SCIENCEDOMAIN

Determinants of Credit Access and Demand among Poultry Farmers in Akwa Ibom State, Nigeria

Sunday B. Akpan[1*], Inimfon V. Patrick[1], Samuel J. Udoka[1], Edem A. Offiong[2] and Uwemedimo E. Okon[1]

[1]*Department of Agricultural Economics and Resources Management, Akwa Ibom state University, Ikot Akpaden, Mkpat Enin, Akwa Ibom state, Nigeria*
[2]*Department of Animal Science, Akwa Ibom state University Ikot Akpaden, Mkpat Enin, Akwa Ibom state, Nigeria.*

Authors' contributions

This work was carried out in collaboration between all authors. Author SBA designed the study, analyzed the data collected and was in charge of result interpretation. Authors IVP, SJU, EAO and UEO were involved in data collection, drafting of the manuscript, introduction, literature review and recommendation as well as proof reading of the entire manuscript. All authors read and approved the final manuscript.

Research Article

ABSTRACT

Aims: The study examined the determinants of access and demand for credit among poultry farmers in Ikot Ekpene area of Akwa Ibom State in Southern Nigeria.
Study Design: A multi-stage random sampling technique was employed to select 90 poultry farmers. Structured questionnaires and personal interviews were used to collect cross sectional data used in the study.
Place and Duration of Study: The study was conducted in Ikot Ekpene senatorial district of Akwa Ibom state in Southern Nigeria.
Methodology: Independent double hurdle model was specified and used to determine factors influencing credit accessibility and demand among poultry farmers in the study area. Various tests were conducted to validate the used of the model. The variance inflation factor (VIF) was also employed to test the multi-collinearity among variables used in the analysis.

Corresponding author: Email: sundayakpan10@yahoo.com;

Results: Empirical result from the first hurdle model revealed that the farmers' age, gender, farm size, membership of social organization, extension agent visits, distance from the borrower's (farmer) resident to lending source, years of formal education and household size are important determinants of access to credit in the study area. On the other hand, the amount of loan demanded by the poultry farmers was significantly influenced by the farmers' experience in poultry business, cost of hired labour, previous years of experience on credit, present of surety, farm size, perceived loan repayment period, years of formal education and net farm income.

Conclusion: poultry farmers in the study area should form cooperative societies to take advantage of ease of accessing and obtaining credit from credit institutions. The extension system in the study area should be strengthened for effective information dissemination especially on credit issues. Operators of credit institutions should endeavor to locate some of the lending outfits nearer to the poultry farmers. Also, to increase the demand for credit in the study area, the study advocated for the re-assessment of the collateral needs of the lending agents and the duration of loan to the poultry farmers among others.

1. INTRODUCTION

Majority of rural farmers in Nigeria have low income and savings capacity [6]. This makes it difficult for most of them to adopt modern technology that would have led to increase in their farm incomes [1]. Farm credit is widely recognized as one of the intermediating factors between adoptions of farm technologies and increase farm incomes among rural farmers in Nigeria [27,25,4,3]. It is one of the fundamental ingredients of sustainable agricultural production; as such its accessibility and demand is among the prerequisites for attaining the national goal of reducing rural poverty and ensuring self food sufficiency in the country [21, 3].

In Nigeria, the three tiers of governments had identified the importance of credit to farming communities and have formulated and implemented agricultural credit policies, programmes and created institutions in order to enable rural resource poor farmers acquired credit. The Agricultural credit Guarantee Scheme Fund is unarguably, one of such policy interventions in agricultural financing in the country [2]. These interventions by the tiers of government were seen as palliative measures because of the poor attention formal financial institutions gave to credit supply in the agricultural sector. Several studies have shown that a large percentage of farmers in developing countries are faced with credit constraints and production inefficiencies [11,8,28].

In Nigeria, poultry enterprise is among the agribusiness sub-sectors that require additional financing apart from the farmer's owned investment fund. Modern poultry production requires the application of modern technology in the management of the poultry business. It is among the quickest sources of meat available to most Nigerians. Poultry sub-sector today, is unarguably one of the most attractive investment options in the agricultural industry in Nigeria. This agricultural sub-sector is resource driven and requires the farmer to be in control of the housing or environmental, nutritional and health needs of the birds for optimal productivity [26]. Previously, Nigeria's government had encouraged the development of modern poultry enterprises through the establishment of research institutes, hatcheries and training programmes on modern poultry management. Also, private partnership has been stimulated through the policy of privatization and commercialization of the federal

government. These incentives have resulted in the sudden rush of people of diverse backgrounds into the industry [24]. Currently, commercial poultry production in the midst of modern technologies is attractive because birds are able to adapt easily, have high economic value, high rate of productivity and high demand for the products [31].

Following the reports from Food and Agriculture Organization (FAO), the daily minimum crude protein requirement of an adult Nigerian ranges from 65gm to 85gm [9,16]. However it is recommended that 36gm of this minimum requirement should be obtained from animal products [14,29]. Recently, the estimated per capita daily animal protein intake in the country stood at 20gm [9,12]. This implies that, there is a short fall in animal protein intake among majority of Nigerians. Given the advantageous characteristics of the poultry enterprise over livestock areas, the sub sector can be a reliable source of cheap animal protein to many people in Nigeria. Therefore promoting poultry production in the country will imply providing animal protein to many poor households. Based on the capital intensive nature of the business and high poverty rate among farmers in Nigeria, increase poultry production cannot be achieved on its own without exogenous stimulus such as credit. Unfortunately, several factors are thought to limit farmers' access and demand for credit in Nigeria. Identification and understanding of these factors among poultry farmers will better inform the policy makers on how to tackle the problem of credit deficiency in the sub sector. In light of these factors, this study provided answers to the following research questions: What factors affect access to credit by poultry farmers: and what factors affect the demand for credit in Ikot Ekpene area of Akwa Ibom state in southern Nigeria? Based on the above research questions, the study specifically investigated factors that influence access and demand for credit among poultry farmers in the study area.

1.1 Literature Review

Ajagbe [34] analyzed determinants of access and demand for credit by small scale entrepreneurs from Oyo State in Nigeria. The empirical result showed that the respondent's age, membership of a social group, value of asset, education and the nature of the credit market are the major determinants of credit access and demand among respondents. Oladeebo and Oladeebo [25] examined determinants of loan repayment among smallholder farmers in Ogbomoso Agricultural Zone of Oyo State, Nigeria. Results of the multiple regression analysis showed that the amount of loan obtained by farmers; years of farming and credit experience and level of formal education were the major factors that positively and significantly influenced loan repayment. Ugbomeh [32] investigated determinants of loan repayment performance among women self-help groups in Bayelsa State, Nigeria. The estimated regression model indicated that women as household heads, interest rate, household size, price stability of farm proceeds, and commitment to self help groups significantly affected loan repayment of women farmers in the group. Oboh [22] examined the socio-economic determinants of farmers' loan size in Benue State, Nigeria. The result shows that annual income, distance from the farmer's resident to credit source, farm size and previous loan status were significant factors that encouraged larger loan size to farmers. Henri-Ukoha et al. [10] studied determinants of loan acquisition from the financial institutions by small-scale farmers in Ohafia agricultural zone of Abia state, Southeast Nigeria. Factors that influenced the amount of loan disbursed by the financial institutions were age of the farmers, level of education, farming experience and farm size. Oboh and Kushwaha [23] studied the effect of socio-economic and demographic factors on the rate of credit allocation to the farm sector by arable crop farmers in Benue State, Nigeria. Empirical result reveals that factors that affect the rate of credit allocation to the farm in the study area were; age, education, farm size, household size, length of loan delay and visitation by lenders. Another

study on the determinants of credit rationing among formal and informal lenders was conducted by Zeller [33] in Madagascar. The regression results showed that the probability of applying for informal credit increases with age, years of education, and number of sick days of household during the recall period. On the other hand, the probability of being credit constrained by the informal lender increases with age, and years of education. The study also identified the leverage ratio of household as the most important determinant for loan rationing. Physical collateral plays a minor role in credit rationing. Lawal et al. [15] 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 effect on farm business expansion.

Akudugu [3] estimated the determinants of credit demand by farmers and supply by Rural Banks in the Upper East Region of Ghana. Semi-structured questionnaire complemented by key informant interviews and focus group discussions were used in gathering data from 250 farmers in 5 districts of Upper East Region. The logit model was used to estimate the determinants of credit demand by farmers and the Tobit model used to estimate the determinants of credit supply by Rural Banks. The findings showed that age of farmers, gender and political affiliations among others were the main determinants of credit demand by farmers. Type of crop grown, farm size and the amount of savings made were some determinants of credit supply by the Rural Banks. Nwaru et al. [21] examined the determinants of credit demand and supply in informal credit markets among food crop farmers in Akwa Ibom State of Nigeria. Results of data analyses revealed that farm income, profit, education, and interest amount determined demand for credit among crop farmers in the area. Ng'eno et al. [19] studied farmers' inaccessibility to agricultural credit in Nyandarua District, Kenya. The study established that socio-economic constraints such as age, gender, household size, farm income, collateral and awareness are critical determinants of access to credit.

2. METHODOLOGIES

2.1 The Study Area

The study was conducted in Ikot Ekpene senatorial district of Akwa Ibom state, Nigeria. The district consist of eight local government areas namely; Ikono, Ikot Ekpene, Abak, Ika, Etim Ekpo, Obot Akara, Ini and Essien Udim local government areas. The area is popularly known for its raffia production, palm oil production, palm wine and carving as well as crafting. Some of the common food crops grown in the area are; cassava, plantain, waterleaf, fluted pumpkin, white yam, cocoyam, maize and banana. Ikot Ekpene is the political head quarter of the district; it has a land area of about 125km^2 or 48sqaure miles and a population of about 225,000 [20]. Poultry enterprise is an emerging business in the area. Commercial Broiler and egg production are becoming very popular among inhabitants of the area.

2.2 Sampling Techniques and Data Collection

Combination of sampling procedures were used in selecting respondents; first, three local government areas were randomly selected from the ten local government areas that constitute the district. In the second stage; ten (10) villages from each of the three Local Government Areas were purposively selected based on information on poultry production derived from the state ministry of Agriculture agency. The state Agricultural Development

Programme office (ADP) is responsible for keeping agricultural production records and monitoring farmer's performances in the state. The criterion for selecting the ten villages was based on a benchmark fact that a village must have at least five (5) poultry farmers. In the third stage; three poultry farmers were randomly sampled from each of the selected ten (10) villages. A total of 30 poultry farmers were selected from each local government area. A grand total of ninety (90) poultry farmers were used for data collection. In this study, we defined access to credit as a situation whereby poultry farmers or respondents have full access to authentic or reliable credit information; while demand for credit is considered as the amount of credit measured in Naira (₦) that a farmer actually borrowed from any lending source. Note, the study considered informal, semi-formal and formal credit sources.

2.3 Empirical Model

This study employed the independent double-hurdle model with the assumption that access to and amount of loan actually borrowed by poultry farmers in the area are two distinct or independent decisions. In addition, different sets of decision variables are believed to influence the decisions of a poultry farmer to access credit and actually borrow a given amount as loan from any credit source. Double-hurdle model was formulated by Cragg [7], the model assumes that poultry farmers make two sequential or independent decisions with regard to access to credit and acquisition of loan or credit. In this model, a different latent variable is used to model each decision process. Each hurdle is conditioned by the poultry farmer's socio-economic and environmental as well as credit institution characteristics. The double-hurdle model considers the possibility of zero outcomes in the second-hurdle arising from the individuals' deliberate choices or random circumstances. The model assumes that zero values can be reported in both decision stages. The zeros reported in the first-stage arise from zero access to credit by the poultry farmers; and those in the second hurdle come from zero loan acquisition from credit source due to farmer's deliberate decision or random circumstances. The first hurdle is the credit accessibility equation estimated with the normal Probit model as described in equation 1.

$$Index\ Equation \quad A_i^* = X_{Ii}^{'}\beta_1 + U_i, \quad U_i \sim N(0,1) \dots \dots \dots \dots .. (1)$$
$$Threshold\ index\ Equation\ A_i = \{1\ if\ A_i^* > 0, and\ is\ 0\ if\ A_i^* \leq 0\}$$

Where A_i^* *is* the latent discrete accessibility choice variable that denotes binary censoring, $X_{Ii}^{'}$ is a vector of explanatory variables hypothesized to influence credit accessibility choice and β_i is a vector of parameters and U_i is the standard error term. The empirical model used to estimate the Probit model or the first hurdle equation is given below;

$$A^* = \beta_0 + \beta_1 AGE + \beta_2 GEN + \beta_3 EDU + \beta_4 HHS + \beta_5 SOC + \beta_6 EXT + \beta_7 EXP_7 + \beta_8 FAS + \beta_9 PDF$$
$$+ \beta_{10} INF + U \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots .. \dots (2)$$

Where A^* is credit access which takes the value of 1 for those that have access and 0 otherwise.
Other variables in the model are as defined below;
   AGE = Age of farmer (years)
   GEN = Gender of the farmer (1=Male, 0 otherwise)
   EDU = formal educational level of poultry farmers (years)
   HHS = Household size of farmer (number)
   SOC = Membership of social group (1 for member and 0 otherwise)
   EXT = Number of times in contact with an extension agent in a month

EXP = Experience in poultry business (years)
FAS = Average number of birds per cycle as a proxy of farm size
PDF= Physical distance from farmer resident to lending source (1 is far and 0 otherwise)
U = stochastic error term

The second hurdle involves an outcome equation, which uses a truncated Tobit model to determine factors affecting the actual amount of loan borrowed by poultry farmers in the study area. This stage uses observations only from respondents who reported positive or greater than zero amount of loan borrowed. The truncated model, which closely resembles Tobit's model, is expressed as shown in equation 3.

$$Y_i^* = X_{2i}'\beta_2 + V_i, \qquad V_i \sim N(0.\delta^2) \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (3)$$
$$Double - Hurdle\ Model \quad Y_i$$
$$= \{Y_i^*\ if\ A_i = 1\ and\ Y_i^* > 0\ and\ is\ 0\ if\ A_i \leq 1\ and\ Y_i^* \leq 0\}$$

Y_i is the observed amount of loan borrowed by the sample respondent. For poultry farmer who does not borrow, Y_i cannot be measured and was set to be equal to zero (0). This indicates that the observed loan borrowed Y_i is zero either when there is censoring at zero ($Y^* \leq 0$) or if there is faulty reporting, or due to some random circumstance. Rewriting Equation (3) more elaborately reveals implicitly the processes involved in recording zero values for amount of credit borrowed by respondents [13]:

$$Y_i = Y_i^* = X_{2i}'\beta_2 + V_i \quad if \quad X_{1i}'\beta_1 + U_i > 0\ and\ X_{2i}'\beta_2 + V_i > 0 \ \dots\dots\dots\dots\dots (4)$$
$$= 0 \qquad\qquad if \quad X_{1i}'\beta_1 + U_i > 0\ and\ X_{2i}'\beta_2 + V_i \leq 0$$
$$or \quad X_{1i}'\beta_1 + U_i \leq 0\ and\ X_{2i}'\beta_2 + V_i > 0$$
$$or \quad X_{1i}'\beta_1 + U_i \leq 0\ and\ X_{2i}'\beta_2 + V_i \leq 0$$

In the double-hurdle model, the two error terms are assumed to be jointly normal and uncorrelated or independently distributed and is express as shown below;

$$\binom{U_i}{V_i} \sim N\left[\binom{0}{0}, \begin{pmatrix} 1 & 0 \\ 0 & \delta^2 \end{pmatrix}\right]$$

The empirical model used to estimate the truncated Tobit model of credit access among poultry farmers is given below;

$$Y^* = \beta_0 + \beta_1 AGE + \beta_2 EXP + \beta_3 EXC + \beta_4 COL + \beta_5 FAI + \beta_6 HHS + \beta_7 COS + \beta_8 INT + \beta_9 FPL$$
$$+ \beta_{10} FAS + \beta_{11} EDU + \beta_{12} DEP$$
$$+ U \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (5)$$

Where;

Y* =   Amount of loan borrowed by a poultry farmer as described in equation (4) measure in naira
AGE = Age of poultry farmer (years).
EXP = Experience in poultry business (years).
EXC = Previous years of credit experience (years).
COL = Collateral/surety availability (1 if available and 0 otherwise).
FAI = Net farm income defined as total revenue less total cost (₦).
HHS = Household size (measure in number).
COS = Cost of hired labour (₦).

INT = Interest paid on loan (Amount paid in naira).
FPL = Farmer perception of loan repayment period (1 for short period and 0 for long period).
FAS = Farm size proxy by average number of bird/cycle.
EDU = Farmer's years of formal education.
DEP = Farmer dependent ratio (measure as number of children from 0 to 14 plus number of aged member of the family above 65 years divided by the household size).

The double hurdle model is said to be a dependent model if there is a relationship between the decisions by poultry farmers to access credit and the amount of loan actually borrowed. This relationship can be expressed as shown in equation 6.

$$\rho = \frac{Cov(V_i, U_i)}{\sqrt{Var(V_i)\,Var(U_i)}} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

If ρ = 0, then there is dominance (the zeros are only associated to non-access to credit, not standard corner solutions) then the model decomposes into a Probit for access and a standard ordinary least squares (OLS) for $Y_i = Y_i^*$. The double-hurdle model with independent error terms can be estimated by the following log-likelihood function [18,5]:

$$LogL = \sum_0 In\left[1 - \emptyset(X_{1i}'\beta_i)\phi\left(\frac{X_{1i}'\beta_i}{\delta}\right)\right] + \sum In\left[\phi(X_{1i}'\beta_i)\frac{1}{\delta}\phi\left(\frac{Y_1 - X_{1i}'\beta_i}{\delta}\right)\right]\dots\dots. (7)$$

The first term corresponds to the contribution of all the observations with an observed zero. It indicates that the zero observations are coming not only from the access decisions but also from the demand decisions. Furthermore, under the assumption of independence between the two error terms, the log-likelihood function of the double-hurdle model is equivalent to the sum of the log likelihoods of a truncated regression model and a univariate Probit model [5]. Consequently, the log-likelihood function of the double-hurdle model can be maximized, without loss of information, by maximizing the two components separately: the probit model (over all observations) followed by a truncated regression on the non-zero observations [13,17,30].

2.4 Test for Collinearity of Variables Used in the Model

Multi-collinearity is among prominent econometric problems of cross sectional data. This property of econometric was tested among variables to ensure the consistency and unbiaseness of the Probit model estimates. The variance inflation factor (VIF) was used. For VIF, the minimum possible value is 1.0; while value greater than 10 indicates a probably collinearity problem. VIF was estimated using the formula stated below:

$$VIF_j = 1/\{1 - R^2_j\}\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots. (8)$$

Where $R^2_{(j)}$ is the multiple correlation coefficient between variable j and the other specified explanatory variables.

3. RESULTS AND DISCUSSION

The independent double hurdle model assumes that the two error terms from the two hurdles are uncorrelated as such the two-stage decisions are done independently. To test whether the two decision were independent, we investigate the relationship between the error term in the first hurdle and the second hurdle model. The result of the exercise is presented in Table 1.

Table 1. Relationship between error term in the 1ˢᵗ hurdle and error term in the 2ⁿᵈ hurdle

Variable	Coefficient	Standard error	T-value	P-value
Constant	0.005	44155.78	0.000	1.000
Error (2ⁿᵈ Hurdle)	32762.62	80678.79	0.406	0.686
Coefficient of correlation (R) = 0.058				

Note: $(Error_{1st\ Hurdle} = \alpha_0 + \alpha_1 Error_{2nd\ Hurdle})$

The result reveals that the error term from the first hurdle was statistically insignificant and unrelated to the error term in the second hurdle. This implies that factors that influence poultry farmers' decision to access credit were unassociated with the decision variables in the second hurdle involving amount of loan borrowed. Also in the co-variance analysis of (V_i, U_i), the "ρ" value defined in equation 5 was 0.058. Under the assumption of null hypothesis of no-correlation the t-value (88) was 0.406 (with two tailed test) and was insignificant at standard level of probabilities. This result confirmed that the two error terms were not correlated and the two-stage decisions were uncorrelated. This result further confirmed the relevance of the double hurdle model in this study.

3.1 Test Result for Collinearity among Specified Variables in the Model

Table 2 presents the VIF test result for collinearity of variables used in the two hurdles with respect to the two dependent variables. The result reveals that there was no significant collinearity between the specified explanatory variables and the dependent variables in the two hurdles. The result implies that the estimates of the two models to an appreciable extent are consistent and probably unbiased.

Table 2. The Variance inflation factors (VIF) test result for collinearity of variables used in the two hurdle equations

2ᴺᴰ Hurdle		1ˢᵀ Hurdle	
Variable	**VIF Estimate**	**Variable**	**VIF Estimate**
AGE	2.625	AGE	2.535
EXP	1.673	GEN	1.158
EXC	1.751	EDU	1.524
COL	2.178	HHS	1.751
FAI	1.298	SOC	1.083
HHS	1.884	EXT	1.204
COS	2.137	EXP	1.661
INT	1.596	FAS	1.388
FPL	1.697	PDF	1.233
FAS	2.171	-	-
EDU	1.494	-	-
DEP	1.314	-	-

Source: Computed by authors, 2012.

3.2 Summary Statistics

The summary statistics of variables used in the analysis is presented in Table 3. The result revealed the average farm size of about 458 birds with a standard deviation of 302 for the respondents. The mean total cost of hired labour used was ₦30647 with a standard deviation of ₦41293. The average age of farmers was 42.75 years with a standard deviation of 11.06 years. This shows that the poultry farmers in the study area are in their active years. The average farming experience was 8.03 years with a standard deviation of 8.27 years and coefficient of variability of 1.03. This implies that the farming experience varied significantly among farmers and that the poultry business is relatively young in the area.

Table 3. Summary statistics of variables used in the analysis

Variables	Nature of data	MIN	MAX	MEAN	Standard deviation	CV
Age (year)	continuous	22.00	70.00	42.75	11.06	0.26
Experience (year)	continuous	0.00	40.00	8.03	8.27	1.03
Household size	continuous	1.00	9.00	4.90	2.27	0.46
Net farm income	continuous	200500	1343000	679504.	276010	0.41
Cost of hired labour	continuous	0.00	90000	30647.1	41293	1.35
Interest paid on loan	continuous	50000	1000000	250066.7	177567.2	0.71
Farmer perception of loan period	Binary	0.00	1.00	0.18	0.388	2.16
Farm size	continuous	150	1800	458.29	302.34	0.66
Farmer's education	continuous	0.00	21.00	13.02	3.79	0.29
Farmer dependent ratio	continuous	0.20	9.00	2.33	1.99	0.85
Gender of the farmer	Binary	0.00	1.00	0.90	0.30	0.33
Membership of social group	continuous	0.00	1.00	0.73	0.45	0.62
Number of contacts with ext. agent	continuous	0.00	4.00	0.86	0.94	1.09
Distance to lending source	Binary	0.00	1.00	0.41	0.49	1.21
Collateral/surety availability	Binary	0.00	1.00	0.24	0.423	1.82
Access to credit	Binary	0.00	1.00	0.92	0.43	0.46
Number that borrowed	Binary	0.00	1.00	0.82	0.39	0.48
Amount of loan borrowed	continuous	250000	3000000	980000	45678	0.15

Source: Computed by authors, 2012. Note, unit of variables are as defined in equations 2 and 5. Total number of sample is 90.

The average years of schooling was 13.02 years with standard deviation of 3.79 years showing that most of the poultry farmers in the study area are educated? The result also showed that about 83% (0.92 X 90) of the total respondent have access to credit while 74% (0.82 X90) of the total respondent actually demanded for credit in the study area.

3.3 Factors that Influence Poultry Farmers' Access to Credit in Ikot Ekpene Area in Akwa Ibom State, Southern Nigeria (First Hurdle)

Table 4 presents the maximum likelihood estimates of the first part of the independentdouble-hurdle model. The estimated Probit regression model gave the Mc Fadden R– squared of about 0.84 which implies that all the explanatory variables included in the model were able to explain about 84 per cent of the probability of the decision of poultry farmers to access credit from various credit sources considered in the study area. The log-likelihood ratio (LR) statistic (15.20) is significant, meaning that the explanatory variables included in the model jointly explain the probability of farmers deciding to access credit from credit sources. The information criteria also attest to the reliability of the probit model in this study. This implies that factors that influence the two-stage decision relating to credit accessibility and acquisition in the study area were better expressed in the independent double hurdle model. The coefficient in the first hurdle indicates how a given variable affects the likelihood (probability) to access credit. Those in the second hurdle indicate how a decision variable influences the amount of loan borrowed by the respondent.

The result of the first hurdle (Probit Model) indicates that coefficients of farmer's age (AGE at 5%), education (EDU at 5%), membership of social group (SOC at 1%) and farm size (FAS at 1%) are positive and statistically significant with respect to the decision or probability to access credit by poultry farmers in the study area. The result implies that as the poultry farmer's age, education, membership of social group and farm size increase, the chance to have access to credit increases too. The result satisfied the *a priori* expectations because increase in the farmer's age implies increase in exposure and probably experience. Also, increase in the farmer's formal years of education will expose them to the environment of new innovations and better management techniques. In addition, membership of a social group will widen farmer's interactive tendencies and exchange of ideas relating to their businesses. Furthermore, increase in farm size is an incentive to seek for credit in other to sustain productivity and expand production capacity of the farm. The result for age, education and farm size corroborate the research findings of Oboh and Kushwaha [23] in northern Nigeria, Zeller [33] in Madagascar, Ajagbe [34] in western Nigeria and Henri-Ukoha et al. [10] in South Eastern Nigeria. The result for membership of a social group is in consonance with finding of Lawal et al. [15] in Nigeria.

Table 4. Probit model estimates (1st Hurdle) of Poultry farmers' decision to access loan from credit sources in Ikot Ekpene area of Akwa Ibom State, Nigeria

Variable	Coefficient	Standard error	Z-value	Marginal effect	P- value
Constant	-0.067	1.439	-0.046	-	0.963
Age	0.064	0.032	2.007	0.009	0.045**
Gen	-1.215	0.738	-1.645	-0.092	0.099*
Edu	0.031	0.013	2.385	0.109	0.045**
Hhs	-0.171	0.101	-1.694	-0.025	0.090*
Soc	1.618	0.521	3.108	0.375	0.002***
Ext	-0.749	0.265	-2.821	-0.111	0.005***
Exp	0.011	0.036	0.315	0.002	0.753
Fas	0.041	0.007	5.848	0.510	0.001***
Pdf	-1.442	0.552	-2.614	-0.265	0.009***
Log likelihood = -15.20		*Akaike criterion = 50.41*			
MC Fadden R-square = 0.84		*Schwarz criterion = 69.72*			
Mean Dependent Variable = 0.823		*Hannan-quinn = 57.79*			
*Normality of Residual = 15.33***					

Note: ** ** and *** represent 10%, 5% and 1% significant levels respectively. Variables are as defined in equation 2.*

On the other hand, coefficients of gender (GEN at 10%), household size (HHS at 10%), extension agent visit (EXT at 1%) and distance from farmer's resident to credit lending source (PDF at 1%) are negatively signed and statistically significant with respect to decision to access credit by poultry farmers in the study area. The result reveals that the probability or decision to have access to credit source decreases among male poultry farmers in the study area. This result could be attributed to the multi-functional roles of African males. It was observed that all poultry farmers in the study area have other income generating engagements apart from their primary occupation. Increase income and occupation diversification could be linked to poverty status of the farmers and the risky nature of the poultry business. Increased household size increases the non-farm expenditure and diverts the concentration of farmer on farm expenditure to family welfare. The result on the relationship between decision to access credit and extension agent visit could be traced to many possible reasons: one of the probable reason is the low efficiency of the extension agent. The second reason could be the policy content and the focus of the extension system in the study area. If the extension system is not well organized, farmers might be misinformed and their decision to access credit daunt. The distance from the farmer's residence was found to have a negative relationship with the credit accessibility. This implies that farmers who live further away from the credit sources are less likely to consider decision to access credit compared to those who live closer to the credit sources. Zeller [33], Oboh and Ineye [22] and Henri-Ukoha et al. [10] in their separate reports attested to the above findings.

The marginal effects of the Probit model show changes in the probability to access credit for additional unit increase in the independent or decision variables. For instance the probability of credit access increases by 51.10%, 37.50%, and 10.90% for every unit increase in the farmer farm size, social organization membership and formal education respectively; while 26.50%, 11.10% and 9.20% reduction in the chance to access credit occurs for every unit increase in distance from farmer's resident to lending source, extension agent visit and gender (i.e. for every increase in male respondent). However, based on the magnitude of the slope coefficients in the estimated model, farm size, membership of social organization, extension agent visits, distance from the lender resident to lending source, education and household size appear to be the most important policy variables that impact on the decision of poultry farmer to have access to credit sources in the study area.

3.4 Factors that Influence Poultry Farmer's Demand for Loan in Ikot Ekpene Area in Akwa Ibom State, Southern Nigeria (Second Hurdle)

The maximum likelihood estimates of the truncated Tobit model are presented in Table 5. The estimated truncated Tobit regression model reveals a normal distributed regression residual (significant at 1% level) and a significant log-likelihood ratio. These diagnostic tests justified the used of the maximum likelihood estimation technique and confirmed that the explanatory variables included in the model jointly and adequately explain the demand for credit by poultry farmers in the study area. The information criteria of the estimated Tobit model further validate the reliability of the estimated model.

The result of the truncated Tobit model reveals that coefficients of farming experience (EXP), previous years of credit experience (EXC), cost of hired labour (COS), farm size (FAS) and farmer's education (EDU) are significant and positively related to the amount of loan borrowed by poultry farmers in the study area. The result implies that increase in the farmer's experience in poultry business increases the demand for credit in the study area. This result could be attributed to the urge by farmers to increase productivity by increasing

the productive capacity of their farms. This result is substantiated by research findings of Henri-Ukoha et al. [10].

Table 5. Truncated Tobit's model estimates (2ⁿᵈ Hurdle) of Poultry farmers' that borrowed loan from credit sources in Ikot Ekpene area of Akwa Ibom state, Nigeria

Variable	Coefficient	Standard error	Z-Value	P- Value
Constant	522990	587303	0.8905	0.373
Age	-13356.8	11022.2	-1.212	0.226
Exp	35508.9	11879.9	2.989	0.002***
Exc	158002	52976.9	2.982	0.002***
Col	-235171	22995.9	-10.227	0.000***
Fai	-0.1694	0.10057	-1.685	0.092*
Hhs	-41029.9	44726.3	-0.917	0.359
Cos	6.26263	3.38601	1.850	0.064*
Int	-0.18763	1.02755	-0.183	0.855
Fpl	-509642	260795	-1.954	0.051*
Fas	572.766	228.095	2.511	0.035**
Edu	37105.1	17906.9	2.072	0.041**
Dep	-106558	212612	-0.501	0.616

Log likelihood = -281.19   Akaike criterion = 590.39

*Chi-square (12) = 38.35***   Schwarz Criterion = 614.39   Hannan-quinn = 599.13*

*Normality Of residual = 14.385****

Note: * ** and *** represent 10%, 5% and 1% significant levels respectively. Variables are as defined in equation 5.

Increase in the cost of labour and farm size of poultry farmers would increase the cost of production and expand the need for more capital investment in the farm. This would create need for more credit in order to sustain the business. Also, increase in years of farmers' formal education would expose them to various sources of credit and thus increase tendency to acquire credit too. In addition, it will enhance access to various information sources and some criteria needed to formalize any loan acquisition procedures. These findings agreed with the empirical research reports of Oboh and Ineye [22], Nwaru et al. [21] in Nigeria and Akudugu [3] in Ghana.

On the other hand, the slope coefficients of the net farm income (FAI), collateral or surety availability (COL) and farmer's perception of loan repayment period (FPL) are negatively signed and statistically significant at 10%, 1% and 10% probability levels respectively. Increase in the net farm income of poultry farmers will increase the chances of plough back profit or revenue in the business. This means that farmers that are exposed to this financial situation will prefer to re-invest their gains rather than acquired fresh loan which most times require long processes to get through and the issue of bulky interest rate. Also, the uncertain business environment, corrupt tendencies and high default rate among farmers especially in the developing countries could be among possible reasons for the negative relationship between surety and the amount of loan borrowed. Furthermore, the gestation period, seasonality in production, risky nature of the business and price uncertainty could also be linked to the adverse relationship between loan acquired and perception of the loan repayment period.

4. CONCLUSION

This study was conducted to identify factors that determine poultry farmers' access to credit facilities and actual amount borrowed in Ikot Ekpene Area of Akwa Ibom state, southern Nigeria. Data for the study was elicited from a total of 90 poultry farmers spread across the study area. The study uses the independent double hurdle model to analyze the two-stage decision of credit access and acquisition by poultry farmers in the study area. The Probit model regression analysis reveals that age, gender, education, household size, membership of a social group, extension agent contact, farm size and the perceived distance from the farmer's resident to the credit source are statistically significant decision variables influencing the probability of accessing credit by poultry farmers in the study area. However, the magnitude of farm size, membership of social organization, extension agent visits, distance from the farmer resident to the lending source were the most important policy variables that affect the decision of poultry farmers to access credit sources in the study area. On the other hand, the amount of loan actually acquired by the poultry farmers was significantly influenced by farmers' experience, cost of hired labour, previous years of experience on credit, present of surety, farm size, perceived loan repayment period, years of formal education and net farm income.

To improve farmers' access to credit, the study recommended that poultry farmers in the study area should form cooperative societies as this will ensure appropriate information sharing, risk reduction and increase awareness on matters relating to farm credit. The extension system in the study area should be strengthened for effective information dissemination especially on credit issues. Operators of credit institutions should endeavor to locate some of the lending institutions or outfits nearer to the farmers. Adult education programme should be implemented for the poultry farmers as this would affect their access to credit positively. Also, to increase the demand for credit in the study area, the study advocated for the re-assessment of the collateral needs of the lending agents and the duration of loan to the poultry farmers. Family planning programme should be intensified in the rural area where most of these poultry farmers reside. This will help to reduce household size of farmers which will probably contribute to increase in household saving and reduction in pressure on demand for credit facilities in the study area.

COMPETING INTERESTS

All the contributing authors have declared that there are no competing interests among us.

REFERENCES

1. Agom DI, Idiong IC. Effect of credit use on gross margins in food crop enterprises of small scale farmers in cross River state. Nigeria International Journal of Social Science and Public Policy. 2002;5(2):180-185.
2. Akpan SB, Obot DA. Ubon AE. Government Agricultural Credit Policy and Macroeconomic Fundamentals: a case study of Agricultural Credit Scheme Fund (ACGSF) in Nigeria. Public Policy and Administration Research. 2012;2(2):61-75.
3. Akudugu MA. Estimation of the Determinants of Credit Demand by Farmers and Supply by Rural Banks in Ghana"s Upper East Region. Asian Journal of Agriculture and Rural Development. 2012;2(2):189-200.

4. Anyiro CO, Orriaku BN. Access to and investment of formal micro credit by small holder farmers in Abia state, Nigeria. A case study of ABSU Micro Finance Bank, Uturu. The Journal of Agricultural Sciences. 201;6(2):70-76.

5. Aristei D, Perali F, Pieron L. Cohort, Age and Time Effects in Alcohol Consumption by Italian Households: A Double-hurdle Approach, Empirical Economics; 2007. DOI 10.1007/s00181-007-0142-5.

6. Audu SI, Oliu S, Enefola FO. Savings mobilization by cooperative societies in Ibaji local government area of Kogi state, Nigeria. Production Agriculture and Technology. 2007;3(2):1-10.

7. Cragg JG. Some Statistical Models for Limited Dependent Variables with Applications to the Demand for Durable Goods. Econometrica. 1971;39:829-44.

8. Dorfman JH, Koop G. Current developments in productivity and efficiency measurement" Journal of econometrics, Elsevier. 2005;126(2):233-240.

9. FAO. The State of Food Security in the World. Progress Report on World Food Hunger, Rome; 1992.

10. Henri-Ukoha A, Orebiyi JS, Obasi PC, Oguoma NN, Ohajianya DO, Ibekwe UC, Ukoha II. Determinants of loan acquisition from the financial institutions by small-scale farmers in Ohafia Agricultural zone of Abia State, South East Nigeria. Journal of Development and Agricultural Economics. 2011;3(2):69-74.

11. Hussein HK, Ohlmer BO. Influence of Credit Constraint on Production efficiency: The Case of Farm Households in Southern Ethiopia. Department of economics, Swedish University of Agricultural Sciences. Sweden; 2008.

12. Iyangbe CO, Orewa SI. Determinants of Daily Protein Intake among Rural and Low-Income Urban Households in Nigeria. American-Eurasian Journal of Scientific Research. 2009;4(4):290-301.

13. Jones A. A Double-Hurdle Model of Cigarette Consumption. Journal of Applied Econometrics. 1989;4(23-39).

14. Joseph JK, Ajayi S. Agricultural Products and Man. History and Philosophy of Science: General Studies Approach: Akanji MA, Jolayemi ET (eds.). 2002;118-141.

15. Lawal JO, Omonona BT, Ajani OI, Oni AO. Effects of Social Capital on credit Access among Cocoa Farming Households in Osun State, Nigeria. Agric. J. 2009;4:184–191.

16. Lawal MA, Balogun GS. Animal protein consumption among rural households in Kwara State, Nigeria. African journal of General Agriculture. volume. 2007;3:21-28.

17. McDowell A. From the help desk: hurdle models. The Stata Journal. 2003;3:2;178-184.

18. Moffatt P. Hurdle Models of Loan Default. Journal of the Operational Research Society. 2005;56:1063-1071.

19. Ng'eno V, Muiruri EJ, Nyangweso PM, Langat BK, Kipsat MJ. Farmers Inaccessibility to Agricultural Credit in Nyandarua District, Kenya. Asian Journal of Agriculture and Rural Development. 2011;1(2):64-68.

20. NPC. National Population Commission 2006. Provisional Population Figures.

21. Nwaru JC, Essien UA, Onuoha RE. Determinants of Informal Credit Demand and Supply among Food Crop Farmers in Akwa Ibom State. Nigeria Journal of Rural and Community Development. 2011;1712-8277.

22. Oboh VU, Ineye DE. Determinants of formal agricultural credit allocation to the farm sector by arable crop farmers in Benue State, Nigeria. African Journal of Agricultural Research. 2011;6(1):181-185.

23. Oboh VU, Kushwaha S. Socio-economic Determinants of Farmers' Loan Size in Benue State, Nigeria. Journal of Applied Sciences Research. 2009;5(4):354-358.

24. Okoli IC, Anyaegbunam CN, Etuk EB, Uchegbu MC, Udedibie AB. Socio-economic characteristics of poultry business entrepreneurs in Imo State, Nigeria. Journal of Agriculture and social research. 2004;4(2).

25. Oladeebo JO, Oladeebo OE. Determinants of Loan Repayment among Smallholder Farmers in Ogbomoso Agricultural Zone of Oyo State, Nigeria. J. Soc. Sci. 2008;17(1) 59-62.

26. Oluyemi JA, Robert FA. Management and housing of adult birds. Poultry Production in Warm wet Climates. 1979;49-106.

27. Omonona BT, Akinterinwa AT, Awoyinka YA. Credit Constraint and Output Supply of Cowan Farmers in Oyo state Nigeria. European Journal of Social Sciences. 2008;6(3):382-390.

28. Omonona BT, Lawal JO, Oinlana AO. Determinants of Credit Constraint conditions and production efficiency among farming households in Southwestern Nigeria. Contributed paper presented at the joint 3rd African association of agricultural economists (AAAE) and 48th agricultural economists association of South Africa (AEASA) conference, Cape Town, South Africa. September 2010;19-23.

29. Omotosho JS. Keynote address, Proceedings of the FISON annual conference Fisheries Society of Nigeria in 2004.

30. Shrestha R, Alavalapati J, Seidl A, Weber K, Suselo T. Estimating the Local Cost of Protecting Koshi Tappu Wildlife Reserve, Nepal: A Contingent Valuation Approach, Environment, Development and Sustainability. 2006; DOI 10.1007/s 10668-006-9029-4.

31. Smith JD. Introduction to animal parasitology. London: Hodder and Stoughton; 1990.

32. Ugbomeh GM, Achoja M, Ideh FO, Ofuoku AU. Determinants of loan repayment performance among women self help groups in Bayelsa State, Nigeria. Agriculturae Conspectus Scientificus. 2008;73(3):189-195.

33. Zeller M. Determinants of Credit Rationing: A study of Informal lenders and Formal Credit Groups in Madagascar. Food Consumption and Nutrition Division, International Food Policy Research Institute, Washington, D.C. U.S.A; 1994.

34. Ajagbe FA. Analysis of Access to and Demand for Credit by Small Scale Entrepreneurs. Evidence from Oyo State, Nigeria. Journal of Emerging Trends in Economics and Management Sciences (JETEMS). 2012;3(3):180-183.