Livelihoods Diversification, Non-farm, Off-farm, Multinomial Logit Model.

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Introduction

Agriculture remains the main source of income for the majority of rural population of developing countries. However, a large proportion of rural households modify their economic activities through intensification, extensification or diversification of their agricultural production. Moreover, they diversify their economic activities outside agriculture. According to Binswanger *et al.* (2010), the relative reduction of the importance of agriculture and the expansion in Rural Non-farm (RNF) activities and livelihood diversification are likely features of the process of economic development. Thus, growth in RNF activities is connected with agricultural production.

Smallholder rural farmers generate their means of living from multifaceted sources besides agricultural production. The livelihood of rural population is the outcome of the associations of sophisticated source of income strategies (Kilicet *al.*, 2009). For instance, on-farm (engaged in crop and livestock production), off-farm activities and market or non-market activities are the major livelihood sources pursued by the majority of rural households of less developed as well as developed countries. Role of livelihood diversification, mainly non-farm and off-farm, in creating employment opportunity, spreading out of farm activities, reduced vulnerability to poverty, income increment and improved food security among rural farmers of Sub-Saharan African (SSA) countries, including Ethiopia is well known (Haggblade *et al.*, 2010; Adewunmiet *al.*, 2011; Benedito *et al.*, 2011; Bernardin, 2012).

Although enhancing agricultural production is considered to improve the lives of rural people and to ensure food security, the sector is not capable to supply ample means to run away out of poverty and food insecurity for a large amount of low income farmers (World Bank, 2008; Asmah, 2011). This shows that agriculture alone cannot provide adequate livelihood opportunities in many rural areas to support their economy. World Bank Report, 2008 also suggests that pathways out of rural poverty, besides agriculture, are diversification activities. The people's livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture. Studies conducted by Winters *et al.* (2010) and Loschet *al.* (2011), in Sub-Saharan Africa show that farmers are more and more expanding their livelihood activities through combination of on-farm and non-farm sources to secure their income.

According to Canali and Slaviero, 2010, low productivity of the smallholder agriculture in Ethiopia resulted in a vicious circle of poverty and chronic food insecurity. Factors such as very small landholdings, nature of rainfall patterns, backward production technologies, absence of insurance markets, drought, floods, crop loss due to pest and/or disease, seasonality of agriculture, low level of irrigation usage, poor road status and gaps in market access in rural areas are the main reasons for the low agricultural productivity in the country. For instance, International Food and Agricultural Development (IFAD, 2011) indicated that most of the Ethiopian rural people are poor with access to one hectare or less of land. Moreover, return from agricultural activities is

very low in Ethiopia. One of the reasons is very small per household landholding size (Sisay, 2010). On the other hand, opportunities for employment in non-farm sources are scarce in the country (Gebrehiwot and Fekadu, 2012). Hence, if different livelihood strategies stand in this condition, both the current and future generation will confront serious challenges. Therefore, it is critical to understand that income from non-farm and off-farm strategies enable rural households to smoothen their consumption and move into high earning and more sustainable income.

In Ethiopia, rural farmers involved in non-farm and/or off-farm strategies complement their agricultural production and productivity (Beyene, 2008). However, some rural households of the study area allocate their work time between farm and off-farm/non-farm activities to have secure income (consumption) for their family members, while others are engaged in farming only. But, it is not clear why some households engage only in farm activities, while others engage in on-farm and non-farm strategies. Therefore, the study was conducted to examine livelihood diversification strategies, pursued by smallholder farmers and to identify the major issues which are influencing rural household's choice of livelihood diversification strategies in the study area.

Review of Related Literature

Reasons for Rural Households to Diversify

Income Sources: The major reasons that force individuals and households pursue diversification as a livelihood strategy are pull and push factors. Pull factors will catch the attention of farmers to

the non-farm activities to get more profits, in contrast to agricultural activities. This means, households diversify by their choice for various reasons which may not necessarily force them to diversify. The need to enhance income to improve the general quality of life of rural people, particularly poor people such as achieving food security, upgrade housing, educate children, build-up assets or otherwise improve the household's standard of living are the pull factors. Voluntary diversification is opted with the goal to maximise profits (Kilicet *al.*, 2009).

According to Kilicet *al.*, 2009 and Oseni and Winter, 2009, the second type of diversification (push factors or necessity) occur by force to cope risk. Necessity refers to unintentional and desperation reasons for diversifying livelihoods. Examples might be dispossession of a tenant family from its access to land, fragmentation of farm holdings on inheritance, environmental deterioration leading to declining crop yields, natural or civil disasters like drought, floods or civil war resulting in dislocation and abandonment of previous assets or loss of the ability to continue to undertake strenuous agricultural activities due to accident or ill-health.

Empirical Studies on Livelihoods

Diversification: Agbolaet *al.* (2008), studied livelihood diversification and food insecurity in the farming household of Osun State of the Southwestern Nigeria. They found that livelihood diversification strategies have an important role in achieving food security. The findings showed that 60, 10, 8, and 22 per cent of smallholder

farmers engaged in agricultural production, agricultural crop production, off-farm income, animal production and agricultural crop production, respectively for their livelihood diversification. It was found that food insecurity among farming households was influenced by income diversification strategies. Similarly, Barrett (2008) studied livelihood diversification in rural Africa. He found that asset, off-farm and non-farm activities are placed at the heart of livelihood diversification strategies.

Sisay (2010) undertook the study on off-farm income generating activities of smallholder farmers in rural areas of Ethiopia. He found that poor farmers are engaged in off-farm due to the 'push factor', while the rich are involved for the sake of choice. Moreover, his finding indicates that off-farm activities encompass about 35 and 18 per cent of households' income for poor and rich farmers, respectively. Furthermore, results shows that poor people rely on off-farm activities for their livelihood. Thus, off-farm income generating activities play a great role in declining/eliminating poverty and income disparity among rural households.

Stampini and Davis (2009), conducted the study on the role of rural non-farm income in covering expenses of agricultural inputs in rural Vietnam. They reported that income generated from non-farm by rural farmers is connected with expenses on agricultural inputs, hired labour and veterinary services. Similar findings in Nigeria indicate that involvement in non-farm income has positive effect on inorganic fertilisers expenses (Oseni and Winter, 2009). Anriquez and

Daidone (2010) study the impact of rural non-farm employment on farm inputs in Ghana. Their result shows that growth of non-farm activities enhances the utilisation of improved agricultural technologies. Senegal, Maertens (2009), reported that smallholder farmers, engaged in non-farm activities, use more fertilisers, insecticides, pesticides and herbicides for their agricultural production and productivity, than their counterparts.

Sisay (2010) conducted the study on factors influencing the involvement of rural households on off-farm activities in rural Ethiopia. His result shows that size of family and education level has positive influence on diversification strategies of livelihoods. The same result was reported by Dilruba and Roy, 2012 and Saha and Bahal, 2010 in West Bengal; Olale *et al.*, 2010 in Western Kenya; Adugna, 2012 in Southern Ethiopia and Asmah (2011) in Ghana. These investigations elucidate that the higher educational level of the household will build-up their capacity of engagement in livelihood choices. Oluwatayo (2009), in contrast, enlightens that people with high educational status in rural Nigeria obtain improved fee from formal employment and have no interest to involve in other choices of livelihoods.

According to Sisay (2010), age of the household has no significant influence on livelihood diversification. But, rural households' aspiration to diversify increases with age (Olale *et al.*, 2010; Wanyama *et al.*, 2010; Dilruba and Roy, 2012). Simtowe's (2010) in Malawi and Oluwatayo (2009) in Nigeria report

that the chance of livelihood diversification is more linked with female households than men. However, Asmah (2011) in Ghana found result which is different from this view. Studies in other countries like Kenya indicate that male farmers have greater likelihood of diversifying into horticultural production because of their access to land. Hence, Olale *et al.* (2010) found that men have more probability to diversify than females.

Access to market information is important for livelihood diversification of smallholder farmers to enhance their agricultural productivity, improve their quality of life, sell output and buy agricultural inputs and open opportunity for non-farm wage employment and self-employment activities (Chamberlin and Jayne, 2012; Winters *et al.*, 2009). Rural households with access to market infrastructure are involved in markets activities, while those who lack those essential opportunities largely do not (Barrett, 2008). Rukhsana and Shahbaz (2009) hypothesised that remittance was the possible variable affecting income. The authors established relationship between income and foreign remittances. Finding of the study revealed that remittances helped in eliminating poverty, thereby enhancing income. Remittances increased the money supply and stimulated demand for consumption and investment.

Better infrastructure such as roads is highly related to greater chance for farm and non-farm activities to raise their agricultural production (Djurfeldt *et al.*, 2008). Less touched in the literature is the role of geography in determining

rural income diversification patterns. Deichmann *et al.* (2008), identify two main strands of literature that help frame the arguments around location and income diversification. First, one key empirical regularity of the rural farm/non-farm employment (and income) literature is that at very low levels of development, non-farm activities tend to be closely related to agriculture. When agricultural growth starts taking off (e.g. due to technical change), so does the non-farm economy, thanks to the backward and forward linkages from agriculture. Such growth patterns are likely not to be location-neutral, as the potential for agricultural growth (e.g. agro-climatic conditions) and demand for agricultural products are not randomly allocated across space. Over the course of time, endogenous sectoral growth biases may play a role, as infrastructure and other investments may tend to locate where growth is occurring, leading to increased spatial disparities in growth patterns. The second key strand of literature is the new economic geography debate, which focuses on the extent to which geography, as opposed to institutions, explains differential development outcomes. One main tenet of that debate is that even if soil quality and climate were the same everywhere, location would still matter. On the one hand, dispersion of economic activities occurs as firms tend to locate in areas with lower wages, and the production of non-tradable goods and services locates close to demand. Activities connected to non-mobile inputs (such as agricultural land) are by definition going to be spread over space to some extent. On the other hand, agglomeration

pushes businesses to locate close to consumers or to the source of raw material. Businesses depending on mobile inputs, but with higher transport costs for their outputs would tend to have the highest gains from concentrating in particular locations. Agricultural potential and distance may interact in determining locational advantage, occupational choices and returns to economic activities. Bringing these arguments and evidence together, it becomes clear that both exogenous physical location, as well as the interaction between sectors (and factor markets) and endogenous issues related to policies (infrastructural as well as sectoral policies) come into play in complex ways that make it less than straightforward to predict the spatial location of economic activities in rural areas.

Methodology

Description of the Study Area: The study area, Agarfa district, is located at 460 km to south-east from the capital city of Ethiopia which is Addis Ababa. The total population of the district is 1,32,005 of which 63, 244 are men and 68,761 women (CSA, 2007). It encompasses a total of 1,14,084 hectares of land. The district's minimum and maximum temperature is 10°C and 25°C respectively, whereas its annual rainfall ranges from 400 to 1200 mm with an altitude 1250 to 3500 m above sea level. Wheat, barley, red pepper and maize are the main crops produced in the locality and cattle, goats, sheeps, horses and donkeys are the dominant animals reared. Furthermore, petty trade, services, poultry and honey bee production are other income sources of the area (Agarfa District Agriculture and Rural

Development Office, 2014-unpublished).

Sampling Techniques: The study involved a multi-stage sampling. First, Agarfa district was selected purposively. Second, the kebeles of the district were stratified into three as near, medium and far, based on distance from district's town. Then, three kebeles were selected through simple random sampling from each category of distance. In the third stage, sampling frame was gained from each kebele's office. Next, members of each kebele were stratified into two groups as male and female-headed households, based on gender. In the fourth stage, sample households are drawn from each stratum based on probability proportional to sample size methods. Lastly, lottery method was applied to select 150 households (125 male and 25 female-headed households).

Data Collection: Quantitative primary data were gathered from selected sample households using interview schedule tools while focus group discussions and key informant interview tools were used to collect qualitative data. Secondary data were gathered from different sources such as agriculture office of the district, journal articles, reports of government and non-government organisations, theses, books and conferences.

Data Analysis: Quantitative dummy variables were analysed using percentage, frequency and chi-square test to see the existing relationship between categorical or dummy variables and livelihood diversification strategies, while quantitative continuous variables were analysed

using F-test (one way ANOVA), mean and standard deviation to see the existing relationship between continuous variables and livelihood diversification strategies. The qualitative data were categorised and narrated for analysis. Multinomial logit model was applied to test the association of the independent variables with livelihood diversification strategies. The software used to analyse data were SPSS version 16 and STATA version 11.

Specification of Multinomial Logit Model:

The dependent variable, choice of livelihood diversification strategy, is a polytomous variable. Thus, if the dependent variable is categorical and has more than two levels, multinomial logit model needs to be employed (Brown *et al*, 2006). Hence, the multinomial logit model for a multiple choice is specified as follows:

Assume for the i^{th} sample household faced with j choices, the study specifies the utility choice j as:

$$U_{ij} = Z_{ij}\beta + \varepsilon_{ij} \quad (1)$$

If the sample household makes choice j in particular, then it is assumed that U_{ij} is the maximum among the j utilities. Therefore, the statistical model is derived by the probability that choice j is made, which is:

$$\text{Prob}(U_{ij} > U_{ik}) \text{ for all other } k \neq j \quad (2)$$

Where, U_{ij} is the utility to the i^{th} sample household from livelihood strategy j

U_{ik} is the utility to the i^{th} respondent from livelihood strategy k .

If the household maximises its utility, defined over income realisations, then the household's choice is simply an optimal allocation of its asset endowment to choose a livelihood that maximises its utility (Brown *et al*, 2006). Thus, the i^{th} household's decision can be modeled as maximising the expected utility by choosing the j^{th} livelihood strategy among J discrete livelihood strategies, i.e,

$$\max_j = E(U_{ij}) = f_j(x_i) + \varepsilon_{ij}; j = 1 \dots J \quad (3)$$

In general, for an outcome variable with J categories, let the j^{th} livelihood strategy that the i^{th} household chooses to maximise its utility could take the value 1 if the i^{th} household choose j^{th} livelihood strategy and 0 otherwise. The probability that a household with characteristics x chooses livelihood strategy j , P_{ij} is modeled as:

$$P_{ij} = \frac{\exp(X'_i \beta_j)}{\sum_{j=1}^J \exp(X'_i \beta_j)} \quad J=1 \dots 4 \quad (4)$$

With the requirement that $\sum_{j=1}^J P_{ij} = 1$ for any i

P_{ij} = probability representing the i^{th} sample household's chance of falling into category j

X = Predictors of response probabilities

β_j = Covariate effects specific to j^{th} response category with the first category as the reference.

According to Greene, 2003, a convenient normalisation that removes indeterminacy in the model is to suppose that $\beta_1 = 0$. Therefore,

that $\exp(X_i'\beta_1) = 1$, implying that the generalised equation (4) above is equivalent to

$$\Pr(y_i = j/X_i) = P_{ij} = \frac{\exp(X_i'\beta_j)}{1 + \sum_{j=1}^J \exp(X_i'\beta_j)}$$

$$\Pr(y_i = 1/X_i) = P_{i1} = \frac{1}{1 + \sum_{j=1}^J \exp(X_i'\beta_j)} \quad (5)$$

Where: $y = A$ polytomous outcome variable with categories coded from 1... J. (6)

Coefficient Interpretation of the Model

In multinomial logit model predicted probabilities are interpreted using the marginal effect (Greene, 2003). Therefore, every sub-vector of $\hat{\alpha}$ enters every marginal effect both through probabilities and through weighted averages that appear in δ_{ij} . By differentiating equation (4)

above, the marginal effects (δ_{ij}) of individual characteristics on the probabilities are specified as:

$$\delta_{ij} = \frac{\partial P_{ij}}{\partial x_i} = P_{ij} \left[\beta_j - \sum_{j=0}^J P_{ij} \beta_j \right] = P_{ij} [\beta_j - \beta] \quad (7)$$

Where, δ_{ij} denotes the marginal effect (the coefficient), of the explanatory variable on the probability that alternative j is chosen.

Operational Definition of Variables and Hypothesised Relationships

Dependent Variable: It is a polytomous variable which represents the household livelihood diversification strategies. Therefore, the polytomous dependent variable for multinomial logit was defined as follows to have the following values: $Y = 1$, if a farm household is pursuing farming only; $Y = 2$, if selecting farming and non-

Table 1: Definition of Explanatory Variables

Explanatory/Independent variables	Nature	Value/Measurement	Expected sign
Gender	Dummy	1 = male and 0 if female	+ve if male
Age	Continuous	Age of the households in years	-ve if old
Education level	Continuous	Number of years of formal schooling	+ve if high years
Family size	Continuous	Number of persons	-ve if large size
Dependency ratio	Continuous	Dependents to independents ratio	-ve if high ratio
Receiving remittances	Dummy	1 if yes and 0 if no	+ve if yes
Farm size	Continuous	The total farm size in hectares	-ve if large size
Livestock ownership	Continuous	Livestock ownership in TLU	+ve if large size
Frequency of extension contact	Continuous	Number of contacts per year	+ve if more contacts
Use of improved agricultural inputs	Dummy	1 if Yes and 0 if No	+ve if yes
Utilisation of irrigation	Dummy	1 if Yes and 0 if No	+ve if yes
Access to non-farm training	Dummy	1 if Yes and 0 if No	+ve if yes
Utilisation of formal credit	Dummy	1 if Yes and 0 if No	+ve if yes
Distance from market	Continuous	Distance to market in hours	-ve if large distance
Distance from road	Continuous	Distance to road in hours	-ve if large distance

Source: Own Definition, 2014.

farming; Y= 3, if adopting farm with off-farm activities; Y= 4, if choice is a mixture of farm, non-farm and off-farm activities.

Results and Discussion

Characteristics of Sample Farm Households, Human Capital and Household Livelihood Diversification Strategies: Male and female-headed households constitute 83.3 and 16.7 per cent of the sample, respectively. As indicated in Table 2, female households' participation in off-farm/non-farm activities was less than male households' participation due to their triple domestic roles. In the survey, the average age of the respondents was 44.68 years and the average years of attained formal schooling of the sampled household head is grade five (Table 3).

The average household size is six members which is more than that of the national average, i.e., five persons per household (CSA, 2010). This indicates that having more family size, but less than that of the national average, helps to improve the living condition of the household through participating in numerous sources of livelihoods. According to the survey result, the mean dependency ratio was 1.027. This briefly indicates that, one productive labour force of household member covers up all the expenses of 1.027 unproductive members of household.

Natural Capital and Household Livelihood Diversification Strategies: Regardless of the size, all the sampled households have ensured that they own land they operate. The mean farm

size was 2.3 hectares. As Table 3 shows, higher the farm size households, lower their concentration to participate in non-farm and off-farm livelihood strategies.

Physical Capital and Household Livelihood Diversification Strategies: The mean livestock holding in TLU is 6.81 per household (Table 3). This shows that majority of the households residing in Agarfa district own large herd sizes due to the availability of grazing land and ample animal health services. The survey revealed that 32.7 per cent of the selected households were irrigation users while 67.3 per cent of them non-users (Table 2).

The result from chi-square test show that irrigation utilisation significantly affects the choice of households' to diversify at less than five per cent. That means households who have large irrigation land have better chances to diversify. The reason behind this is that with such irrigation opportunities, they can produce crops twice or thrice a year, instead of once which would create agricultural surplus for households who have irrigable land. This surplus can be used for doing non-farm activities, particularly self-employment activities.

Social Capital and Household Livelihood Diversification Strategies: Survey result showed that the mean walking time to reach the nearest market was 1.25 hours. In relative terms, households engaged in a combination of on-farm, non-farm and off-farm incomes have a better access to the nearby market place (Table 3). Thus, households near to the market area have the

chance to engage in non-farm and off-farm income generating activities which in turn promote and sustain their livelihoods. The mean walking time for the sample households to reach the nearest all-weather main road to avail bus or any other transport facility was 0.99 hours. Table 4 indicates that the longer the mean walking time from households' village to all-weather road, lesser the tendency to diversify.

Financial Capital and Household Livelihood Diversification Strategies: The study findings show that 40.7 per cent of the sample households received credit, while 59.3 per cent of them did not, due to various reasons such as high interest rate (38 per cent), fear of loan repayment time (7 per cent), longer distance of credit institutions from their locality (5 per cent), and unavailability of the credit institutions (2 per cent). The result further showed that the proportion of households that get remitted was 29.3 per cent, whereas 70.7 per cent of them did not receive remittance. As Table 2 shows, households engaged in farm and non-farm activities get remitted than the others. The reason behind this is because of their social linkage with their friends and/or relatives alive in towns and engaged in skilled or expert-based non-farm income generating activities. Thus, they earn money from them.

Institutional Supports and Household Livelihood Diversification Strategies: Survey result showed that 40, 30.7, 21.3, 7.3 and 0.7 per

cent of the household heads get extension contact 52, 12, 24, 4 and 0 times a year, respectively (Table 2). This indicates that households who are engaged only in farm activities were more frequently contacted extension agents. The possible justification for the percentage of contact difference is that a household who has the frequent contact with extension agents has a potential to improve agricultural production and gain high income from agricultural production which in turn allows him/her to start non-farm activities. Result also revealed that 64.7 per cent of sample households, utilised different improved agricultural inputs while 35.3 per cent of them did not utilise in the previous cropping seasons due to expensive inputs (20.7 per cent), unavailability (8 per cent) and lack of awareness (6.7 per cent). Participants of focus group discussion raised that extension experts recommend the farmers to use 150-200 kg of DAP per hectare.

The finding indicates that 26 per cent of the sample households took training, while 74 per cent of them were never trained. The result from chi-square test indicates the presence of significant difference among the households engaged in diversification activities at less than 10 per cent level of significance (Table 2). This means, households who took training were found to participate in non-farm activities than the

Table 2: Summary of Categorical Variables Across Income Diversification Strategies

Independent variables	Response of sample households	Household income diversification strategies (%)				Total (N=150)	χ ²
		Farm only (N=75)	Farm and Non-farm (N=48)	Farm and Off-Farm (N=16)	Farm, Non-farm and Off-Farm (N=11)		
Sex	Male	84	83.3	81.2	81.8	83.3	0.09
	Female	16	16.7	18.8	18.2	16.7	
Remittance	Yes	6.7	62.5	18.8	54.5	29.3	48.29***
	No	93.3	37.5	81.2	45.5	70.7	
Credit utilisation	Yes	38.7	41.7	37.5	54.5	40.7	1.08
	No	61.3	58.3	62.5	45.5	59.3	
Use of inputs	Yes	69.3	54.2	75	63.6	64.7	3.78
	No	30.7	45.8	25	36.4	35.3	
Use of irrigation	Yes	26.7	47.9	18.8	27.3	32.7	7.85**
	No	73.3	52.1	81.2	72.7	67.3	
Non-farm training	Yes	26.7	22.9	12.5	54.5	26	6.43*
	No	73.3	77.1	87.5	45.5	74	
Frequency of extension contact	0	0.0	0.7	0.0	0.0	0.7	13.21
	4	4	0.7	2	0.7	7.3	
	12	13.3	13.3	2.7	1.3	30.7	
	24	9.3	7.3	2	2.7	21.3	
	52	23.3	10	4	2.7	40	

***, **, * indicate statistical significance at less than 1%, 5% and 10%, respectively. Source: own survey, 2014.

Table 3: Summary of Continuous Variables Across Income Diversification Strategies

Independent variables	Response of sample households Mean (SD)	Household income diversification strategies (%)			Total (N=150) F	
		Farm only (N=75) Mean (SD)	Farm and Non-farm (N=48) Mean (SD)	Farm and Off-Farm (N=16) Mean (SD)		
Age (years)	44.49 (11.19)	44.83 (9.10)	45.75 (11.44)	43.73 (14.58)	44.68 (10.77)	0.09
Education level (years)	5.28 (2.94)	4.21 (3.12)	6.56 (4.69)	4.82 (3.34)	5.04 (3.29)	2.37*
Family size (number)	5.97 (2.94)	6.44 (2.86)	7.19 (4.66)	5.82 (1.33)	6.24 (2.74)	1.05
Dependency ratio (ratio)	0.99 (0.61)	0.98 (0.64)	1.18 (0.85)	1.06 (0.71)	1.02 (0.65)	0.42
Farm size (hectares)	2.42 (1.05)	2.17 (1.17)	2.17 (1.00)	2.21 (1.11)	2.30 (1.08)	0.65
Livestock ownership (TLU)	7.21 (2.88)	6.34 (3.44)	6.79 (3.16)	6.15 (2.17)	6.81 (3.06)	0.96
Distance from market (hours)	1.26 (0.65)	1.27 (0.75)	1.22 (0.45)	0.99 (0.44)	1.25 (0.65)	0.62
Distance from road (hours)	1.06 (0.71)	0.86 (0.59)	0.99 (0.61)	1.08 (0.77)	0.99 (0.66)	0.87

* indicate statistical significance at less than 10% probability level. Figures in parentheses are the standard deviations.
Source: own survey, 2014.

households who did not take the skill training, since skill training was an important factor to households to diversify to non-farm activities.

Households' Livelihood Diversification Strategies: Households located in a particular context and economy may choose between three main clusters of livelihood options. These are agricultural intensification and extensification, livelihood diversification and migration. Accordingly, the most common livelihood strategies practised in the study area were farming, farm and non-farm, farm and off-farm and a mixture of farm, non-farm and off-farm. Out of the total sampled households, households engaged in farm only, farm and non-farm, farm and off-farm and a mixture of farm, non-farm and off-farm was 75 (50 per cent), 48 (32 per cent), 16 (10.7 per cent) and 11 (7.3 per cent) respectively.

Typology of Income Sources: Besides farming activities, various income generating non-farm and off-farm activities were identified among the districts of the rural households. These activities were categorised into three groups: on-farm (agriculture - crop production, livestock production and sales of animal products), non-farm and off-farm activities.

Non-farm activities refer to non-agricultural activities in which households work as casual labourers in activities outside agriculture. Moreover, non-farm income aggregates a range of activities that span from regular salaried work to self-employed. Accordingly, non-farm income sources are self-

employment, formal employment/pension, remittances gained from both foreign and home countries, renting out land, house and draft animals. In line to this study, off-farm activities refer to sale of labour for agricultural and non-agricultural activities in which households engaged outside their own farmlands. Accordingly, wage work, housemaid and cattle herder were identified as major instances of off-farm activities practised by rural households of the study area.

In each income source category, a number of specific income sources were identified. Self-employment includes shop keeping, petty trade (grain, livestock, coffee, spices, salt, etc.), food processing for sale (local drink like *areqe, tela*), fuelwood and/or charcoal sale, rural crafts (pottery, bamboo work, carpentry, blacksmiths, weaving), fruits sales, services (repair of shoes, barber, grain milling, tailor, traditional healing, etc.). Furthermore, tree planting, sales of grass and crop residues and sharecropping would generate income in the area. These results were also supported by participants of group discussion. Moreover, the result obtained from group discussion revealed that honey, dairy and beef cattle production were practised by some households as an alternative source of income.

Diversification by Level of Income Share and Households Annual Mean Income: As presented in Table 4, crop income accounts for (77.4 per cent), livestock income (10.4 per cent) and income from livestock products sale was 1.09 per cent. Diversification into non-farm and off-

farm activities contributed 10.12 and 0.99 per cent to the total household income, respectively. The results further indicated that self-employment (5.91 per cent), followed by remittance (3.18 per cent) were the most important sources of non-farm income.

Income from rents such as land, house

and draft animals were less prevalent (less than one per cent). Moreover, income from formal employment/pension was the least source of non-farm income. Income from off-farm activities like wage labour, cattle herder and housemaid contributed less than one per cent to the total household income. Income from food processing for sale (local drink like *areqe*, *tela*) and fuelwood

Table 4: Shares of Income from Livelihood Diversification Strategies

Income sources	Share (%)
Crop production	77.4
Livestock production	10.4
Livestock products sale	1.09
Farm income share subtotal	88.89
Self-employment	5.91
Formal employment	0.24
Remittance	3.18
Rent out house	0.34
Rent out draft animals	0.1
Rent out land	0.35
Non-farm income share subtotal	10.12
Housemaid	0.07
Sale of labour for agricultural/non-agricultural work	0.75
Cattle herder	0.17
Off-farm income share subtotal	0.99
Total	100

Source: Own Survey, 2014.

and/or charcoal sale were non-existent in the study area. This is in agreement with the result reported by Nagler and Naudé (2014) that rural non-farm enterprises are largely small and informal in Ethiopia.

The annual mean income of sample households was 49,518 Ethiopian Birr (ETB) per household. The annual mean income for households engaged in farm only, farm and non-farm, farm and off-farm and a mixture of farm,

nonfarm and off-farm income was 37,720; 72,872; 29,712 and 56,855 ETB, respectively. The results indicate that households involved in both farm and non-farm activities earn more income than those households involved in other livelihood diversification strategies.

In order to allow further understanding in terms of income portfolios, analysis of mean income of each activity has advantages. As Table 5 shows, the mean income from crop sale

Table 5: Mean Income from Each Activity

Mean income in Birr per household

Source of income	Farm only (N= 75)	Farm + Non-farm (N=48)	Farm + Off-farm (N=16)	Farm+ Non-farm+ Off-farm (N=11)	Total	F
Crop	31779	53223	22338	41130	38320	2.98**
Livestock	5163.5	5415.5	3962.5	5634.5	5150.6	0.41
Livestock products	313.8	1060.5	268	222.73	541.19	1.46
Self-employment	0	8196.9	0	4145.5	2927	2.21*
Formal employment	0	375	0	0	120	0.70
Remittance	6660	5713.3	2666.7	3983.3	5377.3	0.49
Rent out house	0	530.62	0	0	169.8	9.25***
Rent out animals	0	93.75	0	236.36	47.33	1.31
Rent out land	0	291.67	0	1090.9	173.33	1.91
Housemaid	0	0	0	500	36.66	5.51***
Wage work	0	114.58	2012.5	1609.1	369.33	29.43***
Cattle herder	20	0	631.25	113.64	85.66	5.32***

***, ** and * indicate statistical significance at less than 1%,5% and 10% probability level, respectively
Source: own survey, 2014.

is high for households engaged in farm and non-farm activities, whereas, it was low for households that adopted farm and off-farm households. The main reason that income of the sample households were low, as mentioned by the participants of focus group discussion, was unavailability of off-farm employment. Off-farm employments were rare throughout the year, except during harvesting time in the study area.

Econometric Results

Multinomial Logit (MNL) regression was run to see the effect of hypothesised explanatory variables on households' choice of livelihood diversification strategies.

Model Fitness

The value of Pearson Chi-square indicated the goodness of fit for the fitted model. The

likelihood ratio statistics is significant at less than 1 per cent level. This shows that at least one of the independent variables in the model has a significant effect on households' selection of livelihood diversification strategies. According to Chilot, 2007, multinomial logit model shows the direction of the effect of explanatory variables on the dependent variable. The marginal effect measures the expected change in the probability of a given choice.

Interpretation of the Significant Variables

The result indicates that among 15 hypothesised explanatory variables, six, two and one variables significantly affect the choice of on-farm and non-farm, farm and off-farm and a mixture of farm, non-farm and off-farm strategies, respectively. The multinomial logit model

outcome indicates that education level of sample household (EDU), family size (FAMSIZ), remittance (REMITA), use of improved agricultural inputs (UIMPAI), distance from the nearest market (DMKT), access to non-farm training (ANFTRA), utilisation of irrigation (UOIRR) and distance from the nearest all-weather road (DAWROD) were determining farmers' choice of livelihood diversification strategies (Table 6).

It has to be noted that the multinomial logit estimates are reported for three out of the four categories of livelihood diversification strategies choice. In the multinomial logit, $k-1$ models are estimated for any outcome consisting of k unordered categories. Accordingly, the first alternative (farm only), in this study, was used as a benchmark alternative/reference category/against which the choice of the other three alternatives was seen.

Table 6: Model Results

Variables	Livelihood diversification strategies											
	Farm and Non-farm				Farm and Off-farm				Farm, Non-farm and Off-farm			
	Coefficient	Standard Error	Marginal Effect	Standard Error	Coefficient	Standard Error	Marginal Effect	Standard Error	Coefficient	Standard Error	Marginal Effect	Standard Error
SEX	-0.726	0.761	-0.138	0.093	0.850	0.030	0.030	0.850	-0.516	1.063	-0.016	1.063
AGE	-0.038	0.029	-0.008	0.028	0.033	0.003	0.003	0.033	-0.006	0.041	0.007	0.041
EDU	-0.180	0.089**	-0.038	0.135	0.102	0.017	0.017	0.102	-0.052	0.131	-0.007	0.131
FAMSIZ	0.272	0.114**	0.047	0.265	0.123	0.016	0.016	0.123	-0.040	0.221	-0.007	0.221
DEPR	-0.404	0.472	-0.085	0.284	0.487	0.036	0.036	0.487	-0.139	0.621	-0.002	0.621
FARMSIZ	-0.472	0.311	-0.080	-0.470	0.359	-0.029	0.029	0.359	0.020	0.476	0.010	0.476
LIVEST	-0.052	0.097	-0.008	-0.016	0.118	0.0003	0.0003	0.118	-0.071	0.153	-0.002	0.153
REMITA	3.971	0.693***	0.667	1.162	0.855	-0.054	-0.054	0.855	3.057	0.891	0.051	0.891
FEXTC	0.051	0.289	0.020	-0.325	0.311	-0.030	-0.030	0.311	-0.080	0.405	-0.003	0.405
CREDITU	0.909	0.724	0.174	0.631	0.752	0.034	0.034	0.752	-0.705	1.464	-0.048	1.464
UIMPAL	-1.081	0.580**	-0.225	0.647	0.759	0.083	0.083	0.759	-0.880	0.895	-0.031	0.895
DMKT	0.774	0.513	0.173	0.033	0.643	-0.009	-0.009	0.643	-1.577	0.967**	-0.090	0.967**
ANFTRA	-0.501	0.826	-0.129	-1.465	0.980**	-0.108	-0.108	0.980**	2.598	1.489	0.286	1.489
UOIRR	1.620	0.613***	0.348	0.898	0.809**	0.111	0.111	0.809**	0.924	0.975	0.021	0.975
DAWROD	-1.107	0.555**	-0.219	-0.327	0.639	-0.003	-0.003	0.639	0.730	0.659	0.054	0.659
_CONS	1.508	2.692		-3.018	3.118			3.118	0.215	3.805		3.805

*** and ** indicates significant at less than 1% and 5% probability level, respectively. Number of observation = 150, Log likelihood = -117.609, LR chi2(45) = 107.24, Prob > chi2 = 0.000***, Pseudo R2 = 0.313, Source: own survey, 2014.

Education Level of Household Head (EDU)

As indicated in Table 6, education negatively and significantly affects the household choices of farm and non-farm activities at less than 5 per cent significance level with respect to reference category. According to the model result, keeping other variables constant, the likelihood of diversifying income into farm and non-farm decreases by 3.8 per cent for educated households. In other words, adding one year education can decrease the likelihood of selecting on-farm and non-farm livelihood diversification strategies by aforementioned per cent. The result is in agreement with the result reported by Adugna and Wagayehu (2012).

Family Size (FAMSIZ)

In this study, household size was positively and significantly associated with households' selection of on-farm and non-farm activities at less than five per cent significance level. This implies that increase in number of household member increases the chance of working on farm and non-farm activities due to larger household labour. In other words, adding one person to household member increases the chance of diversifying livelihoods into farm and non-farm activities by 4.7 per cent for those farmers with larger family size with respect to reference category (on-farm only). This result is in agreement with that of Adugna and Wagayehu (2012).

Receiving Remittance (REMITA)

The model identified remittance as it has significant role in income generation of the household apart from agriculture to non-farm at

a significance level of less than one per cent. The elucidation of the marginal effect for households getting remittance shows that, keeping other variables constant, the likelihood of the households to select farm and non-farm activities increases by 66.7 per cent as households' income from remittance increases. This indicates that remittances were important for diversifying rural households' income into non-farm and off-farm activities.

Use of Improved Agricultural Inputs (UIMPAI)

On the contrary to the hypothesis, use of improved agricultural inputs was found to be negatively and significantly affecting the rural farmers' selection of farm and non-farm activities at less than five per cent level of significance. This result revealed that households using improved agricultural inputs likely have less diversified income to non-farm activities than those who did not use. The probable reason for this is that the important role of improved agricultural inputs in enhancing production and productivity of the crops. Those farmers who use the improved inputs may produce more from unit area than those who do not use and this can help them to have more income. This situation may reduce households' engagement in non-farm activities. The negative coefficient shows that, keeping other factors constant, the chance of household's choice of farming with non-farm decreases by 22.5 per cent as the households are using improved agricultural inputs. This is similar with the results of the study undertaken by Yishak *et al.* (2014), but disagree with the result of the study undertaken by Adugna (2008) and

A dugna and Wagayehu (2012) which indicates using agricultural inputs positively related to livelihood diversification.

Distance from Nearest Market (DMKT)

As hypothesised, distance from the nearest market was significantly and negatively related to livelihood diversification into the combination of farm, non-farm and off farm strategies at less than five per cent level of significance. This relationship indicates that households located at far distance from market centres are less likely engaged in non-farm and off-farm diversification strategy. This finding is in consistent with that of Babatunde (2013) that larger market distance have negative effect on off-farm income generating activities. Moreover, this result is in agreement with that of Abera and Manfred (2012) that found households located near to the market centres have more probabilities of getting market accessibility and lower transaction cost. Further, results reported by Babatunde and Qaim (2010) indicate that, distance to nearest market has a negative impact on the probability of non-farm employment by rural farmers. The marginal effect shows that the chance of livelihood diversification into on-farm, non-farm and off-farm activities decreases by nine per cent for those households further away from the market centre by one hour, provided that the other factors remain constant.

Access to Non-farm Training (ANFTRA)

This variable had a negative association with participation in farm and off-farm livelihood

diversification strategies and significant at 5 per cent level of significance. This indicates that household's participation in non-farm training most likely decreases the likelihood of livelihood diversification into combining farm with off-farm activities. The probable reason is that the training improves the skills, knowledge and experiences of households which in turn helps households to get better income to fulfill their family requirements. According to the result of the model, keeping other factors constant, the marginal effect indicates that the chance of diversifying into farm and off-farm activities decreases by 10.8 per cent as the households involve in non-farm training. This is consistent with the study conducted by Yishak *et al.* (2014), but inconsistent with study conducted by Dilruba and Roy (2012) that indicates the positive association of training and livelihood diversification.

Utilisation of Irrigation (UOIRR)

Irrigation utilisation have positive and significant influence on rural households' selection of farm and non-farm as well as farm and off-farm livelihood diversification strategies at less than one and five per cent, respectively. The positive coefficient indicates that households' utilised irrigation have more likelihood to diversify income generating activities into non-farm and off-farm strategies. The probable justification is that irrigation opportunities make multiple cropping which would create agricultural surplus. This surplus can be used for doing nonfarm activities, particularly self-employment activities. Model result reveals that,

keeping other factors constant, probability of livelihood diversification into on-farm and non-farm as well as on-farm and off-farm activities increased by 34.8 and 11.1 per cent, respectively for those households who participated in irrigation activities. This is in agreement with the findings of Dilruba and Roy (2012).

Distance from the Nearest All-weather Road (DAWROD)

As expected, distance to all-weather road negatively and significantly affects household's choice of livelihood diversification strategies into on-farm and non-farm sources at less than 5 per cent, considering the level of significance. This shows that farther the household from main road, lower the probability to involve in non-farm work. Keeping other things constant, the chance of households selecting, on-farm and non-farm strategy decreases by 21.9 per cent as household's residence increase from all-weather road by one hour. This result is consistent with result reported by Babatunde and Qaim (2010) and Wen-Chi Huang *et al.* (2014).

Conclusions and Recommendations for Policy Implications

Survey result revealed that livelihood diversification is not to the expected levels among smallholder farmers of the study area. The findings indicate that only 11 per cent of rural household income is generated from both non-farm and off-farm activities. Therefore, it is possible to conclude that the agriculture sector alone cannot be considered as the core sources

of livelihood promotion for rural farmers to improve their living standard, achieving food and nutritional security and eradicating/declining poverty in the study area. This means that inter-sectoral issues such as non-farm and off-farm activities are essential to enhance the quality of life of rural people, particularly poor people practising agriculture and allied activities.

The finding of the survey revealed that income generated from off-farm and non-farm activities contribute 11 per cent to the total income of sample rural households. In this regard, interventions that expand the opportunity of off-farm and non-farm activities through investments that generate employment and increase the wage to attract rural households in order to diversify their income sources need to be planned. Thus, agriculture and rural development strategies and policies should give attention to enhance non-farm and off-farm sectors in the rural areas in addition to rising agricultural production.

The model result revealed that households of the study area are more probable to have a diversified livelihoods when they have access to market. Thus, concerned bodies have to improve marketing access to rural farmers through building and maintaining physical infrastructures as well as through providing efficient and reliable market information.

Irrigation development at the community level needs to be emphasised for enhancing livelihood diversification since the study area is

conducive for irrigation activities and availability of rivers in the area. Therefore, development planners need to devise locally owned small scale irrigation development strategies.

Self-employment was the major concern in the non-farm income share of rural farm households. Therefore, providing practical support, skill training and connecting rural farm households with rural financial institutions is needed to commence an entrepreneurial culture. The authors would like to thank Ministry of Agriculture and Natural Resources for funding this study. The authors also would like to thank all

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Appendix A

Contingency coefficients for categorical independent variables							
Variables	SEX	REMITA	CREDITU	UIMPAI	ANFTRA	UOIRR	FEXTC
SEX	1	0.065	0.067	0.031	0.02	0.12	0.218
REMITA		1	0.063	0.044	0.052	0.012	0.152
CREDITU			1	0.262	0.547	0.197	0.192
UIMPAI				1	0.211	0.009	0.190
ANFTRA					1	0.183	0.154
UOIRR						1	0.268
FEXTC							1

Source: SPSS output, 2014.

Appendix B

The variance inflation factors of continuous independent variables		
Collinearity statistics		
Variables	TOL	VIF
Age	0.707	1.415
Education level	0.855	1.169
Family size	0.718	1.393
Dependency ratio	0.869	1.150
Farm size	0.686	1.457
Livestock ownership	0.735	1.361
Distance from market	0.638	1.566
Distance from road	0.619	1.616

Source: SPSS output, 2014.

Appendix C

Conversion factors used to estimate Tropical Livestock Unit (TLU)			
LivestockType	TLU	LivestockType	TLU
Ox	1	Mule	1.10
Cow	1	Donkey (adult)	0.70
Calf	0.25	Goat (adult)	0.13
Bull	0.75	Sheep (adult)	0.13
Heifer	0.75	Chicken	0.013
Horse	1.10		

Source: Storck, *et al.* (1991).

Appendix D

Collinearity diagnostic of continuous variables		
Collinearity statistics		
Variables	TOL	VIF
Age	0.707	1.415
Education level	0.855	1.169
Family size	0.718	1.393
Dependency ratio	0.869	1.150
Farm size	0.686	1.457
Livestock ownership	0.735	1.361
Distance from market	0.638	1.566
Distance from road	0.619	1.616

Source: SPSS output, 2014.

Appendix E

Contingency coefficients of discrete variables							
Variables	Sex	Remittance	Credit utilisation	Use of inputs	Access to non-farm training	Use of irrigation	Frequency of extension contact
Sex	1	0.065	0.067	0.031	0.02	0.12	0.218
Remittance		1	0.063	0.044	0.052	0.012	0.152
Credit utilisation			1	0.262	0.547	0.197	0.192
Use of inputs				1	0.211	0.009	0.190
Access to nonfarm training					1	0.183	0.154
Use of irrigation						1	0.268
Frequency of extension contact							1

Source: SPSS output, 2014.

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