

Socio-Economic Determinants of Rice Farmers' Loan Size in Shama, Ghana

¹Henry De-Graft Acquah and ²Joyce Addo

¹Department of Agricultural Economics and Extension University of Cape Coast, Cape Coast, Ghana

²Institute for Development Studies University of Cape Coast, Ghana

Abstract: Farm credit can stimulate the transfer of technology into agriculture and hence lead to increased crop yield. However, most often than not farmers are faced with the problem of loans received being far lower than what they applied for. The objectives of this study are therefore to: (i) analyze the size of loan applied for and received (ii) identify the constraints regarding loan obtainment and (iii) analyze the socioeconomic determinants of farmers' loan size. A random sample of 91 rice farmers from Shama in the western region of Ghana was used for the study. A well structured interview schedule was the main tool for data collection, while descriptive statistics and multiple regression analysis were the main analytical techniques. The farmers interviewed stressed loan availability and accessibility as major problems. The size of loan received by farmers was far lower and significantly different from the amount applied for. Empirical results from the regression analysis find the farm size, income and years of farming experience as positive and significant predictors of farm loan size.

Key words: Rice farmers • Socio-economic determinants • Loan size • Regression analysis

INTRODUCTION

The development of Agriculture requires adoption of new technology which is largely depended on availability of agricultural credit. Thus, the provision of agricultural credit can be a powerful economic force for development if it is used to inject appropriate capital or agricultural inputs which lead to output expansion.

Availability and accessibility of credit can stimulate the transfer of technology into agriculture, alleviate the constraints inherent in farming and hence lead to increased crop yield. Importantly, access to adequate credit increases the ability of farmers to acquire agricultural inputs essential for production and also increase their risk-bearing ability.

Despite the positive effect of agricultural credit on output and employment in many developing countries, credit institutions find it difficult to lend to small-holder farmers. They perceive agricultural lending as a risky endeavor because of high loan default by farmers in many developing countries. As a result, farmers access to credit is mostly far below what they apply for and this continues to impede the transfer of technology and investment into agriculture.

This paper therefore attempts to analyze the socio-economic factors that determine rice farmers' loan size. Specifically, the paper aims to (1) examine the socio-economic characteristics of the rice farmers; (2) analyze the size of loans they apply for and received; (3) identify the various constraints in their activities; (4) analyze the socio-economic determinants of loan size using regression analysis.

Previous Studies: Agricultural credit has for long been identified as a major input in the development of agriculture in developing countries, including Ghana. Yet, most of the time farmers are faced with situations in which their access to credit is often far below what they apply for. This may lead to their inability to pay back the loan on time and may explain high level of loan default by farmers in most developing countries. Many studies have tried to examine the determinants of loan size and loan repayment performance among various socio economic groups.

Oboh and Kushwaha [1] examined the socio-economic determinants of farmers' loan size in Benue State, Nigeria. Empirical results from regression analysis identified the coefficients of annual income, distance, farm size and previous loan status as significant and positive

signs indicating that these variables encouraged larger loan size to farmers.

Olagungu and Ajiboye [2] using a tobit regression analysis evaluated agricultural lending process in Oyo and Ondo States, Nigeria. Tobit estimates showed that institutional, environmental and part of the resource variables were important determinant factors of loan approval decision. Farm size had a positive significant effect on the probability of loan approval. However, demographic and household size variables were not significant in the model.

Rahji and Adeoti [3] examined the determinants of agricultural credit rationing by commercial banks in South-Western Nigeria. Evidence from the estimated logit model indicated the farm size of the farmers, previous year's income, enterprise type, household net worth and level of household agricultural commercialization as significant but negative factors influencing the bank decision to ration credit. Number of dependents in the household has a positive significant impact on the probability of being credit constrained by the banks.

Tran, Tho Dat [4] used a logit model and OLS regression to examine determinants of households' access to formal credit in Vietnam. The results showed farm size, farm size squared, total number of household members, number of dependents, the possibility of pledging collateral and social participation as having significant impact on the probability of access to formal credit.

Tra and Lensink [5] compared lending policies of formal, informal and semi-formal lenders with respect to household lending in Vietnam. Their analysis suggests that the probability of access to formal credit increases if borrowers provided collateral, a guarantor and/or borrow for business related activities and also increase in household welfare up to a certain threshold, but at a decreasing rate.

Empirical work by Arene [6] showed that income, farm size, age of farmers, farming experience and level of formal education of farmers contributed positively to the credit worthiness of farmers.

Turkey [7] in his research reviewed four alternative credit scoring models for agricultural loans, namely the linear probability model, discriminant analysis, logit and probit. The economic models were based on 9,403 loan applications for Canada's farm credit corporation. Results indicated that there was not a great deal of difference in underlying assumptions and statistical properties. The predictive accuracies of the four models were as follows; Discriminant analysis 71.5 %, logit 69.7 %, probit 69.4 % and linear probability model 67.1 %.

Okorie [8] examined the major determinants of agricultural smallholder loan repayment in Ondo State, Nigeria. Empirical results identified the nature and timeliness of loan disbursement, the number of supervisory visits by credit officers, profitability of the enterprise on which loan funds were invested as significant factors that stimulate loan repayment.

MATERIALS AND METHODS

Study Area Description: Western Region of Ghana covers an area of approximately 2,391 km², which is about 10% of Ghana's total land area. The region has about 75% of its vegetation within the high forest zone of Ghana and lies in the equatorial climatic zone that is characterized by moderate temperatures. It is the wettest part of Ghana with an average rainfall of 1600 mm per annum. It is bounded on the east by Central Region, to the west by the Ivory Coast (Côte d'Ivoire), to the north by Ashanti and Brong-Ahafo Regions and to the south by the Gulf of Guinea. The southernmost part of Ghana lies in the region, at Cape Three Points near Busua, in the Ahanta West District.

The population of the region is 1,924,577, constituting about 10% of the total population of the country. The region is endowed with considerable natural resources, which give it a significant economic importance within the context of national development. It is the largest producer of cocoa, rubber and coconut and one of the major producers of oil palm.

Western Region is one of the most economically active regions in the country. Both agriculture and industry feature prominently in the region's economic activities and influence the demographic complexities of the various districts.

Shama: Shama is a town in the western region of Ghana. Its geographical coordinates are latitude 4° 59' 54" N and longitude 1° 38' 23" W with a population range between 10,000-20,000.

Figure 1 shows the Shama Ahanta East Metropolitan which houses Shama.

Sampling and Sample Size: The target population was rice farmers in Shama in the Shama Ahanta East Metropolitan in the western region of Ghana who obtained credit from the Agricultural Development Bank. A random sampling technique was used to select 91 rice farmers in Shama who received loans to support their activities.

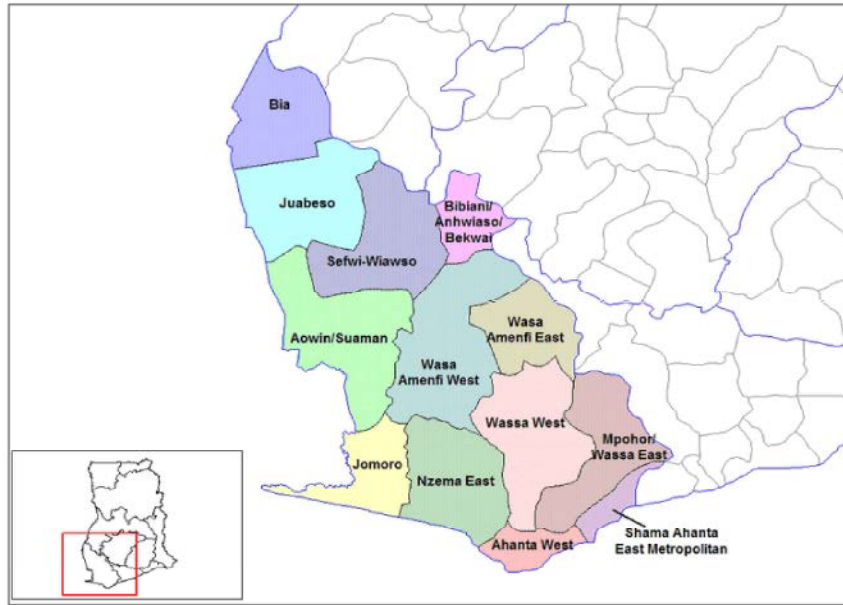


Fig. 1: Map of Districts in the Western Region of Ghana

Data Analysis: An interview schedule was the main tool of data collection while descriptive statistics and multiple regression analysis were the main analytical techniques. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 15.0 and the R Statistical Programming Language version 2.12.0. While frequency, percentages and means were used to describe the socio-economic characteristics of respondents, the paired – sample t-test was employed to test for any significant difference between the amounts of loan demanded by and supplied to farmers. Multiple linear regression model was used to analyze factors affecting the size of loan received by respondents. Specification of multiple linear regression model using matrix notation becomes:

$$Y = \beta X + \varepsilon \quad (1)$$

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_n \end{bmatrix} \quad X = \begin{bmatrix} 1X_{11} & X_{21} \\ 1X_{12} & X_{22} \\ 1X_{1n} & X_{2n} \end{bmatrix} \quad b = \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_n \end{bmatrix}$$

The method of least squares is used to obtain the beta estimates that minimize the sum of the squared deviations as follows:

$$\text{Min}(Y - X\hat{\beta})(Y - X\hat{\beta}) \quad (2)$$

$$\begin{aligned} 2X(Y - X\hat{\beta}) \\ X'Y - X'X\hat{\beta} &= 0 \\ X'X\hat{\beta} &= X'Y \\ (X'X)^{-1}X'X\hat{\beta} &= (X'X)^{-1}X'Y \\ I\hat{\beta} &= (X'X)^{-1}X'Y \\ \hat{\beta} &= (X'X)^{-1}X'Y \end{aligned} \quad (3)$$

This research uses information criteria as technique for providing the basis for model selection. Most commonly used information criteria such as Akaike Information Criteria (AIC) and the Bayesian Information Criteria are employed. The idea of AIC [9] is to select the model that minimizes the negative likelihood penalized by the number of parameters as specified in the equation (1).

$$AIC = -2 \log(L) + 2p \quad (4)$$

Where L refers to the likelihood under the fitted model and p is the number of parameters in the model. Specifically, AIC is aimed at finding the best approximating model to the unknown true data generating process and its applications draws from [9, 10, 11].

The Bayesian Information Criteria (BIC) is derived within a Bayesian framework as an estimate of the Bayes factor for two competing models [12,13]. BIC is defined as:

$$BIC = -2 \log(L) + p \log(n) \quad (5)$$

Where L refers to the likelihood under the fitted model, p is the number of parameters in the model and n is the sample size. Models that minimize the Bayesian information criteria are selected. From a Bayesian perspective, BIC is designed to find the most probable model given the data.

RESULTS

Socio-Economic Profile of Respondents: In an attempt to investigate their socio-economic characteristics, farmers were asked questions pertaining to that. Results revealed that majority of the farmers were in the age ranges 32-51 years with an average age of 45.29 years. 61.5% of the farmers were males whilst 38.5% were females. Farmers spent an average of 6.55 years in formal education, whilst they had an average household size of 5.91 persons. Farmers had an average farming experience of 8.58 years and operate on an average farmland of 2.75 (acres). Results also revealed that farmers had an average annual income of GH¢1896.92 with an average of 25.12 bags of rice harvested annually.

Based on the results from the analysis, it can be seen that most of the rice farmers included in the sample fall within the productive age and they had long years of farming experience. However, given their low level of education, small farmland, low annual earning and large household size, availability of credit may be used to enhance farm productivity.

Size of Loan Applied for and Received: In an attempt to examine the disparity between sizes of loan applied for and received, farmers were asked to indicate the size of loans they applied for and received in the last season. Of the farmers interviewed, 75.8% applied for GH¢1000 or less; 18.7% applied for loan between GH¢1100-GH¢2000; 3.3% applied for loan between GH¢2100-GH¢5000. Only 2.1% applied for loan more than GH¢5000. The average loan applied for was GH¢1127.473.

However, 59.3% of the farmers received loan between GH¢500 or less; 31.9% received loans between GH¢510-GH¢1000; only 2.2% received loans greater than GH¢2000. The average loan size received was GH¢644.198. The paired sample t-test finds a significant difference between the amount of loan demanded by and supplied to the farmers with a t value of 3.8515 and a P value of 0.000186.

This problem faced by farmers concerning their access to loans being far lower than what they apply for is likely to lead to credit diversion by the farmers.

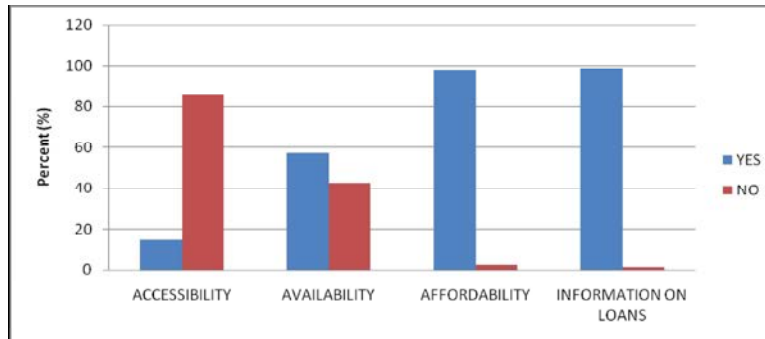


Fig. 1: Constraint regarding loan obtainment

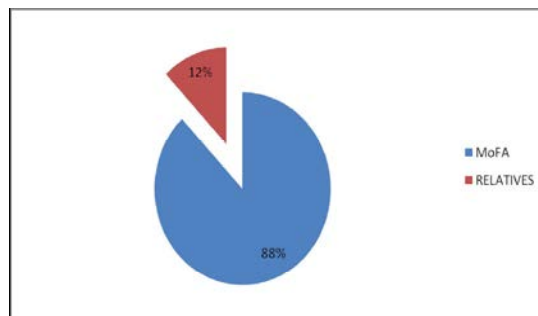


Fig. 2: Sources of information on loans

Table 1: Parameter estimates of the Multiple Regression Model

Variables	Estimates	Std. Error	t value	Pr (> t)
AGE	2.892	1.933	1.496	0.1384
EDU	8.138	8.057	1.010	0.3153
INC	0.068	0.031	2.182	0.0318*
EXP	13.498	6.895	1.958	0.0535.
FS	90.860	22.969	3.956	0.0001***

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 374.5 on 86 degrees of freedom

Multiple R-squared: 0.7984, Adjusted R-squared: 0.7867

F-statistic: 68.12 on 5 and 86 DF, p-value: < 2.2e-16

Note: AGE= Age of respondents, EDU= Years of education, INC= Annual Income of respondent, EXP= Experience (measured by years of farming), FS= Size of farmland

This is because loan size that is inadequate for meaningful investment is likely to be diverted to solve non-farm needs thereby reducing their loan repayment ability and intensifying their poverty conditions.

Constraint Regarding Loan Obtainment: In an attempt to examine the constraints regarding loan obtainment, farmers were asked to express their opinion on whether loans were accessible, available, affordable, as well as information adequacy on loans.

The results revealed that 85.7 % of the farmers stressed loans accessibility as a problem in the area; only 14.3% thought loans were accessible. This can be attributed to the long distance travel to process formal loans. The results revealed an average of 17.214 Km between source of loans and homes of farmers. 57.1 % of the farmers interviewed thought loans were available, yet 42.9% stressed loan availability as a problem. On the issue of affordability of interest on loans, almost all (97.8%) the farmers thought loans were affordable. 98.7% of the farmers had enough information on loans.

Sources of Information on Loans: Results revealed existence of adequate information on loans. Consequently, farmers were asked to identify their sources of information on loans. More than half (87.9%) of the farmers interviewed had information from officers from Ministry of Food and Agriculture (MoFA). Only 12.1 % had information from their own relatives.

Determinants of Size of Loans Received by Farmers: A multiple regression analysis was employed to analyze the socio-economic factors that influence farm loan size. The Akaike Information Criteria [9] and the Bayesian Information Criteria [12] provided the basis for selecting the model that provided the best fit to the Loan size model detailed in Table 1.

The model specification with loan size as the dependent variable and age, years of education, income, experience and farm size as the covariates provided the best fit with AIC and BIC of 1343 and 1358, respectively. The model estimation result reveals a positive relationship between loan size and the regression covariates (i.e. Age, years of education, annual income, years of farming experience and farm size). The regression analysis finds the farm size, income and years of farming experience as significant predictors of farm loan size. The covariates in the model explained 78% of the variation in the farm loan size.

CONCLUSION

Availability and accessibility of credit can stimulate the transfer of technology into agriculture, alleviate the constraints inherent in farming in developing countries and hence lead to increased crop yield. However, most often than not farmers are confronted with the problem of loans received being far lower than what they applied for. This consequently leads to loan diversion and poor repayment performance of farmers. The objectives of this study were therefore to analyze the size of loan applied for and received, identify the constraints regarding loan obtainment and analyze the socioeconomic determinants of farmers loan size received.

The study showed that majority of the loan beneficiaries had poor socio-economic background such as low level of education, small farm size, low annual income and large family size. The size of loan received by farmers was far lower and significantly different from the amount applied for. The farmers interviewed stressed loan availability as a problem. The study identified farmer-related factors such as income, farm size and experience in farming as having significant effects on the size of loan received. It is recommended that the Agricultural Development Bank increase the volume of loan facilities to the agricultural sector for onward disbursement to the farmers. The increase in individual loan size of the farmers will lead to increase farm output, productivity and income.

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