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Determination of Loan Repayment Potentials of Group Borrowers in Oyo State of Nigeria

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Abstract: The problem of high incidence of default seem to be one common feature of the public credit schemes in developing countries Approach on appraising previous project focus on analyzing repayment from implementation records. Little is however known about repayment from the producers point of view. Hence, it is needful to identify and incorporate the relevant producers characteristics, determine repayment ability on producers perspective.

Key words: Repayment, procedure, loan, credit agency, farmers, Nigeria

INTRODUCTION

The history of the institutional credit administration in many parts of Nigeria has not been impressive when evaluated on the basis of their repayment performance. In the past, many credit agencies were scrapped for gross inefficiency, while others were heavily subsidized in order to keep them alive. These actions became necessary because of high default rate among borrowers.

It is now generally accepted that agricultural development effort which aims at improving the production resources employed by farmers is not misdirected, since that sector employed the largest body of producers and contains most of the underemployed labour resource that can he mobilised. Agriculture in less developed countries is characterized by the use of more traditional methods of cultivation, unwillingness to adopt innovative ideas partly caused by a lesser access to financing valid partly by farmers' aversion to undertake risky ventures. Olowa (2004) established the major role of credit in peasant farming as the opening of greater opportunities for acquisition of much needed inputs. It is mainly in this way that credit can effectively function to overcome agricultural stagnation in developing countries of the world.

The lending agencies in developing countries are faced with the nagging problem of ensuring credit effectiveness in a sociological set up where government properties and financial assistance are erroneously considered as booties (Aku, 1993). Added to this ring are the inherent retrogressive government bureaucracy in processing and disbursing agricultural loans to applicants, lack of organized marketing arrangements for agricultural commodities produced with borrowed funds and traditional land tenure system, which together constitute formidable economic impediments to successful loan administration.

Thus the problem of high incidence of default seem to be one common feature of the public credit schemes in developing countries. According to Arene (1993), in Nigeria during the period 1964-65 to 1964/65-70/71, the defunct Western Nigeria Agricultural credit Corporation recorded default rate of 33, 64 and 52% for loans issued to Individuals, cooperatives and unions, respectively. In the same vein Chigbo (1992), while assessing loan repayment performance of customers of N.A.C.B, Keffi branch office, she discovered that out of 2531 loan approved for the farmers between 1981-91, just 615 farmers fully repaid their loan, while 746 payed part of their debt but a whopping 1104 farmers did not pay at all. Bulk of the borrowers included individuals, groups and cooperative societies. This was further confirmed in African Concord Publication (1991) report on N.A.C.B situation accounts, where it was reported that there was high rate of default between 1985-90 although, the categories of defaulters was not indicated.

In addition, Kashuliza (1998), discovered that in small farmers credit scheme in Africa, the rear East and Latin America, default rate ranging between 50-60% have been reported. This present study seeks to verify all the above statements by assessing the loan repayment performance index of Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) Ltd., Ibadan branch office between 2003 and 2005, which shows a continuous decrease from 77.8, 45.6 and 32.1%, respectively. The consequence of high level of default can be serious.

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Low repayment reduces volume of loanable funds available and requires a disproportionate amount of administrative time for loan recovery thus reducing profitability. The major reason attributing to high default rate include crop failure (due to bad weather, pests and diseases); unwillingness to adopt innovative ideas, defective loan administration including untimely disbursement, under-financing and over-financing, absence of elf orts for linkage of credit recovery with sale of produce and defective appraisal and follow-up. As a number of defaulters grow, the ability of credit institutions to expand or even maintain their port-folio tends to diminish. The need arises, to identify those variables that discriminate farmers and thus have an insight into the means of reducing the error of judgment by lenders in selecting capable borrowers.

Approach on appraising previous project focus on analyzing repayment from implementation records. Little is however known about repayment from the producers point of view. Hence, it is needful to identify and incorporate the relevant producers characteristics, determine repayment ability on producers perspective thus have an insight into the means of reducing error of granting loans to those who may not be able to repay.

Objective of the study: The objective of this study is to investigate the effects of socio-economic characteristics of group farmers that were beneficiaries of NACRB Ltd., (Ibadan branch office) group loan scheme as it affects their repayment capabilities (Table 1 and 2).

Hypothesis tested

H_o: There is no significant improvement in a groups repayment potentials as its socio-economic variables vis (income of groups, adoption of technology, liquidity groups, area of land cultivated by group and proportion of group land utilized for maize) increases.

H_1: There is significant improvement in a groups repayment potential as its socio-economic variables increases.

H_o: All the discriminant co-efficient are equal to zero.

H_1: All the discriminant co-efficient are not equal to zero.

MATERIALS AND METHODS

Sources of data and sampling procedure: This study covered five local government areas of Oyo State namely: Ibadan Northwest, Aknyele, Irewole Iwo, Kajola, Afijio and Ona-Ara local governnent areas where the target groups for this study (i.e., group farm) exists and which fall under Ibadan NACRDB coverage. Some few villages were chosen for data collection. The distribution of this villages reflected the major agricultural zones, the selected local government areas and concentration of the target group. Only maize/maize-cassava production groups served as respondents and constitute the target groups for the study. The data used in this study are of two types:

- Primary data were obtained from beneficiaries by means of structured questionnaires and interviews
- Secondary data were obtained from records of the groups most of which are kept at the zonal office of NACRB and interview with the management of the bank

Two types of questionnaires were designed, one for beneficiaries and other for the management staff of NACRDB. Using appropriate questionnaires, interviews were conducted for both beneficiaries and the management staff of the organizatl on. Beneficiaries were traced to their farms following the contact address obtained from NACRDB Ltd, Ibadan branch office.

A list of total population of 745 beneficiaries spanning 2003-2005 was obtained from NACRB Ltd., Ihadan branch office comprising of individuals, groups and cooperative societies majority of whom were arable crop farmers. This list served as sampling frame. A sample size of forty was drawn by employing purposive sampling technique because group loan is quite uncommon.

Table 1: Selected characteristics of group

Group characteristics	No. of respondents	Percentage
Area cultivated by group (ha)		
<1	4	10.0
1-2	18	45.0
3-4	13	32.5
5>	5	12.5
Total	40	100.0
Proportion of group land utilized for maize (%)		
10-30%	1	2.5
31-50%	5	12.5
51-70%	9	22.5
71>	25	62.5
Total	40	100.0
Average age of group members (years)		
<30	3	7.5
31-40	15	37.5
41-50	21	52.5
<50	1	2.5
Total	40	100.0
Number of members in group		
<5	20	50.0
6-10	16	40.0
11-15	4	10.0
>16	0	0.0
Total	40	100.0

Table 2: Ranking of socio-economic characteristics of groups as they affect their loan repayment

Socio-economic variables	Very important		Important		Not important	
	Respondent	%	Respondent	%	Respondent	%
Liquidity of groups (₦a)	17	43.6	15	38.5	7	17.9
Area cultivated by group	8	20.5	20	51.3	11	28.2
Income of group	10	25.6	25	64.4	6	15.4
Adoption of technology (per use)	7	17.9	19	48.7	13	33.3
Proportion of group land utilize for maize	13	33.3	18	62.2	8	20.5
Average age of group members	10	25.6	9	23.1	20	51.3
Educational level of group member	2	5.1	22	56.4	15	38.5

N.B. Respondents do not add up to 40 because one group ranked the variables not applicable. Field survey data, 2009

Table 3: Loan repayment performance

Years	No. of beneficiaries (individuals, co-op. and groups)	Amount loaned	Amount repaid	Performance index (%)
1993	372	1,581426	1,230,731,0.2	77.8
1994	341	1,943,300	886,88.32	45.6
1995	181	1,501,100	481,801.15	32.1
1996	223	1,868,00	70361,61	3.8

NACRDB Ltd. Ibadan, 2009

Table 4: Discrimination between non-defaulters (good customers) and defaulters (bad customers)

Values	Large scale	Small scale
Minimum	N50,000	N5,000
Most common	N500,000	N15,000
Maximum	Millions	N25,000

Methods of data analysis: The analytical methods used in this study are:

- Descriptive statistics such as percentages, mean and mean differences. These were employed in the identification and analysis of the socio-economic characteristics of the beneficiaries and loan repayment performance (Table 3). Also in the classification performance of discriminant function and contribution or each socio-economic variables used in the study to the total discrminant score (Z)
- Discriminant model used in this study is dichotomous, seeking to discriminate between two classes of loan beneficiaries designated as non-defaulters (good customers) and defaulters (bad customers). Defaulters here is defined a borrower who does not repay the loan obtained en agreed time. A threshold (Z) is determined and those that fall below this constitute the defaulters vice versa. A linear discrminant function is estimated that best discriminate between the good and bad customers (Table 4)

On a priori basis, the major variables which are assumed and used to discriminate between defaulters and non-defaulters are identified as follows:

X_1 = Liquidity of groups (₦)
X_2 = Area cultivated by groups (ha)
X_3 = Income of groups (₦)
X_4 = Adoption of technology (fertilizer use kg ha^{-1})
X_5 = Proportion of group land utilizes (%) for maize

The general form of te function is given as follows:

$$Z = \lambda_1 X_1 \_ + \lambda_2 X_2 + \lambda_3 X_3 + \lambda_4 X_4 + \lambda_5 X_5$$

Where:
Z = Total discriminant scores
$X_{(1.5)}$ = (i = 1, 2,..... 5)
λ_{1j} = The weight assigned to jth variable as a measure of its contribution to the Z-score 1, 2, ... , 5)

The concept of discriminant analysis: The method of discriminant analysis seeks to discriminate between two or more populations on the basis of multivariate measurements made on samples drawn from these populations. If we draw a sample from each of two known populations and we make measurement of some identified variable that describe the characteristics of the member of each population, we can use the information thus collected to set up a rule, which can be used to allocated a new member to the correct population, even when we do not know a priori, from which population it emanates.

Let X_{ij} (i = l, 2,....., N and j = 1, 2.M) be set of M random variables from a normally distributed multivariate population. If we split the N observations in the sample into two classes with sizes N_1 and N_2, respectively and with $N_1 + N2 = N$, we obtained the mean values X_{ij} and X_{2j} for each variable j in the two samples and compute the differences between these means as:

$$dj = \overline{X}_{ij} - \overline{\overline{X}}_{2j} \quad (1)$$

To find a linear function:

$$Z = \lambda_1 X_1 \_ + \lambda_2 X_2 + \ldots\ldots\ldots\ldots\ldots \lambda_m X_m \quad (2)$$

which best discriminate between tile two classes.

Where:

Z = Total discriminant scoe
X_m = The observation on jth variable
λ_m = Is the weight assigned jth variable as a measure of it's contribution to the Z-score

And if we represent the differences between the means Z1 and Z for the two classes by D, we have

$$D = \lambda_1 d_1 \_ + \lambda_2 X_2 + \ldots\ldots\ldots\ldots\ldots \lambda_m X_m \quad (3)$$

The variance of Z is proportional to:

$$V = \sum_{j=1}^{m}\sum_{k=1}^{m} \lambda_j \lambda_k S_{jk} \quad (4)$$

$$Sjk = \sum_{i-1}^{N} \left(X_{ij} - \bar{X}_i\right)\left(X_{ji} - \bar{X}_k\right) \quad (5)$$

And are elements of a dispersion matrix formed from X_{ij} and X_{ik}. If we assume homogeneity of variance, the function that best discriminate between the two classes is given in matrix from as follows:

$$S\lambda = d \text{ or } \lambda = S^{-1}d \text{ i.e.,}$$

$$\begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \cdot \\ \cdot \\ \lambda_m \end{bmatrix} = \begin{bmatrix} S_{11} & S_{12} & . & . & . & S_{1m} \\ S_{12} & S_{22} & . & . & . & S_{2m} \\ . & . & . & . & . & \\ . & . & . & . & . & \\ . & . & . & . & & \\ S_{m1} & S_{m2} & . & . & . & S_{mm} \end{bmatrix}^{-1} \begin{bmatrix} d_1 \\ d_2 \\ . \\ . \\ d_m \end{bmatrix} \quad (6)$$

This provides the required solution for λ_{ij} in the discriminant function. These co-efficient are according to Tintner proportional to the coefficient to the linear function, which in the population, discriminate best between the two classes in the particular sense indicated above.

A statistical test of significance of the discriminant function requires the computation of a co-efficient:

$$e = \frac{N_1 N_2}{N} \sum_j \lambda_j d_j \quad (7)$$

The variance ratio with M and N-M-1 degrees of freedom:

$$F = \frac{(N - m - 1)e}{M(1 - e)} \quad (8)$$

Subsequently, after solving for m, Z scores for good customer (Z_G) and for bad customer (Z_B) can be estimated from:

$$Z_G = \lambda_1 X_{1G} + \lambda_2 X_{2G} + \lambda_m X_{mG} \quad (9)$$

$$Z_B = \lambda_1 X_{1B} + \lambda_2 X_{2B} + \lambda_m X_{mB} \quad (10)$$

Cut of point: The cut-off is usually taken as the mid-point of Z_G and Z_B = ½ (Z_G + Z_B) because discriminant function analysis itself assumes equal cost of misclassification. Lugenwa and Darroch (1995).

Discrimination between non-defaulters (good customers) and defaulters (bad customers): A single dichotomous discriminant function was estimated in this study. The estimated discriminart function, which can be used for screening new applicant is given as below:

$$Z = 0005 + 0.000003X_1 + 0.0506X_2 - 0.000001X_3 - 0.000084X_4 + 0.00440X_5$$

The criterion for discrimination was that a beneficia was nondefaulter if the total discriminant score (Z) was at least 0.5175136. Any beneficiary falling below these minimum discriminant score was classified as defaulters. Five variables identified earlier are used in the function.

From Table 5, mean Z_G, Z_B and Z_K are the mean values of Z for good customers (non-defaulters), bad customers (defaulters) and combined classes of both good and bad customers, respectively. They were obtained by inserting the mean values X_j, X_{j2} and X_{j3} of each variable, X_j for good, bad and combined customers, respectively into the discriminant function estimated above.

In this regard, the mean Z values are very important for predicting the probability of an applicant or beneficiary belonging to the defaulter class or non-defaulter class. If the Z value of an applicant is higher than Zk (0.5175136) that applicant probably belongs to the good customer class (non-defaulters). But if it is lower than Zk, the applicant probably belongs to

Table 5: Mean values of Z

Mean	Values
Z_G	0.5491770
Z_B	0.4857400
Z_K	0.5175136

Calculation from data (2009)

Table 6: Co-efficient of discriminant and percent contribution of Individual variables to the total Z-scores

Variables	Coefficient	Mean differences	Product	Percent contribution
Constant term	0.005	-	-	7.31
X_1 (N)	0.000003	13700	0.0411	60.60
X_2 (ha)	0.0506	0.4	0.02024	29.57
X_3 (N)	-0.000001	10275	-0.010775	-15.74
X_4 (kg ha^{-1})	-0.000084	-17.00	-0.001428	-2.09
X (%)	0.00440	-	-	20.90

Table 7: Group means and mean differences for discriminant variables

Variables	Mean of good customers	Mean of bad customers	Differences	Mean of combine group
X_1 (N)	51450	37750	13700	44600
X_2 (ha)	3.150	2.750	0.4	2.950
X_3 (N)	74675	63900	10275	69288
X_4 (kg ha^{-1})	532	515.0	17.00	523.1
X^2 (%)	79.50	76.25	3.25	77.88

Field Survey data (2009)

Table 8: Analysis of variance for discriminant function

Source of variation	Sum of squares	df	Mean square	F-ratio	p-value
Discriminant	0.5971	5	0.1194	0.43	0.824
Residual error	9.1465	33	0.2772	-	-
Total	9.7436	38	-	-	-

Calculation from data (2009)

the bad customer's class. The classification performance of the estimated discrimjnant function based on the data collected on observations during the course of this study will be analyzed based on the above explanation.

In the Table 6, the signs of the coefficients of the discriminant function shows the direction in which a group repayment or an applicant chance if belonging to the group of good or bad customers would move as the values of the variables in the function change. A look at Table 6 shows that the signs of the coefficients X_1, X_2 and X_5 are consistently positive. This suggest that an applicant's chance of belonging to the group of good customer probably improves as it's liquidity, area of land cultivated and of group land utilized for maize production increases, respectively. However, the negative signs of X_3 and X_4 suggest that a group potential of repayment decreases as it's income and adoption of technology i.e., fertilizer use increases, respectively. This observation contrast well with an earlier result obtained by Orafidiya and Osuntogun (1987), where these two variables (X_3, X_4) showed positive contribution to the group repayment potentials.

Whereas the negative value of X_4 is not surprising because a farmer could possibly be farming on a naturally fertile land, which may increase his level of output tremendously leading to a better repayment ability compared to those farmers that utilizes fertilizer on their farm. However, the negative contribution of X_3 (group income) may be due to differences in characters of group members. Where some members may be nursing the ambition of squandering the income, others may be pressing for prompt repayment of the loan. In addition some groups have enough income to pay but are not willing due to reasons explained earlier. Also the capacity of group income is of great importance to their repayment ability, whereas a farmer may receive a higher income on his produce in one season in another season the produce may attract a lesser income. This fluctuation in income affect a farmers capacity to adhere to repayment terms for agricultural sector is full of risks ranging from the risk of weather, diseases and price changes. Also the capital base of group is of great importance to their repayment ability.

It will be noted from the Table 6 that X_1, X_2 and X_5 accounted for >90% of the total Z value of Z-score for the function. This observation contrast well with an earlier result arrived at by Orafidiya and Osuntogun (1987), where group income (X_3) and proportion of group land utilized for maize production (X_5) accounted for >80% of the total Z values of Z-scores.

Table 7 set out the group mean and the differences in means between the good and bad customers. These shows positive mean differences in favour of good customers and this lend weight to the estimation of the discriminant function for the variables. The mean for the good customers, the bad customers and the mean of the combine group were used to calculate Z_G, Z_B and Z_K in Table 7.

Here, the estimated function was subjected to statistical test of significance, using the variance ratio F shown in Table 8. The test shows that the discrirninant function for discriminating between the two groups is statistically significant at about 5% level. The low statistical significance of the function compared to 3.81

Table 9: Classification performance of estimated discriminant function

Actual group membership	Classification effort		
	Good (%)	Bad (%)	Total
Good	7 (47)	8 (53)	15
Bad	12 (50)	12 (50)	24
Both	19	20	39
Number correct	7	12	
Proportion	0.368	0.600	

Proportion correctly classified into good customer 47%; Proportion correctly classified into bad customer 50%; Proportion of good customer classified as bad 53%; Proportion of bad customer classified as good 50%; Overall correctly classified 49%; Calculation from data (2009)

F-ratio result recorded by Orafidiya and Osuntogun (1987) at the same level of significance may be due to the fact that differences between the mean values of some variables in the good and bad customer class were small. The implication of this is that probability of mis-classification of applicants may be a little hit high when this function (i.e., estimated function) is used for predicting the repayment potentials of new applicant. This is evident in Table 9.

Based on the statistical significance of the function the hypothesis that all the discriminant co-efficients were equal to zero is rejected. This means that the estimated function can be used to discriminate between good (non-defaulters) and bad (defaulter) customers as initially defined.

Classification performance of discriminant function: In order to know how well the function developed in the course of this study will perform in classifying potential applicants, it was subjected to validation test using sample of 40 observations obtained for the study. Since usefulness of a discriminant function lies in it's power to classify correctly, then the higher the rate, the better is the predicting power of the function (Orafidiya and Osuntogun, l987). The result obtained using the 40 sample observation is given in Table 9.

Note: Thirty nine observations used -1 observation contains missing value. The result in Table 9 deserves some comments especially the proportion of bad customer erroneously classified as good customers. This group forms 50% of the 20 known bad customers (defaulters) subjected to test. This kind of error constitutes the greatest risk in agricultural credit administration. Whereas the 53% misclassification of good customers (non-defaulters) fur bad ones will mainly, affect interest earning foregone, the 50% bad customers may default in the payment of accruable interest as web as the principal loan. The totality of both may he high enough to reduce amount of loan available for subsequent operations. Because of dual nature of losses to credit agencies, misclassification errors may lead to loan shrinkage, ineffectiveness and liquidation. The classification performance of the function is not sul ficiently high to alleviate the fear associated with misclassification errors.

However, the overall classification performance of 49% is relatively very low when compared with 67% recorded by Orafidiya and Osuntogun (1987), 74% obtained by Makinta (1992) and 75% recorded by Bauer and Jordan.

The socio economic characteristics of We beneficiaries identified include; liquidity of group, Area cultivated by group and proportion of group land utilized for maize production. The discriminant function result of the analysis of socio-economic characteristics of beneficiaries revealed some considerable variation which affected farmers potentials to repay loan.

RESULTS AND DISCUSSION

The result shows that in giving loan to group farmers, the credit agency should focus attention on three major characteristics namely; the Liquidity of such groups, the area of land cultivated and the proportion of group land utilized for maize proportion. These three characteristics accounted for 61%, 2S)/C and 20% of the predictive power of the function developed in the study, respectively. While income of group and adoption of technology had negative percentage contribution to the function. The changes of belonging to one group (good) or the other (bad) will increase when the three Identified characteristics increases in magnitude.

The classification performance of the function estimated in the study is not sufficiently high to alleviate the fear associated with misclassification errors. However, the overall classification performance of 49%. It is intolerable which compared with 67% obtained by Orafidiya and Osuntogun (1987), 75 and 74% recorded by Lugenwa and Darroch (1995) and Makinta (1992), respectively.

Results of the descriptive analysis shows that all the respondents were small scale farmers as revealed by the area of land cultivated by the beneficiaries which ranges from I ha to about 6 ha of land. And about 63% of the beneficiaries utilize s over 70% of their landed area for maize production as intercrop of maize and cassava is of course an expected practice before NACRB can grant loans to the farmers. While, some respondents based their source of income solely on maize and cassava production others engages in some other occupations to supplement their income.

A cursory look at the average age of group members shows that 52% of the respondent fell within the average

age of 41-50, while 37% were within the age of 31-40. In the same vein, 50% of the respondent had between 2-5 members in their group, while 40% had between 6-10 members and the highest number of members in a group was between 11-15 which accounted for 10% of the respondents. Majority of the respondent admitted using fertilizers on their farm.

The examination of the amount of loan disbursed and rapid from 2003-2005 indicated a continuous decrease in loan repayment every year. The loan repayment record was not very encouraging with the lowest loan repayment performance index of 77.8% was recorded in 1993. The dwindling volume of loan is seriously taking it's toll on the availability of both loanable and administrative fund to the institution.

CONCLUSION

The result shows that in giving loan to group farmers, the credit agency should focus attention on three major characteristics namely; the liquidity of such groups, the area of land cultivated and the proportion of group land utilized for maize proportion.

RECOMMENDATIONS

The preceding analysis has brought out some findings that have implications to this study based on these findings, the following recommendations are made to address the problem of loan administration to groups with the view to improving it's effectiveness.

- In as much as NACRB does not grant loan in kind they should create an avenue for farmers to be able to procure their fertilizers at the official price in order to increases the effectiveness of loans
- There is need for the intensification of monitoring supervision to advise and to check those beneficiaries that are interested in loan diversion
- Although, there was negative contribution of groups income to the discrminant function estimated in this study, nevertheless greater attention should be paid to group income in the course of screening applicants because income serves as an indicator for a farmer's potential to repay loans obtained
- To ensure higher repayment NACRB should employ more competent agricultural officers and extension personnel to take charge of the operations
- Marketing structure should be introduced by so that recovery is made at the time of sale so as to ensure prompt repayment among farmers
- Also proportion of group land under cultivation should be given consideration
- The prospects for repayment of loan are greatly enhanced by group responsibility for individual liabilities. Given the cohesiveness of most communities, then the village cooperative society or farmers association has stake in an individual performance, it is difficult for him to wisthand the pressure of his peers and avoid his obligations as such emphasis should be given to cooperatives society than individuals
- Agricultural industry is a very risky industry that depends on weather the control of which is beyond farmers power. NACRB should therefore, liaise with Nigeria Agricultural Insurance Corporation to give prompt attention to beneficiaries in case of any hazard since they are all automatically insured.

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