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Employment and Income Sources: Key Determinants of Off-Farm Activity Participation Among Rural Households in Northern Zambia

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Abstract: The study analysed off-farm activity participation and determinants for rural households in Northern Province of Zambia. The multinomial logit (MNL) model was used in estimating factors influencing the households' choice of off-farm activity. Secondary data for the 2012 Rural Agricultural Livelihoods Survey (RALS12) from Central Statistical Office (CSO) of Zambia, which used a multistage sampling method, was utilized. Cross sectional data for 1,000 farm households was used in this analysis. The findings shows that 46.40% of the respondents do not combine agriculture with off-farm activities. The age, education, number of adult household members, farm size, cooperative membership and extension service access were key significant determinants of households' participation into off-farm activities. This shows the need for off-farm activities to be part of rural development policies. The interventions should also be designed to suit the needs and situations of different categories of the households in the study area.

Keywords: Off-Farm Activities, Determinants, Multinomial Logit, Rural Household, Zambia

1. Introduction

Agriculture is the major activity for most rural households in Sub-Saharan Africa (SSA) and offers opportunity for stimulating growth, overcoming poverty, and enhancing food security. The agricultural sector in SSA contributes 29% to gross domestic product (GDP), employs 65% of the labor force and is mainly based on smallholder farms (World Bank, 2008). In Zambia agriculture remains a key priority sector in the growth and poverty reduction agenda and provide livelihood to over 60% of the population. This sector offers employment to 72% of the labour force and remains the main source of income and employment for 78% of rural women who constitute 65% of the total rural population (CSO, 2012; FAO, 2014). To fully exploit agriculture, Zambia has developed agricultural policies and strategies which emphasize attainment of food security and maximizing farmers' incomes (MACO, 2004). However, the expectation that agriculture on its own can achieve the goal of reducing poverty and unemployment is unrealistic and is an insufficient means of survival for the majority of rural households (World Bank, 2008).

Smallholder farming is the primary source of income and employment in rural Zambia, but households tend to diversify their sources because of the need to manage risks, secure a smooth flow of income, allocate surplus labour, respond to various kinds of market failures, and apply coping strategies (Karttunen, 2009; CSO, 2012). Therefore, off-farm activity participation are one of the main income diversification strategies and copying mechanisms widely practiced by most households as it offers employment opportunities for the growing rural population, usually in the form of wage labour and self-employment. Overall, about 49% of smallholder households in Zambia have at least one member who receives income from a business (self-employment) activity, whereas 29% have at least a member receiving income from wage employment activities (RALS, 2016).

In the Northern Province of Zambia, while most households primarily work on their own fields during the cropping season, off-farm employment activities are common. The country's long dry season allows for only one harvest per year and this entails the harvest must generate income to last the entire year. Consequently, many rural households turn to different off-farm activities outside their farm during the hungry season to cope with short-term financial needs as income earned from agriculture alone cannot satisfy their needs. Off-farm income, thus, helps in overcoming credit and insurance problems. It could also provide income-earning opportunities outside the growing season, employ the household's extra labour, and ensure smoother consumption throughout the year (Karttunen, 2009). Since the markets for factors, goods and services in rural Zambia are poorly integrated, households in different locations face different constraints. Thus, where a household is located influences its choice set. It is easier to diversify out of agriculture if a household has access to thriving off-farm activities (Bigsten and Tengstam, 2011). However, it is not surprising to find households that do not involve in any activity outside their farm.

Despite the importance of off-farm activities in Zambia, the information available on its determinants is scanty and thus, it needs an investigation to identify the key factors that determine rural households' participation. This study will address the potential incentives that promote household's participation and the constraints or barriers that hinder participation between varying off-farm diversifying activities. A significant part of the aspect of off-farm activities has not yet been researched in Zambia. Previous studies concentrated on quantifying the contributions of the different income sources to households' total income and wellbeing in rural household economy (Karttunen, 2009; Bigsten and Tengstam, 2011). Moreover, no effort was made to see the impact of both self and wage employment members of the family simultaneously in their participation decision in Zambia. This makes the results inconclusive and hence it is necessary to pursue the analysis empirically.

In spite of the potential of the off-farm sector in generating income and employment in Zambia, they are not covered by government policies and strategies because policy makers concentrate on the farm sector. Therefore, looking into the link between off-farm activity participation and their determinants is necessary before policy measures are taken to promote off-farm activities. This paper will add to existing literature and provide up-to-date information on off-farm activities in Northern Province. While the findings presented in this paper are specific to the particular setting in rural Zambia, they might also contribute to a better general understanding of the underlying issues and linkages.

2. Literature Review

The economic crises of the 1970s and 1980s lead to changes in the allocation of production factors (notably the labour factor) by farmers and fostered the rapid increase of off-farm activities which people get involved in, in tandem with farming. In rural areas, most households are involved in farm activities, but many of them get their income from off-farm activities (World Bank, 2008). Literature from developing countries show the significant role of off-farm employment on reducing rural poverty, inequality, and income vulnerability. In Latin America, rural households earn 40-45% of their income from off-farm sources (Reardon *et al*., 2001). Moreover, some studies in Africa have reported a substantial and increasing share of off-farm income in total household income because rural households are diversifying their income sources by combining farm and off-farm activities to sustain their livelihoods (Haggblade *et al*., 2007; Losch *et al*., 2011; Winters *et al*., 2010; Ellis, 2005; De Janvry *et al*., 2002; Sitienei *et al*., 2013). This shows the importance of off-farm income in meeting subsistence needs as well as absorbing shocks to agricultural income.

The motivation to engage in off-farm activities are different across geographical areas, communities and households. However, studies suggest that two factors initiate participation in off-farm activities. The *push* factors force farmers to participate in off-farm activities to manage income risk; with off-farm income used as a coping mechanism. These factors include shortfalls of agricultural production resulting from temporary failures due to unexpected drought or long term factors like shortage of farm land, absence of crop insurance and failures in input and credit markets (Reardon, *et al*., 1998; Barrett *et al*., 2001b; Kilic *et al*., 2009). Whereas the *pull* factors are incentives that attract households when off-farm activities offer higher return than the farm activities and the less risky nature of investment in the off-farm sector (Kilic *et al*., 2009; Barrett, *et al*., 2001b). Smallholder productions are generally characterized by low access to improved technologies, financial services, modern inputs, agricultural markets and irrigations services. This is attributed to variability of incomes from the farming sector and thus households are forced to participate in off-farm activities to overcome these obstacles (Rahman, 2007). According to Haggblade *et al*. (2007), off-farm employment income account for about 35% of rural incomes in Africa. The share of off-farm income is expected to increase substantially in the coming years, especially in SSA where increasing population growth and limited agricultural resources are threatening the growth of the agricultural sector (Haggblade *et al*. 2007). One components of rural off-farm activities in which the poor can participate since it does not require any complementary physical capital is wage employment (Mduma and Wobst, 2005).

De Janvry and Sadoulet (2001) studied the role of off-farm activities in rural households in Mexico. The result showed that participation in off farm activities helps reduce poverty and contributes to greater equality in income distribution. One empirical consistency identified is a positive relationship between off-farm income and household welfare (Barrett *et al*., 2001b). Also a positive association between diversification and income levels was found in studies by Lanjouw *et al*. (2001) for Tanzania, Barrett *et al*. (2001a) for

the Ivory Coast and Canagarajah *et al*. (2001) for Uganda. The studies showed that increased off-farm earnings lead to more rapid growth in consumption. Households that have the endowments required to enter into higher return off-farm activities are thus able to improve their incomes. Furthermore, the off-farm sector is increasingly perceived as having a potential in absorbing a growing rural labor force and in slowing rural exodus (Lanjouw and Lanjouw, 2001). The common argument is that the promotion of the rural non-farm economy is not only limited to the above mentioned potential outcomes but could also be of interest for agriculture as a support. Nevertheless there is uncertainty on what policies to be introduced to make non-farm income opportunities available for broad removal of rural poverty (Holden *et al*., 2004).

3. Methodology

3.1. Study Area

The study was conducted in Northern Province of Zambia located in Agro-Ecological Region (AER) III. The mean annual rainfall in this region exceeds 1,000 mm and the length of the growing season varies from 120 to 150 days. The province was selected purposively for being the area where majority of rural farm households are found in Zambia. It has a population of 1,106,000 or 8% of Zambia's total population. More so Northern Province is predominantly rural, with 85% (940,100) of the population living in rural households. The province has a total of 251,000 agricultural households in eight districts. The main economic activities in are growing crops especially maize, beans, groundnuts, cassava among others and rearing of small ruminants, in addition to off-farm activities (CSO, 2012).

3.2. Data

The study utilized the 2012 Rural Agricultural Livelihoods Survey (RALS12) data from the Central Statistical Office (CSO) of Zambia. RALS12 was conducted by Indaba Agricultural Policy Research Institute (IAPRI) in partnership with the Ministry of Agriculture and Livestock (MAL) and CSO. The survey was done to provide policy relevant information that is not practical to collect annually from the GRZ agricultural surveys. RALS12 covered the whole country and used a two-stage stratified cluster sample design to collect data. The sample was designed to be representative of the rural farm households cultivating less than 20 hectares of land for farming purposes and/or raising of livestock. A sample of 442 Standard Enumeration Areas (SEAs) was drawn using probability proportional to size sampling scheme. The measure of size of the SEAs is the number of households located within each SEA on the area sampling frame as per the 2010 Census of Population. RALS12, which was carried out in 2012, covered 8,839 households in Zambia. Cross sectional data for 1,000 farm households in Northern Province were used in this analysis.

3.3. Analytical Techniques

This study intended to identify the determinants of households' participation into off-farm activities with a particular interest to discover the factors influencing households' choices between varying off-farm activity options. In this case, the dependent variable, *participation*, is not a continuous variable but takes several modalities depending on whether the household participates in off-farm activities or not and according to participation choices. In this case application of linear regression models is not appropriate, hence the unordered multinomial logit (MNL) model is used because it is appropriate for responses without ordering. The MNL regression model used is generally effective where the dependent variable is composed of a polytomous category having multiple choices. The basic concept was generalized from binary logistic regression (Aldrich and Nelson, 1984; Hosmer and Lemeshow, 2000). In a MNL regression model, the estimates for the parameter can be identified compared to a baseline category (Long, 1997). The MNL regression model used in this study estimates the effect of the individual variables on the probability of choosing a type of alternative off-farm activity. Our empirical model is based on random utility theory. Since we expect the factors that affect participation in different off-farm activities may not be the same, we disaggregate off-farm activities in to off-farm wage employment, off-farm self-employment and both off-farm wage and self-employment. This estimation method takes into account the simultaneity of both self and wage employment participation decision (where no participation in off-farm activities is the choice comparison or baseline category). Following the works of Green (2000), the MNL for a multiple choice problem is specified as follows:

Let U_{ij} represent the utility that household i gets from choosing alternative activity j with the highest utility and;

$$U_{ij} = \beta_j x_{ij} + \varepsilon_{ij} \tag{1}$$

Where β_j varies and x_{ij} remains constant across alternatives; ε_{ij} is a random error term reflecting random choice behavior, measurement or specification error and unobserved attributes of alternatives. Let also P_{ij} indicate the probability associated with off-farm activities choices of household i from category j with; $j=0$ if household does not participate in off-farm activities, $j=1$ if household participates in off-farm wage employment, $j=2$ if household participates in off-farm self-employment, and $j=3$ if household participates in both off-farm wage and self-employment; x_i = predictors of response probabilities; e is the natural base of logarithms; and β_j are parameters to be estimated by maximum likelihood estimator (MLE). Then the MNL model is given as:

$$P_{ij} = \frac{e^{x_i \beta_j}}{\sum_{j=0}^{j=3} e^{x_i \beta_j}}, \; \mathrm{j} = 0, 1, 2, 3 \tag{2}$$

The estimated equations provide a set of probabilities for the $j + 1$ choice for a decision maker with x_i characteristics. For identification of the model, we normalize by assuming $\beta_0 = 0$ (Greene, 2000). Thus, the probabilities are given by:

$$prob.\left(y_i = {}^{j}\!/_{x_i}\right) = P_{ij} = \frac{e^{x_i\beta_j}}{1+\sum_{j=1}^{J} e^{x_i\beta_j}}, \text{ for J>0} \quad (3)$$

$$prob.\left(y_i = {}^{1}\!/_{x_i}\right) = P_{i0} = \frac{1}{1+\sum_{j=1}^{J} e^{x_i\beta_j}}, \quad (4)$$

The parameter estimates of the MNL model provide only the direction of the effect of the independent variables on the dependent variable, but estimates do not represent either the actual magnitude of change nor probabilities (Greene, 2000; Yishak *et al*., 2014). To interpret the effects of explanatory variables on the probabilities, marginal effects are computed. The marginal effects (δ) of the characteristics on the probabilities are given as;

$$\delta_{ij} = \frac{\partial P_{ij}}{x_i} = P_{ij}\left[\beta_j - \sum_{j=0}^{J} P_{ij}\beta_j\right] = P_{ij}\left[\beta_j - \overline{\beta}\right] \quad (5)$$

The marginal effects or marginal probabilities are functions of the probability itself and measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable from the mean. In addition, the multinomial logit analysis works if the decisions between multiple alternative choices are truly made simultaneously indicating independence of the choices. Thus, it is required to test the assumption of Independence of Irrelevant Alternatives (IIA). The Wu-Hausman test for IIA is done to test the null hypothesis that the odds are independent of other alternatives. If the null hypothesis is rejected, then an alternative to the multinomial logit model is needed.

3.4. Variable Used and Their Measurement

Based on theory, empirical literature, and researchers' knowledge of the contextual setting, seven (7) explanatory variables were identified and used. The potential explanatory variables which are posited to influence households' participation into off-farm activities in the study area are summarized and presented in Table 1.

Table 1. *Variable descriptions, units of measurement and hypothesized relationships.*

Variable	Description	Sign	References
Age	Age of household head (years).	-	Sosina *et al*., 2009; Demie and Zeray, 2015.
Education	Completed highest level of formal education of household head (years).	+	De Janvry and Sadoulet (2002); Mduma and Wobet, 2005; Bezu *et al*., 2009
Gender	Gender of the household head (male =1, female=0)	+/-	Bezu *et al*., 2009
Adults	Number of household members 12 years and above.	+	Sosina, 2009; Demie and Zeray, 2015.
Farm size	All land for agricultural purposes owned by household (hectares).	-	Mduma and Wobet, 2005; Bezu *et al*., 2009
Cooperative	Membership to a cooperative or farmer organization (yes=1, no=0).	-	Yishak *et al*., 2014.
Extension	Access to agricultural extension services (Yes=1, No=0).	+/-	Demie and Zeray, 2015.

Following recommended procedures, the variance inflation factor (VIF) and contingency coefficients (CC) were used to test the degree of multicollinearity and association among explanatory variables, respectively. Breusch-Pagan (BP) test was conducted to assess the presence of heteroscedasticity in the model. The maximum likelihood method was employed to estimate the parameter estimation of the multinomial logit model and statistically significant variables were identified to measure their relative importance on the households' decision to participate in off-farm activities. The Statistical Analysis (STATA) version 12 was used to generate the parameter estimates.

4. Results and Discussion

4.1. Descriptive Statistics

The results show that out of 1000 rural smallholder farm households selected, 46.40 % do not participate in any off-farm activity option (Table 2). This group of households rely entirely on the output of crops cultivated and the rearing of small ruminants for their livelihoods. Majority are participating in self-employment, with 14.78% being female heads households. The overall average age of farmers in the province is 44.48 years. This is close to the national average age of smallholder household heads of 48 years. This shows that the farmers are within the active age group with a higher likelihood of adopting new technologies. A study by Musaba and Bwacha (2013) also found an average age of 46 years for small scale maize farmers in Masaiti District of Zambia.

A look at education levels shows that on average household heads had about 6 years of formal education (Table 2). The province is lagging behind in terms of general educational attainment because the average years of formal education for household members is less than the national average of 6.7 years (CSO, 2012). The results further reveal that those households that pursued wage employment alone and those that pursued both wage and self-employment had relatively higher levels of education than the others. Additionally, the results show that those who perused wage employment have relatively higher percentages in discrete variables among the categories (see Table 3). When asked about membership to a cooperative, less than half (48.2%) indicated that they had such membership. Cooperative membership is a requirement for a farmer to receive

subsidized improved seed and fertilizer under the FISP in Zambia (MAL, 2014).

F-tests (ANOVA analysis) and chi-square tests were used to make sure presence or absence of differences between the four groups of households, when appropriate. The mean values of continuous variables in all livelihood categories were compared using ANOVA analysis (F-test). According to F-value out of 4 continuous variables, the four categories of households were found to differ significantly in 2 of them (Table 2). The F-values showed mean differences for two variables, education at 5% level and farm size at 1% level of significance respectively. On the other hand, a chi-square test was used to examine the existence of statistically significance difference between the discrete variables of the four categories. Accordingly, discrete variables were considered and the four categories were found to be different in terms of 3 of the 3 discrete variables (Table 3). More specifically, the chi-square test reveals that participation in cooperative membership and access to agricultural extension were statistically significant at less than 1% probability level.

Table 2. *Descriptive statistics of the participant farmers in the different off-farm activities.*

Variables	Overall		Not participated		Wageemployment		Self employment		Wage and Self employment		F-Value	p-value
Observations	**(n =1000)**		**(n = 464)**		**(n = 61)**		**(n = 433)**		**(n = 42)**			
	mean	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**		
Age	44.84	14.49	47.22	15.74	41.92	10.32	43.24	13.53	39.14	9.89	1.02	0.4457
Education	6.00	3.60	5.26	3.29	9.92	4.71	5.89	3.04	9.62	4.53	1.85**	0.0254
Adults	3.30	1.55	3.24	1.61	3.87	1.82	3.28	1.41	3.43	1.78	0.96	0.4707
Farm size	0.96	2.59	1.05	3.09	0.74	0.90	0.86	2.19	1.19	1.72	2.37***	0.0069

Note: **, and *** signify levels of significance at 5% and 1%, respectively
Source: calculated from RALS12 data.

Table 3. *Descriptive statistics of the participant farmers in discrete variables.*

Variables	Overall		Not participated	Wage employment	Self employment	Wage and Self employment	Chi-square	p-value
	Farmers' percentage frequencies (%)							
Observations	**(n =1000)**		**(n = 464)**	**(n = 61)**	**(n = 433)**	**(n = 42)**		
Gender	Male	83.10	80.17	88.52	85.22	85.71		
	Female	16.90	19.83	11.48	14.78	14.29	5.6992	0.127
Cooperative	Yes	48.20	53.23	62.30	39.95	57.14		
	No	51.80	46.77	37.70	60.05	42.86	22.6991***	0.000
Extension	Yes	23.80	29.31	39.34	16.17	19.05		
	No	76.20	70.69	60.66	83.83	80.95	30.3320***	0.000

Note: *** signify levels of significance at 1%.
Source: calculated from RALS12 data.

4.2. Estimation Diagnosis

To establish the relative importance of different options of off-farm activities, a MNL model was formulated to identify factors which influence participation. Table 4 show results of MNL on the relative likelihood of households choosing a particular type of off-farm activity relative to the base category. The likelihood ratio chi-square of 210.19 with a p-value < 0.000 implies that the model as a whole fits significantly better than an empty model. The likelihood ratio statistic is significant at 1% level showing that at least one of the variables in the model has a significant influence on households' choice of off-farm activity participation.

The variables included were tested for multicollinearity using variance inflation factor (VIF). The mean VIF of 1.10 showed that there was virtually no multicollinearity in the model since the value found is less than 10 (Gujarati and Porter, 2008). In addition, Breusch Pagan (BP) test (H0: constant variance) showed that there was no serious problem of heteroskedasticity in the model as justified by a value of 1.34 ($p = 0.246 > 0.05$). Moreover, the model was run and tested for the validity of the independence of the irrelevant alternatives (IIA) assumptions by using Hausman test for IIA. The test failed to reject the null hypothesis of independence of the off-farm activity options, suggesting that the multinomial logit (MNL) specification is appropriate to model households' participation choice. This implied that the alternative participation categories are mutually exclusive or the ratio of probabilities between two choices would not change if an alternative is removed or added.

4.3. Determinants of Participation in Off-Farm Activities

The results of the maximum likelihood estimates of the MNL model presented in the Table 4 show a disparity in the effect of explanatory variables on participation decision of households. All the 7 hypothesized explanatory variables have the expected signs and among them, 4, 5 and 3 variables were found to significantly influence choice of wage employment, self-employment and a combination of both, respectively. Age, education, number of adults as well as farm size significantly affected participation into wage employment activities. Whereas participation in self-employment was significantly influenced by age, education of household head, number of adults, membership to a cooperative/farmer organization and access to agricultural

extension services. Similarly, age, education and extension significantly influenced participation in multiple self and wage employment activities. The gender of the household head had no influence on participation to any of the off-farm activity.

The result showed that the age of household head influenced negatively and significantly wage employment, self-employment and a combination of wage and self-employment as choice of off-farm activities at less than 5%, 1% and 5% probability levels respectively. This implies that older household heads are less likely to participate into off-farm activities since experience in farming increases with age. The negative association shows the preference of younger households for off-farm jobs over arduous agricultural activities in developing countries. This is consistent with the findings of Sosina *et al*. (2009) in a study of non-farm employment choice of individuals in Ethiopia. Demie and Zeray (2015) also reported a negative influence for age among households in Eastern Ethiopia.

Table 4. *Multinomial logit regression estimates of the determinants of farmers' participation in off-farm activity.*

Variables	Wage employment			Self-employment			Wage and Self-employment		
	Coefficient	*P-value*	*Marginal effect*	*Coefficient*	*P-value*	*Marginal effect*	*Coefficient*	*P-value*	*Marginal effect*
Constant	-4.2612***	0.000		-1.6946***	0.001		-5.5163***	0.000	
Age	-0.0332**	0.021	-0.0009	-0.0178***	0.001	-0.0025	-0.0495**	0.004	-0.0013
Education	0.3820***	0.000	0.0155	0.0574**	0.014	0.0014	0.3578***	0.000	0.0101
Adults	0.2070***	0.043	0.0070	0.1066**	0.033	0.0175	0.1470	0.231	0.0024
Gender	0.4724	0.319	0.0172	-0.2280	0.245	-0.0753	0.7110	0.166	0.0277
Farm size	-0.3647**	0.034	-0.0172	-0.0253	0.442	0.0031	-0.0464	0.601	0.0008
Cooperative	0.1334	0.692	-0.0055	0.5184***	0.001	0.1149	0.1007	0.788	-0.0059
Extension	-0.2887	0.388	-0.0338	0.7025***	0.000	0.1572	0.7337*	0.100	0.0142
Number of observation = 1000, LR $chi^2(21)$=210.19, Prob > chi^2 = 0.0000***, Log likelihood = -917.38023, Pseudo R^2 = 0.1028									

Note:

i. *, **, and *** signify levels of significance at 10%, 5% and 1%, respectively;

ii. The dependent variable is the category of participation into off-farm activities, taking a value of 1 if a farm household is participating in wage employment only, a value of 2 if participating in self-employment only and a value of 3 if choice is wage and self-employment.

iii. The regression model was run with the category of households that did not participate as the base to enable the determination of the relative effect of each specific predictor on off-farm activity participation.

iv. For dummy variables the marginal effect is the discrete change of dummy variable from 0 to 1. z and P>|z| are the test of the underlying coefficient being 0.

Source: calculated from RALS12 data.

The education variable positively and significantly influenced households' choice of wage employment, self-employment and wage and self-employment as off-farm activities at less than 1%, 5%, and 1% probability level respectively. The finding shows that farmers with high educational level are more likely to participate into off-farm activities than those that do not. The marginal effects reveals that the likelihood of a household participating into wage employment, self-employment and combination of wage and self-employment off-farm activities increase by 1.53%, 0.16% and 0.99%, respectively, for those farmers with more level of education. This implies adding one grade education can increase the chance of choosing off-farm activities by aforementioned percent. The possible explanation is that education of the household is an opportunity to find other income opportunity activities. The result confirms that households with formal education had the possibility and capacity to participate into both wage and self-employment activities than the households with no formal education; also confirmed in studies by De Janvry and Sadoulet (2002).

Having additional adult members in the household, measured as the number of productive age group (12 years of age and above) is a highly significant determinant for participation in off-farm activities, especially for self-employment (with 1% significance level) and self-employment (with 5% significance level). Addition of one adult member in the household results in a 0.7% and 1.75% increase in the likelihood of participation in wage employment and self-employment activities respectively, than not participating in any off-farm activity. This implies that having a larger household with children of productive age, thereby having a greater labor force, gives the household the flexibility to distribute work between the farm and off-farm employment, and therefore have a higher capacity of participating in off-farm activities. Similar result was found in Ethiopia in the work of Sosina (2009) and Demie and Zeray (2015).

The effect of farm size on participation decision is statistically significant only for wage employment (at 5% level). The negative sign for shows that farmers are participating in such off-farm activities for push reasons. A unit increment in farm size results in decreasing 1.72% of household's participation in wage employment as an off-farm activity at 5% significance level. This implies that farmers with large farm sizes are less likely to participate into off-farm activities than those farmers who have small land sizes. Large farm size helps farmers to cultivate and produce more, which in turn increases farm income and improves livelihood of a household. However, declining land sizes under population pressure may encourage rural households to diversify their income sources (Mduma and Wobst, 2005).

Belonging to a cooperative positively and significantly influenced the household participation in self-employment only as an off farm activity at 1% probability level. The marginal effect reveals the likelihood of a household participating into self-employment off-farm activities as a

result of membership to a cooperative increase by 11.49%. Further, extension access positively influenced participation in to self-employment (at 1%level) and a combination of both self and wage employment (at 10% level) in the study area.

5. Conclusion

The MNL regression model was applied to answer the questions 'what determines rural households' participation in off-farm activities'. The result showed that out of 7 hypothesized variables in the model, 6 significantly influenced household's participation into alternative off-farm activities. Accordingly, the results showed that the age of household head influenced negatively, while education level affected positively the choice of participation into wage employment, self-employment and a combination of wage and self-employment. An addition of one adult member in a household significantly increased the likelihood of participation in wage employment and self-employment. Further, the farm size variable negatively influenced the households' choices of wage employment as an off-farm activity, whereas membership to a cooperative had a positive and significant influence of participating into self-employment only. Lastly, access to extension services positively influenced participation into self-employment and a combination of wage and self-employment. From the study finding, it is clear that agriculture cannot be relied upon as the core activity for rural farm households to improve their livelihood, achieve food security and reduce poverty in the study area.

Based on the results it is clear that off-farm activities should be part of rural development policies in Zambia. This could help to improve the rural households' welfare and to expand their income and employment opportunities outside agriculture. The policies should be attentive to individual characteristics of the targets such as age and education level and the household characteristics such as number of adults, cooperative membership and extension access. The influence of farm size on off-farm activity participation suggests the need to develop appropriate strategies and policies especially for land resource-poor farmers.

References

[1] Aldrich, J. H., and Nelson, F. D. (1984). *Linear Probability, Logit, and Probit Models*. Newbury Park, CA: Sage Publications.

[2] Barrett, C. B., Bezuneh, M., and Aboud, A. (2001a). Income Diversification, Poverty Traps and Policy Shocks in Cote d'Ivoire and Kenya. *Food Policy*, 26 (4): 367-84.

[3] Barrett, C. B., Reardon, T., and Webb, P. (2001b). Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics, and Policy Implications. *Food Policy*, 26(4): 315-331.

[4] Bezu, S., Holden, S., and Barrett, C. B. (2009). Activity Choice in Rural Non-farm Employment: Survival versus Accumulation Strategy. *Paper presented at the 8th Nordic Conference in Development Economics*. Oscarsborg, Drobak, Norway, June 18-19, 2009.

[5] Bigsten, A., and Tengstam, S. (2011). Smallholder Diversification and Income Growth in Zambia. *Journal of African Economies*, 20(5): 781-822

[6] CSO (Central Statistical Office). (2012). *Living Conditions Monitoring Survey Report (2006 and 2010)*. Lusaka, Zambia.

[7] De Janvry, A. and Sadoulet, E. (2001). Income Strategies among Rural Households in Mexico: the Role of Off-farm Income. *World Development,* 29(3): 467-480.

[8] De Janvry, A., Sadoulet, E., and Murgai, R. (2002). *Rural Development and Rural Policy. Handbook of Agricultural Economics*, Chapter 31, Volume 2, Edited by B. Gardner and G. Rausser. Elsevier Science B. V.

[9] Demie, A., and Zeray, N. (2015). Determinants of Participation in the Rural Nonfarm Economy in Eastern Ethiopia. *Journal of Economics and Sustainable Development*. 6(23): 9-20.

[10] Ellis, F. (2005). Small-Farms, Livelihood Diversification and Rural-Urban Transitions: Strategic Issues in Sub-Saharan Africa. *A Paper prepared for the Research Workshop on: The Future of Small Farms. Withersdane Conference Centre*, Wye, Kent, UK, June, 26-29, 2005.

[11] Greene, W. (2000). *Econometric Analysis*. Englewood Cliffs, NJ: Prentice Hall.

[12] Gujarati, D. N., and Porter, D. C. (2008). *Basic Econometrics*, Fifth Edition, TATA McGraw –Hill, Companies

[13] Haggblade, S., Hazell, P. and Reardon, T. (Eds.), (2007). *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*. Johns Hopkins University Press and IFPRI, Baltimore.

[14] Holden S., Shiferaw, B., and Pender, J. (2004). Non-Farm Income, Household Welfare and Sustainable Land Management In A Less-favoured Area in the Ethiopian Highlands. *Food Policy*, 29(4): 369-392.

[15] Hosmer, D. W., and Lemeshow, S. (2000). *Applied Logistic Regression*. New York: Wiley.

[16] Karttunen, K. (2009). *Rural Income Generation and Diversification-A Case Study in Eastern Zambia*. University of Helsinki, Department of Economics and Management Publications No. 47, Agricultural Policy, 158 p.

[17] Kilic, T., Carletto, C., Miluka, J. and Savastano, S. (2009). Rural Nonfarm Income and its Impact on Agriculture: Evidence from Albania. *Agricultural Economics*, 40(2): 139-160.

[18] Lanjouw, J. O., and Lanjouw, P. (2001). The Rural Non-farm Sector: Issues and Evidence from Developing Countries. *Agricultural Economics*, 26: 1-23.

[19] Lanjouw, P., Quizon, J., and Sparrow, R. (2001). Non-agricultural Earnings in Peri-urban Areas of Tanzania: Evidence from Household Survey Data. *Food Policy*, 26(4): 385-403.

[20] Long, J. S. (1997). *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage.

[21] Losch, B., Freguingresh, S., and White, E. (2011). *Rural Transformation and Late Developing Countries in a Globalizing World: A Comparative Analysis of Rural Change*. Final Report of the Rural Struc Program, Revised Version. Washington, DC: World Bank.

[22] MACO (Ministry of Agriculture and Co-operatives). (2004). *National Agricultural Policy for Zambia (2004-2015)*. Government of the Republic of Zambia, Lusaka, Zambia.

[23] MAL (Ministry of Agriculture and Livestock). (2014). *Farmer Input Support Programme (FISP) Implementation Manual, 2014/2015 Agricultural Season*. Lusaka, Zambia.

[24] Mduma, J., and Wobst, P. (2005). Determinants of Rural Labor Market Participation in Tanzania. *African Studies Quarterly*, 8(2).

[25] Musaba, E., and Bwacha, I. (2014). Technical Efficiency of Small Scale Maize Production in Masaiti District, Zambia: A Stochastic Frontier Approach. *Journal of Economics and Sustainable Development*, 5(4): 104-111.

[26] Rahman, M. (2007). Socio-Economic Determinants of Off-Farm Activity Participation in Bangladesh. *Russian Journal of Agricultural and Socio-Economic Sciences*, 1(13).

[27] RALS (Rural Agricultural Livelihoods Survey). (2016). *2015 Survey Report*. Indaba Agricultural Policy Research Institute (IAPRI). Kabulonga, Lusaka, Zambia. Available at: http://www.iapri.org.zm

[28] Reardon, T., Stamoulis, K., Balisacan, A., Cruz, M., Berdegué, J., and Banks, B. (1998). *Rural Non-Farm Income in Developing Countries. The State of Food and Agriculture*, 1998, 283-356.

[29] Sosina Bezu S, Holden B, Barrett C. (2009). *Activity Choice in Rural Non-farm Employment (RNFE): Survival versus Accumulative Strategy*. Norwegian University of Life Sciences, Cornell University.

[30] Winters, P., Essam, T., Zezza, A., Davis, B., and Carletto, C. (2010). Patterns of Rural development: A Cross-Country Comparison Using Microeconomic Data. *Journal of Agricultural Economics*, 61(3): 628-651

[31] World Bank. (2008). *World Development Report 2008: Agriculture for Development*, Washington DC: The World Bank.

[32] Yishak, G., Gezahegn, A., Tesfaye, L., and Dawit, A. (2014). Rural Household Livelihood Strategies: Options and Determinants in the Case of Wolaita Zone, Southern Ethiopia. *Social Sciences*, 3(3): 92-104.