

Original Research Article**A PROBIT ANALYSIS OF COTTON FARMERS' ACCESSIBILITY TO CREDIT IN
NORTHERN GUINEA SAVANNAH OF NIGERIA****ABSTRACT**

The study was designed to examine the determinants of credit accessibility among cotton farmers in the Northern Guinea Savanna zone of Nigeria. A purposive sampling technique was adopted to select two hundred and forty (240) cotton farmers for enumeration. Primary data were collected using structured questionnaires. Descriptive statistics and the probit regression model were used to analyze the data. The result revealed that formal education, off-farm income, household size, farm size and farming experience were factors that significantly influenced credit accessibility by cotton farmers. Farmers had more access to informal sources of credit than the formal sources and the rate of accessibility of the credit by the farmers is highest with those farmers sourcing from relatives and friends. The study recommends the need to educate farmers and create awareness on the importance of attaining higher level of formal education as it influences their farm output, credit demand and making rational choices.

Keywords: Probit regression, credit, cotton farmers, Nigeria.

23 1.0 INTRODUCTION

24 Access to financial services by small holders is normally seen as one of the constraints limiting
25 their benefits from credit facilities (Omonona et al., 2008). This is further complicated by the
26 restriction of credit to a few sectors of the economy (Okurut et al., 2004). Consequently, access
27 to credit is restricted to a small proportion of the population who can overcome significant
28 barriers to credit such as high minimum balance for account opening, onerous collateral
29 requirements and a long and costly bureaucratic process (Okurut et al., 2004).

30 In Nigeria, empirical evidence (Mejeha and Ifenkwe, 2007) has established a positive link
31 between the declining agricultural productivity and limited credit facilities, a situation which
32 threatens the capacity of farmers in their quest for sustainable production. Credit availability to
33 agriculture is justified when farmers are faced with low savings capacity, poorly developed rural
34 financial markets and limited availability of appropriate farm technologies whose adoption is
35 constrained by shortage of funds. The demand for credit is increased as a result of increased
36 economic activities in the informal sector (Jaime, 2006). This informs why farm credit has
37 become a critical factor in modeling the growth of agricultural productivity and the development
38 of the rural economy, which consists mainly of agriculturally based economic activities.

39 Farmers require fund for both capital investment and other relevant expenses: where this is
40 available, farmers would be able to adopt various technologies. Farmers are also expected to use
41 improved inputs to enhance productivity on farms. The absence of production oriented credit
42 condition tends to limits the possibilities for improving and rehabilitating agricultural production
43 and for stabilizing and improving the economic activities and prospects of rural producers
44 (Ochagla, 2004). Information on the factors affecting the demand for agricultural credit would be

helpful to educate farmers on how to improve access to agricultural credit. It will provide base line information on credit availability to the farmers in the study area and consequently influence productivity on farms. As opined by Ike (2009), the policy made would also be appropriately guided through the expressed relationship between the access to agricultural credit and farmer characteristics to enact effective policy that may boost productivity on farm through effective credit delivery system.

Cotton is one of the most important cash crops in the Nigerian economy and grown by about 0.8 million farmers on a total estimated area of 6000-7000ha (Manyong *et al.*, 2005). The major feature of cotton production in Nigeria is that about 80% of the total production is done by peasant farmers. In addition, cotton seed provides edible oil for human consumption while cotton seed cake are used for livestock feeds due to its high oil and protein content. The major feature of cotton production in Nigeria is that about 80% of the total production is by peasant farmers under rain fed conditions with simple tools and animal drawn implements. Production of cotton in Nigeria is mainly in three zones: the Northern zone (60%), Eastern zone (30%) and the Southern zone (10%). (World Bank, 2001). This notwithstanding, cotton production needs to be fully exploited in order to achieve optimum agricultural growth and development and hence the economic development of the country at large.

2.0 METHODOLOGY

Study Area: The study was conducted in the Northern Guinea Savanna zone of Nigeria. The zone extends between latitudes 9° 30' and 12° 31' N and longitudes 4° to 14° 30' E, occupying a geographically area of about 12.8 million hectares. Its rainfall is unimodal and ranges in space and in time between 600 and 1000 mm per annum while the relative humidity is generally low. The major source of lively-hood in the area is agriculture and trading but the bulk of agricultural

68 production is done or undertaken by small scale farmers of which women are included. Farming
69 practices in the study area involve the use of hand tools and other simple implements. The
70 prominent crops grown in this area include; vegetables, yams, maize, cowpea, sorghum, cotton,
71 cocoyam and millet.

72 **Sampling:** The population used for this study was cotton farmers and focused on formal and
73 informal credit users. Two hundred and fifty (250) cotton farmers (all registered members of the
74 Cotton-farmers Association) were used for the study. All members were also credit users who
75 obtained credits from either formal and/or informal sources.

76 **Data Collection:** Primary data were used for the study, collected using structured questionnaires
77 administered to cotton farmers in the area. The information collected from the sampled farmers
78 include: socio-economic characteristics of the farmers (age, marital status, gender, educational
79 qualification, farm size, household size, off-farm income), types of agricultural credit available
80 to them, amount of credit needed and the amount obtained by the farmers in the study area.

81 **Analytical Techniques:** Tools of analysis that were used for the study include: Descriptive and
82 inferential Statistics.

83 **Conceptual Framework and Model Specification**

84 Accessibility could be described by the utility maximization theory. It is expected that a
85 respondent will desire to access credit if the utility derived from credit accessibility ranks highest
86 compared to the utility derived from not accessing the credit. In this study, accessibility is
87 assumed to be binary choice such that a respondent is expected to either borrow or not. The
88 preference of the i^{th} respondent to access credit is therefore given by the difference between the
89 marginal utility derived from credit accessibility against the marginal utility foregone. A farmer

is therefore expected to have access to credit for the highest marginal benefits. Let the state of accessibility be represented by P_r , where $P_r = 0$ for no-access and $P_r = 1$ for access. If it is assumed that the error term follows a normal distribution, then the estimation can be achieved by using a probit distribution model as descbed by Gujarati (2009). Specifically the model takes the implicit form as follows:

$$P_r = (Y = 1|X) = \phi(X'\beta) \dots\dots\dots (1)$$

Where P_r denotes probability and ϕ is the Probability Distribution Function of the standard normal distribution. The parameters β are typically estimated by maximum likelihood method. Motivating the probit model as a latent variable model, Equation (1) becomes:

$$Y = \beta_0 + \beta_i \sum_i^n X_i + e_i \dots\dots\dots (2)$$

Where: $e \sim N(0, 1)$. Therefore Y_i becomes

$$Y = \begin{cases} 1 & \text{if } Y^* > 0 \text{ } (-e < X'\beta) \\ 0 & \text{otherwise} \end{cases} \dots\dots\dots (3)$$

Therefore applying the normal CDF, equation (1) becomes explicitly written as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_i \dots\dots\dots (4)$$

Where:

- Y_i = Credit accessibility (1 if accessed and 0 if not)
- X_1 = Gender (1 if male, 0 if female)
- X_2 = Age of respondents (years)
- X_3 = Household size (number)
- X_4 = Educational level (years).

- 110 X_5 = Farm size (hectares)
 111 X_6 = Farming experience (years)
 112 X_7 = Off- farm income (Naira)
 113 $\beta_1 - \beta_7$ = estimates of respondents' socio-economic characteristics
 114 ε = Error term

115 The maximum likelihood method of the probit model is specified as:

$$116 \quad \text{Log}L = \sum \log(1 - \Phi_i) + \sum \log \left[\frac{1}{\frac{1}{2}(2\pi\sigma^2)} \right] - \sum \log \frac{1}{2\sigma^2} (f_i - X_i\beta)^2 - (f_i - X_i\beta) - 16 \dots\dots(5)$$

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118 **3.0 RESULTS AND DISCUSSION**

119 **3.1 Description of Variables Included in the Model**

120 Table 1 shows the distribution of respondents according to their various socio-economic
 121 characteristics. The cotton farmers had a mean age of 35 years with standard deviation of 12.80.
 122 The results imply that majority of the farmers in the area are young, strong and agile. The
 123 assumptions are the older the farmer, the greater his awareness about the availability of credit, the
 124 better placed he is to meet lending requirement and the greater therefore his access to credits.
 125 The second assumption is that the older the farmer, the more likely he is to have larger household
 126 and the greater the tendency for him to expand production for consumption and sale in order to
 127 meet the financial requirement of his household.

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133 Table 1: Descriptive Statistics of Variables Employed in the Probit Model

Variable	Description	Mean	Std Deviation
Credit accessibility	Measured as dummy for 1 if accessed, 0 if not accessed	0.457	0.128
Gender	Measured as dummy for 1 if male, 0 if female	1.000	1.000
Age	Age of respondent in years	35.114	12.799
Farm size	Total farmland area of farmer devoted to cotton production in hectares	1.085	2.314
Education	Value 1 if respondent has formal education and 0 otherwise	11.611	10.59
Off- farm income	Amount of the respondent's annual off-farm income measured in naira (₦)	14318.751	13.783
Household size	Number of persons within the respondent's household	8.030	11.423
Farming experience	Number of years spent by a farmers in cotton production	18.000	13.703

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135 The education variable was employed in this study as a proxy for managerial activity. The
 136 respondents' mean level of formal education is 11.6 with a standard deviation of 10.6. A higher
 137 level of educational achievement may lead to better assessment and management of funds, good
 138 farming decision and efficient allocation of inputs cost. The farming experience variable had a
 139 mean of 18.0 with standard deviation of 13.7. Considering the fact that most of the farmers were
 140 illiterates (judging from the low mean value of the education variable 0.26) as shown in table 1,
 141 farmers with more years of experience in this study are likely to be older and more conservative
 142 in attitude; therefore, less willing to adopt new practices that would enhance the efficiency of
 143 their production. The average annual off farm income of 14318.751 which is low shows that the
 144 farmers are likely to be credit strapped such that they will find it difficult to carry most of the
 145 farming activities that will be credit demanding.

4.2 Probit Regression Analysis of Credit Accessibility by Cotton Farmers

Table 2 shows that interest rate, age, off-farm-income, household size and farm size were all found to be significant at various level of significance (1%, 5% and 10%), implying that the independent variables included in the model were all important in influencing the dependent variables. In other words, the null hypothesis that socio-economic characteristics of farmers have no significant influence on the demand for credit is rejected. R^2 value which measures the proportion of the variation in dependent variable that is explained by the independent variables was 0.68. This implied that the variables included in the model could explain 68% of the variation that occur in the amount of credit demanded by the respondents in the study area.

Table 2: Estimates of the Probit Regression Model

Variables	Coefficients	Standard error	t-value
Constant	37086.886	15920.152	2.332**
Interest rate	-0.096	0.013	-7.613***
Sex	25346.603	9593.821	2.643**
Age	31.713	25.112	1.263
Household size	829.063	263.719	2.761**
Formal education	0.375	0.116	2.258**
Farm size	0.059	0.045	1.311
Farming experience	5403.651	3201.101	1.671*
Off- farm income	-0.274	0.023	-11.915***
Pseudo $R^2 = 0.681$			
F = 17.01			

* $P < 0.1$, ** $P < 0.05$ and *** $P < 0.01$

Farming experience was significant at 10% level of significance but the sign of the coefficient shows that a direct relationship exists between the farming practice and the credit demanded by the farmers, that is as farming practices are increased, credit demanded also increases and vice

162 versa. This is similar to result obtained by Okunade (2007). Farming experience of a farmer
163 determines his ability to make effective farm management decisions, not only adhering to
164 agronomic practices but also with respect to input combination or resource allocation.

165 Off-farm income was significant at 1% level of significance and the sign of the coefficient shows
166 a direct relationship with credit demanded by farmers in the study area. That is as farm income
167 increases, credit demanded also increases and vice versa. Farmers with high farm income have
168 better abilities of repaying loans being extended to them by financial institutions. Due to
169 farmers' ability to generate farm income, they had accumulated collaterals to secure loans.

170 Level of formal education was significant at 5% level of significance and the sign of the
171 coefficient shows a direct relationship with the credit demanded by farmers. That is the more
172 educated the farmers are the more the credit demanded by them. Farmers with higher education
173 were more inclined to seek for external funds, while those with no formal education would not
174 appreciate the demands of modern technology.

175 The significance of household size on credit accessibility could be associated with the household
176 head's responsibility in catering for the family. However increase in size of household may
177 increase per-capita consumption expenditure of farm household, hence reduce the farmers'
178 capital that could be used for production activities. The respondent needs to pay a certain amount
179 before the credit is made available. It means that large households may not have the ability to
180 meet with terms of collateral and interest rates due to extra mouth to feed. This is consistent with
181 findings by Bolarinwa and Fakoya (2011) and also Oyedele and Akintola (2012) which showed
182 that access of households to credit is determined by farmers' age, size of landholding, location of
183 the household head farm, access to other credit, financial contribution of the household head in
184 his or her group, access to agricultural extension services and membership of registered farming

groups. Also, Okunade's (2007) findings of a similar study revealed that accessibility to credit facilities was significantly affected by level of education, household size and occupation.

3.3 Rate of Accessibility to Credit from Different Sources

From table 3, it shows that the respondents obtained more credit from relatives and friends with an accessibility rate of 25.6%. 23.2% of the farmers obtained money from money lenders, 10.91% obtained from informal savings/credit groups, 4.93% from NGO/Church/Mosque, 35.27% obtained from Bank/Microfinance. It shows that informal sources of credit were the main options of sourcing for credit the respondent had because they borrowed more from the informal sources than the formal sources. In addition, the highest interest rate (24.56%) was found on credit sourced from informal/ local/ traditional money lenders. This agrees with findings by Udoh (2005).

Table 3: Farmers' rate of accessibility to credit from different sources

Credit source	Amount	Rate	Interest (%)
Relatives and friends	873000	35.66	18.76
Informal money lenders	270000	10.91	24.56
Cooperatives	575000	23.23	10.00
NGO/Church/Mosque	122000	4.93	0.00
Bank/Microfinance	635000	25.27	12.50
Total	2475000	100	

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202 CONCLUSION AND RECOMMENDATIONS

203 From the findings of the study, it can thus be concluded that formal education, farm income and
 204 farming practices are factors significantly influencing credit demand by cotton farmers. Farmers
 205 have more access to informal sources of credit than the formal sources and the rate of
 206 accessibility of the credit by the is highest with those farmers sourcing from relatives and friends.
 207 Also, farmers are highly constrained with high interest rate on loans. Based on the findings of
 208 this study, the following recommendations were therefore made;

209 (i) Extension agents should intensify their work by educating farmers and creating
 210 awareness on the importance of attaining higher level of formal education as it
 211 influences their farm output and credit demand.

212 (ii) Due to the fact that farmers need credit/loans to purchase other farm inputs that would
 213 maximize productivity, their general income and hence the general well-being of the
 214 beneficiaries, there is need for the appropriate agencies and government to render the
 215 necessary services such as timely provision of loans.

216 (iii) Farmers should be assisted by NGOs/CBOs in providing subsidized farm inputs
 217 (fertilizer, chemicals and improved seeds) and improved farming practices.

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