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Impact of Household Decision Making Criteria on Access to Productive Capital in Northern Ghana: A Baseline Evidence of The United States Government's Feed The Future (FTF) Programme

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Abstract
Resources are the key considerations for rural livelihoods. Rural households negotiate their livelihoods by obtaining access to land, labour, capital, knowledge and market, which leads to enhanced family well-being and sustainable use of resources. Much has been written about the importance of household decision criteria in accessing productive capital/resources and in designing and implementing agricultural development projects. Using a cross-sectional data from United States Government's feed the future initiative; this study employed the Probit model to determine the impact of household decision criteria on access to productive capital/resources. A total sample size of 11196 farm households were selected from Northern Ghana for the study. The result of the probit model revealed gender, ownership of productive resource, household decision criteria as the significant variables in accessing productive capital/resources. The study therefore calls on donors, NGOs and government organisations to initiate integration of resource allocation in development policies and programmes for sustainable development.
Keywords: Access, Decision making criteria, Probit model, Productive capital/resource, Ghana

1. Introduction

The availability of land with excellent soil and climate, plentiful water for irrigation, inexpensive farm labor, subsidized agricultural mechanization services and fertilizers and the establishment and management of block farms presents attractive attributes to any country for bringing about innovation, efficiency gains and economic growth in the long run. This is because productive resources such as land, labour and capital contribute to production and to a larger extent leads to agricultural growth. However, availability of these resources to household members for production depends on the decision making process by the members. Many important economic decisions that affect the well-being of individuals– e.g., agricultural production, labor supply, residential location, buying insurance or a new car, and investing in stocks and bonds or in children's education – are often made by households within families rather than by individuals. The decision-making processes by which resources are allocated among individuals and the outcomes of those processes play an important role in the outcome of development policy as reported by a growing body of literature since the early 1990s (see for instance Strauss and Thomas 1995; Behrman 1997; Haddad et al, 1997). For instance in the traditional, neoclassical model of household behavior (known as the unitary model) households behave as if they were a single entity with a common utility function and income pooling. In this instance, decision made by the household head is decision for all and thus outweighs individual preferences. The disadvantage is that, if household members in fact have different preferences, resources, and responsibilities, then there may be policy failures since policies are designed while relying on the unitary model (e.g. Haddad et al, 1997), thus resulting in a wobbling economy. The approach of collective (non-unitary) models of households decision making on the other hand argued that household behavior is determined in a bargaining process and thus allowed for different preferences of household members leading to an efficient use of the available resources (e.g. Manser and Brown, 1980; McElroy and Horney, 1981; Bourguignon et al., 1995; Lundberg and Pollak, 1993, 1997).

Halpern (1997) also argued that in order to arrive at consensus, several steps must be followed. First, one must realize that it is going to be necessary to make a decision, determine the goals to be achieved, generate alternatives that lead to attaining the proposed goals, evaluate whether these alternatives meet one's expectations and, lastly, select the best alternative, the one that implies an efficient global result. This entire process affects timely resource use.

Coupled with the low level of resources, is the decision-making with regards to individual resource-use which requires the consent of all members of a household or the whole community in some cases. This renders the availability and efficient use of resources, contributes to the low agricultural productivity and thus impairs development, especially in the face of global economic crunch. These situations are worrisome given that numerous interventions by successive governments have been implemented to promote accessibility of resources

among farmers. Together with other factors, this study assesses the impact of household decision making criteria on the individual access to productive resources.

2. Methodology

2.1 The Theoretical and Analytical Framework

In this study, as in other studies, the access to productive capital/resource by a given household is considered to be discrete so that the choice variable is qualitative in nature. Qualitative choices are modeled using binary response models such as the logit and the probit models. Using the probit model, the factors that influence farm households' access to agricultural productive capital were estimated. The use of the probit model for this analysis is consistent with the literature (*see for instance Donkoh et al, 2011;* Nambiro and Okoth, 2013 and Abdul-Hanan et al, 2014) and is also based on the random utility theory proposed in the works of Greene (2008) and Maddala (1983). According to Green (2008), if productive capital/resource is seen as a possible access, then a household will be expected to make a choice that will maximize its utility. This approach is based on the linear random utility assumption (Greene, 2008), which is normally given as:

$$\begin{cases} U_{i0} = x_i'\beta_{i0} + e_{i0} \\ U_{i1} = x_i'\beta_{i1} + e_{i1} \end{cases} \quad (1)$$

Where U_{ij} is a measure of utility derived by household from choosing alternative j (with the decision not to access productive capital/resource being U_{i0} while access to productive capital/resource is denoted as U_{i0}), x_i is a vector of characteristics specific to household i as well as attributes associated with alternative j and specific to the i[th] household, β is a vector of unknown parameters, and e_{ij} is random disturbances associated with the choice of alternative j by household i.

The probability that household chooses a particular alternative (i.e. $Y_i = 1$) versus another (i.e.$Y_i = 0$) is associated with the probability distribution of the error differences in the expected utilities from the choices and given by:

$$P_i = Prob\,(Y_i = 1|x) = Prob\,(y_i^* > 0|x) = Prob\,(e_i > -x_i'\beta|x) = F(x'\beta) \quad (2)$$

From (2), F is the cumulative distribution function of $e_i(= e_{i1} - e_{i0})$ evaluated at $x_i'\beta$, and $y_i^*(= U_{i1} - U_{i0})$ is a latent variable, since it is unobservable, and is linked to y_i, the observed binary variable, through the relation below:

$$y_i = \begin{cases} 1 \; if \; y_i^* > 0 \\ 0 \; if \; otherwise \end{cases} \quad (3)$$

The specification of a model to describe the relation between the probability of choosing an alternative and the explanatory variables is dependent on the distribution of the error term (i.e. whether it is normal and logistic in nature). Therefore, if the error term in the utility model is assumed to be normally distributed, then the model is specified as:

$$Y_i = X_i'\beta + \varepsilon_i \quad (4)$$

Where Y_i^* is households' access to productive capital/resource and a latent variable which can be related to the observable binary variable Y_i through the expression:

$$Y_i = \begin{cases} 1 \text{ if } y_i^* > 0 \\ 0 \text{ otherwise} \end{cases} \quad (5)$$

X_i is a vector of explanatory factors and consists of sex, education, age, household size, income, productive capital/resource ownership, household decision variables (who makes decision on selling, renting, giving of resources) and relationship with others; the β is the vector of unknown parameter estimates and the ε_i is the stochastic error term which is assumed to be normally distributed.

2.2 Choice of Variables for Probit Model and Hypotheses

Gender: In Ghana, households are usually headed by males who are always considered as the decision-makers in terms of resource use. Females only make decisions in the absence of males. There is gender discrimination when it comes to decisions concerning resource use due to resource limitations (Chiputwa et al., 2011). Therefore, male farmers are more likely to access productive capital/resources than their female counterparts. Access productive capital/resource is therefore expected to be positive for male farmers.

Age of the Farmer: The likely effect of age of the farmer on access to productive resource is positive. This is because older farmers may be in a better position to access productive capital/resource due to their comparative advantage in terms of capital accumulated and credit worthiness.

Household Size: Farmers with larger household size tend to spend more on food and other basic household requirement including clothing and shelter, such that they have little or no money left for acquisition of productive capital/resource. Also, an individual share of households' productive capital/resource decreases with larger households. Household size is therefore postulated to have a negative impact on access to productive capital/resource.

Education: Farmers with formal education are expected to have more exposure to the external environment and accumulate knowledge. They have the ability to analyze costs and benefits and can therefore acquire resources at lower cost than their illiterate counterparts. Education is therefore expected to have a positive influence on access to productive capital/resource.

Income: This is measured as the total income of the farmer for the year. Farmers with higher annual income will be able to acquire productive capital/resource. It was therefore hypothesized that farmers with high annual income access productive capital/resource than those with low annual income. The expected sign for the coefficient of this variable is negative.

Ownership of productive capital/resource: This is expected to have a negative effect on access to productive capital/resource. This is because resources in African societies are usually family owned or group owned. Release of productive capital/resource to an individual for production takes several processes.

Household decision criteria: These variables are each expected to exert a negative effect on access to productive capital/resource. Decision making with regards to individual resource use requires the consent of all members of a household or the whole community in some cases. This renders the availability, timely and efficient use of resources.

The descriptions, measurements and a priori expectations of the variables used in the Probit model are summarized in Table 1.

Table 1: Description/measurement and a priori expectation of the variables used in the Probit Model

Variable	Description/Measurement	Expected Sign
Access to productive capital	Dummy (1 = access to productive capital/resource; 0 otherwise)	
Gender	Dummy (male = 1; female = 0)	+
Age	Number of years	+
Education	Dummy (1 = formal education; 0 otherwise)	+
Household size	Number of people in the household	-
Income	Amount in Ghana Cedis	+
Ownership of productive capital	Dummy (1 = if productive capital belongs to the household; 0 if productive capital belongs an individual)	-
Who decides in selling	Dummy (1 = if selling is decided by household; 0 if selling is decided by an individual)	-
Who decides in mortgage/rent	Dummy (1 = if mortgage/rent is decided by household; 0 if mortgage/rent is decided by an individual)	-
Who decides in giving	Dummy (1 = if giving out is decided by household; 0 if giving out is decided by an individual)	-
Relationship with others	Dummy (1 = if farmer relates with others farmers; 0 if otherwise)	+

2.3 Data

The data use for this study is from the United States Government's Feed the Future (FTF) initiative that aims to support growth of the agricultural sector and promote good nutrition to attain its key goal of sustainably reducing global hunger and poverty. The survey was implemented in the three northernmost regions of Ghana namely: Upper West, Upper East, and Northern Region, as well as some selected areas in Brong Ahafo Region, to provide baseline data on the prevalence of poverty, per capita expenditures, nutritional status, women's empowerment, household hunger, dietary diversity and infant and young child feeding behaviours. The survey was funded by USAID and implemented by USAID-Ghana Monitoring Evaluation and Technical Support Services (METSS), Kansas State University (KSU), University of Cape Coast (UCC), the Institute of Statistical,

Social and Economic Research (ISSER) at the University of Ghana, and the Ghana Statistical Service (GSS) with US Department of Agriculture (USDA) and USAID providing technical support. This paper uses a sample of 11196 farm households in the northern Ghana which was collected from 230 enumeration areas located in the four selected regions.

3. Results And Discussions

This section presents the results of the estimation of Probit model. Table 2 presents the descriptive statistics of the variables used in the study. About 45% of the farmers had access to household productive capital/resources for production. The results also indicated that the population of the farmers in this study is evenly distributed as 50% was recorded each for males and females respectively. The result also revealed that the occupation is lively in the northern part of the country as indicated by the average of 37 years. The mean annual income was found to be GH¢ 406.52. The level of education among the farming households was low, considering the fact that only 15% were educated. The mean household size was 6. About 67% of the households own productive capital/resources. For our main variable of interest, about 45% of the households sell resources with help of the traditional mode of decision making while 36% mortgage/rent resources using the traditional mode of decision making. Also, about 68% of the households giving out resources while resorting to the traditional mode of decision making. Lastly, about 24% of households have relationship with other households.

Table 2: Summary Statistics of the Variables used in the Probit Model

Variable	Mean	Standard Deviation	Min.	Max.
Access to productive capital	0.4541	0.4979	0	1
Sex	0.5000	0.5000	0	1
Age	37.2743	16.8581	18	100
Education	0.1510	0.3581	0	1
Household size	5.6923	3.3751	1	35
Income	406.5200	1159.8410	1.2	30000
Ownership of productive capital	0.6741	0.4687	0	1
Who decide in selling	0.4588	0.4983	0	1
Who in decide in mortgage/rent	0.3558	0.4788	0	1
Who in decide in giving	0.6810	0.4661	0	1
Relationship with others	0.2394	0.4267	0	1

Source: Authors' Computation, 2014

3.1 Factors Influencing Households' Access to Productive Capital/Resources

The regression results are presented in Table 3. Diagnostic test for multicollinearity which is a common problem in any regression analysis was conducted using the Variance Inflation Factor (VIF). The test indicated that the largest VIF is less than 1. This value is below the maximum value of 10 which is used as a rule of thumb to indicate the presence of multicollinearity. The results therefore indicate that multicollinearity is not a problem in the estimated model. Another problem that was expected is heteroscedasticity which is a common problem mostly associated with cross-sectional data. The established procedure for correction of heteroscedasticity is to estimate the model using the weighted least squares or robust standard errors. Therefore, the model was estimated using the robust standard errors.

The Probit model estimation gave a Pseudo R^2 of 0.5087 (Table 3) which implies that the variables included in the model are able to explain about 51percent of the probability of farm households' access to agricultural productive capital/resources. The Log-likelihood Ratio (LR) was also found to be significant at the 1 percent level. This means that all the explanatory variables included in the model jointly influence farmers' probability of adoption of modern agricultural production technologies. The results indicate a reasonable degree of uniformity regarding the sign of the parameter estimates and statistical significance at either 5% or 10%.

Surprisingly, gender was found to be negatively related to access of agricultural productive capital/resources by farm households (Table 3). This was found to be significant at 1 percent level. This means that female farmers are more likely to access agricultural productive capital/resources than their male counterparts. The result contradicts with our a priori expectations and the findings of Parveen (2008) in which

women's access to extension services and training, technologies, formal or informal institutions, land and inputs for production was limited.

Contrary to widely held beliefs and that of our a priori expectation is the result of the ownership of productive capital which was found to be significant at 1% and negatively related to productive capital/resource access. This implies that the probability of accessing resources belonging to family or household is low. This is because resources in African societies are usually family owned or group owned. Release of productive capital/resource to an individual for production takes several processes or even fails in some cases.

All the variables under our main variable of interest (household decision criteria) except decision on mortgage/rent were significant and negatively related to resource access. Decisions on selling and giving out were significant at 5% and 1% respectively. This implies that farmers are less likely to access resources in households in which decision making with regards to sale or giving out resource for use requires the consent of all members of a household or the whole community. The effect of decision-making on mortgage/rent is significant at 1% and positively related to access to productive capital/resource. This implies that farmers are more likely to access resources in households in which decision on mortgage/rent is done by the family or household. The reason is that mortgage/rent of household resources to farmers is temporal and will not lead to complete loss of the resources, thus stimulating a quick release of resources without further holdups by members.

Table 3: Estimates of the Determinants of Households' Access to Productive Capital

Variable	Coefficient	Robust Standard Error	Z
Constant	2.8563	0.0918	31.12***
Gender	-0.6544	0.0623	-10.51***
Age	0.0010	0.0010	0.97
Education	-0.0329	0.0502	-0.66
Household size	-0.0011	0.0048	-0.24
Income	0.0000	0.0000	0.71
Ownership of productive capital	-2.6489	0.1203	-22.03***
Decision Criteria			
Who_decide_sell	-0.1214	0.0558	-2.17**
Who_decide_mortgage_rent	0.4157	0.0728	5.71***
Who_decide_giving	-0.9531	0.1113	-8.56***
Relationship with others	-0.0590	0.0426	-1.38
Number of observations	11196		
LR χ^2 (9)	7847.89		
Probability χ^2	0.0000		
Log likelihood	-3789.2676		
Pseudo R^2	0.5087		

*, **, *** are levels of significance at 10, 5 and 1%, respectively

Source: Authors' Computation, 2014

4. Conclusion and Recommendations

The paper employs a cross-sectional dataset and the Probit model to examine the impact of household decision making criteria on access to productive capital in northern Ghana. The analysis provides useful insight of productive capital/resources and the role played by socio-demographic factors and decision criteria in accessing productive capital in northern Ghana. Results indicate that factors such as gender, ownership of productive resource and household decision criteria are significant variables in accessing productive capital/resources. It is therefore crucial for development actors to address the issue of households in a comprehensive and holistic manner. In particular, allocation of resources related to the practical and strategic interests of households should be integrated into development policies and programmes. Donors, NGOs in addition to government

organisations, should come forward to take this initiative for sustained development.

Competing Interests
Authors have declared that no competing interests exist.

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