DETERMINANTS OF CREDIT CONSTRAINT CONDITIONS AND PRODUCTION EFFICIENCY AMONG FARMING HOUSEHOLDS IN SOUTHWESTERN NIGERIA

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ABSTRACT

Sustaining and improving production efficiency of resource poor smallholder farmers under the existing credit constraint conditions require the improvement of access to credit facilities and other factors involved. The study examined the factors influencing credit constraint (CC) and production efficiency of farming households in Oyo State, Nigeria. Primary data was randomly collected using structured questionnaire from 120 mixed farmers in the study area. Data was analyzed using descriptive analysis, probit regression and stochastic frontier analysis. The results shows that 79.2 percent of the respondents were credit constrained and this has negative influence on their production efficiency as credit constrained farming households (CCFH) were found to be less efficient with mean efficiency of 0.721 than unconstrained farming households with 0.913. Age, gender, education, and dependency ratio of farmers are significant variables that influenced credit constraint conditions of the farmers while the maximum likelihood estimate of the production frontier revealed that farm size, labour and quantity of agro-chemical used are positively and significantly related to the production efficiency of farmers. Given the largest proportion of CCFHs among farming population in South-Western Nigerian, this gap implies considerable potential loss in output due to inefficient production. Improving credit access of farming households in general but more particularly the CCFHs is desirable for higher production efficiency.

Keywords: Credit constraint, Production efficiency, Farming households, stochastic frontier, Nigeria.

INTRODUCTION

Credit is one of the components of financial services considered fundamental in all production units (Dicken, 2007). There has been a general awareness of the significance of credit as a tool for agricultural development (Omonona et al. 2008). And also, there has been a growing interest recently, in understanding the impact of financial structure on production as well as on the efficiency of production (Barry and Robinson, 2001).

Credit for rural smallholders especially in agriculture is assuming increasing importance in many parts of the world in response to the needs of less privilege entrepreneurs with limited capital base in the sector. According to Serageldin (1996), 'traditional' composition of capital (i.e. natural, physical or product and human capital) needs to be expanded to include social capital for sustainable development. There is also growing evidence that social capital is an element of sustainable development. Hence, increased attention is being given to the role of social capital in affecting the well-being of households and the level of development of communities and nations. Lawal *et al*, (2009) found that a direct relationship exists between social capital and credit access, and that membership and cash contribution in the associations' by the farming households drives access to credit positively for productivity and welfare. According to development professionals, the lack of access to credit by poor rural households has negative consequences for agricultural productivity, income generation and household welfare (Von-Pischke and Adam, 1980). The role of credit cannot be overemphasized. Without credit accessibility, it will be impossible to purchase the inputs needed for production let alone maximizing output from given resources or minimizing the resources required for producing a given level of output. Credit market literature distinguishes between access to credit and participation in credit markets (Diagne and Zeller, 2001). A farm household has access to credit from a particular source if it is able and entitled to borrow from that source, whereas it participates in the credit market if it actually borrows from that source of credit. Different farming households will have different need for credit, but a good sign that indicates some level of credit constraint is the gap between the demand and supply of credit. The wider the gap, the greater the credit constraint level (Nagargan et al, 1998). Credit Constraint can be defined as gap between demand for and supply of credit. (Hussien, 2008) defined credit constraints as the situation where the household cannot avail itself of the credit it desires at the prevailing relevant market conditions thus classify households into credit constrained and unconstrained households.

Growing empirical literature suggests that in rural areas of developing countries, credit constraints have significant adverse effects on farm output (Feder et. al, 1990; Sial and Carter, 1996; Petrick, 2004); farm profit (Carter, 1989) and farm investment (Carter and Olinto, 2003). In Nigeria, the prevalence of credit constraints and their impact on production efficiency as led to low productions on the farms. Economics of agricultural production at the micro-level is to attain the objective of profit maximization through efficient farm allocation of resources over a period of time or by either maximizing output from given resources or minimizing the resources required for producing a given level of output. Farrel (1957) referred to technical efficiency as the ability to produce the highest level of output given a bundle of resources.

Hussien (2008) examined the influence of credit constraint on production efficiency of farming households in Southern Ethiopia. A parametric approach was used to access farm households' specific technical efficiency. The technical efficiency of credit constrained respondents was calculated using Maximum Likelihood Estimator. The study found out that all input variables except herbicide and land variables were found to be statistically significant. The results also show that credit constrained farming households use lower levels of capital intensive inputs due to binding financial constraint .The result also show that the credit constrained farming households had a lower mean productive efficiency.

Omonona et al., (2008) studied credit constrained condition and output supply of Country Women Association of Nigeria **(**COWAN) farmers in Oyo State, Nigeria. The findings of the study revealed that majority of the farmers (80 percent) were constrained and therefore this affected their productivity. The results showed that age, sex, farm size, level of education, marital status, contact with extension agent, land acquisition and income of household head are the determinants of credit constraint conditions. A test of hypothesis on the difference in the value of the output of the farmers showed that credit unconstrained farmers have their output supply higher than that of credit constrained farmers.

Battese (2002) studied the influence of credit and agglomeration externalities on productivity and efficiency differences on a panel of salmon aquaculture farm in Norway. They estimated a stochastic frontier production function model. The results confirmed the importance of agglomeration externalities and credit for the productivity and technical inefficiency of the farm.

In general, the theoretical literature shows that credit market failures give rise to heterogeneous resource allocation and different outcomes among farm households with varying characteristics.

That is, a farm household that faces a binding credit constraint, ceteris paribus, will misallocate its resources and under-invest compared to its unconstrained peer. Availability of finance and its accessibility crucially affect production start-up and subsequent performances of the farmers. Barriers to access adequate loans will have adverse effect on technical efficiency of the farm households.

Problem Statement

Credit constraints have both direct and indirect effects on farm production. Directly, it affects the purchasing power of producers to procure farm implement, and make farm related investments which they can fall back on to help them overcome credit constraints. Indirectly, it affects the risk behaviour of producers (Eswaran and Kotwal, 1990 and Guirkinger and Boucher, 2005). Thus, a credit constrained farmer will invest in less risky and less productive technologies rather than in the more risky and but productive ones Dercon, (1996).This risk behavior has negative effects on technical efficiency of the farmers in that it limits the effort of the farmer in attaining maximum possible output hence, efficiency is compromised.

Studies have shown that a large percentage of farmers faced with credit constraints have low production efficiencies (Hussien and Olhmer, 2008; Dorfman and Koop, 2005; Coelli, 1995; Bravo and Pinheiro, 1997). Credit has direct effects on agricultural production and the problem of credit constraint has been shown to be the major cause of low agricultural output (Iqbal, 1986), which eventually cumulate into low farm income. It is interesting to know that many farmers do not even have access to any means of credit let alone sufficient output. Formal sources of credit have some ambiguities and time-consuming procedure which most of the times do not favour small scale mixed farmers. Informal sources of credit also have peculiar problems such as small size of credit and high interest rates. Inadequate credit supply is a central problem upon which other production factors exert negative influence on farmers' output and efficiency. The inability of most peasant farmers to have access to adequate capital has heightened the problem of low efficiency in production. The need for a study on the determinants of credit constraints and efficiency of production of farmers cannot be overemphasized. For farmers that are fortunate enough to have access to credit, the problem of low efficiency in production still comes up in situations where there is a wide gap between the amount of credit requested and the amount supplied. For some farmers, an addition of the payment made for the use of capital, cost of inputs and other costs far exceeds revenue from sales of farm produce. Akinade (2002) found

that there are very few branches of commercial banks in the rural areas of Nigeria, adding to the constraints of farmers and this suggests that the availability to credit facilities by rural dwellers is inadequate.

This study will provide answers to the following questions: What are the determinants of credit constraints conditions among farmers?

Which factors have effect on the efficiency of production of farmers? The general objective of the study is to estimate the factors influencing credit constraints and production efficiency of farmers and specifically to:

- examine some socio-economic characteristics of the respondents;
- determine the factors influencing credit constraints condition of mixed farmers;
- estimate the factors influencing the production efficiency of mixed farmers.

METHODOLOGY

A two-stage random sampling technique was used for the survey to select the respondents. The first stage involved random selection of villages from the four zones of Ido Local Government Area which are Akufo, Ido, Omi-Adio and Idi-Iya representing Ido North, Central, south and East respectively. The second stage involved random selection of 30 farmers in the each of the four villages to make a total of 120 respondents. The analytical tools used are descriptive statistics for the socio-economic characteristics, stochastic frontier production for estimation of factors influencing constraints to credit by farmers. The study also made use of probit model to determine factors affecting farmers' credit constraint conditions and a number of socio-economic and credit variables. The maximum likelihood estimates of the parameters of the stochastic frontier production function were obtained using LIMDEP 7.0 software (Greene 1995).

Stochastic frontier analysis is a special form of regression model which considers output variability by two-part error term such that one of the error terms is associated with statistical noise or data noise while the other error term is associated with technical efficiency as against the traditional ordinary least square (OLS) which assumes output variability by one-part error term usually associated with measurement error. The parameters were estimated by the method of maximum likelihood.

$Y_i = F(X_1, X_2, X_3, X_4, X_5, X_6, , X_7, X_8, X_9 \beta) + \sum_i$ ----------Equation(i)

Where:

X_1 = Gender of farmer (Male = 1, females = 0)

X_2 = Age of farmers (Actual age in years)

X_3 = Level of education (Years of formal education)

X_4 = Marital Status (married = 1, otherwise = 0)

X_5 = Household size (Actual number)

X_6 = Primary occupation (farming = 1 otherwise = 0)

X_7 = Experience of farmer (in years)

X_8 = Type of land ownership (Personal = 1 otherwise = 0)

X_9 = Distance to the credit facility (near = 1 otherwise = 0)

β_1 stands for unobservable parameters indicating the efficiency parameter and the output elasticity coefficients respectively.

The estimating equation becomes:

$LnY_{ij} = \beta_1 LnB_1 + \beta_2 LnB_2 + \ldots\ldots + \beta_5 LnB_5 + \sum i$ ---------- equation (ii)

Where ln denotes natural logarithms

Yij = Output of the i-th farmers in the j-th group (farm output in value)

Bi = Vector of the farmer input (i.e. $x_1 - x_5$)

B_1 = farm size (hectares)

B_2 = Family labour (man days)

B_3 = Hired labour (man days)

B_4 = Fertilizer & other agrochemicals (kilogramme)

B_5 = Seeds (kilogramme).

Following Feder et al (1990) the production behaviour of the two groups of farmers is modeled by reduced form equations specified by in the probit model as:

$Y1j = B'_1 X_{1j} + u_j$ if J = 1 ----------(1)

$Y2j = B'_2 X_{2j} + u_{2j}$ if J = 0----------(2)

Where X_{1j} and X_{2j} are vectors of exogenous variables, B_{1j} and B_{2j} are vectors of parameters and u_{1j} and u_{2j} are random disturbance terms. Y_{1j} and Y_{2j} represent output supply functions for credit constrained and credit non-constrained farmers respectively.

Results and Discussion

Credit Status of Respondents

The credit status and mean efficiency of farmers are shown in Table 1.0. It shows that 79.2 percent of the farmers are credit constrained with mean efficiency of 0.721 while the remaining 20.8 percent were unconstrained with 0.913 efficiency. This shows that most farmers are credit constraint and it is a serious issue in the study area as it affects the production efficiency of many farmers. This result is in line with the findings of Hussien, 2008.

Table 1.0: Credit Status of Farmers

Credit Status	**Frequency**	**Percentage**	**Mean Efficiency**
Constrained	95	79.2	0.721
Unconstrained	25	20.8	0.913
Total	**120**	**100.0**	

Source: Field Survey, 2009

Socio-economic characteristics of farmers in the study area

Socio-economic characteristics of farmers in Table 2.0 shows that most of the farmers are males constituting about 88.3 percent of the total respondents interviewed while 11.7% are females. This implies that majority of the farmers are men than women in the study area. The age group shows that most farmers fall between 40 and 49 years, followed by those within the age range 30-39 years. This implies that about 71.6 percent of respondents are less than 49 years which also implies that the farmers in the study area are still in their productive years. Precisely, 68 percent of the farmers had no form of education at all, while about 26 percent have primary education with just 0.8 percent of the total respondents having the secondary education. This might have effect on the administrative productivity for credit access processing since they have low literacy level. The farmers sampled are not likely to appreciate the need to adopt new technology which can enhance their production efficiency. The table below also shows that 58.3percent of the farming households have 5-8 persons in their households. This is an indication

that farming household may spend less on hired labour while they will enjoy the use of family labour otherwise it may also mean that the higher the number of persons per household the higher the number of mouths to feed and needs to meet with the little income available.

Table 2.0: Selected Socio-economic characteristics of farming households

Variables	Frequency	Percentage
Gender		
Male	106	88.3
Female	14	11.7
Total	120	100
Age		
Below 30	2	1.7
30-39	28	23.3
40-49	56	46.7
50-59	23	19.2
60-69	11	9.2
Total	120	100
Education		
None	82	68.3
Primary	31	25.8
Secondary	1	0.8
Non-formal	6	5.0
Total	120	100
Household size		
1-4	10	8.3
5-8	70	58.3
9-12	36	30.0
Above 12	4	3.3
Total	120	100

Source: **Field Survey, April 2009**

The factors influencing Credit Constraint Condition of Farmers

Probit regression model was used to identify factors influencing credit constraint condition of farmers. Table 3.0 shows the maximum likelihood estimates of the probit model. In the model, coefficients of four out of nine explanatory variables are significant. It is evident from the table that the age of farmers, gender of farmers, education of farmers, and dependency ratio are significant variables that influence credit constraint condition of farmers. The marginal effects were an indication of one unit change in an exogenous variable on the probability that a farmer was credit constrained.

The age of respondents was found to be statistically significant at 10%. The coefficient of age variable was 0.00725. This indicates that the higher the age of the farmers or the older they become, the greater the likelihood of being credit constrained. This might be because the younger farmers are still agile and more receptive to new technologies and activities that will generate income for them, aside this, most people will not like to lend out money to old people for the fear that they may not live long enough to pay back the money. 1 percent increase in age of the farmers will increase the probability of a farmer being constrained by 7.6 percent. Another significant variable is gender, it was found to be significant at 10% but has a negative coefficient -0.02167.This means that males are associated with reduced levels of credit constraints compared to their female counterparts, this result is similar to that obtained by Lawal *et al*, 2009b and Omonona *et al,* 2008.

Education was found to be statistically significant at 5% with a negative value of coefficient 0.227. 1 percent increase in educational status will decrease the probability of the farmer being constrained by 3.1 percent; this result is in consonance with results from studies by Lawal *et al*, 2009b and Omonona *et al,* 2008.

Dependency ratio is also statistically significant at 10% .This indicates that the more the level of dependency, the more credit constrained the farmers will be. This might be because dependency ratio shows they will have many dependents to take care of, thus, increasing their household per capita expenditure and therefore reducing the amount of money that they can invest in agricultural. Similarly, farmers may divert the funds collected from associations to consumption

with increase in dependency ratio. A unit increase in dependency ratio will increase the probability of the farmers being constrained.

Table 3.0: Determinants of Credit Constraint Condition among Farming Households

Variables	Estimated Coefficient	Marginal Probability
Constant	-0.6531	0.0756
Age	0.00725	0.0785*
Gender	-0.2167	0.0918*
Marital Status	0.02699	0.8596
Occupation	0.2170	0.13140
Education	-0.2270	0.0310**
Household Size	0.0167	0.2801
Land Ownership	-0.1140	0.1373
Type of Farming	-0.0125	0.9342
Dependency Ratio	0.0794	0.0676*

Number of observations 120

Log likelihood function -49.3151

Restricted log likelihood -61.4088

Chi- squared 28.18742

Significant at *** (O <0.01) ** (P<0.05) * (P<0.10)

Source: Computer Printout, 2009.

Factors influencing Production Efficiency among Farmers

Table 4.0 shows significant variables as farm size, labour, quantity of agro-chemical used, all at one percent level of significance. The positive coefficient of farm size, labour and quantity of agro chemical used implies that, the higher the quantity of any of these three, the higher the level of production. 1 percent increase in farm size brings about 0.958 percent increase in farm output. Similarly, 1 percent increase in the number of farm labour used leads to 0.342 percent

increase in farm output, this result is in agreement with Udoh and Faleke, 2006. Also, 1 percent increase in the use of agro chemical brings about 0.597 percent increase in farm output.

Table 4.0: Maximum Likelihood Estimates of the parameters of the stochastic production frontier of the production efficiency of farming households

Variable	Coefficient	T- value
Constant	5.427	4.075***
Ln Farm size B_1	0.958	5.557***
Ln labour B_2	0.342	2.901***
Ln Fertilizer B_3	-0.344	0.936
Ln Chemical B_4	0.597	3.310***
Ln Seed B_5	0.368	0.896

Source: Computer Printout, 2009.

Log-likelihood function = -91.99847

*** (O <0.01) ** (P<0.05) * (P<0.10)

CONCLUSION

It can be concluded that most farmers in the study area are credit constrained and in their active working age years, uneducated and with household size of 5 to 8 members. It also can be concluded that age, gender, education and dependency ratio are factors that influence credit constraint condition of farmers while farm size, labour used and use of agro-chemicals influence farmers' production efficiency in the study area.

RECOMMENDATION

The study recommends that mixed farmers improve their level of education as this can also reduce credit constraint conditions, increase the farm size cultivated and use of appropriate agro-chemicals for increased production efficiency.

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