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Analysis of Credit Constraints on Adoption of Modern Technology among Groundnut Farmers in Hong Local Government Area of Adamawa State, Nigeria

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***Abstract*:** *This study analysed credit constraints on adoption of modern technology among groundnut farmers in Hong Local Government area of Adamawa state, Nigeria. Data for this study were collected through the use of structured questionnaire. The regression variables that were statistically significant in influencing credit accessibility were level of education, distance between lenders and borrowers, perception of lending procedure, cost of borrowing, security of collateral and association membership. Moreover, in determining adoption of modern technologies were farmers' age, cost of technology, income level, farming experience, access to modern input, credit accessibility and number of extension contacts. Lastly, the ANOVA result showed that the mean square were 11.631 and 1.240 between and within groups respectively. The study recommended that adequate extension services should be provided to promote demand for modern technologies and link the farmers to financial institutions to access credit facilities, which will enable them adopt improved technologies for higher productivity.*

Keywords: *Credit constraints, Technology adoption, Groundnut farmers, Hong Local Government Area*

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I. Introduction

For an economy to attain any meaningful development it has to be self-sufficient in terms of food security among others; this makes agriculture one of the important sectors of any economy. The ever increasing number of world's population and the drive to be food secure raises both domestic and international demand for food worldwide. Nigeria is endowed with large fertile agricultural land as well as a large active population that can sustain a productive and profitable agricultural sector. These enormous resources base can support a vibrant agricultural sector capable of ensuring self-sufficiency in food and providing gainful employment for the teeming population and generating foreign exchange through exports. In spite of the endowments, the sector has continuously produced below its potentials[17].

The Nigeria's ability to efficiently utilize its agricultural production potential depends on the innovativeness and decision to adopt by the farmers of modern production technologies based on how they perceived it. This is for the fact that promotion of technological change through the generation of agricultural technologies by research and their dissemination to farmers help in boosting agricultural production in the developing countries. It is widely known that adoption of modern technologies not only in the area of agricultural activities but also in other sectors contribute to economic growth and development.

Groundnut or Peanut (*Arachishypogaea*) is a major crop grown in the arid and semi-arid zone of Nigeria. It is either grown for its nut, oil or its vegetative residue. The use of groundnut meal is becoming more recognized not only as a dietary supplement for children on protein poor cereals-based diets but also as effective treatment for children with protein related malnutrition. Its seeds contain high quality edible oil, easily digestible protein and carbohydrates. The crop is mainly grown in the northern part of Nigeria; over 85% of the groundnuts produced in the country were accounted for by Kano, Kaduna, Taraba, Bauchi, Borno, Yobe and Adamawa States. It is usually grown in rotation with cereals as it helps in efficient nutrient utilization and reduces soil borne diseases[6]. Nigeria is one of the countries of the world with a variety of oil seeds notably groundnut, oil palm, soybean and cotton seeds. Vegetable oils are used principally for food (mostly as shortening, margarines, and salad and cooking oils) and in the manufacture of soap and other products. Groundnut is by far the most nutritive oil-seed used in West Africa. In Nigeria, Groundnut provides high quality cooking oil and is an important source of protein for both human and animal diet and also provides much needed foreign exchange by exporting kernels and cake[32].

Like any other farming practices, groundnut farming also requires the use of modern inputs (Technologies) such as tractors, inorganic fertilizer, herbicides, pesticides, improved seedlings, threshing machines, pitch bags, sprayers etc. However, the availability of modern agricultural production technologies to farmers and the farmers' capabilities to acquire and adopt these technologies are the considerable factors in boosting the agricultural productivity[31]. Farmers' capabilities can be empowered through agricultural credit in order to acquire modern technologies for the purpose of increasing productivity and improve standard of living through breaking the vicious circle of poverty. This is for the fact that sufficient credit determines farmers' access to all his farming inputs. Credit can be obtained from formal financial institutions (Standard Bank, Bank of Agriculture, Commercial banks, development banks etc), Semi-formal institutions (Micro Finance, Non-Governmental Organisation etc) and informal financial institutions (Money Lenders, Rotating Saving and Credit Association). In spite of the importance of credit in farming activities, the financial institutions at times withheld and cut down the credit allotted for farmers and sought for less risky investment outside the agricultural sector which invariably affects productivity[42].

In an effort to attain self-sufficiency in vegetable oil, attention was focused on the promotion of eleven schedule oil seed crops in Nigeria among which were groundnut, oil palm, soya beans, beniseed, cotton, sunflower, cashew, coconut and cocoa under the presidential initiative programme. It was targeted that 15 million tons of groundnut would be produced annually[17]. Groundnut is one of the important oil seed crops of the world which is use for both animal and human consumption. It's also being traded domestically and internationally in various developing and developed nations. Nigeria is the fourth largest producer in the world and the highest producer in Africa with 1.55 million metric tons. The crop is mainly grown in the northern part of Nigeria; over 85% of the groundnut produced in the country was accounted for by Adamawa, Bauchi, Borno, Kano, Kaduna and Taraba. In spite of the economic importance of groundnut not only in Adamawa State but also in Nigeria and the world at large, groundnut farmers still cannot meet up with both domestic and international demand [21].

Hong Local Government Area in particular is one of the northeast areas producing groundnut in commercial quantity and various agricultural schemes and programmes operate at the local government levels. The RUFIN (Rural Finance) programme plays a vital role in facilitating credit among the farmers, where by efforts were made to link the borrowers (farmers) and the lenders (Bank of Agriculture, Standard Micro-Finance Bank, Commercial Banks etc) serving as intermediary. It also encourages farmers to form cooperatives and provides capacity building as well as close supervision to make sure that credit sourced were channel accordingly. There were various Non-Governmental Organizations that supported the farmers with soft loans, fertilizer, pitch bags, improved seedlings, sprayers, water pumps, herbicides and pesticides to enable them increase productivity and reduce economic hardship. However, farmers still face constraints in adopting modern technologies in groundnut farming.

Many studies were conducted on economic analysis of groundnut farming, credit supply and resources productivity as well as determinants of credit among rural farmers[15,29,24,36]. However, less emphasis was made on credit constraints on adoption of modern technology among groundnut farmers. Hence, this research work focused on analysing credit constraints on adoption of modern technology among groundnut producers in Hong Local Government area of Adamawa State, Nigeria. The research objectives, therefore, were to: examine the socioeconomic factors influencing credit accessibility; examine socioeconomic factors determining the adoption of modern technologies among Groundnut farmers; and determine the effect of credit constraints on the adoption of modern technologies among Groundnut farmers.

II. Literature Review

[2]Credit constraints were described in different forms; firstly, credit constraints could be quantity constraint. That isa situation where by the credit demand of a lender is unmet or not granted. It could also be in form of transaction cost constraint where a borrower that is willing to participate in the credit market at a given interest rate withdraws as a result of additional indirect cost associated with processing and administration of loans. Moreover, credit constraint could be in form of risk constraint where by a borrower withdraw from participating in the credit market because of the fear of losing his/her asset. This implies that access to credit can be constraint externally imposed in the household, while participating in a credit market made by a household. Therefore, a household can have access to but may not choose to participate in the credit market for such reasons as expected rate of return of the loan and/or risk consideration. However,credit constraints can be explained as incidence that take place when demanding individuals are hindered from getting credit. This may be discouragement for approach of creditors and lack of creditors. [34]It can be deduced that credit constraint refers to inability of a person, organisation or an entity to access credit due to social or economic barriers beyond their powers.

A common feature of rural credit markets in developing countries is the coexistence of formal and informal credit markets [16]. However, credit institutions has been categorised into three groups: (i) formal, such

as commercial banks, microfinance banks, Bank of Agriculture (BOA), and state government-owned credit institutions; (ii) semi-formal, such as Non-Governmental Organizations (NGO), Micro Finance Institutions (MFIs) and cooperative societies; and (iii) informal, such as money lenders, and rotating savings and credit associations (RoSCAs)[11,9].

The main objective of agricultural credit policies over the years was to make adequate credit available to the farmers at the right time and affordable cost. A policy measure adopted to achieve this during the period 1970-1985, was purveyance of credit to the agricultural sector at concessionary interest rate. Based on the fact that banks discriminated against agriculture in granting credit facilities, financial institutions were compelled to support agricultural activities through credit quota at concessionary interest rate. In order to develop the agricultural sector, Nigeria Agricultural and Cooperative Bank (NACB) was established in 1973 while Agricultural Credit Guarantee Scheme (ACGS) and Nigerian Agricultural Insurance Company in 1978 and 1987 respectively. Moreover in 1999 Trust fund Model was introduced as a credit guarantee product designed to facilitate and expand the channels of credit purveyance to farmers under the ACGS. In the year 2000, the development financial institutions were merged and recapitalized to form the new Agricultural and Rural Development Bank (ARDB). As at the period 1999-2007 the average interest rate stood at 19.9% and the agricultural sector witnessed a great increase because of the various mechanisms put in place by the government to provide credit to farmers. Among those mechanisms were the presidential Initiatives and the Agricultural Credit Support Scheme (ACSS)[17].

Agricultural credit scheme was introduced in 2006 by the Federal government and Central Bank of Nigeria (CBN) with the active support and participation of the bankers' committee. The main objectives of the scheme include enabling the farmers to exploit untapped potentials of the countries' agricultural sector, reduced inflation and lower the cost of food items, diversify Nigerian' revenue base, and earn more exchange from export[17].

Credit Accessibility

[30]A study that examined factors influencing farm households' modern agricultural production technology adoption decisions in Ghana. Samples of 300 farmers in the Bawku West District of Ghana were used; and the Logit model was estimated to ascertain the factors. The results showed that access to credit was one of the significant factors that positively influenced technology adoption decisions of farm households in the study area. [33]There was an extensive reviewed on the various factors influencing adoption of agricultural technology among smallholder farmers. The results of the findings showed that changes in technology adoption were associated with changes in the access to credit. Moreover,in a study ofthe determinants of Agricultural Technology Adoption in Mozambique, theanalysis of improved agricultural technology adoption indicates that households with access to credit were more likely to adopt new agricultural technologies[38]. In a study on factors affecting adoption of appropriate technologies on cassava production in Oriire Local Government Area of Oyo State, Nigeria, the study used relevant information from 120 farmers in 5 selected villages in the study area. Data collected were analysed with correlation. The correlation coefficient indicates that significant relationships exist between lack of credit facilities and the adoption level of the appropriate technologies[10].

Effects of Credit Constraints on Agricultural Production

[7]In studying the relationship between credit constraints, agricultural productivity and rural nonfarm participation of households in Rwanda, they used a nationally representative data of 3600 households in rural Rwanda. Their study considered credit rationing in the semi-formal sector alone and 71 percent of households were credit constrained. They used an endogenous switching regression and estimated by using the Full information maximum likelihood procedure. The loss of agricultural productivity due to credit constraint under this study in Rwanda is estimated for 17%.

[40]It was observed that the main goal of the research was to show the agricultural credit access landscape and investigate the impact of credit constraints on agricultural productivity in Ethiopia by using a household survey data from rural Amhara collected in 2013. By using an endogenous switching regression model, the study shown the effect of demographic and other socioeconomic variables on credit constraint status of households and simultaneously the impact of credit constraints on agricultural productivity. Finally, it uncovered the existence of a huge productivity loss due to various types of credit constraints. The cumulative impact was estimated to be 17.94 percent, i.e. an additional per hectare income of 1410.17 Ethiopian birr productivity gain if all types of credit constraints happen to be eliminated.

[26,20,4,5]These studies found that credit constraints causes misallocation of resources in agricultural production. This misallocation of agricultural inputs causes farmers to maintain lower levels of productivity than their unconstrained counterparts. This lower productivity comes in line with the conventional argument in production theory. If a typical household is tied with binding liquidity constraint, it will have lower investment

levels in production and also suffer misallocation of variable inputs which will result lower level of productivity. [22]

Furthermore, in studying the relationship between credit constraint status of households with agricultural productivity by using a panel survey of eight years on 914 households, they found that 52.2 percent of households under the study were credit constrained. The estimated relationship between households' endowments and agricultural productivity for both constrained and unconstrained households was found that the marginal effects of these endowments are not similar for the two groups of households and they believed that these differences are aroused due to credit constraint status of households[25].

In agriculture, at the beginning of the production period, farm households need to allocate their available resources between current period consumption, purchase of variable inputs for production, and investment. The unconstrained household in the capital market can separate consumption decision from farm production decisions. Households can then choose production inputs optimally for production process they face. However, in the case of credit constrained farm households, the choices they made in acquiring inputs for investment and production depends on the amount of credit they receive. They will have a productivity impact on constrained households[19,22,26,5]. All the studies derived testable relationships between credit constraints and potential outcome variables using the framework of the standard agricultural household model that combines both consumption and production decisions of farm households under imperfect market situations[39].

Effects of Credit Constraints on Groundnut Farming

There are many factors such as climate, natural disaster (flood, pestilence, drought, earthquake, and fire-outbreak), thieves, animals (monkeys, birds, rats, mice, squirrels, porcupines) and humans that influence production of groundnut apart from economic and social factors. Notwithstanding what to be focused on are the effects of credit constraints on groundnut production. [8,3]It was identified that credit constraints (lack of collateral 47.62%, high interest rate 38.09%) was one of the major problems of groundnut production in Ezeagu Local government Area of Enugu State, affecting groundnut farming. Meanwhile, it is also discovered out of 100 sample size of groundnut farmers, they were facing credit constraints which invariably affect their output in Mymensingh District using cobb-douglass production function for analysis [37]. From the foregoing, it is concluded that though a number of studies have been conducted across the world on technology adoption, however, more literature is required on credit constraints as it influence adoption of modern technologies in agricultural production, especially among groundnut farmers in Nigeria. This is a serious gap that must be bridged if the problem of low technology adoption among groundnut farmers is to be addressed and improve groundnut production in the economy.

III. Methodology

The sampling procedure**:** The multi-stage sampling procedure employed was as follows; firstly, the study areas were stratified into wards because it was widely dispersed. The study area has twelve wards, namely; Bangshika, Daksiri, Garaha, Gaya, Hildi, Hong, Husherism, Kwarhi, Mayolope, Shangui, Thilbang and Uba. Secondly, simple random sampling was employed to select two villages/Areas from each of the twelve wards in the study area. This was done by listing all the villages in each ward and made two consecutive draw from each well-shuffled (12) boxes containing listed names of the villages per ward in order to get twenty four villages. Finally, to avoid biasness a systematic sampling procedure was employed in selecting the required proportionate sample size of House-holds (Groundnut farmers) per ward as presented in Table 1

Table no 1: Sample Selection Procedure

W a r d s	**No. of Groundnut farmersper ward**				**Proportional Sample sizeper ward**			
Bangshika	1	4	6	0	2			3
Daksiri	2	4	0	4	3			8
Gaya	2	6	0	3	4			1
Garaha	2	5	4	1	4			0
Hildi	1	9	2	6	3			1
Hong	2	5	5	7	4			1
Husherism	2	1	8	9	3			5
Kwarhi	2	0	2	1	3			2
Mayolope	1	3	1	7	2			1
Shangui	2	0	0	6	3			2
Thilbang	2	3	0	1	3			6
Uba	1	5	4	6	2			4
T o t a l	**2**	**4**	**8**	**7**	**4**	**3**	**9**	**4**

Source: Agricultural Department-Hong LGA, 2016.

The source of data for this study was primary in nature. It was obtained using survey method and the use of well-structured questionnaires to elicit information from the respondents (Groundnut farmers). Data were collected on the following; ages of farmers, levels of education, gender, farm size, farming experience, types of institution they source credit, family size, number of extension contacts, amount of credit obtained and cost of borrowing. A total of 394 questionnaires were designed and distributed to the required sample size of the groundnut farmers in the study area.Only the data from three hundred and fifty-six (356) copies were analyzed as others were discarded for inconsistency/incompleteness.

Analytical Techniques

Data collected were analyzed using descriptive statistics, logistic regression and ANOVA (Analysis of Variance). The descriptive statistics was used for data presentation. Logit regression was used to achieve objective i and ii, while ANOVA was used to achieve objective iii.

Model Specification

Binary logistic regression model was employed to determine the socio-economic factors influencing access to credit in the study area. The logit regression model (logit model) is applicable to a broader range of research situations than discriminate analysis. The term "logit" refers to the natural logarithm of the odds (log odds) which indicates the probability of falling into one of two categories on some variable of interest[43]. Binary logit has only two categories in the response variable, that is, event A and non-event A. The model shows how a set of predictor (explanatory) variables (X's) are related to a dichotomous response variable Y(ln (Pi/1 – Pi). The dichotomous response variable Y= 0 or 1 with Y=1 denotes the occurrence of the event of interest while Y=0 denotes otherwise. The dummy variables, also known as indicators and bound variables, characterize dichotomous responses. In this study, since only two options were available, namely "access to credit" or "no access to credit" a binary model was set up to define Y=1 for situation where the farmer accessed credit and Y=0 for situations where the farmer did not access credit from either formal or informal credit sources[27].[43]Assuming that **X** is a vector of explanatory variables and **P** is the probability that Y=1, two probabilistic relationships can be considered as follows:

$$P(Y=1) = \frac{e^{Bx}}{1+e^{Bx}} \quad \text{……..1}$$

$$P(Y=0) = 1 - \frac{e^{Bx}}{1+e^{Bx}} = \frac{1}{1+e^{Bx}} \quad \text{…….. 2}$$

Both equations present the outcome of the logit transformation of the odds ratios which can alternatively be represented as:

$$\text{Logit } [\emptyset(x)] = \text{Log } [\frac{\emptyset(X)}{1-\emptyset(X)}] = \propto + \beta_1 x_1 + \ldots\ldots \beta_k x_k \ldots\ldots\ldots\ldots\ldots\ldots \text{ 3}$$

and thus allowing its estimation as a linear model for which the following definitions apply:

θ = logit transformation of the odds ratio;

$\propto$= the intercept term of the model;

β = the regression coefficient or slope of the individual predictor (or explanatory) variables modeled and

Xi = the explanatory or predictor variables.

The logit regression in this study can be specified as:

$$Yi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \ldots + \beta_{14} X_{14} + U_k \ldots\ldots\ldots\ldots 4$$

Where:

Yi (GFMS) = the dependent variable defined as the access to credit by Groundnut farmers = 1 and 0 otherwise;

$\propto$ = constant and intercept of the equation;

X_1 (FRA) = Farmer's age. (Years)

X_2 (FLE) = Farmer's level of education.(Years schooling)

X_3 (FLI) = Farmer's level of income.(₦)

X_4 (NCR) = Need for credit by the farmer. (Dummy;1= have need, 0= No need)

X_5 (RSK) = Farmer's Attitude towards risks. (Dummy;1=Not fearing Risk, 0= Fear Risk)

X_6 (DIS) = Distance between the lender and borrower-farmers.(km)

X_7 (PLP) = Farmers perception of lending procedures.(Dummy;1= Not Boring, 0= Boring)

X_8 (PLR) = Farmers' perception of loan repayment.(Dummy; 1= Not Boring, 0= Boring)

X_9 (EXT) = Extension Contacts (hours).

X_{10}(FSS) = Farmers' Saving Status.(Dummy; 1= Had savings, 0= No Savings)

X_{11} (COB) = Cost of borrowing.(%)

X_{12} (FSC) = Farmers' Security of Collateral. (Dummy;1= Has Collateral, 0= No Collateral)

X_{13} (FHS) = Farmers Household Size. (Number of members in household)

X_{14} (FAM) = Farmers' Association Membership.(Dummy:1= A member, 0= Non member)

U_k = Error term.

In analysing the factors that determine adoption, the study assumed that adopting and not adopting of modern technologies were independent. It should also be noted that when a farmer adopts six out of nine modern groundnut production technologies, the farmer is regarded as an adopter; otherwise the farmer is regarded as non-adopter. The reduced form of the econometric model is explained below.

The decision of farmer to adopt was described by the following latent variable model.

$B_i^* = x_{1i}\beta_1 + \varepsilon_{1i}$ 5

Where B_i* is the net benefit attained by the farmer by adopting modern groundnut technologies, X_{1i} are the vector that are expected to influence the farmer's decision to adopt or not to adopt modern groundnut technologies, and $\varepsilon_{1i}$is the random error, with zero mean and constant variance. However, B_i* is not to be observed; what will be observed is the following binary variable:

$$\begin{cases} 1, & \text{if farmer adopted modern groundnut Technologies} \\ 0, & \text{Otherwise} \end{cases}$$

which is written as thus:

$Y_i = B_i^* > 0$ (if a farmer adopt modern groundnut technologies)

$Yi = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 \ldots + \beta_{12}X_{12} + U_k$-----6

Where Y_i is dichotomous choice model, which is "1" if farmer adopted at least 6 of modern groundnut production technologies, 0 otherwise.

X_1 = Age of the farmers. (Years)

X_2 = Cost of Technology.(₦)

X_3 = farmers' Level of education.(Years Schooling)

X_4 = Gender of the farmer. (Dummy:1= Male, 0= Female)

X_5 = Distance of the financial institution. (km)

X_6 = Farmer's income level.(₦)

X_7 = Farming experience. (Years)

X_8 = Farm size.(Hectare)

X_9 = Accessibility of modern technologies.(Dummy;1= had Access, 0 = No Access)

X_{10} = Farmer's family size. (Number of members in a household)

X_{11} =Credit Accessibility. (Dummy:1= had Access, 0 = No Access)

X_{12} = Number of extension contacts with farmer.(Hours)

U = Error term.

For the effect of credit on adoption of modern technologies among groundnut farmers, ANOVA (Analysis of Variance) was employed in finding if really there is no significant difference between output of farmers that accessed credit and adopt modern technologies with the output of farmers that did not accessed credit and did not adopt modern technologies.

IV. Results and Discussion

Socio-economic Characteristics of the Respondents

Gender: Results in farmers' gender revealed that 62.4% of the respondents were male while 37.6% of the respondents were female. This result invariably trend with the cultural as well as religious indoctrination that confers household headship to males and most importantly the responsibility of sustaining the household economy. It implies that groundnut farming is mostly done by male in the study area.

Age: Table 2 described the socio-economic characteristics of the respondents, about 74%were between the ages of 18-42 years, while only 14% were between the age of 55-66 years respectively. The mean age was 36.8 years. This implies that greater percentage of the groundnut farmers were within their youthful age and would easily embrace and adopt modern technology compared to the older farmers.

Educational Level: From Table 2, about 73% of the respondents had tertiary education (NCE/ND and Degree/MSc/PhD). This also shows that greater percentage has acquired higher education which gave the farmers better understanding of the importance of access to credit and technology adoption in groundnut production. This ultimately boost production and income level of farmers.

Farm Size: Results in Table 2 also shows that about 40% and 36% of the respondents cultivated 3-4 and 1-2 hectares of farm land respectively, while average farm size was 3.4 hectares. This could be as a result of greater participation of youths in groundnut production and do not have access to sufficient land as the older farmers because of the problem of land tenure system.

Farming Experience: Farming experience of a farmer cannot be overemphasized in adoption of modern technology. The study revealed that about 63% of the respondents had 1-10 years farming experience. This further buttressed the fact that considerable percentage of groundnut farmers are youth and would embrace

modern technology easily and faster due to their level of enlightenment and access. Older farmers may not easily accept change being that they have practiced the traditional method for several years and not willing to take risk.

Table no 2: Socio-economic Characteristics of the Respondents n =356

Variables	Frequency	Percentage	Mean
Gender			
Male	22	26.4	
Female	13	43.6	
Age			
18 - 30	13	03	6.5
31 - 42	13	23	7.1	36.8
43 - 54	4	43 - 12.4	
55 - 66 above	5	01	4.0	
Educational Level			
Primary	3	61	0.1	
Secondary	6	21	7.4	
NCE / ND	17	04	7.8	
Degree/M.sc/PhD	8	82	4.7	
Farm Size (hectares)			
1 - 2	12	83	6.0	
3 - 4	14	23	9.9	3.4
5 - 6	5	81	6.3	
7 - 8 and above	2	87	. 9	
Farming Experience			
1 - 5	9	63	0.3	
6 - 10	11	63	3.1	9.5
11 - 15	8	42	3.7	
16-20 and above	6	01	6.9	
Farming Output			
1 - 20	11	23	1.5	
21 - 40	11	43	2.0	
41 - 60	8	92	5.0	34.5
61 - 80	2	87	. 9	
81-100 & above	1	33	. 6	
Sources of Credit			
Banks	6	81	9.1	
Asso./Organisations	13	23	7.1	
Friends/Family/Asusu	15	64	3.8	

Source: Field Survey, 2017.

Farming Output: As presented in Table 2, about 64% of the total farm outputs fall between 1-40 bags, while the mean output was 34.5 bags. This shows that the farming output was at subsistence level to meet their present consumption need in the study area. Only few farmers practice commercial farming. Adoption of modern technology could improve groundnut production in the study area.

Sources of Credit: Results in Table 2, showed that 19% of the respondents received credit from banks, 37.1% received credit from their Association/Organisation, and about 44% received credit from Friends/Family/Asusu. Majority of farmers sourced their credit from Friends/Family/Asusu. This implies that farmers have strong social/family ties which made such sources of credit more convenient to farmers. This source also is closer and readily available to farmers.

Table no 3: Socio-economic Characteristics of the Respondents (contd.) n = 356

Variables	Frequency	Percentage	Mean
Credit Proximity (km)			
1 - 5 km	10	629.8	
6 - 10 km	8	423.6	10.2
11 - 15 km	7	019.7	
16 - 20 km & above	9	626.9	
Access to Credit			
Access	17	348.6	
No access	18	351.4	
Access to Technology			
Accessible	23	465.7	
Not-Accessible	12	234.3	
Farming income (₦)			
Less than ₦50,000	10	830.3	
₦50,000 - ₦99,999	11	833.1	85,000
₦10,000 - ₦149,999	8	423.7	

₦150,000- ₦199,999	3	0	8.4
₦ 200,000 and above	1	6	4.5
Farmers Association			
Members	16	54	6.3
Non-Members	19	15	3.7

Source: Field Survey, 2017.

Credit Proximity: Proximity to credit is essential in adoption of modern technology for groundnut production. About 53% of the respondents are within the distance of 1-10 km to access credit. This implies that most farmers could access credit in the study area for improved seedlings, fertilizer, insecticides for improved farm output etc.

Access to Credit: Table 2, also indicated that about 49% of the respondents have access to agricultural credit while 51.4% did not have access to agricultural credit. This could be as a result of farmers' inability to join farmers association as well as unavailability of collateral security by the farmers in the study area. Although about 44% could source credit from Friends/Family/Asusu, a good surety may be needed based on the integrity of the farmers.

Access to Technology: In Table 2, 65.7% of the respondents had access to technology, 34.3% had no access to modern technology. This implies that modern technology is readily available to farmers for practice and adoption. This will ultimately improve groundnut production in the study area.

Farmers' income level: From Table 2, 30.3% of the respondents had income below ₦50,000 while 33.3% had income between ₦50,000-₦99,999. Only about 5% of the respondents earned above ₦200,000. Farmers' average income was ₦85,000. The farmers' income is a reflection of the size of farm cultivated in the study area. This implies that farmers can improve on their income level with more farm land under cultivation.

Membership of Farmers Association: In Table 2, 46.4% were members of farmers association while 53.7%were not members of farmers association. This also may be attributed to lack of awareness by the farmers to know the benefits of membership. The extension workers are also saddled with the responsibility to make such awareness to encourage farmers to form associations.

Socioeconomic Factors Influencing Credit Accessibility among Groundnut Farmers

In Table 3, the level of education, distance between lenders and borrowers, perception of lending procedure, hours spent with extension workers, cost of borrowing, farmer' security of collateral, household size and association membership were statistically significant. The logistic regression coefficients give the change in the log odds of the outcome for a one unit increase in the predictor variable. The likelihood ratio chi-square of 70.68 with a p-value of 0.000 indicates that the model as a whole fits significantly.

Table no 4: Logit Regression on the Influence of Socio-economic Factors on Credit Accessibility

Y (Credit Accessibility)	Coefficient	Odds Ratio	Std. Error	Z	P>|z|
Cons	-1.853	0.157	0.164	-1.77	0.076
Farmers' Age (x_1)	0.441	1.555	1.744	0.39	0.694
Farmers' Level of Education (x_2)	3.292***	0.037	0.024	5.03	0.000
Farmers' Level of Income (x_3)	-0.241	0.786	0.897	-0.21	0.833
Farmers' Need of Credit (x_4)	0.369	1.447	0.806	0.66	0.500
Farmers' Attitude towards Risk (x_5)	0.439	1.552	1.139	0.60	0.549
Distance between lenders and Borrowers (x_6)	1.542***	4.672	2.604	2.77	0.006
Farmers' perception on Lending Procedure (x_7)	1.218**	3.381	1.913	2.15	0.031
Farmers' Perception on Loan Repayment (x_8)	0.986	2.681	1.576	1.68	0.093
Hours Spent with Extension Works (x_9)	1.018**	0.277	0.135	2.08	0.037
Farmers' Saving Status (x_{10})	0.273	1.314	0.755	0.47	0.635
Cost of borrowing (x_{11})	-2.028**	0.759	0.562	-2.74	0.006
Security of Collateral (x_{12})	1.408***	0.409	0.181	3.18	0.001
Farmers' Household Size (x_{13})	2.202***	9.046	4.442	4.48	0.000
Farmers' Association Membership (x_{14})	0.694**	0.200	0.127	1.09	0.027
LR chi-square (15)=70.68					
Prob > chi^2 = 0.00000					
Log likelihood = -68.637272					
Pseudo R^2 = 0.3757					
No. of obs = 356					

***Significant at 1%; **Significant at 5%

Source: Field Survey, 2017.

Farmers Level of Education: Farmers' level of education was statistically significant at 1% level. The coefficient 3.292 shows a positive relationship between farmers' level of education and credit accessibility. Moreover, the odds ratio revealed that as farmers' educational level increases by 1 unit, the odds of credit accessibility also increases by a factor of 0.037. The groundnut farmers in the study area mostly are NCE/ND (47.8%) and Degree/MSc/PhD (24.7%) holders. Majority of these farmers are enlightened to understand the forms and the associated risks involved in credit accessibility. This implies that for a farmer to access credit, level of education plays a significant role as the findings of [5] showed that when education level increases, the possibility of accessing credit also increases.

Distance between Lenders and Borrowers: Distance between Lenders and Borrowers was statistically significant at 1% level. The coefficient 1.542shows a positive relationship between credit accessibility and distance between lenders and borrowers. This implies that as distance increases, the possibility of accessing credit also increases. Moreover, the odds ratio revealed that as Distance between Lenders and Borrowers increases by 1 unit, the odds of credit accessibility also increases by a factor of 4.672. This finding is in line with [18] which also found that distance had positive relationship with credit accessibility.

Farmers Perception of Lending Procedure: Farmers' perception of lending procedure was statistically significant at 5% level. This implies that as farmers' perceived procedure of accessing credit increases, the more they can access credit. Moreover, the odds ratio revealed that as farmers' perception of lending procedure increases by 1 unit, the odds of credit accessibility also increases by a factor of 3.380. This finding is in line with[38] which found that lending procedures significantly influence access to credit facility by SME from financial institutions.

Time Spent with Extension Workers: Time spent with extension workers was statistically significant at 5% level. This implies that the higher the number of extension contact of the farmer, the higher the credit access will be. Moreover, consistent contact with the extension workers makes adoption of modern technology more practicable and adoptable. The odds ratio revealed that as time spend with extension workers increases by 1 unit, the odds of credit accessibility also increases by a factor of 0.277. This also agreed with the findings of [7]which analysed peasant farmers' access to agricultural credit in Benue State, Nigeria.

Cost of Borrowing: Cost of borrowing was statistically significant at 5% level. The coefficient showed negative relationship with credit accessibility. Also, the odds ratio revealed that as cost of borrowing increases by 1 unit, the odds of credit accessibility also decreases by a factor of 1.314. Cost of borrowing becomes an additional burden to farmers which affect profit margin. Since mean farm land holding in the study area is 3.4 hectares of land, consequently high cost of borrowing will reduce farmers' income which deters adoption of modern technology. This finding agreed with [23] which shown a negative (r = - 0.418) association of interest rate and credit accessibility. That means as interest rate increases, credit accessibility decreases.

Farmers' Security of Collateral: Farmers' security of collateral was statistically significant at 1% level and positively related to credit access. Also, the odds ratio revealed that as security of collateral increases by 1 unit, the odds of credit accessibility also increases by a factor of .409. This implies that inadequate security of collateral by a farmer can make him/her loose access to credit and vice versa. This is for the fact that financial institutions provide loans to those that present their collateral. This finding is in line with[16].

Household Size: Household size was statistically significant at 1% level with positive relationship to credit access. Moreover, the odds ratio revealed that as household size increases by 1 unit, the odds of credit accessibility also increases by a factor of 9.045. It is believed that households with more economically active adults can utilize their potential to increase productivity and income. This finding however contradicts[13] which stated that larger household is exposed to shock such as illness from the older household members.

Farmers' Membership to Association: Farmers' membership of association was statistically significant at 5% level with positive relationship to credit access. Moreover, the odds ratio revealed that as farmers' membership to association increases by 1 unit, the odds of credit accessibility also increases by a factor of .2001070. This is for the fact that membership of association strengthen lenders confidence to any credit demand by borrowers. [45]This also found that it is easier to get loan in a group/association than individual.

Socioeconomic Factors Determining Adoption of Modern Technologies among Groundnut Farmers

In Table 4, the farmers' age, cost of technology, level of education, income level, farming experience, farm size, accessibility of modern inputs, credit accessibility and number of extension contacts were statistically

significant. The logistic regression coefficients give the change in the log odds of the outcome for a one unit increase in the predictor variable. The likelihood ratio chi-square of 127.40 with a p-value of 0.000 indicates that the model as a whole fits significantly.

Table no 5. Logit Regression Analysis on the influence of Socioeconomic Factors on Adoption of Modern Technologies among Groundnut farmers

Y (Adoption of Modern Technology)	Coefficient	Odds Ratio	Std. Error	Z	P > | z |
Constant	-7.290	0.001	0.001	-5.90	0.000
Farmers Age (x_1)	2.202***	9.046	4.442	4.48	0.000
Cost of Technology(x_2)	-1.403**	4.069	1.948	-2.93	0.003
Farmer' Education Level (x_3)	1.488**	0.443	0.517	1.28	0.022
Farmers Gender (x_4)	-0.055	0.946	0.426	-0.12	0.902
Financial Institutional Proximity (x_5)	-1.228	2.929	2.207	-1.63	0.103
Farmers' Income (x_6)	1.408***	0.409	0.181	3.18	0.001
Farming Experience (x_7)	0.693**	2.001	1.268	1.09	0.027
Farm Size (x_8)	1.337**	3.807	2.164	2.35	0.019
Accessibility of Modern Technology(x_9)	2.606***	13.543	8.947	3.94	0.000
Family Size(x_{10})	-0.369	1.447	0.806	-0.66	0.508
Credit Accessibility (x_{11})	0.439**	0.155	0.114	0.60	0.049
Extension Contacts (x_{12})	1.542***	0.467	0.260	2.77	0.006
LR chi-square (15) =127.40					
Prob > chi^2 = 0.00000					
Log likelihood = -69.982143					
Pseudo R^2 = 0.4765					
No. of Obs = 356					

***Significant at 1%; **Significant at 5%

Source: Field Survey, 2017.

Farmers' Age: The farmers' age is statistically significant at 1% level. The coefficient (2.202) shows a positive relationship between farmers' age and adoption of modern technology. Likewise the odds ratio revealed that as farmers' age increases by 1 unit, the odds ratio of adoption of modern technologies also increases by a factor of 9.045. The results on the socio-economic characteristics indicated that majority of the respondents are youth and educated. This implies that as the respondents advance in age the level of adoption of modern technology increase, hence improved production. However, in a similar study, opined that age was significant and negatively related with adoption of technology.[12,1] This could be attributed to the nature of crops cultivated and the system of cultivation over the years.

Cost of Technological Input: Cost of technological input was significant at 5% level. The coefficient (-1.403) shows a negative relationship between cost of technology and adoption of modern technology. The odds ratio revealed that as cost of technological input increases by 1 unit, the odds of adoption of modern technologies also decreases by a factor of 4.069. This implies that as the cost of technology increases, the adoption rate decreases. This is also in support of the law of demand which states that "the higher the price, the lower the quantity demanded". High cost of inputs such as improved seedlings, herbicides etc will in turn affect the profit margin of farmers which ultimately may affect adoption rate of modern technology. This finding is in line with[30,10] in a study on factors affecting adoption of appropriatetechnologies on cassava production in Oriire Local Government Area of Oyo State.

Farmers' Level of Education: Farmers' level of education was significant at 5% level. The coefficient (1.488) shows a positive relationship between farmers' level of education and adoption of modern technology. The odds ratio revealed that as farmers' level of education increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of 0.443. Educational level of respondent is an additional factor which ought to influence rate of adoption of modern technology. The awareness of modern technology and its adoption may be dependent upon the level of education of the farmer which ultimately improves farm yield. This study is in line with [28] that schooling of Household head reduces risk aversion and encourages the adoption of agricultural innovations.

Farmers Level of Income: The farmers' level of income was statistically significant at 1% level. The coefficient (1.407) also showed a positive relationship between farmers' level of income and adoption of modern technology in the study area. The odds ratio revealed that as farmers' level of income increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of .408. Consequently, increased income could positively influence adoption of technology and farm output on quantity and quality. As farmers' income increase and invests in more modern technology, the nature (system) of agricultural production improves, increased yield and also level of income and consumption.

Farming Experience: Farming experience was statistically significant at 5% level. This shows that farming experience as a factor has significant influence on adoption of modern technology in the study area. The coefficient (0.693) shows a positive relationship between farming experience and adoption of modern technology in the study area. The odds ratio revealed that as farming experience increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of 2.001. Most experienced farmers known cropping practices to employ for optimum yield. Although about 63% of the respondents had 1-10 years of farm experience, coupled with the educational level, the adoption of modern technology will increase with experience in farming to improve level of groundnut production in the study area. This study is in line with [44,35] in a study on factors affecting the adoption of yam storage technologies in the northern ecological zone of Edo State, Nigeria.

Farm Size: Farm size was statistically significant at 5% level. The coefficient 1.336 shows a positive relationship between farm size and adoption of modern technology. More so, the odds ratio revealed that as farm size increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of3.807. Farmland holding is a basic asset in semi-urban livelihood. Availability of large farm land encourages experimentation with new agricultural technologies as well as determines adoption. This is for the facts that availability of large farmland encourages experimentation with new agricultural technologies as well as determining adoption.

Technology Accessibility: Technology accessibility was statistically significant at 1% level. The coefficient 2.605 shows positive relationship between technology accessibility with adoption of modern technology. Moreover, the odds ratio revealed that as technology accessibility increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of 13.544. This implies that as farmers are constantly in contact with extension agents and new technologies demonstrated, this influences adoption. Farmers are encouraged to adopt due to nearness to and availability of modern technology for groundnut production. This study is in line with [14] in a study on credit constraints and adoption of modern cassava production technologies in rural farming communities of Anambra State Nigeria.

Credit Accessibility: Credit accessibility was statistically significant at 5% level. The coefficient result 0.439 shows positive relationship between credit accessibility and adoption of modern technology in the study area. The odds ratio revealed that as credit accessibility increases by 1 unit, the odds of adoption of modern technologies also decreases by a factor of .155. Adoption of modern technology may be capital intensive for farmers in the area. Credit accessibility therefore enhances adoption as farmers are convinced through demonstration farms of the efficacy and efficiency of new technology that boost production. This study is in line with [30] in a study that examined factors influencing farm households' modern agricultural production technology adoption decisions inBawku West District of Ghana.

Number of Extension Contacts: The number of extension contacts was statistically significant at 1% level. The result of the coefficient 1.541 shows a positive relationship between extension contacts and adoption of modern technology in the study area. The odds ratio revealed that as number of extension contacts increases by 1 unit, the odds of adoption of modern technologies also increases by a factor of .467. Frequent extension contacts exposed farmers to new and improved farming practices, enhances the level of adoption and general farm outputs. This encourages departure from traditional farming system that do not support increased yield.

Effect of Credit Constraints on the Adoption of Modern Technologies in Groundnut Farming

Table no 6. Analysis of Variance on the Output of Farmers that Accessed Credit and Adopted Modern Technologies and Farmers that do not Access and do not Adopt Modern Technologies in Groundnut Farming

	Sum of Squares	D f	Mean Square	F	Sig.
Between Groups	139.574	2	11.63	19.370	.000
Within Groups	417.995	531	.240		
Total	557.569	535			

Source: Field Survey, 2017.

From Table 5, the mean-outputs of groundnut farmers that accessed credit and adopted modern technologies was statistically significant and differed with farmers that did not access credit and not adopt modern technologies at 0.000 significant level. This shows that credit accessibility and adoption of modern technologies had significant effects on groundnut output in the study area. Farmers with access to credit facilities would be economically empowered to direct income, access and adopt new technologies. It has also

agreed with the findings of [40] which uncovered the loss of huge productivity due to various types of credit constraint.

IV. Conclusion

The study based on the mean level of income, output and farm size concluded that majority of groundnut farmers in the study area were within work-force age-range, practicing subsistence cropping system. Although 44% of the farmers could source credit from friends/family/Asusu, yet majority 51% had no access to credit and about 54% were also not members of farmers associations were credit could also be accessed. The study therefore concluded that some of the socio-economic characteristic of respondent captured in logistic regression model influenced their credit accessibility and adoption of modern technologies in the study area. Also, farmers' credit constraint had effect on their adoption of modern technologies and invariably their output.

V. Recommendations

Based on the findings of this study, the following policy measures aimed at increasing groundnut output through adoption of modern technologies and credit sufficiency in the study area were proffered:

i. Adequate extension services should be provided as extension services are the main instruments used in the promotion of demand for modern technologies. Since education, training, and farming experience were found to be crucial factors in determining the farmers' decision to adopt the technology, Adamawa state government should establish both formal and informal types of farmers' education, farmers' training centres, technical and vocational schools in order to give room for experience sharing among farmers regarding the importance.

ii. Adamawa State Government should provide an enabling environment for groundnut farmers to grow and thrive. Therefore there is need to develop strategies to enhance increased access to microfinance credit by groundnut farmers from commercial banks and microfinance institutions. The state government should also facilitate and link the farmers to financial institutions that will help access credit facilities to enable them adopt modern technologies for higher productivity.

iii. Technology dissemination to farmers should be based on potential economic benefits and should be simple and suited to the educational/ technological level of the respondents.

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