Table 4: Average local market price of small ruminants across the year

Month	Market price for Sheep (per head)	Market price for Goat (per head)
January	6000.02± 12.78	4000.13 ±8.35
February	8000.29±13.67	5000.67 ±9.58
March	10000.27±14.62	7000.37 ±10.25
April	10000.38±14.89	7000.68 ±10.35
May	6000.34±11.72	5000.48 ±9.75
June	6000.89±12.63	4000.78 ±8.46
July	6000.87±11.89	4000.47 ±8.19
August	12000.56±13.75	7000±.38 10.89
September	13000.29±13.89	7000.46 ±11.27
October	8000.31±12.26	5000.68 ±9.46
November	9000.78±13.78	4000.65 ±8.46
December	10000.48±14.86	7000.78±10.87

RICE FARMERS' LOAN ACCESS AND DISPOSABLE INCOME GENERATION IN WESTERN ZONE OF BAUCHI STATE, NIGERIA

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ABSTRACT
The study was conducted to examine the rice farmers' access to agricultural loan and disposable income generation in western zone of Bauchi State, Nigeria. Multistage sample technique was employed to select 313 rice farmers sampled through structured questionnaire. Data were analyzed using multiple regression and binomial logistic regression. The multiple regression results showed that the determinants of the rice farmers' disposable income of farmers' initial capital, farm size, loan amount, market tax and interest rate were significant at P≤0.001 and farm resource at P≤ 0.01. The result of the logit regression disclosed that age, sex, years of experience, interest rate, off farm income, loan distance significantly (P≤0.001) affected the likelihood of farmers' access to loan, membership at (P≤0.05) and disposable income (P≤0.01). The study recommended that credit should be made available at the right time in the farming preparation season and financial institutions or credit sources should be strategically localized to enable easy access by the farmers.

Keywords: Access, Agriculture, Disposable income, Loan, Rice farmers.

INTRODUCTION
Access to loans has been recognized as one of the significant intercession required to quicken development and improvement of farming household in developing countries. Extending agricultural loans is one of the solid alternatives for empowers financial development, decreasing destitution, and improving food security. Hermes and Lensink (2011) contended that, access to loan may add to dependable increments in income from a rise of investment in income-generating activities and a conceivable broadening of source of income for low- income groups, especially rural households from destitution, encourage savings, and improve interest in physical and human capital which vitalizes economic development. Sani (2017) define Agricultural finance as the economic study of the acquisition and utilization of capital in agriculture that is the supply and demand for fund in agriculture. It has been contended that the vast majority of these farmers are excessively poor and cash- strapped to be able to benefit from any form any form of access to loan even if they received adequate supplies of the right inputs, their land has a binding constraint which are so severe that any increase in productivity will fall short of guaranteeing their food security.

Farm income is an important component of rural life. Income is considered as wealth for the households. This household wealth includes the endowment such as land, housing, etc. The probability to access sufficient credit is positively linked to wealth. According Sani (2017) farmers' income is the total savings of the farmer from his farm productive activities. The saving is the total assets plus his wealth and investment; he also defined farmers' disposable income as the summation of the farmers' consumption expenditure from his total savings. A study from Li *et al.* (2011) reveals that farmers' income affects the likelihoods of accessing microcredit in Hubei province China. There is a positive and significant relationship between income and credit access by rural farmers in China. Higher income farmers are likely to have their microcredit application accepted. Household that earn higher income tend to have more investment and might have more confident on repayment of loan.

Rice is a main staple crop in Nigeria cultivated and consumed in all pieces of the nation. It is the Agricultural commodity with the third most astounding overall production after sugarcane and maize (Food and Agriculture Organization [FAO], 2012). Its domestic supply has incredible ramifications for food security and self-sufficiency in the country. Rice production rose gradually over the years with area expansion to overtake major rice producing countries like Cote d'Ivoire and Sierra Leone (Ayanwale and Amusa, 2011). The broad objective of the study was to examine the effects of rice

farmers' access to agricultural loan and income generation, the study determined the factors affecting the disposable income of the farmers; and also estimated the various determinants of the farmers' access to agricultural loans.

MATERIALS AND METHODS

THE STUDY AREA

The study area is western agricultural zone of Bauchi State. It is located between latitude $9^{o}03`$ and $10^{o}30`$N and longitude $8^{o}50`$ and $11^{o}3$E of Greenwich meridian in Nigerian Sahel and Sudan Savannah at an altitude of 600m above sea level. The zone consists of 7 Local Government Area (LGA) which includes Alkaleri, Bauchi, Bogoro, Dass, Kirfi, Tafawa Balewa, and Toro. The zone has a population of 2,518,204 people based on 2006 (NPC, 2006) figure and a projected figure of 3,696,723 people at 3.6% growth rate per annum with land area of 24,270.701 km^2 (NPC, 2019). The climate of the area is tropical based on the inter-tropical convergence zone, which gives rise to Northeast and Southwest winds system. The Northeast wind system has a temperature range of 40.55^{o}C, (maximum) and 9.11^{o}C (minimum). The area has an annual rainfall range of 600-1200mm. The area is characterized by distinct rainy (April-October) and dry (November-March) seasons. The economic activities of the zone are rearing of large and small ruminant, crop production, marketing of agricultural products.

SAMPLING TECHNIQUES

A multi-stage random sampling technique was used in selecting the respondents for the study. In the first stage, three (3) Local Government Areas (LGAs); Bauchi, Alkeleri and Dass were selected from the zone using randomly sampling technique. In the second stage, two (2) districts were randomly choosing from each of three (3) LGA selected making a total of six (6) districts. In the third stage, three (3) villages were randomly selected from each of the districts selected using simple random sampling technique making a total of 18 villages. In the final stage, using a confident level of 95%, the sample size of (10%) was proportionately selected from each of the 18 villages to give 312 rice farmers for the study area (Table 1).

Table 1: Sampling Frame and Sample Size Selection Plan

LGA	Districts	Village	Sample Frame	Sample Size (10%)
Bauchi	Galambi	Inkil	360	36
		Turum	157	16
		Kangyere	336	37
	Miri	Kundum	230	23
		Durum	160	16
		Birshi	157	16
Sub-total			**1,750**	**144**
Dass	Bundot	Bagel	138	14
		Bundot	95	10
		Baraza	93	9
	Dot	Lukshi	92	9
		Ung. Mal.Shuaibu	95	10
		Durr	135	14
Sub-total			**648**	**66**
Alkaleri	Alkaleri	Alkaleri	263	26
		Pali	185	19
		Gar	128	13
	Duguri	Yalo	138	14
		Digire	122	12
		Gwana	183	18
Sub-total			**1,019**	**102**
Total			**3,417**	**312**

Source: Field survey, 2019

METHOD OF DATA COLLECTION

The research utilized primary data. The primary data were collected in the study through the administration of structured questionnaires to respondents with the assistant of trained enumerators.

ANALYTICAL TECHNIQUES

The research employed the use of Multiple Regression and Logit Model to analyze the objectives. The multiple regression model specified was subjected to four (4) functional forms and the lead equation was selected based on the econometric and statistical criteria. The estimated functions were evaluated in terms of the significance of the coefficients and the magnitude of the standard errors. The four functional forms to be fitted are linear, semi log, double-log, and quadratic forms.

The specified model was:

$Y = X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}$ …(1)

The explicit form of this function takes the following forms:

1. Linear:

$Y = \beta_\circ + \beta_1 X_1 + +\beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + +\beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \cup_1$

2. Semi-log: …(2)

$Y = \beta_\circ + \beta_1 I_n X_1 + \beta_2 I_n X_2 + \beta_3 I_n X_3 + \beta_4 I_n X_4 + \beta_5 I_n X_5 + \beta_6 I_n X_6 + \beta_7 I_n X_7 + \beta_8 I_n X_8 + \beta_9 I_n X_9 + \beta_{10} I_n X_{10} + \beta_{11} I_n X_{11} + \cup_1$ …(3)

3. Double-log:

$I_n Y = \beta_\circ + \beta_1 I_n X_1 + \beta_2 I_n X_2 + \beta_3 I_n X_3 + \beta_4 I_n X_4 + \beta_5 I_n X_5 + \beta_6 I_n X_6 + \beta_7 I_n X_7 + \beta_8 I_n X_8 + \beta_9 I_n X_9 + \beta_{10} I_n X_{10} + \beta_{11} I_n X_{11} + \cup_1$ ...(4)

4. Quadratic:

$Y = \beta_\circ + \beta_1 X_1 + +\beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + +\beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \cup_1$ ...(5)

where;

Y = disposable income (₦)
X_1 = initial capital (₦)
X_2 = farm size (hectare)
X_3 = household size (numbers of individual)
X_4 = farm resources (₦)
X_5 = farm output surplus (tonnes)
X_6 = loan amount (₦)
X_7 = labour used (₦)
X_8 = household consumption (₦)
X_9 = membership (yes 1; otherwise 0)
X_{10} = interest rate (%)
X_{11} = market tax (₦)
a = Constant term
$X_1 – X_{11}$= variable input
$b_1 – b_{11}$ = the coefficients of independent variables and
U_1= error terms.

For binary logit models to regress the dependent variable on the independent variables using ordinary least squares would produce nonsensical results as the disturbances are not normally distributed, hence a nonlinear probability function with special limiting properties is employed. (Gujarati, 2009).

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \ldots Ei$ ….(6)

where Y= Access to loan = 1, otherwise 0.
a = constant
b_1-b_{10} = Regression coefficients;
X_1 = farm size (hectare)
X_2 = sex (male= 1; otherwise 0)
X_3 = age of the respondent (years)
X_4 = loan interest rate (%)

X_5 = education level (years)
X_6 = household size (Number of people)
X_7 = farmer disposable income (₦)
X_8 = off-farm income (yes =1; otherwise 0)
X_9 = marital status (1= yes; otherwise 0)
X_{10} = distance from loan source (1=yes; otherwise 0)
X_{11} = value of collateral (₦)
X_{12} = years of experience (years)
Ei = error term

RESULTS AND DISCUSSION

The econometric model employed in measuring the effects disposable income as a dependent variable (Table 2).

Table 2: Factors Affecting the Disposable Income of the Farmers

Variables	Linear	Quadratic	Semi log	Double log
Constant	-122177.14 (-4.541)	138452.940 (12.008)	-2.986E6 (-7.644)	5.588 (7.420)
Initial capital (X_1)	0.251 (1.075)	2.975E-6 (3.203)	27417.31 (1.107)	0.135 (2.721)***
Farm size (X_2)	111557.7 (7.687)	0.451 (9.037)	160354.07 (4.596)***	0.368 (4.759)
Farm resources (X_3)	1.476 (3.978)	25718.562 (3.258)	85559.55 (3.433)	0.082 (1.599)*
Household size (X_4)	480.56 (.395)	101.521 (3.990)	-18414.10 (-.896)	-0.030 (-0.804)
Loan amount (X_5)	0.585 (4.557)	1.422E-6 (3.610)	121791.24 (4.531)	0.226 (4.270)
Labour used (X_6)	0.921 (2.741)*	7.284E-6 (3.944)	20680.837 (1.073)	0.032 (0.842)
Home consumption (X_7)	2072.10 (.726)	-371.941 (-3.422)***	25918.57 (1.337)	0.056 (1.497)
Membership (X_8)	37710.529 (2.165)**	1205.961 (.229)	164382.63 (3.559)	0.132 (1.422)
Interest rate (X_9)	-2146.303 (-2.542)***	-65.713 (-1.920)**	-26741.36 (-2.293)**	-26741.36 (-2.293)***
Market tax (X_{10})	18.619 (7.327)	0.001 (6.740)	63533.81 (-2.293)***	0.207 (5.440)
Farm output surplus (X_{11})	-11393.164 (-1.012)	1254.315 (.489)	-17646.39 (-.829)	0.014 (1.320)
R^2	0.854	0.876	0.671	0.760
Adjusted R^2	0.848	0.871	0.657	0.750
Std error	104253.251	95925.465	163591.309	0.31976
F-ratio	155.892	188.977	47.483	74.369

*significant at 10%, **significant at 5% and ***significant at 1%; values in parenthesis are the t-values.
Source: Field survey, 2019

The double log model was chosen as the lead equation because it has a relative low mean square error, highest level of significant. The econometric result showed that the major determinants of rice farmers' disposable income are initial capital (0.135), interest rate (-26741.36) and farm resources

(0.082). These variables were significant at the 1%, and 10% probability level. The result showed that initial capital and farm resources would increase the disposable income because they have a positive coefficient and these sign are consistent with the a *priori* expectation. Increase of initial capital will lead to more productivity because initial capital can be increased with the aid of loan accessibility. This means that farmers who accessed agricultural credit have higher farm income than those without. This is an important finding since farmers would be able to retrench their credits. Empirically, Shah *et al*. (2008) also estimated a positive effect of credit on crop yield and income of the borrowers over the non-borrowers. Farm resources also have a positive and significant relationship with disposable income. This means that increase in the farm resources will increase the disposable income by 0.072. On the other hand, interest rate had a negative but significant relationship with disposable income. This is because as the interest rate on loan increases, the farmers' disposable income reduces. However, high interest rate reduces the lending capability of the farmers.

The coefficient of multiple determinants (R^2) was 0.760 implying that the explanatory variables in the model were able to explain 76% of the variation in the disposable income. The F statistics is not significant; this means that the overall regression equation was not statistically significant.

FARMERS' ACCESS TO AGRICULTURAL LOANS

The positive sign of age agrees with the *a priori* expectation implied that the younger the farmer, the higher the likelihood of having access to credit and is significant at 1%.Younger farmers are still active, mobile and ready to take risk which may induce them into taking loans. As presented in Table 3, the positive effect of age found in this study corroborates with the finding of Henri-Ukoha *et al.* (2011) who reported that, the age of the farmers, level of education, farming experience, farm size and marital status significantly affect the amount of loan acquired by small scale farmers in Ohafia agricultural zone of Abia State, south-east Nigeria. Sex of the respondent has a positive coefficient of 12.226 and is significant at 1%. This implies that the male farmer have higher credit access compare to their female counterpart. This is in line with the findings of Ololade and Olagunju (2013) who suggested that the males have better access to loan in Oyo State, Nigeria. Farmer disposable income has a positive coefficient of 2.930 and was significant at 10%.the credit need of rice farmer is determine by their disposable income, increase in the farmer disposable income will lead to increase in access credit. This implies that people with higher income tend to take higher credit amount since the anticipated higher disposable income in the future. Also, Adegbite and Adeleye (2011) who found a positive relationship between farmer's income and loan access to microcredit in Oyo State, Nigeria. Membership has an inverse relationship with the loan access and was significant at 1%. This implies that been a member of a cooperative society do not guarantee credit accessibility, the rice farmer need to partake in the activity of the society such as monthly saving, and punctuality. This contradicts the finding of Akinbode (2013) who reported a positive relationship between group membership and access to credit. Interest (26.048) was found to have a positive relationship with access loan and was significant at 1%. It means that a 1% increase in the interest rate results in 26% increase in high access to loan. This agrees with the study of Ololade and Olagunju (2011) who found a significant positive relationship between farmer's access to loan and interest loan charged in Oyo State, Nigeria.

The Cox and Snell R^2 were 0.44 which indicates about 44% of farmers' likelihood of accessing loans is influenced by the explanatory variables included in the model. The log likelihood is statistically showing the overall model fit. If farmers have adequate access to credit, agricultural production can be carried out without disruption on an economically sustainable basis. Access to credit has been said to be able to break the vicious cycle of low productivity and poverty common among peasant farmers in developing countries such as Nigeria.

Table 3: Determinants of the Farmers' Access to Agricultural Loans

Variables	Coefficient	Std. error	z-statistic	Sig.	Exp.(B)
Intercept	92.994	9.7208	91.519	.000	2.437
Age	.454***	.1434	10.010	.002	1.574
Marital status	-1.442	3.6711	.154	.694	.236
Sex	12.261***	4.3183	8.061	.005	2.112
Years of experience	-1.101	.1997	30.403	.000	.332
Household size	.247	.5362	.213	.644	1.281
Educational level	.157	.3515	.200	.654	1.170
Farm size	5.120	4.2378	1.460	.227	167.350
Disposable income	2.930*	1.5914	3.390	.066	1.000
Interest rate	26.048	.6374	1670.236	.000	2.053
Value of collateral	7.616	.0001	.313	.576	1.000
Off farm income	.050	1.6990	296.598	.000	1.000
Membership	-2.929***	1.1536	6.447	.011	.053
Loan distance	-63.573	2.9398	467.646	.000	2.457
Likelihood Ratio Chi-Square (13)	7.81			.000	
Log Likelihood	-254.0				
Cox & Snell R Square	0.44				

***significant at 1%, *significant at 10%.
Source: Field survey, 2019

CONCLUSION AND RECOMMENDATIONS

The major determinants of rice farmers' disposable income were initial capital, interest rate and farm resources while age, sex, disposable income, and membership of cooperative affected the likelihood of the farmers having access to agricultural credit. The study recommended that:

i. Credit should be made available to farmers at the right time in the farming preparation season.
ii. Financial institutions or credit sources should be strategically positioned to be easily accessible to farmers whiles reducing the cumbersome processing for credit among farmers who are less educated.

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