

Original Research Article

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 questionnaire. Descriptive statistics and the probit regression model were used to analyze the data. The results revealed that formal education, off-farm income, household size, farm size and farming experience were factors that significantly influenced credit accessibility to cotton farmers. Farmers had more access to informal sources of credit than the formal sources and the rate of accessibility to credit is highest among those 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, accessibility, cotton farmers, Nigeria.

1. INTRODUCTION

Access to financial services by small holders is normally seen as one of the constraints limiting their benefits from credit facilities [1]. This is further complicated by the restriction of credit to a few sectors of the economy [2]. Consequently, access to credit is restricted to a small proportion of the population who can overcome significant barriers to credit such as high minimum balance for account opening, onerous collateral requirements and a long and costly bureaucratic process [2].

In Nigeria, empirical evidence [3] has established a positive link between the declining agricultural productivity and limited credit facilities, a situation which threatens the capacity of farmers in their quest for sustainable production. Credit availability to agriculture is justified

when farmers are faced with low savings capacity, poorly developed rural financial markets and limited availability of appropriate farm technologies whose adoption is constrained by shortage of funds. The demand for credit is increased as a result of increased economic activities in the informal sector [4]. This informs why farm credit has become a critical factor in modeling the growth of agricultural productivity and the development of the rural economy, which consists mainly of agriculturally based economic activities.

Farmers require fund for both capital investment and other relevant expenses: where this is available, farmers would be able to adopt various technologies. Farmers are also expected to use improved inputs to enhance productivity on farms. The absence of production oriented credit condition tends to limits the possibilities for improving and rehabilitating agricultural production and for stabilizing and improving the economic activities and prospects of rural producers [5]. 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 [6], 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 [7]. 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%) [8]. 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. MATERIAL AND METHODS

Study Area: The study was conducted in the Northern Guinea Savanna zone of Nigeria. The zone extends between latitudes 9° 30' and 12° 3 1' N and longitudes 4° to 14° 30' E, occupying a geographical 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

59 humidity is generally low. The major source of livelihood in the area is agriculture and trading
60 but the bulk of agricultural production is done or undertaken by small scale farmers of which
61 women are included. Farming practices in the study area involve the use of hand tools and
62 other simple implements. The prominent crops grown in this area include; vegetables, yams,
63 maize, cowpea, sorghum, cotton, cocoyam and millet.

64 **Sampling:** The population used for this study was cotton farmers and focused on formal
65 and informal credit users. Two hundred and fifty (250) cotton farmers (who are the registered
66 members of the Cotton-farmers Association) were used for the study. These were also credit
67 users who obtained credits from either formal and/or informal sources.

68 **Data Collection:** Primary data were collected using structured questionnaire administered to
69 cotton farmers in the area. The information collected from the sampled farmers include:
70 socio-economic characteristics of the farmers (age, marital status, gender, educational
71 qualification, farm size, household size, off-farm income), types of agricultural credit
72 available to them, amount of credit needed and the amount obtained by the farmers in the
73 study area.

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

76 **Conceptual Framework and Model Specification**

77 Accessibility could be described by the utility maximization theory. It is expected that a
78 respondent will desire to access credit if the utility derived from credit accessibility ranks
79 highest compared to the utility derived from not accessing the credit. In this study,
80 accessibility is assumed to be binary choice such that a respondent is expected to either
81 borrow or not. The preference of the i^{th} respondent to access credit is therefore given by the
82 difference between the marginal utility derived from credit accessibility against the marginal
83 utility foregone. A farmer is therefore expected to have access to credit for the highest
84 marginal benefits. Let the state of accessibility be represented by P_r , where $P_r = 0$ for no-
85 access and $P_r = 1$ for access. If it is assumed that the error term follows a normal
86 distribution, then the estimation can be achieved by using a probit distribution model as
87 described by [9]. Specifically the model takes the implicit form as follows:

$$88 \quad P_r = (Y = 1|X) = \phi(X'\beta) \dots\dots\dots (1)$$

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

$$Y = \beta_0 + \beta_1 \sum_{i=1}^n X_i + e_i \dots \dots \dots (2)$$

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

$$93 \quad Y = \begin{cases} 1 & \text{if } Y^* > 0 \quad (-e < X'\beta) \\ 0 & \text{otherwise} \end{cases} \dots \dots \dots (3)$$

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

$$95 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_i \dots \dots (4)$$

96 Where:

97 Y_i = Credit accessibility (1 if accessed and 0 if not)

98 X_1 = Gender (1 if male, 0 if female)

99 X_2 = Age of respondents (years)

100 X_3 = Household size (number)

101 X_4 = Educational level (years).

102 X_5 = Farm size (hectares)

103 X_6 = Farming experience (years)

104 X_7 = Off- farm income (Naira)

105 $\beta_1 - \beta_7$ = estimates of respondents' socio-economic characteristics

106 ε = Error term

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

$$108 \quad \text{Log}L = \sum \log(1 - \Phi_i) + \sum \log \left[\frac{1}{\frac{1}{2}(2\pi\sigma^2)} \right] - \sum \log \frac{1}{2\sigma^2} (f_i - X_i\beta)^2 - (f_i - X_i\beta) - 16 \dots \dots \dots (5)$$

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110 **3. RESULTS AND DISCUSSION**

111

112 **3.1 Description of Variables Included in the Model**

113 Table 1 shows the distribution of respondents according to their various socio-economic
 114 characteristics. The cotton farmers had a mean age of 35 years with standard deviation of
 115 12.80. The results imply that majority of the farmers in the area are young, strong and agile.
 116 The assumptions are the older the farmer, the greater his awareness about the availability of
 117 credit, the better placed he is to meet lending requirement and the greater therefore his

118 access to credits. The second assumption is that the older the farmer, the more likely he is
 119 to have larger household and the greater the tendency for him to expand production for
 120 consumption and sale in order to meet the financial requirement of his household.

121

122 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	1.016	0.149
Education	Number of years spent in formal education	11.611	10.590
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	8.7234	0.559
Farming experience	Number of years spent by a farmers in cotton production	18.000	13.703

123

124 The education variable was employed in this study as a proxy for managerial activity. The
 125 respondents' mean level of formal education is 11.6 with a standard deviation of 10.6. A
 126 higher level of educational achievement may lead to better assessment and management of
 127 funds, good farming decision and efficient allocation of inputs cost. The farming experience
 128 variable had a mean of 18.0 with standard deviation of 13.7. Considering the fact that most
 129 of the farmers were illiterates (judging from the low mean value of the education variable
 130 0.26) as shown in table 1, farmers with more years of experience in this study are likely to be
 131 older and more conservative in attitude; therefore, less willing to adopt new practices that
 132 would enhance the efficiency of their production. The average annual off farm income of
 133 14318.751 which is low shows that the farmers were likely to be credit strapped such that
 134 they would find it difficult to carry most of the farming activities that will be credit demanding.

135

136 4.2 Probit Regression Analysis of Credit Accessibility by Cotton Farmers

137

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

147

148 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			

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

150

151 Farming experience was significant at 10% level of significance but the sign of the coefficient
 152 shows that a direct relationship exists between the farming experience and the credit
 153 demanded by the farmers. This implies that with a unit increase in farming experience, credit
 154 demanded increases by a magnitude of the coefficient and vice versa. This is similar to the
 155 result obtained by [10]. Farming experience of a farmer determines his ability to make
 156 effective farm management decisions, not only adhering to agronomic practices but also with
 157 respect to input combination or resource allocation.

158 Off-farm income was significant at 1% level of significance and the sign of the coefficient
 159 shows a direct relationship with credit demanded by farmers in the study area. That is as

160 farm income increases, credit demanded also increases and vice versa. Farmers with high
161 farm income have better abilities of repaying loans being extended to them by financial
162 institutions. Due to farmers' ability to generate farm income, they had accumulated
163 collaterals to secure loans.

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

169 The significance of household size on credit accessibility could be associated with the
170 household head's responsibility in catering for the family. However increase in size of
171 household may increase per-capita consumption expenditure of farm household, hence
172 reduce the farmers' capital that could be used for production activities. The respondent
173 needs to pay a certain amount before the credit is made available. It means that large
174 households may not have the ability to meet with terms of collateral and interest rates due to
175 extra mouth to feed. This is consistent with findings by [11] and also [12] which showed that
176 access of households to credit is determined by farmers' age, size of landholding, location of
177 the household head farm, access to other credit, financial contribution of the household head
178 in his or her group, access to agricultural extension services and membership of registered
179 farming groups. Also, [10 and 13] findings of similar studies revealed that accessibility to
180 credit facilities was significantly affected by level of education, household size and
181 occupation.

182

183 **3.3 Rate of Accessibility to Credit from Different Sources**

184 From table 3, it shows that the respondents had more access to credit from relatives and
185 friends with an accessibility rate of 25.6%. 23.2% of the farmers obtained money from
186 money lenders, 10.91% obtained from informal savings/credit groups, 4.93% from
187 NGO/Church/Mosque, 35.27% obtained from Bank/Microfinance. It shows that informal
188 sources of credit were the main options of sourcing for credit the respondent had because
189 they borrowed more from the informal sources than the formal sources. In addition, the
190 highest interest rate (24.56%) was found on credit sourced from informal/ local/ traditional
191 money lenders. This shows that despite the high rate of interest charges on the informal
192 sources, the farmers still borrow as these sources have higher degrees of accessibility. This
193 agrees with findings by Udoh (2005).

194

195 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	

4. CONCLUSION

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

- (i) Extension agents should intensify their work by educating farmers and creating awareness on the importance of attaining higher level of formal education as it influences their farm output and credit demand.
- (ii) Due to the fact that farmers need credit/loans to purchase other farm inputs that would maximize productivity, their general income and hence the general well-being of the beneficiaries, there is need for the appropriate agencies and government to render the necessary services such as timely provision of loans.
- (iii) Farmers should be assisted by NGOs/CBOs in providing subsidized farm inputs (fertilizer, chemicals and improved seeds) and improved farming practices.

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