

# Regression Analysis of Loan Repayment Capacity among Farmers in Doma, Nasarawa State

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## ABSTRACT

This empirical paper is aimed at Regressionally Analyzing the socio-economic factors affecting Doma micro-financed farmers in repaying loans got from micro-financed organization. Farm credits are crucial inputs required by the small holder farmers to establish and expand farms. These credits are geared towards increasing agricultural production, enhancing food sufficiency, prompting household and national income as well as augmenting borrower's ability to repay loans. Microcredit facilities have played vital roles in the socio-economic transformation of the rural economics. This study was conducted in five wards of Doma where farming is the main occupation of the people. Ten respondents from four cooperative societies each in the wards totaling two hundred respondents were randomly stratified and used as sample for the research. The logistic regression equation and maximum likelihood estimation technique were used for the analysis since the model is a binary choice model. The explanatory variables or interactions reduction reduced the risk of multi-collinearity and the economically and theoretically plausible variables were retained for analysis using the bivariate correlation matrix. The analysis shows that average amount of loan paid by farmers was 78.3% of the amount due for payment.

**KEYWORDS:** Loans; Banks; Doma; Equity; Microcredit; Micro-finance.

## 1. INTRODUCTION

Mokhtar, Nartea and Gan (2012) defined microfinance as a financial instrument like loans, savings, insurance and other financial products that are tailored only to the poor. Microcredit is the lending side of the microfinance that helps the poor to be involved in income generating activities that allow them to accumulate capital and improve their standard of living (Mokhtar et al, 2012). Smith and Thurman (2007:1) quoted late Milton Friedman, Noble prize winner in the Economics 1976 that "The poor stay poor not because they are lazy but because they have no access to capital". Guthman (2007) revealed that Group based microcredit program is the most important innovations in development policy in the last fifty years. In another development, Ojiako and Ogbukwa (2012) believes that Farm credits are required by the farmers to establish and expand farms thereby increasing production, enhancing food sufficiency and socio-economic transformation of the rural economics. Al-mamum, Wahab, Malarvizhi and Mariapun (2011:95) showed that commercial banks in most developing countries exclude the poor and hardcore by imposing strict rules and regulations. The demand for the products and services offered by commercial banks is low among the poor not because the "poor do not need financial services" but the product and services are not designed to meet their requirements (Al-mamum et al 2011). Otero (1999) believes that microcredit provides access to productive capital which enables the self-employed to create productive capital; to protect the capital; they have to deal with risk and to avoid the loss of capital. This empirical paper is aimed at Regressionally Analyzing the socio-economic factors affecting Doma micro-financed farmers in repaying loans got from micro-financed organization (MFO).

### 1.1 THEORETICAL FRAMEWORK

#### 1.1.1 NIGERIAN MICROFINANCE LOANS SCHEMES

Udoh (2008) revealed that in Nigeria, government had at different times been involved directly or indirectly into revision of small to larger-scale financial assistance to farmers as a major policy strategy for increased agricultural productivity (Ojiako and Ogbukwa, 2012). Ojiako et al (2012) further stated that Various schemes, programmes and institutions had been put in place to enable small holder farmers have access to financial services. According to Udoh (2008), the practices of microcredit schemes had been celebrated in many government circles as poverty reduction-focused programme. Quoting Ojiako and Ogbukwa, 2012 pages 53-54, "Among the measures introduced since 1970 in recognition of the unhealthy condition of the Nigerian

mechanized farming by state and federal governments, the River Basin Development Authority, National Accelerated Food Production (NAFP), Operation Feed the Nation (OFN), Green Revolution Programme (GRP), and the Directorate for Food, Roads and Rural infrastructure (DFRRI) (Enoma, 2010). Establishment of the Mandatory Credit Guideline in respect of Small and Medium Enterprises (SME's) in 1970, Small Scale Industries Credit Guarantee Scheme in 1971, Agricultural Credit Guarantee Scheme Fund (ACGSF) in 1973, Rural Banking Scheme (RBS) in 1977, People Bank of Nigeria (PBN) in 1989 and Family Economic Advancement Programme (FEAP) in 1989. In 1992, other small and medium-scale enterprises loan scheme establishment include: Nigerian Agricultural Co-operative and Rural Development Bank (NACRDB)→ a merger of NACB, PBN and FEAP in 2002 and Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) in 2004". Ojiako et al (2012) revealed that there are two main sources of funds for the Nigerian small holders farmers: Equity (internal sources) and Debt (external sources). They also stated that as at December, 2005; the Central Bank of Nigeria (CBN, 2005) gave a breakdown of the structural composition of the Nigeria's formal financial system to include: " the Central Bank of Nigeria (CBN), Nigeria Deposit Insurance Co-operation (NDIC), the Security and Exchange commission (SEC), the National Insurance Commission (NAICOM), 25 deposit money banks, 6 development banks, 757 community (micro- financed) banks, one stock exchange, one commodity exchange, 126 bureau de change, 103 insurance companies and 581 stock brokers"( Ojiako et al ,2012).

### 1.1.2 CONCEPTUAL FRAMEWORK AND REVIEW OF LIFTERTURE

This research concept is based on the following theories: Monetary Circuit Theory and the Main Stream Economic theories of Money Creation.

According to Augusto (1989), the Monetary Circuit theory is a heterodox theory of monetary economics, particularly aimed at money creation. It is often associated with the Post- Keynesian school. This theory is also called the Circuitism and the Circulation Approach. The French and Italian Economists after the World War II developed this theory and were officially presented by Augusto Graziani in 1989. In another development, Colander (2000) described the Mainstream Economics as a term used to refer to widely accepted economics as taught across prominent Universities and in contrast to the heterodox economics. It has been associated with the Neoclassical economics and synthesis which combines Neoclassical methods and Keynesian approach macroeconomics.

Arene's (1992) study in Nigeria measured the effect of clients' number, level of education, business experiences and amount of loan received on repayment performance. Khandaker and Chowdhury (1995) in Bangladesh found that training increases repayment performance. The study also had shown a positive correlation between repayment performance with education, infrastructure, density of commercial banks, Grameen Bank manager's salary, and electric connection in the area and road width (Khandaker and Chowdhury (1995). Zeller (1998) showed that areas with high level of modernization, high density of retailers, program with saving services, size of the group and the ownership of land significantly reduces repayment problem. Wydick (1999) revealed that distance between clients business and lack of knowledge about each other's weekly sales increases the chance of encountering repayment problem. Guttman (2007), an economist identified three advantages of group lending that allowed MFO'S to accomplish impressive repayment rate. Mokhtar et al (2012) reported that the capability of borrowers to repay their microcredit loans is an important issue that needs attention. That borrower can either repay their loan or choose to default. Borrower's default may be voluntary or involuntary: That involuntary could be caused by unexpected circumstances such as lower business revenue generated, natural disasters and borrowers' illness while voluntary default is related to morally hazardous behavior by the borrower (Brehanu and Fufa, 2008). Bhalt and Tang (2002) investigated the determinants of loan repayments in microcredit programmes considering the socio-economic variables (gender, educational level, house hold income, type and year of business) instead of the elements of group lending. Brehanu and Fufa (2008) used the probit and logit regression revealing that Borrowers with larger farms, higher numbers of livestock and farms located in a rainfall area had a higher capacity to repay loans since all those factors increased the farmer's productivity and income. Okorie (1986) studies the repayment behavior in one agricultural cooperation in Nigerian and the research revealed that the nature of loan, either cash or kind (seeds, fertilizer and equipment) can influence the borrower's repayment behavior. Those who received a loan in kind had higher repayment rates while those who received a cash loan misused the cash, diverting it into personal consumption instead of investing it in making their businesses productive ( Okorie, 1986).

The importance of credits in agribusiness promotion and development, notwithstanding, their acquisition management and repayment have been burdened with numerous challenges (Obob and Ekpebu, 2011; Afolabi, 2010), especially for the small holder farmer (Awoke, 2004). Awoke (2004) also reported that the high rate of default arising from poor management procedures, loan diversion and unwillingness to repay loans has been

threatening the sustainability of most public agricultural credit schemes in Nigeria. In another development, Olagunju and Adeyemo (2007), believed that default in the repayment of agricultural loans is a factors that has militated against the development of this sector in Nigeria, because it affects the willingness of the financial institutions to increase lending to the sector.

## 1.2 METHODOLOGY

### 1.2.1 STUDY AREA AND RESEARCH SETTING

Nasarawa state, fondly known as the “Home of Solid minerals” is located in longitude  $8^{\circ}32'0''N$  and latitude  $8^{\circ}18'0''E$  in the central geographical zone of Nigeria. It is one of the six states created by Late General sani Abacha in 1<sup>st</sup> October, 1996 and has grown to become one of the top tourist states with its magnificent beautify landscapes and spectacular highlands (Adisa, 2011). Its total land area is 27,137.8 sq.km and shares borders in the west by the Federal Capital Territory, Abuja, in the North by Kaduna state in the south by Benue and kogi states and in the East by plateau and Taraba states respectively. The Home of solid minerals consists of thirteen (13) Local Government Areas (L.G.A) namely: Awe, Akwanga, Doma, Karu, Keana, Keffi, Kokona, Lafia, Nasarawa, Nasarawa Eggon, Obi, Toto and Wamba. Its early settlers are the Migili people. Nasarawa state has a diverse range of ethnic groups with its own distinct dialects but Hausa is common among the people. According to 2006 census, the state has a population of a little less than 2 million (1,863,275), very hospital and culturally rich. The ethnic groups included: Afo, Agatu, Akye, Alago, Baribari, Bassa, Egbirra, Eggon, Fulani, Gude, Gbagyi, Gwandara, Hausa, Yahaya Ari, Wadata, Dadin Kowa , Sabongari, Jukin, Kanuri, Mada, Ninzom, Arum, Rindei, Yeskwa and Tiv with about Twenty-nine(29) languages.

Doma is one out of the 13 Local Government Areas in the state. It is situated in the south of the state with headquarters in the town of Doma. Doma has an area of 2,714sq.km and a population of 139,607 as at 2006 census (Adisa, 2011) (en-wikipedia.org).

The study was conducted in Doma L.G.A. that is made up of five (5) wards namely: Laminga; Anna Town or Alaye ward; Doka; Sabongari and Ese Lema. Farming is the main occupation of the people of the state and the crops produced include: cassava, yam, rice, maize, guinea corn, melon, beans, soya beans, Asha and Millet. The state is also blessed with precious mineral resources like columbite, coal, aquamarine, salt etc. The primary data was collected using a structured questionnaire consisting of data on the socio-economic and demographic characteristics of the respondents; their loan access; use and repayment behaviors during the 2012 cropping season. Doma was considered as the study area due to cost, time constraints and stratified random sampling was used to select the sample. Randomly five wards were selected out of ten villages that make up the Doma L.G.A. Four Co-operative Societies were selected from the list of societies in each ward to give twenty co-operative societies. Ten respondents were selected from each cooperative society, totaling Two hundred (200) respondents. Questionnaire was administered to all the respondents.

### 1.2.2 DETEMINANTS LOAN REPAYMENT MODEL

Gujarati (1995) stated the following as the determinants of loan repayment problem model and analyzed it using logistic regression.

Loan repayment problem = f (Borrower characteristics, Business farm characteristics, microcredit loan characteristics) (1)

The cumulative logistic distribution function given as

$$p_i = E \left[ Y_i = \frac{1}{X_{ij}} = \frac{1}{1 + e^{-z_i}} = \frac{1}{1 + e^{-(\alpha + \sum_j \beta_j X_{ij} + \varepsilon_i)}} \right] \quad (2)$$

Where  $Y_i = 1$  if the borrower missed loan repayments more than four times in the two years since receiving the microcredit loan (having a repayment problem);

$Y_i = 0$ , if the borrower never missed a loan repayment (not having a repayment problem).  $P_i$  is the estimated probability of a loan repayment problem

( high value of  $P_i$  implies a high loan repayment problem risk).

$$Z_i = \alpha + \sum_j \beta_j X_{ij} + \varepsilon_i$$

$Z_i$  is the probability of a loan repayment problem,  $\alpha$  and  $\beta_j$  are an intercept term and parameter respectively.  $X_{ij}$  are the vectors of borrowers' characteristics, business/farm characteristics and microcredit loan characteristics and  $\varepsilon_i$  is the error term. Udoh (2000) succinctly argued that reduction in the number of explanatory variables or interactions help to ease computation reducing the risk of multicollinearity and ensure that only the economically and theoretically plausible variables are retained for analysis. Following Manyong, Dashiell, Oyewole and Blahut (1996), analysis of bivariate correlation matrix was used to verify the explanatory variables pair-wise to ensure that only plausible variables were retained. Equation (2) is the probability of having loan repayment problem

$$\left( (1 - p_i) = \frac{1}{1 + e^{z_i}} \right) \quad (3)$$

Equation (3) is the probability of not having loan repayment problem.

Odds of equation (2) are

$$\frac{p_i}{1 + p_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \quad (4)$$

Taking the natural log of (4) we have

$$Z = \ln \left( \frac{p_i}{1-p_i} \right) = \log e^{z_i} = z_i \quad Z = \alpha + \sum_j \beta_j X_{ij} + \varepsilon_i \quad (5)$$

Maddala (1983) revealed that if a mode like that above is a binary choice model, the use of the ordinary least squares (OLS) estimation technique is in appropriate, therefore, the maximum likelihood estimation technique is applied to the logistic regression to obtain the efficient parameter estimates. The likelihood function  $L$  for the model is given by (maddala, 2001) as

$$L = \prod_{Y_i=1} p_i \prod_{Y_i=0} (1 - p_i) \quad (6)$$

Green (1997) used equation (5) to derive the probability of having a loan repayment problem as  $p_i = \text{prob}(Y_i = 1/X_{ij}) = \frac{e^{z_i}}{1+e^{z_i}}$  (7)

### 1.2.3 EXPLANATORY VARIABLES

Every model has both dependent and independent variables.

#### 1.2.3.1 DEPENDENT VARIABLE

From(2) above, the dependent variable for the logit model is  $P_i$  and takes a value of "1" for borrowers who missed a loan repayment more than four times in the two years since they received the microcredit loan and "0" if they never missed a loan repayment.

#### 1.2.3.2 INDEPENDENT VARIABLES

The independent variables used in the logit model are:

$X_1$  = Age: A vector of dummy variables indicating age group between Borrowers [ $X_{1(1)} = 1$  for 18-25 years old, 0 = otherwise;  $X_{1(2)} = 1$  for 26-35 years old, 0 = otherwise;  $X_{1(3)} = 1$  for 36-45 years old, 0 = otherwise;  $X_{1(4)} = 1$  for 46-65 years old, 0 = otherwise]

$X_2$  = Annual Income: A vector of dummy variables showing Annual Income indicating amount of income received by borrowers [ $X_{2(1)} = 1$  for less than ₦20, 000;  $X_{2(2)} = 1$  for ₦20,001 – ₦50,000;  $X_{2(3)} = 1$  for ₦50,001 – ₦100,000;  $X_{2(4)} = 1$  for ₦100,001 – ₦150,000;  $X_{2(5)} = 1$  for ₦150,001 more; 0 = otherwise respectively]

$X_3$  = Number of dependents /children: A vector dummy variables indicating number of dependent in the borrowers' house hold. [ $X_{3(1)} = 1$  for 1-2 dependents;  $X_{3(2)} = 1$  for 3-4 dependents;  $X_{3(3)}=1$  for more than 4 dependents; 0 =otherwise respectively]

$X_4$ = Qualifications (-): Educational level of the borrower [1=FSLC, 2=SSCE, 3=ND, 4=NCE/HND, 5=B. Sc, 6=M Sc and PGD, 7= PhD; 0= lower than FSLC].

$X_5$ =Farming Experience: Period of years experienced in farm work [ $X_{5(1)}=1$  for less than 5 years,  $X_{5(2)}=$  for 5-15 years; 0=otherwise respectively].

$X_6$ =Amount Granted. Capital loan given to borrowers. [ $X_{6(1)}=1$  for less than ₦20,000;  $X_{6(2)}=1$  for ₦20,000-₦50,000;  $X_{6(3)}=1$  for ₦50,001-₦100,000,  $X_{6(4)}=1$  for ₦100,001 and above; 0=otherwise respectively].

$X_7$ =Interest Rate: Percentage rate for the repayment of the loan. [ $X_{7(1)} = 1$  for 0-3% rate;  $X_{7(2)}=1$  for 4-6% rate;  $X_{7(3)} = 1$  for 7% and above rate; 0=otherwise respectively].

$X_8$  =loan Duration: loan term period (repayment period)

[1 = more than 1 year; 0 =less than 1 year].

$X_9$  = Sex (+): Sex of borrower (1= male, 0 =female)

$X_{10}$  = Marital Status (+): Marital Status of borrowers (1= single, widower, widow, separated; 0= married).

### 1.3 DATA COLLECTION

The data used in the research was collected through survey interview using a structured questionnaire. Farmers were selected from five wards: Laminga, Alaye, Doka, sabongari and Ese Lema as an adequate representative population of Doma L.G.A. Furthermore, four cooperative groups (societies) were selected from each of the wards and in each group; ten members (farmers) were randomly sampled and selected as respondents to the questionnaire. A total of 200 respondents (farmers) were randomly stratified and used as sample for the research. However, oral interview was granted few farmers from the wards that were not selected from the Doma L.G.A. As a test -re- test sample and data result.

### 1.4 RESULTS AND DISCUSSION

Past studies and theory revealed that explanatory variables and the logistic regression equation has been the basis and the best tools for the analysis of the capacity of farmers to repay their microcredit loans. The maximum likelihood estimation technique was used and preferred to ordinary least squares estimation technique since the model is a binary choice model.

The result reveals that the average age of respondents was 34.5% while a larger proportion (63%) of the respondents (farmers) lied between 46 to 65 years of age. This result supports the ageing farming population that is growing in most rural areas in Nigeria as reported by Akpan (2010). This is also as a result of the high increase in rural- urban migration by young citizens in search for highly lucrative and paying jobs. The analysis shows that average amount of loan paid by farmers was 78.3% of the amount due for payment, which is a little below 90% repayment rate discovered by Oke, Adeyemo and Agbonlahor (2007). However, the high loan repayment performance of small holder farmers in Doma area of Nasarawa State is as a result of the awareness, seminars and influence of cooperative societies and their activities in the state compared to the southwestern Nigeria.

The analysis also shows that there exists a strong and highly positive relationship between loan size and farmers' strength and capacity to repay the loan. In the case of Afolabi (2010), the increase in amount granted and given to farmers to adopt improved agricultural innovations translated to increase in the levels of income and high loan repayment.

### 1.5 SUMMARY

The investigation and analysis shows a significant loan repayment problem with males compared to females. That, there exists a 42.2% probability of farmers experiences at 5% level of significance, meaning most farmers involved in farming order than other business activities are likely to default in their loan repayment as a result of the reliance of agriculture on the weather which in turn affects production that was beyond the control of farmers.

The repayment mode was positive and significant at 5% significance level meaning long term or duration of loan repayment is preferred to short term or duration. The values of the explanatory variables such as qualifications, marital status, and Extra loan, Dependents, Annual Income and Repayment Amount did not significantly play a role in the loan repayment problem among Doma farmers or borrowers. The marginal effects shows that gender factor had a 19.4% probability that male borrowers will have a loan repayment problem; a range of borrowers ages from 46-65 showed a positive response to repayment of loans while others had problems repaying their loans probable because of inexperience, non –commitment and false hope of getting money somewhere else.

## 1.6 CONCLUSION

The research reveals that experienced farmers between the ages of 46-65years whose works are basically related to agriculture, animal husbandry, fishery, poultry etc. not business activities are bound to be regular in their loans repayment irrespective of the number of dependents, ages, marital status, qualifications, extra loans got and nature of sexes while the duration of payment of the loans is made to be long enough.

## 1.7 RECOMMENDATIONS

From the research analysis, the recommendations made are:

- (1) Loans should be given to farmers between the ages of 46-65 years.
- (2) The loan duration should be made reasonable (increased) so as to encourage borrowers to have more months to repay their loans.
- (3) Proper monitoring of the collection of loans, implementation and application of the loans as well as adequate inspection of what the loans would be used for by the farmers.
- (4) Farmers should be given agricultural subsidies, fertilizers and improved varieties of crops instead of cash.

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**TABLE: LOGIT ESTIMATES FOR THE FARMERS LOAN REPAYMENT CAPACITY IN DOMA**

<b>Independent variables<sup>1</sup></b>	Estimated Coefficients	Marginal Effect
Qualifications	-0.5896	-0.2718
Marital status	-1.1155	-0,2361
Farming experience	1.6139 <sup>a</sup>	0.4221
Sex	1.119 <sup>b</sup>	0.194
Loan duration( loan term period)	0.2532	0.1344
Repayment mode	1.3894 <sup>a</sup>	0.3080
Extra loan	0.8865	0..2478
Extra income	-0.0843	-0.01336
<b>Dummy variables<sup>2</sup></b>		
<b>(Age)</b>		
Age 2	0.9830	0.2589
Age 3	0.7532	0.1255
Age 4	1.8933 <sup>a</sup>	0.2895



Dependent		
Dependent (2)	0.1211	0.0292
Dependent (3)	0.5374	0.1844
<b>Annual Income</b>		
Annual Income (2)	0.3095	0.0520
Annual Income (3)	0.0459	0.0158
Annual Income (4)	-0.2861	-0.1299
Annual Income (5)	0.3092	0.0531
<b>Amount Repayed</b>		-0.1422
Amount Repayed (2)	-0.9633	-0.0288
Amount Repayed (3)	-0.2229	-0.0834
Amount Repayed (4)	-0.5706	
Constant	-3.7834 <sup>a</sup>	

**NOTE:**

- Dependent variable= 1, if the borrower has missed payment for more than four times; or =0, otherwise.
- To avoid the dummy variable problem. A dummy variable is dropped in each group and the group with the lowest responses is also dropped. “a” stands for 5% significant level and “b” stands for 1% significant level.

Mc Fadden R-squared----- 0.2682  
 Log likelihood----- -95.387  
 LR statistics----- 48.1937  
 Degree of freedom----- 20  
 Total observation----- 200  
 % of correct prediction ----- 84.38

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