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Determinants of Smallholder Farmers' Livelihood Strategies in Wogera District of Ethiopia

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Abstract

The livelihood of most people in Ethiopia depend on subsistence agriculture whose carrying capacity has decreased due to rapid population growth rate and farm size reduction. The smallholder farmers are engaged in off-farm and non-farm diversified livelihood strategies to improve their food security. However, these farmers could not easily participate in diversified activities. Hence, this study identified the livelihood strategies adopted by smallholder farmers and assessed the determinants of their decisions to choose diversified livelihood strategies in Wogera district. Multistage sampling technique was adopted to systematically select the 118 households from which to collect data through household survey, field observation and FGDs. Besides, descriptive statistics, the multivariate logistic regression was applied for the identification of determinants that helped to choose diversified livelihood strategies. The data analyzed through STATA revealed that most households have diversified their livelihood strategies into off and/or non-farm activities to improve their livelihood. Access to irrigation and credit were positively affected choices of diversified livelihood strategies. While, being aged, having more farm size and far from the main road hinder the households to diversify the livelihood strategies. The study argues that most of smallholder farmers tend to diversify their livelihood strategies although various factors influence the diversification of livelihood strategies. Thus, researchers, governmental and non-governmental institutions should pay attention beyond the farm's activities to strengthen the off-farm and non-farm activities to improve the livelihood of smallholder farmers.

 Key words: *Farm, livelihood, non-farm, off-farm, smallholder farmers*

Introduction

Livelihood requires an adequate flow of food, stocks and cash to meet necessities in the household. It comprises household capabilities, activities, and assets (resources, claims, stores, and access) that are essential for living (Chambers & Conway, 1991). Most Ethiopians livelihood relied on subsistence agriculture. Despite this, the sector's carrying capacity is decreasing over time, and consequently, most rural households are exposed

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to chronic poverty and food insecurity (Danielet *et al.*, 2016; Woinishet, 2010; Yishaket *et al.*, 2014), which could not be solved by farm sector alone (Kebede *et al.*, 2014).

As a result, smallholder farmers have forced to diversify their household into off-farm activities (activities that takes place beyond the household farms in the agriculture sector like daily wage labor, natural resource based activities) and non-farm (activities conducted out of farm) activities to enhance their food security and livelihood (Amare & Belaineh, 2013; Ambachew & Ermiyas, 2016; Daniel et al., 2016; Woinishet, 2010). Consequently, the contribution of the diversified livelihood activities to rural-households is significant particularly for poorer groups (Amare & Belaineh, 2013; Carswell, 2002; Kebede *et al.*, 2014).

In Ethiopia, various studies (Alemayehu *et al.*, 2018; Ambachew & Ermiyas, 2016; Daniel *et al.*, 2016; Kebede *et al.*, 2014; Seid, 2016; Yenesew *et al.*, 2015; Yishak *et al.*, 2014) confirmed that households have been involving on on-farm, off farm and nonfarm strategies. However, variations in contexts, institutional set ups and livelihood resources to which households have access to and control over, always affect the set of choices from the available set of strategies in the specific location and the risk sets. Therefore, participation of rural households in diverse livelihood activities is vital for withstanding the different conditions of vulnerability contexts and the requirements for the various entry options households choose from (Bereket *et al.*, 2018).

In the nutshell, in Wogera District, the main livelihood source has been agriculture, which is sensitive to various climatic factors. Subsequently, shortage of food, limited income source and occurrence of disease become common in the district, which is above the capacity of subsistence agriculture alone. To fill these livelihood gaps, the smallholder farm households must diversify their livelihood strategy; their involvement in diversified livelihood strategies varies across the district and is determined by different factors. However, there remains limited evidence from the district on the existing smallholder farm households' livelihood diversification strategies and factors that influenced livelihood diversification strategies. Therefore, this study aimed i) to assess the existing livelihood strategies and ii) to identify the determinants of smallholder households' choices of the diversified livelihood strategies with the attempt to fill the information gap in the study area.

Conceptualizing Livelihood

A smallholders livelihood is said to be sustainable when it enables to cope with and recover from shocks and stresses; enhance their well-being and that of future generations without undermining the natural environment or resource base (UNDP, 2010). A livelihood is therefore defined as the activities, the assets and the access that jointly determine the living gained by an individual or household (Ellis, 1998).

The smallholders livelihood is determined by their ability to decide what they do with their asset (strategies) for better livelihood outcomes and outputs (DFID, 1999). The access and asset within social, economic, political, and environmental contexts determine the diversification of livelihood strategies. Households may take on several activities to meet its needs that contribute to a collective livelihood strategy (DFID, 1999; Morse *et al.*, 2009; Pedersen & Petersen, 2010).

The subsistence agriculture is a base of smallholder farmers livelihood in the study area. However, due to the insufficient land resource to absorb the household's full labor force endowment and the variability of rainfall pattern in the study area, the agricultural sector

is becoming a risky economic activity which has low return in income, and thus farmers are compelled to seek out off-farm or non-farm income source (Asfaw *et al.,* 2017; Gebru & Beyene, 2012).

Research Methods

Description of the study area

The study was conducted in Wogera District, Central Gondar Zone of Ethiopia, located 36 kms from Gondar town and 763 kms from Addis Ababa at an average altitude of 2,812 m.a.s.l. and found between 37.36°E and 12.460N longitude. The annual rainfall of the study area ranges between 1000 mm and 1200 mm, and the maximum/minimum mean temperature is 330C and 14oC, respectively.

The total population of the district was 268,833, while 137,057 are males and the 131,776 are females. The total area coverage of district is 182,126 ha, of which 46.32% is farm-land, 11% is forestland, 22.7% is grazing land, 4.42% is used for construction and build-ings, 12.85% institutions, and the remaining 2.73% is considered wasteland. In addition, according to the district agricultural office report (2016), the dominant soil type of the area is red, brown, and black. 52% of the area topography is flat, and the remain 23%, 14% and 11% are mountainous, valleys and hills, respectively, and its agro-ecological distribution includes Dega (56%) which is cold, and the remain 26%, 13%, 4% are *Woina Dega* (moderate), *Kolla* (hot), and *Wurch* (frosty), respectively.

The farming system in the district broadly grouped into cropping patterns and livestock ownership. Barley, Wheat, Bean, Chickpea, Pea, Maize, Sorghum, *Teff,* Lentil, Vetch, On-ion and Potato are essential components of the farming system. Most crops grew with the rain fed farming system. The livestock includes cattle, sheep and goat, donkey, mule, horse and poultry with strong interaction between the two, the supplements the cropping (Derbe *et al.*, 2018).

Sample size and sampling procedures

With respect to sampling, Yamane's (1967) sample size determination formula employed at 95% confidence level.

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

(Equation 1)

Where N- the total population size, - the sample size, and e- precision level.

Then 118 households were sampled considering proportional probability to kebeles total household size; Amba Giwergis Zuria kebele (35), Kosoye kebele (47), and YisakDebir kebele (36). Due to the homogeneity of the kebeles in the District, kebeles were selected randomly.

Data collection

The cross-sectional survey collected data mainly sampled rural households from three Kebeles of the district, namely Kosoye, YisakDebir, and Amba Giwergis Zuria. The small-holder farmers answered structured and semi-structured interview, translated into Amharic, the commonly spoken language within the study area. The research tools were pre-tested and modified to ensure attainment of reliability in the results. In addition, the researcher conducted field observation to understand the local farm practices and livelihood activity portfolios with the help of a checklist. Secondary data gathered from numerous sources like research journals and articles, internet sources and reports provided auxiliary information related to the study for triangulation of results.

Data analysis

The data were coded and inserted into STATA ver. 14 computer program, and then descriptive statistics (mean and percentage) was employed to describe the aspects of the households. Econometric model (multinomial logistic regression) employed and identified the determinant factors of choosing diversified livelihood strategies.

Econometrics model

This study targeted to identified determinants of choosing diversified livelihood strategies. Most of the smallholder farmers reported that they adopt more than one livelihood diversification strategies simultaneously to improve their livelihood. In this case, the multinomial and multivariate regression model are appropriate models (Greene, 2002). However, one of the assumptions of the multinomial regression model is the possible livelihood alternatives are mutually exclusive so that error terms are independent. Conversely, the likely livelihood alternatives are not mutually exclusive and smallholder farmers implement multiple livelihood alternatives; therefore, multivariate probit model employed to incorporate the possible correlation in the error terms. Similar studies(Kassie, 2017; Shikuku *et al.*, 2017) employed multivariate probit estimation technique to improve efficacy in the case of simultaneous adoption studies.

Following (Greene, 2002), the empirical model presented as follows:

$$Ym1 = X'jm1\beta1 + \epsilon m1$$
$$Ym2 = X'jm2\beta2 + \epsilon m2$$
$$Ym3 = X'jm3\beta3 + \epsilon m3$$

Where Ym1 =on-farm livelihood strategies; and m= 1; if the farm household uses on farm livelihood strategy (0 otherwise) and so on and m = smallholder household; X'jm1 = vector of explanatory variables, βi= vector of parameter and $\square$mi is error term.

Description and measurement of explanatory variables

Variables	Variable nature	Measurement of variables
Sex of household head	Dummy	1 = male, 0 = female
Age of household head	Continuous	Year
Education level of household	Dummy	1= literate, 0=illiterate
Livestock ownership	Continuous	TLU
Land ownership	Continuous	Hectare
Market access	Dummy	1 yes, 0 otherwise
Credit access	Dummy	1 yes, 0 otherwise
Family size	Continuous	Number
Access irrigated land	Dummy	1 yes, 0 otherwise
Distance to main road	Continuous	Km

Results and Discussion

Characteristics of the sampled households

The study result in table 1 describes the overall sampled household head. Most of the representative household are male headed households (84.7%), while the remaining are female headed households (15.3%). The average family size of the households estimated at 5.75. The mean age of the household was estimated at 52.11 years. Concerning the educational status of the household heads, half of them were unable to read and write.

Regarding the livestock ownership of the households, livestock production in the area is one of the basic economic activities (Derbe *et al.*, 2018), which are rearing for different purpose such as to produce animal products for food (egg, milk & meat), draught power, generate income, means of transport, produce animal dung for organic fertilizer and fuel. The average livestock ownership of the households in terms of tropical livestock unit were estimated 7.02 TLU (table 1). Land holding is also the other important base of the household's economic diversification. The mean landholding of the sampled households estimated at 1.33 hectare ranged from 0.125 hectare to 4.25 hectare, which was less than the national average that is 1.37 ha (CSA, 2013). The land holding includes cultivated, grazing, homestead, and eucalyptus woodlot land.

Table 1. Socio-economic and household characteristics of sampled households

Variables	Minimum/maximum	Mean
Age	25/80	52.11
Family size	1/9	5.75
TLU	.013/ 26.86	7.02
Landholding	.125/ 4.25	1.33
Variables	Category	Percentage
Sex	Male	84.7%
	Female	15.3 %
Education level	Literate	50.8%
	Illiterate	49.2%

Source: Survey data, 2017

Household livelihood strategies

The descriptive statistics result in figure 1 revealed that most of the sampled households are engaged in diversified livelihood strategies (on-farm, off farm and non-farm) to earn the living and fulfill the aspiration for improved and better livelihood. Among the off-farm activities, majorly are in sales of charcoal, firewood, eucalyptus production (sharecropping), and daily wages are common for the rural households. Petty trades, handicrafts, pottery, trading in small ruminants & cattle, priesthood, sale of local beverages and food, remittances, and income from migration are the main non-farm source income that significantly support the livelihood improvement of farm households predominantly for the households with the small-cultivated land.
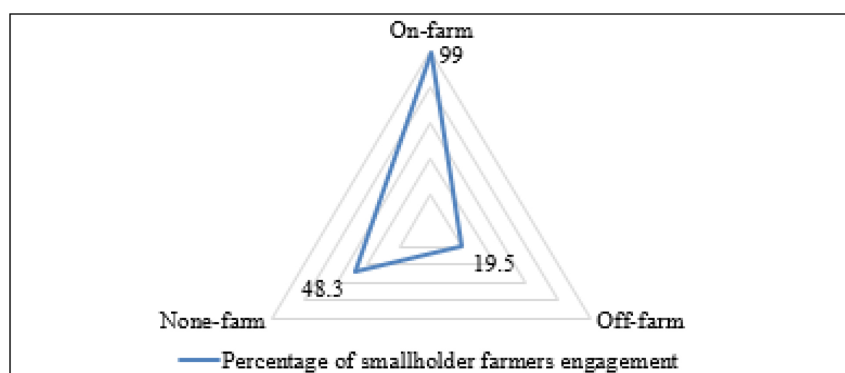

Figure 1. The proportion of smallholder farmers engagement in each livelihood strategies
Source: survey result, 2017

Determinants of choosing livelihood diversification strategies

Different determinants influenced the engagement of the households in different livelihood strategies. Hence, for the identification of determinants, a multivariate probit regression model was employed. Before conducting a multinomial logit regression, multicollinearity problem for both continuous variables (VIF) and categorical variables (contingency coefficient) tested, and verified no sever multicollinearity problem (i.e. VIF < 10; the contingency

coefficients < 0.75) (Gujarati, 2004). Accordingly, five continuous and five discrete explanatory variables analyzed via the multivariate probit regression model.

Table 3. multivariate probit regression result

	(1) On-farm	(2) Off-farm	(3) Non-farm
Age	.004 (.043)	-.314* (.184)	-.529*** (.189)
Farm size	.134 **(.062)	.348 (.265)	.041 (.273)
Market access	-.023 (.024)	-.164 (.101)	.065 (.104)
Irrigation	.008 (.02)	.164* (.086)	-.102 (.089)
Sex	-.009 (.027)	.162 (.118)	.021 (.121)
Credit	.013 (.019)	.063 (.083)	.619*** (.085)
Education level	.018 (.018)	-.022 (.077)	.104 (.079)
Livestock ownership	-.023 (.047)	.139 (.199)	-.015 (.205)
Distance to main road	-.053** (.031)	-.312** (.131)	.066 (.135)
Family size	-.038 (.053)	-.142 (.225)	-.027 (.231)
Constant	1.002*** (.035)	.325**(.148)	.469***(.153)
Correlation coefficient	On farm	Off farm	Non-farm
$\dot{\rho}$(rho)2	-.2932342		
$\dot{\rho}$(rho)3	.4684657	.0127442	
Number of observations= 118 Log likelihood value = -109.21043, Wald chi2(21) = 41.23*** Likelihood ratio test of rho21 = rho31 = rho32 = 0; Prob > chi2 = 0.7916 *** significant at 1% (p<0.01), ** significant at (p<0.05), * significant at 10%			

Source; survey data 2017

Results from the empirical model indicated that on-farm livelihood strategy has a positive and adverse relationship with non-farm and off-farm, respectively. The result also shows the following explanatory variables influencing the engagement of livelihood strategies.

Age of the household head (year): Age of the household head found negatively and significantly affect the livelihood diversification into off-farm and non-farm livelihood strategies. That accounts to the elderly farmers being well established, more experienced in agricultural production and more resistance to new ideas and information that hinder them from diversifying their livelihood strategies. Whereas, younger rural households cannot get enough farmland to support their families, and thus they get into diversified venture activities. In line with the result,Amare & Belaineh (2013); Ambachew & Ermiyas (2016); Seid (2016) stated that the younger are more likely to diversify their livelihood strategies into off and/ non- farm livelihood activities to support their livelihood. Contrary to this study, (Yishak *et al.*, 2014) concluded from their study that the old age farmers are more likely to diversify the livelihood strategies into non-farm activities.

Farm size: Farm size of the households found positively and significantly influences their choice of farmlivelihood strategies. This implies that a unit increment in farm size, the households are more likely to prefer farm livelihood strategies. Hence, the households with a large farm size could able to cultivate a large area of plots and produce more

(Amare & Belaineh, 2013; Kebede *et al.*, 2014)that enable the household to secure their livelihood. Moreover, the farmers with large farm size tend to follow agricultural extensification rather than diversifying and on the other hand, more land tends to follow and devote more time to agricultural intensification rather than diversification (Adugna & Wagayehu, 2012; Ambachew & Ermiyas, 2016; Asfaw *et al.*, 2017; Bereket *et al.*, 2018; Yenesew *et al.,* 2015).

Credit: Credit is an important source of earning future income that plays an essential role in supporting the production and income generating activities of farmers (Gebru & Beyene, 2012). The result of the regression proves that access of credit has a positive and significant contribution to the engagement of households into non-farm livelihood activities. Access to credit might create liquidity guarantee especially among farmers who lack effective demand for production inputs (Shikuku *et al.*, 2017).This finding is consistent with the result of Asfaw *et al.* (2017) that reported that access to credit were important factors for the participation of household in non-farm activities.

Irrigation access: The model result showed that access of irrigation had positive and significant influence on the involvement of households in off-farm livelihood activities. The possible reason is the farmer who participated in irrigation practice has improved life due to high income earned (Ambachew & Ermiyas, 2016).That result correlates with findings reported by (Alemayehu *et al.*, 2018; Bereket *et al.*, 2018).

Distance to main road: distance to the main road negatively correlated with the livelihood diversification into farm and off-farm alternatives. This thought us that the distance from the main asphalt road increase the probability of smallholder farmers engagement in farm and off farm livelihood activities have decreased. Since access to road is an essential infrastructure required for diversified inputs and livelihood activities. This result is consistent with the findings of Ambachew & Ermiyas (2016);Asfaw *et al.*, (2017), reported that the households at proximity to the road would like to choose livelihood diversifications strategies.

Conclusion

The output of the study revealed that most of the sampled smallholder farmers pursued diversified non-farm and off-farm livelihood activities. This indicates that the on-farm activities alone are not enough to sustain smallholder farm household's livelihood. Consequently, they engaged in diversified livelihood strategies to support their livelihood. Thus, the roles of off-farm and non-farm diversified activities are immense for the improvement and reduction of poverty. However, different factors continue to influence the utilization of diversified livelihood strategies. Access to irrigation and credit positively affects the utilization of diversified livelihood strategies by the smallholder farmers. While, age, farm size, distance to main road negatively correlated with the utilization of diversified livelihood strategies. Therefore, besides the on-farm livelihood activities, the non-farm and off-farm livelihood activities require paying attention to absorb the growing population and improving the living of smallholder farmers. Further, determinants of the livelihood diversification should be considered by responsible stakeholders. Finally, lucrative off and non-farm activities must be constantly identified.

Acknowledgments

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