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Livelihood Diversification Determinants in the Teff Growing Area of East Shoa Zone of Oromia Region, Ethiopia

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Abstract
This study was proposed with the aim at identifying factors affecting livelihood diversification strategies in the teff farming system and opportunities to livelihood diversification. . The data were obtained from 148 sample household heads of three kebeles that were selected through multi-stage sampling techniques. The data were collected through both primary and secondary data collection methods. Descriptive statistics was applied to characterize the sample households' socio- economic, demographic, agro-ecological location and institutional factors. The finding of the result indicates that 62.8% of the total sample households depend solely on agriculture for their livelihood strategies, while the remaining 37.2% combine agriculture with other activities like non-farm and off-farm. The study also found that despite the available opportunities to household's diversification of livelihood strategies.. Multinomial Logit model was employed in identifying the factors affecting rural household's livelihood diversification strategies. The result indicates that among 16 hypothesized explanatory variables, 9 variables were found to affect household's diversification of livelihood strategies. Accordingly, total family size, household head education level, dependency ratio, remittance receiving and access to irrigation facility have positive and significant effect on diversification of livelihood activities. However, sex of household head, total land holding, market distance, and agro-ecological location have negative and significant effect on diversification of livelihood activities. Therefore, the results of this study suggest that development interventions, policies and supportive services should be designed and strengthened to promote off-farm and non-farm livelihood activities in addition to agriculture to improve the overall wellbeing of the rural societies.

Background
The smallholders'Agricultural exhibit dynamism in terms of intensification, extensification or expansion (Djurfeldt et al. 2008). It characterized by decreasing farm sizes, low productivity, high degree of subsistence farming (Jirström et al., 2011). It was argued that alternative livelihood need to be promoted; even if most non-farm livelihood options tends to be linked directly or indirectly to growth of agriculture (World Bank 2007; Reardon 1997; Ellis and Biggs 2001; Ellis 1999). Recent studies in SSA indicate that rural households are increasingly diversifying their income sources by combining farm and non-farm livelihood activities (e.g. Losch et al. 2011; Winters et al. 2010; Ellis 2005; De Janvry et al. 2002; Barett et al. 2001). The diversification characterize the livelihood strategies of rural households (Barrett, Reardon and Webb, 2001). Livelihood diversification is at the centre of rural development. However, numerous factors could determine the abilities of rural household's to diversify livelihoods. Constraints in the access to asset and asset endowment, lack of options to diversify livelihood activities, institutional and organizational problems are all contributing to determine the ability of rural household's to diversify livelihoods (Carswell, 2000).

All geographic locations do not have similar resource endowments, do not face similar level of constraints and do not necessarily employ similar strategies to solve their problem (Barret et al., 2001; Warren, 2002; Wolde-selassie, 2001). Even within similar geographic locations, socio-economic factors pose a wide range of differentials among rural households which include demographic characteristics of households, well-being or economic and social status of households and the gender disparity perspective. The differences in endowments of resources in turn influence rural households' capability and their survival strategy. This study focused on assessing livelihood strategies choices persuaded by small holder farmers and its determinants Adea district at household level. This study therefore aims to determine factors that affecting rural livelihood diversification and opportunities of rural livelihood diversification in the study area.

RESEARCH METHODOLOGY

The study was conducted in Oromia National Regional State, East Shewa Zone, Ada'a District. Located with an Altitude ranging from 1500m to 2000m above sea level. The average rainfall was is about 839mm. Mean minimum and maximum temperatures ranging from 7.9 to 28 degree centigrade respectively (IPMS 2005).

Research Design
The research design was a cross-sectional study, employing both qualitative and quantitative approaches. The study was aimed at collecting data at one point in time and describing the study population rather than showing the patterns of change which might be witnessed over time. Although the study was conducted at one point in time, some questions in the survey still required respondents to recall the changes in certain variables over a

specified period of time.

Sample Size and Sampling Methods

The study was involved a multistage sampling techniques to select sample households. In the first stage, Ada'a district was selected purposively as it is typical Teff farming system in central Ethiopia. In the second stage, the kebeles in the district were listed based on their agro-ecological characteristics and stratified into highland and midland. Based on this 3 sample kebeles were selected by using simple random sampling from each category of agro-ecological by taking into account the number of kebeles in each agro-ecology. In the third stage, sampling frame (complete village household lists) was obtained from each kebeles administrative office. In the fourth stage, the number of sample households were selected proportional to size technique. Finally, a total of 148 sample household heads was selected by using simple random sampling technique (Table 1).

The total sample size for this study was determined by using the formula developed by Yamane (1967). According to this, sample size is calculated as:

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

Where;

n = Sample size; N = Population; E = Error term

E: designates maximum variability or margin of error (e) = 5% - 10% (for this research proposal 8% was used to be representative and manageable). As margin error gets approach from 5% to 7%, the sample size gets larger and larger which is difficult to manage it and from 9% to 10%, it is unrepresentative. Therefore using 8%, the total sample size of the respondents' household heads from three *kebeles* was 148 (Table 1).

Table1. The distribution of total and sample households in the sample kebeles

Name of Kebeles	Total number of household heads	Sample households heads
Ude	635	31
Kateba	1,126	56
Dadecha	1,237	61
Total	2,998	148

Data types and sources

Both quantitative and qualitative data were collected from primary and secondary data sources to attain the stated objectives of the study. The primary sources of the information were key informants, focus group discussion, observation, and interview of sample household heads. A interview schedule comprising of household demographic characteristics, livelihood assets, livelihood activities and strategies, and vulnerability context, and other issues related to livelihood diversification, was developed in order to collect both quantitative and qualitative data. Focus group discussions and Key Informant Interview were conducted to obtain qualitative data information through cleared stated check list. Direct Observation on the livelihoods of farming households and their living condition was undertaken.

Methods of data analysis

Descriptive statistics and econometric models were used to analyze the data collected from sample households. The statistical significance of the variables was tested for both dummy/discrete and continuous variables using chi-square and one way ANOVA (F-tests). Content analysis was to analyze qualitative data. After computing the descriptive statistics, multinomial logistic regression was used to identify factors affecting household's diversification of livelihood strategies. The data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 20 and STATA 12.

Econometric model specification

The dependent variable, choice of livelihood diversification strategy, is a polytomous variable the appropriate econometric model used was multinomial logit models, (Chilot and Hassan, 2008). Multinomial logit model is a widely used technique in applications that analyze polytomous response categories in different areas of economic and social studies. Wassie et al. 2008 and Brown et al, 2006)

Following Green (2003), the multinomial logit model for a multiple choice problem is specified as follows; suppose for the ith respondent faced with j choices, the study specifies the utility choice j as:

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

If the respondent makes choice j in particular, then we assume that Uij is the maximum among the j utilities. So the statistical model is derived by the probability that choice j is made, which is: Prob ($U_{ij} > U_{ik}$) for all other $K \neq j$ ..... (2)

Where, Uij is the utility to the i^{th} respondent from livelihood strategy j

Uik is the utility to the i^{th} respondent from livelihood strategy k. Thus, the i^{th} household's decision can be modeled as maximizing the expected utility by choosing the j^{th} livelihood strategy among J discrete livelihood strategies, that is:

Maxj= $E(Uij) = fj(xi) + \mathcal{E}ij, j=1.....J$..... (3)

In general, for an outcome variable with J categories, let the j^{th} livelihood strategy that the ith household chooses to maximize 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, Pij is modeled as:

$$Pij = \frac{\exp(X'i\beta j)}{\sum_{j=1}^{J} \exp(X'i\beta j)} \quad j=1 \quad \text{..... (4)}$$

With the requirement that $\sum_{j=1}^{j} Pij = 1$ for any *i*

Where: *Pij* = probability representing the i^{th} respondent's chance of falling into category *j*

X = Predictors of response probabilities

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

A convenient normalization that removes indeterminacy in the model is to assume that $\beta 1 = 0$ (this arise because probabilities sum to 1, so only J parameter vectors are needed to determine the J + 1 probabilities), (Greene, 2003) so that exp (Xi'β1) = 1, implying that the generalized equation (4) above is equivalent to;

$$\Pr(yi = j/Xi) = Pij = \frac{\exp(X'i\beta j)}{1+\sum_{j=1}^{J} \exp(X'i\beta j)}, \text{ for } j=1 \text{ and}$$

$$\Pr(yi = 1/Xi) = Pi1 = \frac{1}{1+\sum_{j=1}^{J} \exp(X'i\beta j)} \quad \text{..... (5)}$$

Where: y = A polytomous outcome variable with categories coded from 1… J. *Note*: The probability of *Pi1* is derived from the constraint that the *J* probabilities sum to 1. $Pi1 = 1-\Sigma Pij$. Similar to binary logit model it implies that we can compute J log-odds ratios which are specified as;

$$\ln\left[\frac{pij}{pij}\right] = x'(\beta j - \beta J) = x'\beta j, \text{ if } , J = 0 \quad \text{.....(6)}$$

The predicted probabilities are better interpreted using the marginal effects of the multinomial model (Greene, 2003). Therefore, every sub vector of β enters every marginal effect both through probabilities and through weighted averages that appears in δij. By differentiating equation (4) above with respect to the covariates we can find the marginal effect of the individual characteristics on the probabilities (Greene, 2003). The marginal effects (δij) of the characteristics on the probabilities are specified as:

$$\delta ij = \frac{\delta pij}{\delta pij} = \left[\beta j - \sum_{j=0}^{j} pij\beta j\right] = pij\,[\beta j - \bar{\beta}]$$

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

Before conducting econometric analysis, the data were checked for the presence of multi-collinearity problem among the continuous explanatory variables and the degree of association among dummy explanatory variables Gujarati (2004), (Brien and Robert, 2007).

Dependent variable

The dependent variable in this study was the selection of diversified livelihood strategies by farm households i.e. it was identified by categorizing the sample households into livelihood strategy groups based on their choice. Therefore, the polytomous dependent variable for multinomial logit was hypothesized to have the following values: Y= 0, if the choice lies in farm alone; Y= 1, if the choice lies in farm + off - farm; Y= 2, if the choice lies in farm + non- farm; Y= 3, if the choice lies in farm + non-farm + off-farm.

RESULTS AND DISCUSSIONS

Demographic characteristics of the sample households

Under the demographic characteristics of the sampled households, variables such as age, sex, dependency ratio, education level and family size of the household heads that were assumed to determine the household's participation in diversified livelihood were taken into consideration. The results of the analysis made for each variable across livelihood diversification strategies of the households were presented as below.

Table 2. Mean/Proportion of households' demographic characteristics

		Households diversification of livelihood strategies						
	Variable	AG	AG+NF	AG+OFF	AG+NF+OFF	Total	χ^2/F-value	Sig.
%	Sex of the household							
	Male	80.6	60	93.3	100	79.1	11.21***	0.01
	Female	19.4	40	6.7	0	20.9		
Mean	Age of the household	46.60	45.80	47.73	46.57	46.57	0.221	0.88
	Family size of the	6.33	7.13	7.63	8.00	6.76	4.91***	0.003
	Dependency ratio	1.11	1.05	1.36	1.44	1.15	1.155	0.32
	Education level	2.8	3.77	3.13	3	3.05	2.93**	0.03

Source: Survey result, 2017. *** And ** stands for statistical significance at 1% and 5% probability level.

Descriptive analysis made on explanatory variables

According to descriptive analysis, some variations were observed between four livelihood groups in terms of households demographic, socio-economic, institutional and agro-ecological characteristics. Among the sixteen variables hypothesized to determine household's livelihood diversification strategies, eleven variables were found to have statistically significant across household's choice of livelihood diversification strategies. F-tests (ANOVA analysis) and chi-square tests were used to make sure presence or absence of difference b/n the four groups of farmers, when appropriate. The mean values of continuous variables in all livelihood categories were compared using ANOVA analysis (F-test). According to F-values out of 8 continuous variables, the four categories were found to differ significantly in 4 of them. The compared F-values indicated the mean differences for four variables, namely family size, land size, education level and total number of livestock owned in tropical livestock units were statistically significant at less than 1%, 5% and 10% probability level.

Table 3. Descriptive statistic for continuous explanatory variables

Variable	**Households diversification of livelihood strategies (Mean)**						
	AG	AG+NF	AG+OFF	AG+NF+OFF	Total	**F-value**	**Sig.**
Age	46.6	45.8	47.73	46.57	46.57	0.221	0.88
Family size	6.33	7.13	7.63	8	6.76	4.91***	0.003
Dependency ratio	1.11	1.05	1.36	1.44	1.15	1.155	0.32
Education level	2.8	3.77	3.13	3	3.05	2.93**	0.03
Land size	20.09	1.5	1.56	1.67	1.89	2.52*	0.06
Livestock ownership	6.53	4.06	5.13	5.19	5.8	4.80***	0.00
Market distance	10.75	12.11	11.43	8.85	10.97	1.14	0.33
Extension contact	2.1	2.17	2.5	3	2.22	1.65	0.18

Source: Survey result, 2017. ***, ** and *stands for statistical significance at 1%, 5% and 10% probability level respectively.

On the other hand, a chi-square test was used to examine the existence of statistically significance difference b/n the discrete/dummy variables of four categories. Accordingly, discrete variables were considered and the four categories were found to be different in terms of 7 of the 8 discrete variables (Table 8). More specifically, the chi-square test reveals that sex of the household, access to credit, participation in cooperative membership, using improved seed, involvement in local leadership, receiving remittance and agro-ecology were statistically significant at less than 1% and 5% probability level.

Table 4. Summary of Descriptive statistic for discrete explanatory variables

Variable	Response	Households' diversification of livelihood strategies (%)					χ^2-value	Sig.
		AG	AG+NF	AG+OFF	AG+NF+OFF	Total		
Sex	Male	80.6	60	93.3	100	79.1		
	Female	19.4	40	6.7	0	20.9	11.2***	0.01
Cooperative membership	Yes	54.8	60	66.7	90	59.5		
	No	45.2	40	33.3	10	40.5	5.02**	0.02
Local leadership	Yes	37.6	40	20	90	39.9		
	No	62.4	60	80	10	60.1	13.14**	0.04
Receiving remittance	Yes	5.5	53.3	43.8	81.8	25		
	No	94.5	46.7	56.2	18.2	75	53.2***	0.00
Improved inputs use	Yes	75.8	70	37.5	72.7	70.3		
	No	24.2	30	62.5	27.3	29.7	9.60**	0.02
Irrigation utilization	Yes	18.7	66.7	25	72.7	33.1		
	No	81.3	33.3	75	27.3	66.9	32.0***	0.00
Credit utilization	Yes	20.4	33.33	20	70	26.4		
	No	79.6	66.7	80	30	73.6	12.5***	0.00
Agro-ecology	Midland	59.3	73.3	56.2	63.6	62.2		
	Highland	40.7	26.7	43.8	36.4	37.8	2.14	0.54

Source: Survey result, 2017. *** And ** stands for statistical significance at 1% and 5% probability level respectively.

Econometric Model Results

Before running the multinomial regression logit model it is necessary to conduct a multicollinearity test. Thus, variance inflation factor was used to test the multicollinearity problem among continuous variables and contingency coefficient was computed to see the degree of association among dummy/categorical variables.

Table 5 Multinomial logit models output

Variables	Households diversification of livelihood strategies								
	Agriculture + non-farm			Agriculture + off-farm			Agriculture + non-farm + off-farm		
	Coefficients	Marginal effect	P-value	Coefficients	Marginal effect	P-value	Coefficients	Marginal effect	P-value
SEX	0.946	0.362	0.285	-2.580	-0.045	0.079*	-18.093	-0.562	0.991
AGE	0.031	0.004	0.303	-0.029	-0.001	0.443	-0.058	-0.002	0.321
EDULHH	0.505	0.047	0.047**	0.129	0.0005	0.692	-0.139	-0.011	0.769
FAMSHH	0.288	0.007	0.108	0.846	0.045	0.002***	0.399	0.002	0.342
DEPR	0.747	0.014	0.071*	1.293	0.048	0.018**	2.655	0.064	0.015**
LANDSIZ	-1.037	-0.086	0.043**	-0.367	-0.002	0.461	-0.406	0.003	0.682
TLU	0.031	0.007	0.823	-0.107	-0.005	0.565	-0.202	-0.005	0.649
AETCON	-0.334	-0.044	0.202	0.344	0.023	0.272	0.570	0.019	0.239
MKTDIS	-0.019	0.003	0.789	0.003	0.003	0.973	-0.396	-0.012	0.042**
IRGU	2.427	0.247	0.005***	-0.947	-0.098	0.339	-0.236	-0.031	0.890
IMPRINPU	0.381	0.030	0.588	-1.131	-0.091	0.163	1.940	0.064	0.267
CREDITU	-0.068	0.013	0.935	-1.809	-0.118	0.169	0.854	0.040	0.591
REMMIT	2.452	0.067	0.004***	4.182	0.166	0.000***	7.295	0.168	0.002***
COOPER	-0.169	0.032	0.836	-1.474	-0.075	0.189	-1.857	-0.045	0.378
LEADER	0.955	0.056	0.205	0.044	-0.032	0.962	2.585	0.068	0.118
AGROECO	-1.454	-0.184	0.089*	0.936	0.065	0.329	2.490	0.090	0.185
_CONS	-6.358		0.009	-6.846		0.026	-5.991		0.175

Source: computed from own survey data, 2017. ***, ** and *stands for statistical significance at 1%, 5% and 10% probability level respectively. Standard errors and z-ratio are not reported here because of space constraints.

Number of observation = 148 Log likelihood = -80.030073 LR chi2 (48) = 152.59

Prob > chi2 = 0.0000 Pseudo R2 = 0.4881

Discussions of the econometric model results

The multinomial logit model analysis shows that nine variables including sex of the household head, family size of the household, dependency ratio of the household, education level of the household, land holding size (ha), market distance (km), access to irrigation facility, receiving remittances, and agro-ecology were the significant variables determining livelihood diversification up to 10% level of significance. However, the magnitude effect of some significant variables is not similar for the three livelihood strategies. Some may be highly significant to affect the choice of a strategy and may be insignificant for the other. Therefore, multinomial logit analysis results indicate selection of each type of livelihood strategy is affected by different factors and at different levels of significance by the same factor. The possible implication and marginal effects of the significant explanatory variables on the choice of household's livelihood diversification strategies are presented as follows:

Sex (SEX): Gender affects diversification options, including the choice of income-generating activities (both farm and non-farm) due to culturally defined roles, social mobility limitations and differential ownership of/access to assets (Galab *et al*, 2002). In the study, it was found that sex had negatively and significantly affected the probability of diversifying the livelihood into off-farm activities at less than 10% probability level. This result implies that the households headed by female are less likely to participate in off-farm activities. The possible reason is households headed by female have more responsibilities in home management. The likelihood of a household diversifying into off-farm activities decrease by 4.5% when household head become female other things keep constant.

Educational level of the household head (EDULHH): In line with prior expectation, education had positively and significantly influenced the household choices of farm + non-farm activities at less than 5% probability level. This indicate that those farmers with high educational level are more likely diversify their livelihood strategies into non-farming activities like acquiring salaried jobs and self-employment activities than those do not. From the model result, the marginal effect reveals the likelihood of a household diversifying into farm + non-farm activities increase by 4.7% for those farmers with more level of education. In other words, adding one grade education can increase the chance of choosing non-farm activities by aforementioned percent. Various authors in their research found education as an essential in increasing off/non-farm earnings and to diversify the rural economy away from agriculture

Family size (FAMSHH): In line with prior expectation, family size was found to have positive and significant relation to diversification of livelihood strategies into farm + off-farm at less than 1% probability level. The positive correlation between family size and diversification might be due to the relation between larger family size and household labour or corresponding higher demand for food in the household which implies that while an additional member to the household increases the likelihoods to participate in agriculture plus off-farm activities in order to meet basic needs to the family. The marginal effect result reveals that, as the number of total family size increase by one, the probability of engagement in off-farm increases by 4.5%. In other words, additional family member decreases the likelihoods to work only on farming.

Dependency ratio (DEPR): As hypothesized, dependency ratio had positively and significantly influenced the household choices of farm + non-farm, farm + off-farm, and farm + non-farm + off-farm activities at less than 10%, 5%, and 5% probability level respectively. This indicates that with increase in dependency ratio the ability to meet subsistence needs declines and the dependency problems make it necessary in the household to diversify their income source (Khan, 2007. Households with higher dependency ratios follow less remunerative non-farm livelihood strategies (Jansen *et el.*, 2004). This means when the dependency ratio increase, the ability of farmers to meet family needs decrease and chance of diversifying their livelihood activities increases. The marginal effect result reveals that, as the dependency ratio increases by one the probability of the household's falling into farm + non-farm, farm + off-farm, and farm + non-farm + off-farm livelihood strategy activities increases by 7.1%, 4.8%, 6.4% respectively.

Land size of the household (LANDSIZ): As hypothesized, the area of land owned by the household had negatively and significantly influenced the probability of livelihood diversification into farm + non-farm activities at less than 5% probability level. This result implies that farmers with large farm size are less likely to diversify their livelihood strategies into non-farm than those farmers who have small land size. The results of this study suggest that rural households with more land tend to follow agricultural extensification rather than diversifying from agriculture since they draw incentives of land productivity. Large farm size helps farmers to cultivate and produce more, which in turn increases farm income and improves livelihood of a household. On the other hand increased role of off/non-farm activities such as selling labor, part-time wage employment, petty trading, especially for poor and less poor households with less land holding and other necessary resources, suggest how households respond to a decreasing ratio of farm size to household. The marginal effect result implies that, the chances of choosing agriculture in the context of having large land size decreases the probability of diversifying into non-farm activities by 8.6 %. In other words, increasing land size decreases the probability of diversifying livelihoods into non-farm activities by 8.6% as farmers with more land supposed to stay on-farm since land stimulates farming.

Market distance (MKTDIS): In line with prior expectation, distance from the nearest market had negatively and significantly influenced the household choices of farm + non-farm + off-farm activities at less than 5% probability level. This result implies that farm households located far from the market center are less likely to diversify their livelihood strategies into farm + non-farm + off-farm than those do not. Access to market may create opportunities of more income by providing in diversifying income through non-farm employment, easy access to input and transport facilities (Asmah, 2011). This means, access to market encourages farmers to invest in their own businesses and increase the quantity, quality and diversity of the goods they produce. Farmers that were able to sell their farm products had significantly more diversified income sources implying that they were better able to access market opportunities and to engage in non-farm activities as indicated by other studies (e.g. Winters et al. 2009; Barrett et al. 2001). On the other hand, if farmers are unable to reach the market to sell their

outputs from non-farm and/or off-farm activities, they could be discouraged to involve in such activities. Moreover, the marginal effect result implies that, as the market distance increases by 1 km, the likelihood of the farm households' participation into a combination of farm + non-farm + off-farm livelihood strategy activities decreases by 1.2%. This result is in line with that of Abera and Manfred (2012).

Irrigation utilization (IRGU): As hypothesized, irrigation utilization had positively and significantly influenced the household choices of farm + non-farm activities at less than 1% probability level. The results of this study suggest that those farmers who have used irrigation are more likely to diversify their livelihood than their counterparts. The possible justification is that irrigation, whether it is modern or traditional, has a great contribution to increase productivity and enhances the income of the household. Moreover, irrigation opportunities make multiple cropping possible which would create agricultural surplus. This surplus can be used for doing non-farm activities, particularly self-employment activities i.e. non-wage activities. From the model result, other things being constant, the marginal effect reveals that the probability of a household diversifying into farm + non-farm activities increases by 24.7% for those households who are participated in irrigation activities.

Receiving remittance (REMMIT): As hypothesized, remittance had positive contribution to the diversification of livelihood strategies apart from agriculture into farm + non-farm, farm + off-farm, and farm + non-farm + off-farm activities at less than 1% probability level. This implies that those farmers who received remittances from foreign/urban relatives are more likely to diversify their livelihood into a combination of farm, non- farm and off-farm activities than those farmers who do not. The results of this study suggest that having relative economic support from abroad and within the country is positively related to the improvement of income by participating in income generating activities such as local trading for which financial capital is required. Moreover, the marginal effect result indicates that, the likelihood of a household receiving remittance increases choice of diversification into farm + non-farm, farm + off-farm, and farm + non-farm + off-farm activities by 6.7%, 16.6% and 16.8% respectively.

Agro-ecology (AGROECO): In line with prior expectation, agro-ecology had negatively and significantly influenced the household choices of farm + non-farm activities at less than 10% probability level. This result demonstrates that the incidence/magnitude of diversifying the livelihood into farming with non-farming increases as we go from highland to midland. The possible reason might be due to differences in the quality and size of land, the amount and distribution of rainfall that influence between highlands and midlands. Diversity in land quality, distribution of rainfall, and ability to grow diverse food crop is different within the agro ecological zones. In the highland the distribution and amount of rainfalls better as compared to midlands. According to focus group discussions those live in highland have got enough rainfall and their soil character/quality is suitable to grow diversity crop (Agricultural intensification). This in turn helps farmers to get access to more food and generate more income that satisfy their family requirements and households may not wonder searching 'demand push' livelihood strategies when compared to those live in midland. From the model result, the marginal effect reveals that the probability of a household diversifying into agriculture plus non-farm drops by 18.4% for highland households.

Conclusion

Agriculture is found to be the dominant economic activity and the primary source of livelihoods for rural households in the study area. About 62.8% of the total sample households depend solely on agriculture for their livelihood strategies. However, due to small farm size, uncontrolled population growth, low levels of output per farm, the agricultural production has been deteriorating over time, and has forced people to look for alternative employment option other than agriculture. A significant number of rural households (37.2%) engage in diverse livelihood strategies away from purely crop and livestock production towards non-farm and off-farm activities that are undertaken to broaden and generate additional income for survival and livelihood improvement.

The multinomial logistic (MNL) regression model results suggested that different livelihood strategies are influenced by different factors. The model result indicated that variables including sex, education level of household, dependency ratio, agro-ecology, land size, irrigation utilization, receiving remittance, family size, and market distance determine livelihood diversification. Accordingly, the model result indicated that the education level of household head and irrigation utilization, family size, and dependency ratio and remittance receiving positively and significantly affected the diversification of livelihood into farm + non-farm, farm + off-farm, and farm + non-farm + off-farm activities, respectively while land size of the household and agro-ecology, sex of the household head, and market distance negatively and significantly affected the diversification of livelihood into farm + non-farm, farm + off-farm, and farm + non-farm + off-farm activities, respectively.

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