An Economic Inquiry into Access and Utilization of Rural Financing in Southern Ethiopia

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ABSTRACT

The main objective of this paper is to assess farmers' access to and utilization of credit services, and to identify the determinants of access and utilization of agricultural financing in the study area. The study employed a multistage sampling technique in order to solicit 223 households' heads from the study area. From the econometric model results both model results of the probit model and the double hurdle model have been proved to be relevant and statistically significant implying that the explanatory variables put together do explain the variation in the dependent variable of both access and the level of utilization. The probit regression of participation in rural financing access decision results uncovered variables like (AGEHH), (EDUHH), (EXTEN) and (MKTDS). And from the double hurdle model (FMSZE), (FRSZE), (EXTEN), (OFINC) and (TRPLU) are found to be detrimental. Thus, the study recommends that investment in extension services or the facilitation of nongovernment extension, facilitation of an off farm income activity, enhancing the educational capability of the rural farm household and creating and sustaining a well-functioning markets in their vicinity is quite an important tools for improving agricultural productivity and increasing .farmers' incomes by so helping them have access to rural financing and helping them to properly utilize the borrowed finance.

Keywords: Rural Financing; Probit; Southern Ethiopia; Access; Utilization.

1.0 Introduction and Background

Financial services are critical enablers for sustainable economic growth and therefore, poverty reduction and food security in the Ethiopian economy in general and in the agricultural sector in particular. Credit is used for investments to increase the productivity of agricultural operations or to diversify the economic activities of rural households. Sustainable utilization of modern farm inputs (agricultural

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intensification) is a function of financial incentives to farmers, affordability and availability of modern farm inputs. If correctly used, credit should increase the size of farm operations, introduce innovations in farming, encourage capital formation, improve marketing efficiency and enhance farmers' consumption (AEMFI, 2010; Samuel, 2006; FDREMA, 2014).

In theory, agricultural intensification can allow for productivity gains without expansion onto marginal lands and the subsequent environmental problems of soil degradation, erosion, water pollution, and desertification. Poor capital markets in developing countries limit farmers' access to the funds required for agricultural intensification. Many academics suggest that the provision of credit to rural areas of developing countries would allow landowners to increase crop yields by employing more sophisticated inputs and techniques. Presumably, the productivity increases would limit encroachment onto marginal lands and landowners would have access to inputs that would allow them to minimize land degradation. As a result, the production increases would be sustainable.

In Ethiopia, agriculture is a detrimental sector of the Ethiopian economy due to its huge contribution to the gross domestic product, export earnings and creation of employment opportunities. It accounts for 46.3% of the GDP, 83.9% of exports, and 80% of the labor force. Many other economic activities depend on agriculture, including marketing, processing, and export of agricultural products. Production is overwhelmingly of a subsistence nature, and a large part of commodity exports are provided by the small agricultural cash-crop sector (EEA, 2015). Although potential exists for self-sufficiency in grains and export development in livestock, grains, and vegetables, a large part of the agricultural sector is underdeveloped. One of the principal causes of the prevailing problems of agriculture is the low level of utilization of output-enhancing inputs and the means to acquire the yield-enhancing agricultural inputs. (Adelek et al, 2010)

Thus, the provision of credit services to the agrarian economy and its sustainable utilization of rural households has been considered a powerful instrument to lift poor rural households out of poverty. Among the many fold benefits of access and utilization of rural financial services, the prominent ones are: it contributes to alleviating poverty and improving development outcomes, it also empowers the rural poor to excessive consumption smoothing, start or expand a business, cope with risk and increase and diversify household income, it enables them to access technology innovations and more inputs which are essential to increase production, decreases the gap among the diverse rural farm households. It enables rural farm households to easily capture market opportunities. Obviously, access to rural finances can help the rural economy in many ways. Credit access can significantly increase the ability of households to meet their financial needs such as the purchase and use of improved agricultural inputs. Again, access to credit by rural households has the potential to accelerate the adoption of modern agricultural technologies that may increase the income of the smallholder farmers and help break the poverty cycle they often find themselves in.

The question of rural financing has profound implications both at the micro and macro level. When credit is allocated poorly and unduly, farm households will be adversely affected as poor investment projects are undertaken and the nation's resources are squandered, it raises costs for successful borrowers, erodes the fund that would be available for future investment, reduces banks' flexibility in redirecting towards alternative activities.

Access and utilization of credit by rural households is a key ingredient in the promotion of agricultural production and transformation. Credit availability benefits the farm household by alleviating capital constraints on agricultural production activities and also emboldens the farm household to undertake risky activities.

Be this as it may, however, there exists a wide disparity naming farmers in the study area both in their access to and utilization of agricultural financing. The causes of diversity are attributable to various demographic, social, economic, or institutional factors. Uncovering the reasons behind such diversity and understanding farmers' current level of access and utilization of agricultural rural credit services are of great necessity.

This study is thus intended to analyze the determinants of farmers' access and utilization of credit services in southern Ethiopia.

2.0 Objectives of the Study

The main objective of this paper is to assess farmers' access to and utilization of credit services and to identify the determinants of access and utilization of agricultural rural credit services that are of great necessity.

The specific objectives of the study are to:

- Assess whether or not rural financing is accessible
- Assess farmers' utilization of relevant agricultural credit, and
- Identify the determinants of access and utilization of agricultural financing in the study area

3.0 Research Questions

The study has the following research questions to answer

- What is the level of access to agricultural financing?
- What is the level of utilization of agricultural rural financing of farm households?
- What are the factors that influence access and utilization of rural financing?

4.0 Sampling Technique and Sample Size Determination

According to the Population and Housing Census of Ethiopia, there are a total of 239, 816 people living both in the rural and urban areas of the Boricha woreda. Since our study is at the household level, the study focused on the total number of households in the woreda. According to the census report, there are 47, 150 households in all the total rural kebeles of woreda. This makes up the total size of the target population of the study. The sample size for our study was determined by using the formula according to (Yamane, 1967; Cochran 1963):

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

Where n is the sample size, N is the total size of the target population, e is the level of error and given N = 47, 150 and e = 0.07 level sampling error

Then, $n = \frac{47,150}{1+47,150(0.07)^2} = \frac{47,150}{(1+47,150(0.0049))} = 203$ If we add 10% contingency 0.1 * 203 = 20Hence, the sample size is n = 223

5.0 The Model

In the field of agricultural economics and studies on the adoption of technologies, participation in a program, access to credit services and the like, the commonest practice is when the dependent variable is strictly measured as a dichotomous response variable [0 = non-adoption of innovation /non-participation in the program or no information seeking behavior and 1=adoption of innovation/participation in a program or revealed behavior of information seeking] whereby discrete regression models are used.

Discrete regression models are models in which the dependent variable assumes discrete values. The three most commonly used approaches to estimating such models are the linear Probability models (LPM), the logit model and the probit models.

The linear probability model has an obvious defect in that the estimated probability values can lie outside the normal 0-1 range and it also assumes that the marginal or incremental effect of explanatory variables remains constant, that is Pi = E(Y=1/X)increases linearly with X. Thus this model is discarded from the alternatives. The Logit and Probit models are the convenient functional forms for models with binary variable. The choice between the two is one of mathematical convenience. (Amemiya, 1981; Gujarati, 2007).

The econometric model applied for analyzing Determinants of Access and Utilization of Rural Financing is the double hurdle model. We are employing crosssectional data for our analysis purpose where farm households have two sequential decisions to make, in which case it is desirable to use limited dependent variable models to analyze censored data because some households may report zero level of credit utilization. The Tobit model was widely used in early studies for this purpose, which treats all the zero observations as corner solutions

6.0 Model Specification

When we come to econometric modeling the level of access and utilization of rural credit service of rural farm households' farmers are expected to make two separate decisions and essentially, they must pass through two separate hurdles before they are observed with a positive level of credit utilization.

When we come to the double hurdle model, however, the specific double hurdle model can be given by.

$$Y_{i} = \begin{cases} y_{i}^{*} = \beta X_{i} + \epsilon_{1i} \text{ if } \beta X_{i} + \epsilon_{1i} > 0 \text{ and } D_{i}^{*} = \alpha Z_{i} + \epsilon_{2i} > 0 \\ 0 \text{ if } \beta X_{i} + \epsilon_{1i} \le 0 \text{ and } \alpha Z_{i} + \epsilon_{2i} > 0 \\ 0 \text{ or } \beta X_{i} + \epsilon_{1i} > 0 \text{ and } \alpha Z_{i} + \epsilon_{2i} \le 0 \\ 0 \text{ or } \beta X_{i} + \epsilon_{1i} \le 0 \text{ and } \alpha Z_{i} + \epsilon_{2i} \le 0 \end{cases} \qquad \dots (1)$$

The model assumes that the two error terms were jointly normal,

$$\binom{\epsilon_1}{\epsilon_2} \sim N(0, \Sigma)$$
, and uncorrelated, $\Sigma = \binom{\delta_{\epsilon_1}^2 0}{0 1}$... (2)
Where

 D_i^* is a latent variable that takes the value 1 if a farmer decides to commercialize his/her produce of maize and 0 otherwise. Z is a vector of explanatory variables, α is a vector of parameters, y_i is an observed level of commercialization index, X is a vector of explanatory variables, β is a vector of parameters.

The log-likelihood function for the double hurdle model can be given by

$$Log L = \sum ln \left[1 - \Phi(\alpha Z'_i) \left(\frac{\beta X'_i}{\delta} \right) \right] + \sum ln \left[\Phi(\alpha Z'_i) \frac{1}{\delta} \phi\left(\frac{Y_i - \beta X'_i}{\delta} \right) \right] \qquad \dots (3)$$

Under the assumption of independency between the error terms ϵ_1 and ϵ_2 , the model is equivalent to a combination of a truncated regression model and a univariate probit model (Crag, 1971).

The specific model of credit service utilization decision can be given by:
$$\begin{split} D_i &= \beta_0 + \beta_1 AGEHH + \beta_2 SEXHH + \beta_3 EDUHH + \beta_4 FMSZE + \beta_5 FRSZE + \\ \beta_6 EXTEN + \beta_7 MKTDS + \beta_8 OFINC + + \beta_9 TRPLU + \varepsilon_i & \dots(4) \\ y_i &= \beta_0 + \beta_1 AGEHH + \beta_2 SEXHH + \beta_3 EDUHH + \beta_4 FMSZE + \beta_5 FRSZE + \\ \beta_6 EXTEN + \beta_7 MKTDS + \beta_8 OFINC + + \beta_9 TRPLU + \varepsilon_i & \dots(5) \\ \end{split}$$
Where

 D_i is the binary dependent variable that takes the value 1 if the farmers have access to agricultural credit service and 0 otherwise, Y_i is the amount of credit level used as discussed above.

AGEHH age of the household, SEXHH represents sex, EDUHH is the education of the household, FMSZE is family size, FRSZE farm size, EXTEN represents extension, MKTDS is market distance, OFINC is off-farm income and TRPLU is the tropical livestock unit.

7.0 Description of Variables and Expected Sign

The description of these explanatory variables, their measurement and the expected sing of their relationship with the dependent variables are presented in the Table 1.

Dependent variable: Access and utilization of credit							
Variables	Type of variable	Description	Measurement	Hypothesis			
AGEHH	Continuous	Age of the household head	Number of years	Negative			
SEXHH	Dummy	Sex of the household head	1 for male and 0 otherwise	Positive			
EDUHH	Continuous	Education level of the household head	Years of schooling	Positive			
FMSZE	Continuous	Family size	Number of individuals	Positive			
FRSZE	Continuous	Farm size	Number of hectares	Positive			
EXTEN	Dummy	Access to extension	1 if there is access and 0 otherwise	Positive			
MKTDS	Continuous	Distance to the nearby market	Number of hours	Negative			
OFINC	Dummy	Off-farm income	1 if there is off-farm income and 0 otherwise	Negative			
TRPLU	Continuous	Tropical livestock unit	Scale/weight	Positive			

 Table 1: Description of Independent Variable and Hypothesis

8.0 Results and Discussion

It is revealed from the probit regression result of Table 2 below that the likelihood ratio chi-square of 33.24 with a p-value of 0.0000 tells us that our model as a whole is statistically more significant than a model with only the constant term. The explanatory variables put together do explain the variation in the dependent variable.

Dependent variable					
Independent variables	Coefficients	Stand error	Z-stat	P value	
AGEHH	0266091	.0110607	-2.41	0.016***	
SEXHH	.1670821	.4181925	0.40	0.689	
EDUHH	.0782813	.0456411	1.72	0.086***	
FMSZE	0267964	.0650153	-0.41	0.680	
FRSZE	.0312013	.2411386	0.13	0.897	
EXTEN	.9000755	.0178748	50.35	0.000*	
MKTDS	2860813	.0209181	13.68	. 0.000*	
OFINC	.1594086	.2770815	0.58	0.565	
TRPLU	0021276	.0527243	-0.04	0.968	
Constant	1.640583	.923175	1.78	0.076	
Number of $obs = 203$					
LR $chi2(9) = 33.24$					
Prob > chi2 = 0.000					
Log likelihood = -96.705149					

Table 2: Estimation Result of the Probit Model

*, **, *** significant at 1%, 5% and 10 % respectively *Source:* own survey and calculation, 2019

The probit regression of participation in the commercialization decision results in Table 2 above which uncovered that from the total of nine explanatory variables used in the estimation of the probit model, four of them are found to be significant at one per cent and ten per cent level of significance, besides, they are of the expected sign. These are AGEHH, EDUHH, EXTEN and MKTDS.

The above table depicts only the direction of the relationship between the dependent variable and a set of independent variables. Thus, it only reveals the direction of the relationship pertaining to access to financial services in the rural area without duly revealing quantitative determinations. In order to interpret the quantitative implications of the determinants of access to finance, we need to compute

the partial effects, using marginal effects for continuous explanatory variables and average effects for the binary explanatory variable. The partial derivatives (marginal effects) of the variables on the factors determining the probability of farmers' access to rural finance are computed at the means of the variables for all observations and this is displayed in Table 3 below.

Dependent variable				
Independent variables	dy/dx	Stand error	Zst at	P value
AGEHH	0077917	.00323	-2.41	0.016 **
SEXHH*	.0516427	.13577	0.38	0.704
EDUHH	.0229223	.01329	1.72	0.085 ***
FMSZE	0078465	.01903	-0.41	0.680
FRSZE	.0091363	.07062	0.13	0.897
EXTEN*	.0428203	.08363	0.51	0.609
MKTDS	-3241.574	420.0001	7.72	0.000*
OFINC*	.0451353	.07566	0.60	0.551
TRPLU	000623	.01544	-0.04	0.968

Table 3: Marginal Effect of the Probit Model

(*) dy/dx is for discrete change of dummy variable from 0 to 1 *, **, *** significant at 1%, 5% and 10 % respectively **Source:** own survey and calculation 2019.

The age of the household head is found to be significant and negative. It thus negatively and significantly affects the probability of access to rural finances. An increase in age deters access to rural financial services. The intuitive explanation for this is that younger farm household heads are prone to capture any possible advantage that may abound in the rural areas for the youth, generally, are energetic, motivated and daring for any plausible change and productivity-enhancing activities. According to the result above, an increase in the age of the household head by one year decreases the probability of access to rural financing by nearly 8%, keeping all other factors constant.

The education of a farmer has been assumed to have a positive influence on access to rural financing. It is very much intuitive that the education level of a farmer increases his or her ability to obtain; process and use information relevant to on-farm and off-farm activities and any production-enhancing activities to which using financial aids and services are not an exception. The justification for this is that higher education influences respondents' attitudes and thoughts making them more open, rational and able to analyze the benefits of financial aid and credit services. According

to the table above, a one-year increase in education, keeping all other factors constant, increases the probability of access to finance by 23%.

Market proximities reduce travel costs and deterrence of distance barriers. A very close market in the vicinity of farmers' residences does provide farmers with opportunities pertaining to information and related agenda on agricultural practices. In collaboration with other institutional variables or alone, it can channel the information and the means by which credits and other incentives to the farming community can be accessed. This is evidenced by the negative and significant relationship between market distance and access to agricultural finance. The model result revealed that for the average farm household head and keeping all other factors constant, an increase in market distance by one hour decreases the probability of access to agricultural finance by 32 %.

8.1 Estimation result of the double hurdle model

From the estimation result of the double hurdle model, it is understood that as a whole, it is credible as can be evidenced from the likelihood ratio chi-square of 110.02 with a P-value of 0.0000. This tells us that the model as a whole, i.e. the explanatory variables put together, is statistically more significant than a model with only the constant term.

Dependent variable					
Independent variables	Coefficient	Stand error	Z-stat	P value	
AGEHH	0118948	.0132544	-0.90	0.369	
SEXHH	.3963226	.4963285	0.80	0.425	
EDUHH	.0575872	.0513183	1.12	0.262	
FMSZE	0.1269308	.0737947	1.72	0.085***	
FRSZE	1.330672	.2750524	4.84	0.000 *	
EXTEN	.7352563	.3451025	2.13	0.033 **	
MKTDS	0317119	.0233998	-1.36	0.175	
OFINC	.5289888	.3036444	1.74	0.081 ***	
TRPLU	.1161919	.0584951	1.99	0.047**	
Constant	.6450314	1.074306	0.60	0.548	
Number of obs =203					
Wald chi2(9) =110.02					
Prob>chi2= 0.000					
Log likelihood = -395.65704					

 Table 4: Estimation Result of the Double Hurdle Model

*, **, *** significant at 1%, 5% and 10 % respectively

Source: own survey and calculation 2019.

Besides, as it was argued in the econometric modelling section, Table 4 revealed that the factors that are detrimental to access to rural finance and the factors that are detrimental to how much to borrow are not the same.

From Table 4, it can be underscored that five variables are significant at various levels of significance. These are the family size of the household (**FMSZE**), farm size of the household (**FRSZE**), participation in an extension visit (**EXTEN**), off-farm income (OFINC) and the tropical livestock unit (**TRPLU**).

Family size is a great source of human capital for the farmer and it is intuitively assumed to have a significant influence on farmers' decision to look for various sources of rural financing for every industrious endeavor which is at the disposal of the rural household. This is justified by the double hurdle estimation result of the above table. According to Table 4, the family size significantly and positively affected the level of credit services that rural households get. Keeping all other factors constant, an increase in the family size by one unit will increase the amount of credit received by an average rural household head by 0.12 units.

Physical factors such as farm size play a critical role in affecting the level of credit obtained in rural areas. Many studies have reported a positive relationship between farm size and access and the level of credit received in a rural household. The result in the above table has also confirmed this notion. Farm size positively and significantly affected the amount borrowed at one level of significance. An increase in the farm size by one hectare, increases the amount borrowed by 1.33 units.

The extension system and extension services in the rural community, as a facilitating service system comprising diverse actors, have already been proven as the most detrimental and effective institutional service that can reform the rural household in many respects. The extension system contributes to achieving a better performance of the rural household's agricultural production and productivity and food security by so training, informing and inspiring farmers to have access to and utilize any financial services available at their disposal. This is justified in the above table as the extension participation significantly and positively affected the level of rural financing at a five per cent level of significance. Accordingly, an average farm household who attends and participates in extension services is nearly 70 per cent better off in acquiring rural financial services.

The detrimental role of off-arm income and tropical livestock unit is positive and significant at a ten and five per cent level of significance respectively. This is attributable to the obvious fact that a majority of the resource-poor farmers in Ethiopia lack and could use tropical live stocks as collateral and as incentives to work with them and improve their lives and livelihoods. Besides, farmers who are involved in off-farm income generating activities, are generally informed, industrious, and risk takers than otherwise which in turn will increase their chance and level of benefiting from any rural financial services.

9.0 Conclusion and Recommendation

Agriculture is the major contributor to the Ethiopian economy, to GDP, employment and export. Its productivity is hampered by many factors though. Agricultural finance is the provision of multiple types of services dedicated to supporting both on- and off-farm agricultural activities and businesses including input provision, production, distribution, wholesale, processing and marketing. Financial services are critical enablers for sustainable economic growth and therefore, poverty reduction and food security in the Ethiopian economy in general and in the agricultural sector in particular. Credit is used for investments to increase the productivity of agricultural operations or to diversify the economic activities of rural households. Sustainable utilization of modern farm inputs (agricultural intensification) is a function of financial incentives to farmers, affordability and availability of modern farm inputs. If correctly used, credit should increase the size of farm operations, introduce innovations in farming, encourage capital formation, improve marketing efficiency and enhance farmers' consumption.

This research, however, paid an emphasis on the importance of rural financing and its determinants to have access to and benefit from rural financing. Predominantly, the article is aimed at assessing farmers' access to and utilization of relevant agricultural financing and identifying the determinants of access and utilization of rural financing. To this end, the study used a credible and rigorous econometric analysis. The econometric model applied for analyzing the determinants of access and utilization of rural financing is the double hurdle model. The study employs crosssectional data for our analysis purpose where farm households have two sequential decisions to make, in which case it is desirable to use limited dependent variable models to analyze censored data because some households may report zero levels of credit utilization. Thus, the supremacy of the double hurdle model over and above the Probit model is justified.

From the econometric model results, both model results of the probit model and the double hurdle model have been proved to be relevant and statistically significant implying that the explanatory variables put together do explain the variation in the dependent variable of both access and the level of utilization. The probit regression of participation in rural financing access decision results uncovered that from the total of nine explanatory variables used in the estimation of the probit model, four of them are found to be significant at one per cent and ten per cent levels of significance, besides they are of the expected sign. These are the age of the household head (AGEHH), education level of the household head (EDUHH), extension participation (EXTEN) and proximity to the nearest market (MKTDS). And from the double hurdle model in Table 4 above, it can be underscored that five variables are significant at various levels of significance. These are, the family size of the household (FMSZE), farm size of the household (FRSZE), participation in an extension visit (EXTEN), off-farm income (OFINC) and the tropical livestock unit (TRPLU).

Thus, the study recommends that investment in extension services or the facilitation of nongovernment extension, facilitation of an off-farm income activity, enhancing the educational capability of the rural farm household and creating and sustaining well-functioning markets in their vicinity are quite important tools for improving agricultural productivity and increasing farmers' incomes by so helping them have access to rural financing and helping them to properly utilize the borrowed finance.

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