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CROSS CATEGORICAL ANALYIS OF FACTORS INFLUENCING AGRICULTURAL CREDIT DELIVERY DECISIONS BY COOPERATIVE SOCIETIES IN EDO AND DELTA STATES, NIGERIA

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ABSTRACT

The study examined the factors influencing farm credit delivery decisions by Cooperative Societies in Edo and Delta States. Primary data were obtained from 809 loan applications selected from 80 Cooperative Societies purposively selected from 16 LGAs with the assistance of the Ministries of Commerce and Industry. Descriptive statistics and the logit model were used to analyse the data. The results showed that all the Cooperative Societies were multipurpose, but with credit delivery as their major function. They had a male to female ration of 4:1 and a high loan approval rate of 95%. Gender, age and educational level were examined as factors influencing loan decisions. The results of the cross-categorical analysis of the 2x2x2x2 model showed that being a male above 40 years old with no formal education had the highest possible likelihood of increasing the probability of loan decision being positive. The combined effect of all the factors however showed high statistical significance with a Chi square (X^2) value of 29.20 and a likelihood ratio (G^2) of 35.01 at 1%. The study therefore concluded that the major factors influencing the loan delivery decision were gender and age as formal education did not seem to enhance he decision.

INTRODUCTION

Nigeria employs majority of her rural populace in the agricultural sector, dominated by small scale farm holdings with inadequate capital as their major problem as emphasized by Saito (1994). In line with this, credit allocation and control policy, institutional credit incentives and the establishment of highly subsidized lending institutions were adopted by the Nigerian government as some of the measures to address the problem of inadequate capital for farm operations. The general objective of these policies is to provide credit facilities for agricultural development to enhance the level and quality of agricultural production, food processing, storage and distribution as well as living conditions of the rural farmers. Ijere (1975, 1998) and Agu (1998) emphasized the fact that credit enhances production and productivity with resultant higher income and better living standards for the people.

Despite all these efforts, agricultural production is yet to match the needs of either the growing population or the expanding agro-based industrial sector. This situation raises questions as to whether the farmers have access to these credit facilities through these institutions to give out loans for agro-businesses. This study therefore sets out to analyse the socio-economic factors influencing credit delivery decisions by rural credit institutions as its main objective. Specifically, the study seeks to identify and examine the factors influencing credit delivery decisions by Cooperative Societies and to carry out cross-categorical analysis of such factors for their specific effects on loan delivery operations.

The World Bank (2000) indicated that between 78 and 95% of the credit needs of farmers and market women are provided by informal rural sources and Aryeetey (1997) also rated informal rural finance better than the formal system in Africa. This suggest that the rural financial institutions need to be encouraged and developed as veritable tools to meet the financial requirements of rural farmers. He further describes Cooperatives as formalize informal sources which should be considered as credible for credit delivery for the rural populace and small scale

enterprises. Hence, there is need to study all aspects of this institution as it relates to credit delivery for appropriate policy issues.

METHODOLOGY

The study covered Cooperative Societies in Edo and Delta States of Nigeria, where agriculture remains the main stay of the people with considerable involvement in Cooperatives in agricultural credit delivery. The study area covered two Senatorial Districts (Edo South and Delta North encompassing the state capitals due to the proliferation of Cooperatives in these zones. Sixteen (16) LGAs were covered in all. Eighty (80) Cooperative Societies involved in agricultural credit delivery were purposively selected from a list of registered cooperatives obtained from the State Ministries of Commerce and Industry. A total of 809 respondents were randomly selected from a list of 1906 clients who applied for loans (whether given or not). The data so obtained were subjected to both descriptive and quantitative analysis. The logit model was used to analyze the data since the variables were dichotomous.

MODEL SPECIFICATION

The logit model used for the analysis of this study was based on earlier publications (Fienberg, 1980; Erhabor, 1981; Aldrich and Nelson, 1984; and Gujarati, 1995). The decision by the Cooperative Societies to grant loan or not to grant loan gave a binary variable y, assuming the value of 1 if the decision is yes i.e to grant loan and zero otherwise. The independent variables which were gender, age and educational status were also binary with 1 and 0 values. However in order to avoid an all-zero column, all variables were made to assume the values 1 and 2 in place of 1 and 0 respectively. These are shown in Table 1 Figure 1.

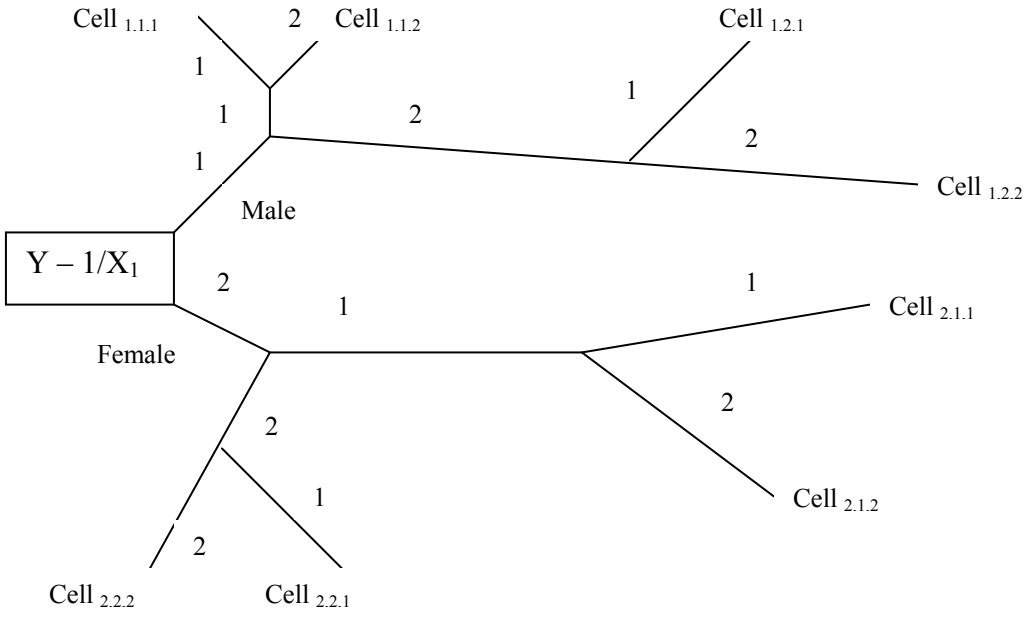

Figure 1. Cell structure for logit analysis of factors influencing credit delivery decisions

The question of interest in this model is the probability (P) that y takes on the value 1 (i.e loan decision is yes), depending on the observed variables, i.e P= P)y= $1/x_i$ ------ X_k). This shows that the exogenous variables are assumed to account for the variations in P, which is analogous to the Ordinally Least Square (OLS) assumption in standard regression analysis.

The logit model is therefore given as
$P(y = 1/X) = \exp(3b_k x_k)/[1 + \exp(3b_k x_k)]$ (Aldrich and Nelson 1984)

The relationship between y and Xi is given by the unknown parameters (b_k) which are to be estimated.
Using the maximum likelihood Estimation (MLE) the logit likelihood is given as:

$$L(y/x,b) = N$$

$$I=1 \quad \left[\frac{\exp(\sum bx)}{I = \exp(\sum b_k x_k)}\right]^{y_i} \left[\frac{1}{1+\exp(\sum b_k x_k)}\right]^{1-y_i}$$

Taking the logarithms in order to work with the sums rather than the products it gives

$$\text{Log } L(y/x,b) = \sum_{i=1}^{N}(Y_i \log p_i + (1 - Y_i)\ \log(1 - p_i)$$

Taking first derivatives to obtain the likelihood equation for logit, gives:

$$\sum_{i=1}^{n}[yi - \frac{\exp(\sum b_k x_{jk})}{I = \exp(\sum b_k x_{jk})}]\chi ij = 0 \qquad j = 1,\ldots k$$

The unknowns which are the b_k^S are solved for and would give the probabable variations in the probability (P) by y (Loan decision) assumes the value 1 (yes).

Three dichotomous exogenous variables were identified giving a 2x2x2x2 model with eigth cells and sixteen outcomes (Finberge, 1980) as defined in Table 1.

Table 1. Factors influencing loan decisions

Factor	Levels	Value	
		Loan decision	
Y	2	1.0	Yes
		2.0	No
X_1	2	Gender	
		1.0	Male
		2.0	Female
X_2	2	Age*	
		1.0	Below 40 years old
		2.0	40 years and above
X_3	2	Educational status	
		1.0	Formal education
		2.0	No formal education

Cell structure was based on the following:

Components			Cell structure (X_{ijk})
X_1	X_2	X_3	1, 1, 1,
X_1	X_2	X_3	1, 1, 2,
X_1	X_2	X_3	1, 2, 1,
X_1	X_2	X_3	1, 2, 2,
X_1	X_2	X_3	2, 1, 1,
X_1	X_2	X_3	2, 1, 2,
X_1	X_2	X_3	2, 2, 1,
X_1	X_2	X_3	2, 2, 2,

Source: Field survey (2002)
* 40 years was chosen because most respondents were around this age category

E.g. Cell 1, 1, 1, shows that the respondent is a male, below 40 years old and has formal education. According to Fienberg (1980), the estimate of the expected count for the (i, j, k,) cell is given as:

$$M_{ijk} = (\frac{xi++}{N})(\frac{x+j+}{N})(\frac{x++k}{N})N$$

Whose logarithms yield:
$\text{Log } M_{ijk} = \text{Log } X_{i++} + \text{Log } X_{+j+} + \text{Log } X_{++k} - 2 \text{ Log N}$

The goodness of fit was therefore obtained using the expected count and the observed count as stated below:

General form of Pearson Chi-square $X^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$

Or the log of the likelihood ratio test statistic $G^2 = 2 \sum (\text{Observed}) \log \frac{(\text{Observed})}{\text{Expected}}$

Where summation is over all the cells.

RESULTS AND DISCUSSION
The study showed that all eighty (80) cooperative societies are multi-purpose, involved in both credit delivery and other revenue generating activities. About 15% were solely women societies, 1.25% solely men, with all the members as hunters, while 83.75% had mixed membership with an average male to female ratio of 4:1. Distribution by gender of the members of the management team also followed similar pattern, with all the presidents of mixed societies being males. The ages of the societies ranged between five to thirty-nine years. The older societies were mainly rural with majority (71%) of the members above 40 years old with an average of 41.2 years. The current membership strength ranged form 50-550 with an average of 60. The staff multi-purpose societies whose members were involved in some form of agricultural activities as their secondary occupation had more members than rural societies. A relative membership growth rate calculated for the Cooperative Societies using the year of formation as base year gave an average figure of

12.5%. This growth in membership may be an indication of some positive results from the activities of the societies which must have motivated the members of the public to join them. The results also showed that 642 (79%) of the selected applicants were males and 167 (21%) were females with 527 (71%) above 40 years old. Only 285 (35%) has some formal education.

Access to loan and availability of loanable funds

All members had access to credit facilities as there were no other conditions qualifying one to apply for credit other than being a member. They also seemed to have funds available since the results indicated high rate of approval of applications for loans as indicated by 95% of the applicants.

Factors identified

The factors identifies as being considered for loan approval were gender, age and level of education of applicants as all other factors were common to all members. Table 2 shows the cross-classification of these three factors while Table 3 shows the distribution of respondents according to cell structure in respect of identified factors.

Table 2: Cross classification of Factors, influencing Credit Delivery decisions by Cooperative Societies

Gender	Cross Delivery Decision	Age (Years)	Educational Status	
			Formal	No Formal
Males	Approved	< 40	65	106
	Not Approved	<40	0	5
	Approved	?40	156	280
	Not Approved	?40	18	12
Females	Approved	< 40	15	43
	Not Approved	<40	0	3
	Approved	?40	31	75
	Not Approved	?40	0	0

Source: Survey Data, 2002

Table 3: Distribution of Respondents According to Cell Structure

Y =1 or 2/x $_{ijk}$	No.	%
$y = 1/x_{111}$	65	8
$y = 2/x_{111}$	0	0
$y = 1/x_{112}$	106	13
$y = 2/x_{112}$	5	16
$y = 1/x_{121}$	156	19.3
$y = 2/x_{121}$	18	2.2
$y = 1/x_{122}$	280	34.6
$y = 2/x_{122}$	12	1.5
$y = 1/x_{211}$	15	1.9
$y = 2/x_{211}$	0	0
$y = 1/x_{212}$	43	5.3
$y = 2/x_{212}$	3	0.4
$y = 1/x_{221}$	31	3.8
$y = 2/x_{221}$	0	0
$y = 1/x_{222}$	75	9.3
$y = 2/x_{222}$	0	0
Total	809	100

Survey data, 2000

Parameter estimates from the logit analysis

Table 4 shows that parameter estimates as obtained from the logit model. The results reflect the effect (the coefficient value) of the interactions of the variables in each cell on the variation in the conditional probability of Y (dependent variable) assuming the value of 1, i.e. loan decision being "yes". In other words, the parameter estimates fro each cell indicate whether the probability the y assumes the value 1 (i.e. P(y=1) will increase or decrease. hence, the results showed that cell 1.1.1; 1.12; 1.2.1; 1.2.2; 2.2.1 and 2.2.2 indicate a possible increase in the probability that Y is 1, with highest possible increase being indicated by cell 1.2.2, with parameter estimate 2.62. That is, being a male, above 40 years old without formal education. This may be related to the fact that this class of respondents will be willing to stay on with their farming activities since they do not possess qualifications for other jobs and will be able to service their loans. Moreover, this also falls within the available rural labor force when younger ones might have migrated to cities and older ones have retires from farming. However, cells 2.1.1 and 2.1.2 indicated a possible decrease in the probability that Y = 1. The highest possible decrease is recorded in cell 2.1.1, with a parameter estimate of -).35. That is, being female, below 40 years old and with formal education. This may be as a result of the possible further educational ambitions of this category which may hinder their ability to service their loans. It may also be because females may be too involved in household chores to have enough time fro farming activities to be able to service their loans. A close look at the results also showed that the effect of the individual factors were not significant in the loan decision process as shown by their t-values. Formal education in particular did not seem to exhibit any influence on loan delivery decisions as reflected by the parameter estimate of cell y = $1/x_{122}$. That is farmers without formal education from the same locality without communication barrier. However, the parameter estimate showed the age factor to be quite important as all cells with age below 40 years old had lower values of probable decrease in probability of loan decision being positive. This also may be associated with the fact that they may not likely take to farming as they seek white collar jobs, hence people within that low age range may not belong to farmers' cooperatives nor seek loan fro farm operations. The effect of gender was obviously displayed by cells 2.1.1 and 2.1.2 as the parameter showed a possible decrease in the probability of loan decision being "yes" as against a possible increase by the males in cell 1.1.1 and 1.1.2.

Table 4. Parameter estimates based on the Logit Model

Cell interaction with $P(y=1/x_i$	Parameter Estimates	Standard Error	t-values
1,1,1	1.34	2.79	0.48
1,1,2	1.50	1.04	1.44*
1,2,1	2.10	4.37	0.48
1,2,2	2.62	1.86	1.43*
2,1,1	-0.35	1.20	-0.29
2,1,2	-0.11	1.99	-0.06
2,2,1	0.38	1.73	0.22
2,2,2	1.57	3.13	0.50
Goodness of fit statistics:			
No. of observation:	809		
Chi-square (X^2), df = 7:	29.20***		
Likelihood ratio (G^2):	35.01***		

Source: Survey data, 2002

* Significant at 10%

* Significant at 1%

This shows that the men had a higher possibility of receiving farm loans than women. This may be due to the fact that the most capital intensive farm operations (land clearing and preparation) are usually done by men. The most important factors influencing the loan delivery decisions were therefore found to be gender and age. The goodness of fit with a Chi-square (X^2) value of 29.20 and a likelihood ratio (G^2) of 35.01 showed a statistical significance of the combine effects of all the factors at 0.01 level.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This study examined gender, age and education status as factors influencing loan delivery decisions by agricultural Cooperative Societies in Edo and Delta States using the logit model. All the Cooperatives studied were multi-purpose with a 4: 1 male to female membership ratio. The cross categorical analysis showed that being a male above 40 years of age without formal education had the highest possible likelihood of increase in the probability of loan decision being positive, giving a parameter estimate of 2.6189. Being a female, below 40 years of age with formal education had the highest possible likehood of decrease in the probability that the loan decision would be positive with a parameter estimate of – 0.3502. This shows that being education may not have any advantage over the non- education in terms of qualifying for farm credit. However, the overall combined effort of all factors showed high statistical significance even at 1% with chi-square (X^2) value, of 29.2 and likelihoodG^2 of 35.013 at 7 degrees of freedom.

The study therefore concludes that the main factors influencing loan delivery decision are gender and age. This means that cooperatives consider gender and age as main factor to approve loans for farmers which may be due to the different farm operations men and women are involved in as well as the active age in farming.

It is therefore suggested that Cooperative Societies should give equal consideration to both male and female farmers especially with the present high involvement of women in almost all agricultural activities to enhance agricultural production. There may also be need to consider applicants below 40 years of age for farm loans as the high unemployment rate may give them no other source of living than farming. The education applicants should also not be lift out in order to have a source of living considering the high rate of unemployment and at the same time transfer some technological innovation to the rural farmers through their participation to enhance production. For the present "Back to Land" policy to be effective, all the categories of applicants for credit need to be considered.

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