Determinants of Rural Household's Livelihood Strategies in Machakel Woreda, East Gojjam Zone, Amhara Nation Regional State, Ethiopia

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Abstract

Rural farm households face an increasing need of looking for alternative income sources to supplement their small scale agricultural activities. However, livelihood strategy is determined by complex and yet empirically untested factors in Machakel Woreda. Thus, the aim of this study was to assess the determinants of livelihood strategies in the study area. The data were obtained from 144 sample household heads that were selected through a combination of multi-stage sampling like purposive and simple random sampling techniques. Data were collected through key informant interview, focus group discussion and interview schedule. Multinomial logistic regression model used to analyze determinants of livelihood strategies. Data analysis revealed that farm alone activities has a leading contribution to the total income of sample households (69.8%) followed by non-farm activities (17.2%) and off- farm activities (13 %.). Crop production was the dominant livelihood in the study area and land fragmentation, decline in productivity, occurrence of disaster risk like crop and livestock disease, hail storm, flash flood etc. and market fluctuation were major threatens of livelihood. Four livelihood strategies namely farm alone, farm plus non-farm, farm plus off-farm and farm plus non-farm plus off-farm were identified. Age, education level, sex of household head, marital status, credit access, farm land size, livestock holding size , agro-ecology, family size, frequency of extension contact, distance from market and total net income were major determinants of livelihood strategies in the study area. From those identified variables, farm land size, educational status, age, livestock holding, family size, extension contact frequency and credit access had significant correlation with farm alone livelihood strategy. Farm plus off-farm livelihood strategy influenced significantly by age, sex, education level and family size variables and farm plus non-farm livelihood strategy was significantly correlated with age, family size and total net income of rural household's. The results of this study suggest that, both agricultural intensification and non/off-farm diversification should be strengthened to attain smallholder households' livelihood security and rural development strategy should emphasis in supporting the payment as well as types of non-farm activities in rural areas.

Keywords: livelihood, farming, non-farm, off-farm, livelihood strategies and determinants

1. INTRODUCTION

According to Birhanu (2010), Ethiopia is one of agrarian countries where small-scale peasant producers dominate its production. About 83.9% of the total population lives in rural areas, of which 90% depend mainly on crop production for its livelihood (CSA, 2008 and 2003).

However, household access to agricultural land has become a growing problem due to population growth. Average holding is diminishing as plots are subdivided to accommodate newly married households while the number of landless households is also rising. Often, production takes place on small and fragmented farm plots. As a result small-scale traditional production has come under pressure, questioning its capacity to cope with the problems of livelihood construction, food security, and environmental protection and poverty reduction (MoFED, 2008; Samuel, 2006).

Hence, looking into the link between farm and non/off-farm activities and their determinants is necessary before policy measures are taken to promote non/off-farm activities (Tassew, 2000). In view of these outstanding issues, various empirical studies have pinpointed the socio-economic rationale of rural livelihoods for pursuing differentiated and contextual livelihood strategies.(Amare and Belaineh, 2013)

Like the national economy of Ethiopia, households in study area are mainly dependent on small scale subsistence agriculture to derive their livelihoods. Nevertheless, the decline in carrying capacity of agriculture forces rural farm households to engage in diverse off/non-farm alone livelihood activities to maintain and improve their livelihood. Comprehending the driving factors of each livelihood strategy is crucial to improve the response mechanisms related to poverty, food security and livelihoods improvement in the study area. However, research work on household livelihood strategies and activities under a condition of resource scarcity in study area is limited. The factors that determine the selection of existing livelihood strategies are not well identified. This study therefore aims to identify the existing livelihood strategies adopted by rural farm households and to assess factors that determine households' choice of available livelihood strategies in the study area.

2. METHODOLOGY

2.1 Description of the Study Area

This study conducted in the year of 2015 in the case of Machakel Woreda. Machakel Woreda is one of 18 districts of East Gojjam Administrative Zone. Amanuel, the capital of the district, situated 328 kms from Addis Abeba and 228 kms from Bahir Dar. Agro ecological zone of the Woreda categorized as 54 % *Woyina Dega* (mid altitude), 37.7 % *Dega* (highlands), 4% *Wurich* (alpine) and2.3 % *Kola* (lowland). (RDAO, 2007).

2.2. Sample Size and Sampling Technique

Multi-stage sampling procedure was used to select samples and their total number is determined using a simple formula developed by (Cochran, 1977). The first stage involved stratification of the district consisting of 24 rural kebeles in to four agro-ecological zones (*Dega woinadega,kola and wurich*) for sample representativeness. Then, a total of 3 kebeles representing the aforementioned agro-ecological zones were selected randomly in proportion to the area coverage of the agro-ecologies. Finally, after identifying the sampling frame containing the complete list of all households within each selected kebele, a total of 144 sample households were randomly selected in proportion to their total number of households.

$$no = \frac{z^2 \, pq}{x^2} \Rightarrow \frac{no}{1 + \frac{no - 1}{N}}$$

Where n0 is the sample size used to determine the real sample size n, Z is the abscissa of the normal curve that cuts off an area α at the tails (1 -α equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, q is 1-p, n is the sample size and N is the population size.

2.3 Data Sources and Collection Methods

Both Primary and secondary data sources used for the successful accomplishment this research. Secondary data were collected from internet, bureaus, offices, and literatures through document reading and note taking. Primary data were collected from the selected sample respondents, key informants and focus group discussants. A structured questionnaire was used to collect quantitative primary data from the selected 144 rural household respondents. Qualitative primary data were collected through focus group discussion with some experts and farmers desire to collect detail information on the stated problems.

2.4 Method of Data Analysis

Both descriptive and inferential statistical tools subjected to analyse the collected quantitative data.

Toanalyse the determinants of livelihood diversification multinomial logit model was used. The assumption is that in a given period at the disposal of its asset endowment, a rational household head choose among the four mutually exclusive livelihood strategies that could offer the maximum utility. Following Greene (2003), suppose for the ith respondent faced with j choices, we specify the utility choice j as:

Uij= Zijβ + εij ....……………………………. (1)

If the respondent makes choice j in particular, then we assume that Uijis the maximum among the j utilities. Sothe statistical model is derived by the probability that choicej is made, which is:

Prob (Uij>Uik) for all other K≠ j ………………………………….(2)

Where, Uij is the utility to the ith respondent form livelihood strategy j

Uik the utility to the ithrespondent from livelihood strategy k

If the household maximizes its utility defined over income realizations, then the household's choice is simply an optimal allocation of its asset endowment to choose livelihood that maximizes its utility (Brown *et al*., 2006). Thus, the ith household's decision can, therefore, be modeled as maximizing the expected utility by choosing the jth livelihood strategy among J discrete livelihood strategies, i.e.,

$$\max_j = E(U_{ij}) = f_j(x_i) + \varepsilon_{ij}; j = 0...J \quad \text{…………………………} (3)$$

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

$$P_{ij} = \frac{\exp(X_i'\beta_j)}{\sum_{j=0}^{J} \exp(X_i'\beta_j)},$$

J=0... 3.. (4)

With the requirement that $\sum_{j=0}^{J} P_{ij} = 1$ for any i

Where: P_{ij}= probability representing the ith respondent's chance of falling into category j

X = Predictors of response probabilities

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

Appropriate normalization that removes an 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 $\exp(X_i\beta_1) = 1$, implying that the generalized equation (4) above is equivalent to

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

for j = 0, 2...J and

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

.... (5)

Where: y = A polytomous outcome variable with categories coded from 0... J.

Note: The probability of P_{i1} is derived from the constraint that the J probabilities sum to 1. That is,

$p_{i1} = 1 - \sum p_{ij}$. Similar to binary logit model it implies that we can compute J log-odds ratios which are specified as;

$$\ln\left[\frac{p_{ij}}{p_{iJ}}\right] = x'(\beta_j - \beta_J) = x'\beta_j, if, J = 0$$

.... (6)

The independent variables that expected to affect choice of livelihood strategies of rural households in the study area were age of the household head, sex of the household head, education level of the household head, marital status, family size, land size of the household, livestock holding size of the household, access to credit, extension contact, distance from market and total net annual income.

3. RESULTS AND DISCUSSION
3.1 Household Livelihood Strategies
In the study area, rural farm households have followed one, two or a combination of these livelihood activities to pursue their livelihood strategies and obtained their household income from four major categories of livelihood activities which include on the farm alone only strategy, farm alone plus non-farm, farm alone plus off-farm and a combination of farm alone off-farm and off-farm activities..

Farm alone activities are focused on both crop production and animal husbandry activities. Based on the survey result, the majority (34.75%) of the rural households were engaged in on farm activities mainly on crop production and to some extent on livestock production.

Off-farm activities here refer to agricultural activities which take place outside the person's own farm and Non-farm activities in this study refer to activities takes place outside the agricultural sector. Rural households involved in farm plus off-farm activities and farm plus non-farm activities consist 30.50% & 21.99% respectively and only 12.77% out of the total households used a combination of on farm, non-farm and off-farm activities.
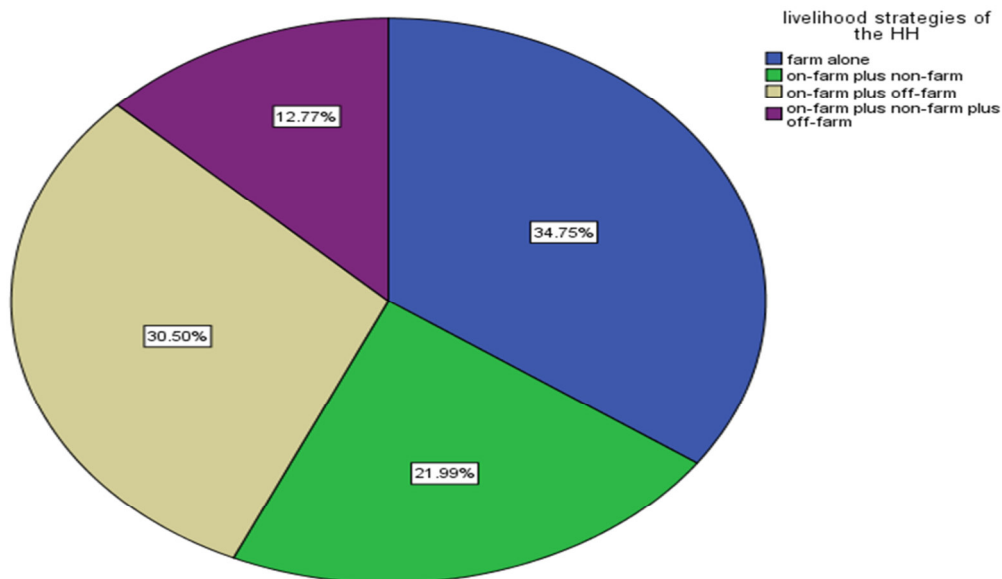
Figure 1; Distribution of sampled HHs with livelihood strategies

3.2 Major Determinants of Livelihood Strategies

Age of household head

Age of the farm households' positively influence farmers decision to select farm alone livelihood strategy at 5% level of significance. Keeping other variables constant, when the age of household head increase by one unit the likelihood of using farm alone livelihood strategy also increase by 2%. Contradict to this result, Yishak (2014) found that those farmers with old age are more likely diversify the livelihood strategies into non-farm activities.

Educational level of household head

Educational attainment proves one of the most important determinants of farm plus off-farm earnings. As the model result indicates, education level of household head had positively and significantly influenced the household choices of farm alone and positively and significantly correlated with farm + off-farm activities at 5% probability level. This indicates that those literate farmers are more likely to engage in off-farm activities to support farming activities. Educated farmers need better living conditions and want to minimize livelihood insecurity risks so they can to diversify their livelihood strategies. This finding is in line with Metasebia, 2009.

Livestock holding

Based on the model result, Livestock holding positively and significantly correlated with the choice of sampled HHs to farm alone livelihood strategy at less than 1% level of probability. Differently, Adugna (2008) and Yishak *et al*. (2014) found that, it has positively and insignificantly correlated with farm plus non-farm and farm plus off-farm livelihood strategies. When the livestock size increase by one TLU the probability of households' choice of farm alone livelihood strategy also increase by 2.6 % of marginal effect , provided that the other factors remain constant.

Family size

The Multinomial Logit model showed that family size had positively and significantly correlated with farm plus non-farm and farm plus off-farm livelihood strategies at 5% level of significance and had negative and significant relation with farm alone livelihood strategy at less than 1% p value. A one person increase in the family can increase the probability of using the two livelihood strategies by 4.28% and 4.52% times greater than those with small families respectively. Those households who have larger family members have an opportunity of engaging various livelihood strategies including farm plus non-farm, farm plus off-farm and farm plus non-farm plus off-farm activities. Thus, its positive sign clearly shows that the larger the family size, the higher probability to diversify livelihood strategies. The positive relationship correlation between family size and diversification is evident that diversified livelihood strategies need allocation of adequate family labour to overcome every activity.

Unlike the above finding, Adugna (2012) argued that family size has the effect of reducing the probability of being in the highly diversified category at (P<0.05); implying that a unit increase in family size reduces the probability of being a highly diversified household compared to the probability of being a less diversified household.

Agro-ecology

This variable has insignificant correlation with the likelihood of choosing farm alone and farm plus non- farm

livelihood strategies but it has positively and significantly association with households choice of farm plus off-farm livelihood strategy at p=0.05.This might be due to the availability of eucalyptus trees in the highland in comparison with midland relatively. Producing cereal crops like teff and maize are limited in high land area and this in turn limit income sources. So, farmers diversify livelihood into off-farming activities in order to fill this income gap.

Farm Land size

The Multinomial logit model showed that, total farm land owned by the household has a significant (p<0.01) and positive correlation with the likelihood of choosing farm alone livelihood strategy. This suggests that rural households with more land tend to follow agricultural extensification rather than diversifying. This implies that probability of choosing farm alone livelihood strategy increases by 11.6 % when the amount of farm size increases by one unit. Thus, farmers just switch away from off-farm and non-farm activities when the farm activity is promising.

This variable has insignificant relation with farm plus non-farm and farm plus off-farm livelihood strategies but in contradictory ,Manjur et al,(2014), found that land holding size has positive and significant influence in off-farm participation for male headed households and the entire sample functions (p=5%). Perhaps households with better holding opted for additional income in casual laborer works to smoothen their farm operations.

Frequency of extension contact

This variable has a positive and significant (p<0.01) relation with the likelihood of choosing farm alone strategy. Keeping other factors constant, the probability of choosing farm alone livelihood strategy increase by 6.75% as the frequency of extension contact increase by a unit. Those who have gained frequent extension contact could highly engaged in farming alone strategy unlike with their counterparts and may master farming by the help of extension agents in order to improve productivity. This finding conforms to Adugna and Bekele (2012). On the other hand, it has insignificant relation with the other two livelihood strategies.

Credit access

This variable has a significant (p= 0.01) but negative association on the likelihood of choosing farm alone livelihood strategy. This implies that, the likelihood of participating in farm alone livelihood strategy drops by 16 % for a household using credit by one unit. This negative impact may be related with the reason that credit access helps farmers to allocate credit to different diversified livelihood opportunities.

Total net income

As the model shows, total net income found to have positive and significant correlation with households' choice of farm plus non-farm, livelihood strategy at less than 1% probability level. The positive coefficient implies that households with large total household income are more likely to diversify the livelihood strategies into non -farm activities. The possible reason can be farm households with large total income can invest in alternative livelihood strategies, especially in non-farm activities. Similarly, Yishak*et al*. (2014) found that the total annual cash income have positive and significant relationship with farm alone plus non-farm; and a combination of farm ,off-farm and nonfarm activities equally at less than 5% probability level.

Market distance

This variable has negatively and significantly correlated with farm plus off-farm livelihood strategy at 5% level of significance, the negative sign shows that keep other factors constant, when a farmer become far from a market in a unit the likelihood of choosing farm plus off-farm livelihood strategy decreased by 0.65 percent. This is because HHs nearby to market center gets several key advantages, such as access to different information, terms of exchange for assets, save their substantial time, much lower transport costs and better and more remunerative non-farm and off-farm activities.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Livelihood of rural households in the study area mainly dependent on crop production and to some extent it depends on livestock production. Four types livelihood strategies identified by sampled rural households namely, farm alone, farm plus off-farm, farm plus non-farm and the union of farm alone, off-farm and non-farm livelihood strategies. Of them farm alone taken as a major livelihood strategy in the study area even it is not enough to survive.

The result of the multinomial logistic regression revealed that age, family size, education level, livestock holding, farm size and total income have influence on households choice of farm alone livelihood strategy. Farm plus Non-farm strategy influenced by variables age, family size, marital status and total net income and farm plus off-farm livelihood strategy influenced by variables called age, education level, family size, distance from market, credit access and agro ecology with less than 10% level of significance.

4.2 Recommendations

- Rural development strategy should not only emphasize on agricultural production but also should

emphasize assisting such activities in the rural areas.

- Non-farm and off-farm sector has to be developed to create employment opportunity for the growing population.
- Strengthening both formal and informal education and vocational training should have to be continued to increase rural household's participation in more viable livelihood options and offer better prospects for improving their livelihood;
- Development of rural infrastructure has to be continued to link rural households with better markets and transportation facilities.

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Table 1. Multinomial logit model estimates of households' choice of livelihood strategies.

Variables	Households livelihood strategies											
	Y=0				Y=1				Y=2			
	Coef.	Std Err	Sig.	Exp (B)	Coef.	Std. Err	Sig.	Exp (B)	Coef	Std. Err	Sig.	Exp (B)
Age of the hhs	-.020	.081	.015**	1.020	-.014	.074	.03**	.986	-.007	.071	.05**	1.007
Sex of the hhs	.072	2.189	.974	1.074	-1.589	.304	.204	.010	-1.28	.404	.277	.014
Familysize	-1.433	.420	.001*	.238	.848	.346	.014*	.428	.794	.323	.014*	.452
Educationlevel	-3.043	1.405	.030**	21.025	1.001	1.312	.446	2.721	2.653	1.31	.043*	14.225
Marketdistance	-.006	.300	.985	.994	.089	.334	.790	1.093	-1.62	.515	.002*	5.065
Maritalstatus	2.356	2.290	.303	10.55	4.144	1.917	.031*	63.02	3.427	1.85	.064*	30.769
Agro ecology	2.020	1.490	.175	7.535	1.768	1.034	.087	5.859	2.197	.996	.027*	9.002
Farm size	2.459	.783	.002*	11.69	.279	.516	.589	1.321	-.934	.632	.140	.393
Livestholding	.957	.329	.004*	2.604	.363	.240	.131	1.437	.260	.214	.225	1.297
Extencontact	1.910	.709	.007*	6.750	.506	.417	.225	1.658	.245	.386	.525	1.278
Creditacess	-5.044	2.229	.024**	.006	11.160	3507.44	.997	70.285.	7.352	1.07	.000	1559.87
Total income	-.001	.000	.000	.999	.000	.000	.005*	1.000	.000	.000	.103	1.000

Source, own survey, 2015, ***, **,* Significant at <1%, 5% and 10% probability level respectively. Farm plus non-farm plus off-farm livelihood strategy taken as a reference category.