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Determinants of loan repayment default among farmers in Ghana

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This paper investigates the determinants of loan repayment default among farmers in Brong Ahafo region of Ghana. Data used in this study was gathered through a survey of 374 farmers in five districts within Brong Ahafo region of Ghana. The study employed Probit model to investigate factors that influence farmer's loan repayment default. The results showed that farm size, and engagement in off-farm income generating activities reduces the likelihood of loan repayment default significantly. Also, larger loan amount and longer repayment period as well as access to training are more likely to reduce loan repayment default. Thus, any policy that aimed at improving farm sizes, farm income and cultivation of cash crops would significantly reduce loan repayment default. In addition, loan repayment default would reduce if lenders train their loan beneficiaries and offer them adequate amount of loan and longer repayment period.

Key words: Loan repayment default, farmers, Brong Ahafo region, Ghana, probit.

INTRODUCTION

In developing countries, improvement in productivity through investment in productive ventures, especially in the agricultural sector where majority of the population derive their livelihood is necessary for accelerated economic growth. At low levels of income, the accumulation of savings may be difficult. Under such circumstances, access to loans can help poor farmers to undertake investment and increase productivity. Agricultural household models suggest that farm credit is not only necessitated by the limitations of self-finance, but also by uncertainty pertaining to the level of output and the time lag between inputs and output (Kohansal and Mansoori, 2009). Also, facilitation of access to credit for the rural poor plays a role in alleviating rural poverty.

Despite these advantages, small scale farmers have mostly been locked out of the formal financial system. This is primarily due to the lack of 'bankable' collateral, high administrative costs and perceived high risks associated with agricultural and small scale farmers (Awoke, 2004).

Thus, in order to increase agricultural productivity especially among the rural poor and to assist rural households in maintaining food security, many governments in

developing countries initiated credit programmes with the idea that rural smallholder farmers will have access to formal sources of credit (Dong and Feathersone, 2010).

In Ghana, several policies were adopted to promote access to financial services by farmers. These policies include provision of capital for the establishment of specialized bank to serve agriculture, Agricultural Development Bank (ADB) and Rural banks (Addaeh, 1989). Rural banking system was introduced in 1976 when it was realized that Agricultural Development Bank (ADB) tends to be urban based and do not have the capacity to reach large proportion of farmers (Kumah and Agbogah, 2001). The objective of establishing rural banks was to provide financial intermediation in the rural areas of the country to promote accelerated growth of the economy and to improve the living standards of majority of people in the agricultural sector.

The Bank of Ghana also sets minimum deposit rate and places ceiling on lending rate. In addition, it mandated all banks to allocate 20% of their outstanding credit to the agricultural sector. These policies rather led to high default rates and accumulation of non-performing assets with consequent heavy losses. Also, high inflation

rates during this period wiped out the capital base of most of the banks pushing them into a state of bankruptcy (Gockel, 1995). Mensah (1997) noted that credit allocation to agricultural sector declined in real terms. To arrest the situation and improve credit allocation to the agricultural sector, Financial Sector Adjustment Programme (FINSAP) was implemented in the early 1990s with a broad objective of developing competitive financial system with private sector participation in the delivery of financial services.

Ghana now has a competitive financial system with 23 universal banks, 126 rural banks and 41 non-bank financial institutions including (14) savings and loans companies as at the end of December 2010 (BoG, 2010). Despite these developments, only 9.9% of rural households had access to credit from formal financial institutions (GSS, 2008). Also a study by Awunyo-vitor and Abankwa (2012) revealed that 64% of formal financial institution operating in Brong Ahafo region do not offer credit to farmers due to poor repayment by the beneficiaries. Furthermore, agricultural credit is somewhat different from most loans offered by formal financial institutions. In the case of other loan types, such as salary loan and business loan, the repayment is by instalment. Hence, formal financial institutions can easily monitor loan repayment and this reduces default. Agricultural credit is however, offered as terminal loan, in that both the principal and the interest are paid at the end of the loan period. The question of repayment of loan by farmers is one of the important questions since it influences access to credit by the farmers. Thus, the aim of this study is to empirically investigate determinants of loan repayment default among farmers.

METHODOLOGY

The study was conducted in five districts within Brong Ahafo region of Ghana. Multistage sampling techniques were used to select the respondents and first purposive sampling technique was used to select the districts. This was guided by the level of agricultural activities within the districts using official statistics from Ministry of Food and Agriculture (MoFA, 2009). The study districts are Sunyani, Dormaa, Techiman, Nkoranza and Kintampo. Secondly, simple random sampling technique was used to select operational areas within the selected districts and respondents respectively. An operational area is a spatial unit canvassed by one agricultural extension agent.

The total number of respondents was estimated using estimation method given by Bartlett et al. (2001) as:

$$n = \frac{S^2(x)(y)}{(E)^2} \quad (1)$$

where n = Sample size; x = The proportion of agricultural credit recipient who default in loan repayment; y = The proportion of agricultural credit recipient who repay their loan; S = Number of

standard deviation for a chosen confidence interval level; E = The allowable margin of error.

According to Ghana Livings Standard Survey (GLSS), five report about 42% of farmers who benefited from agricultural loan from formal financial institutions default (GSS, 2008). Thus, assuming 95% confidence level and 5% margin of error, we have:

$$n = \frac{1.96^2 \times 0.42 \times 0.58}{0.05^2} = 374 \quad (2)$$

Therefore, 374 farmers were sampled for the study. The data was obtained from a primary source through a structured questionnaire and was analyzed using computer based STATA software version 10.

Analytical framework

Agricultural loan is terminal loan in that, both the principal and interest are paid at the end of the loan term. Thus, farmer's loan obligation falls due at the end of the loan term. Defaulters are those who are not able to honour their loan obligation when it falls due. Therefore, a farmer may either default (do not honour loan obligations) or honour his loan obligations resulting in two mutually exclusive alternatives.

The framework for estimating phenomena in which the dependent variable is binary has its roots in threshold theory of decision making. According to this theory, decision is taken only after the strength of a stimulus increases beyond the individual's reaction threshold (Hill and Kau, 1981). Thus, once a farmer faces a choice, he has a reaction threshold which yields a binary dependent variable y_i which takes on the value of zero (if the farmer honour his loan obligations) and 1 if he defaults (does not honour his loan obligations) and influenced by several factors x_i . The probability of observing the value of 1 is:

$$P_r \left(y_i = \frac{1}{x_i \beta_i} \right) = F(-x_i \beta_i) \quad (3)$$

Where F is a cumulative distribution function, it is continuous, strictly increasing function that takes a real value and return a value which ranges from 0 and 1. The probability of observing the zeros is:

$$P_r \left(y_i = \frac{0}{x_i \beta_i} \right) = 1 - F(-x_i \beta_i) \quad (4)$$

Given such specification, a maximum likelihood estimate is used to estimate the parameters of the model. The dependent variable is unobserved latent variable that is linearly related to y_i by the equation:

$$y_i - \beta_i x_i + \mu_i \quad (5)$$

Where μ_i is a random disturbance term. The observed dependent variable is determined by whether y_i exceeds a threshold value or otherwise and this is given as:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} \quad (6)$$

where y_i^* is the threshold value for y_i and is assumed to be normally distributed. Common models for estimating such parameters include Linear Probability Model (LPM), Probit and Logit models (Maddala, 2005). LPM is deficient because the probability does not always lie between zero and one (Gujarati, 1988). The choice is between logit and probit. According to the report by Johnston and DiNardo (1997), the difference between logit and probit is rarely large to discriminate between them because both seem to produce similar result.

Model

The study adopted the probit model partly because of its ability to constrain the utility value within 0 and 1 and its ability to solve the problem of heteroscedasticity. Following from the report of Madala (2005), the probit model adopted for the study is specified as:

$$P_i = P(y_i^* < y_i) \quad (7)$$

$$P_i = P(y_i^* < \beta_0 + \beta_i x_{ij}) = F(y_i) \quad (8)$$

$$P_i = F(y_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{y_i} e^{-\frac{s^2}{2}} ds \quad (9)$$

Where P_i is the probability that a farmer will make a particular choice or probability that a farmer would default or not default; S is a random variable normally distributed with a mean zero and unit variance y_i is the dependent variable (loan default); y_i^* is the threshold value of the dependent variable. To obtain an estimate of the index Z_i , the inverse of the cumulative normal function is used and given as:

$$y_i = F^{-1}(P_i) = \beta_0 + \beta_i x_i + \mu_i \quad (10)$$

The parameters β_0 and β_i of the probit model do not provide direct information about the effect of the changes in the explanatory variable and the probability of default alone. The relative effect of each explanatory variable on the likelihood that a farmer will default is given by:

$$\frac{\partial P_i}{\partial x_{ij}} = \beta_{ij} * f(Z_i) \quad (11)$$

Where P_i is the mean dependent variable whose value is given in the probit result as:

$$f(Z_i) = F^{-1}(P_i) \quad (12)$$

The elasticity of the predicted probability is then computed as:

$$\frac{\partial P_i}{\partial x_{ij}} = \beta_{ij} * f(Z_i) * \frac{Z_i}{P_i} \quad (13)$$

Guided by related studies (Oni et al., 2005; Kohansal and Mansoori, 2009; Oke et al., 2007) socio-economic attributes were identified and hypothesis constructed regarding farmers loan

default. Gender (GEN) of the respondents is included because male farmers are known to have greater access to formal credit than female farmers (Omonona et al., 2010), due to their farm sizes and commercial orientation which can lead to higher loan repayment rates. Thus, male borrowers may have high loan repayment rates (Roslan and Karim, 2009). A dummy variable was used to specify the gender of the respondents. A value of 1 was assigned to males and 0 to females. The coefficient of this variable is expected to be negative.

Higher levels of formal education enables borrowers to comprehend more complex information, keep records, conduct basic cash flow analysis and generally speaking, make the right investment decisions. Eze and Ibekwe (2007) found educational level to have negative effect on loan repayment default. Educational level of respondents was specified as number of years spent in school (YEDU). It is hypothesized that borrowers with higher levels of education are less likely to default in loan repayment. It is argued that older borrowers are wiser and more responsible than younger borrowers. On the other hand, younger borrowers are argued to be more knowledgeable and more independent. A study by Oladeebo and Oladeebo (2008) on determinants of loan repayment among small scale farmers in Nigeria revealed that age had significant positive effect on loan repayment. Hence, age is hypothesized to have negative effect on loan repayment default. Age (AGE) is specified as farmer's age in years at the time of interview (March, 2011). Some farmers engage in secondary occupation or off-farm income generating activities (OFFINCO) to supplement their farm income. It is assumed that a farmer who engage in off-farm income generating activities are less likely to default in loan repayment as they may use income from off-farm sources to support loan repayment. This variable is assigned 1 if the farmer engages in off-farm income generating activities and 0 otherwise. It is expected to have negative relationship with probability of loan repayment default. Distance (DIST) from the farmer's residence to the lending institution. If a borrower is located near to the lender, it is easier for the lender to get information and monitor borrowers and provide appropriate assistance to reduce loan repayment default. Thus, borrowers who lived closer to their lenders are less likely to default on loan repayment.

It is also argued that the larger the farm size, the higher the possibility of generating higher income generated from the farm. Thus, borrowers with larger farm sizes are less likely to default on loan repayment. Farm size (FSIZE) is specified as total area cropped by the farmer in acres. This variable is expected to have negative relationship with probability loan repayment default. Types of crops grown by the farmers have different level of risks and return, consequently loan repayment. Types of crops grown (TCROP) is specified as dummy variable and a value of 1 is assigned to cash crop and 0 otherwise. It is expected that farmers who grow cash crops are less likely to default on loan repayment.

As the absolute amount of the loan [AMLON] increase, the authority to delegate responsibility for it is more limited and that smaller amount of loans may be insufficient resulting in cash flow problems (Roslan and Karim, 2009; Oladeebo and Oladeebo, 2008). With small amount, loan farmers might not be able to buy necessary inputs that would give them optimum yield. This is likely to affect their income and loan repayment negatively. This variable is captured as amount of loan taken by the farmer in 2010. It is expected that this variable would have negative effect on loan repayment default probability. Repayment period (REPAY) refers to the period of time during which the entire loan must be repaid. In the case of agricultural loan, the repayment is done not during the period but at the end of the repayment period. Ledgerwood (1999) demonstrates that cash flow in part determines the

debt-servicing capacity of borrowers. Shorter repayment period might cause the borrower not to have generated enough revenue to settle his loan obligations. Repayment period is hypothesized to have negative effects on the probability of loan repayment default.

As household size (HSIZE) increases, expenditure on food and other household needs also increase. The higher expenditure tends to make borrowers more resource constrained and may affect loan repayment. It is thus expected that as household size increases the loan repayment default will also increase. Training [TRAIN] some of the financial

institutions organise training for credit recipient where they educate them on credit management. Roslan and Karim (2009) found training received by microcredit beneficiaries in Malaysia to have negative and significant effect on repayment default. This variable is specified as dummy variable where 1 is assigned to respondent who received training and 0 otherwise. It is expected that those who have access to training are less likely to default. Hence the coefficient of training variable is expected to be negative. The empirical model is specified as:

$$Y = \beta_0 + \beta_1 \text{GEN} + \beta_2 \text{YEDU} + \beta_3 \text{AGE} + \beta_4 \text{OFFINCO} + \beta_5 \text{DIST} + \beta_6 \text{FSIZE} + \beta_7 \text{TCROP} + \beta_8 \text{AMLON} + \beta_9 \text{REPAY} + \beta_{10} \text{HSIZE} + \beta_{11} \text{TRAIN} + \mu_i \quad (14)$$

Agricultural loan contract does not allow instalment payment. Therefore, the dependent variable Y is the loan repayment default which takes the value of 1 if the farmer defaults in loan repayment and 0 otherwise.

RESULTS AND DISCUSSION

Descriptive statistics

The descriptive statistics of the variables used in the regression analysis are shown in Table 1. The average years of schooling is 6 years with a standard deviation of 5.033. The results show that on the average farmers interviewed spent 6 years in formal school. The deviation of 5.033 suggests that most of the respondents had primary school education. On the average, distance between residence of the farmers and nearest formal financial institution is about 1 km with a standard deviation of 9.75. This depicts that the respondents are not too far away from nearest formal financial institution. In the case of farm size farmers on average cultivate 3.8 acres of land with a dispersion of 12.6. This support observation made by Chamberlin (2007) that average farm size in Ghana is about 2.5 to 10 Acres. Average amount of credit offered to respondent is Gh¢ 378 with a standard deviation of 14.74.

Factors influencing loan repayment default

From the results in Table 2, the Probit regression gave a McFadden R – squared of about 0.64. The log likelihood ratio (LR) statistic is significant at one percent, meaning that at least one of the variables has coefficient different from zero. Therefore, it can be concluded that the Probit model used has integrity and is appropriate. The validity of the probit model in estimating probability of loan repayment default is consistent with related studies by Oladeebo and Oladeebo (2008), Oke et al. (2007) and Kohansal and Mansoori (2009).

The coefficient for off-farm income generating activity variable is negative and significant at 5% probability level (Table 2). Farmers who are engaged

in off farm income generating activities are less likely to default in loan repayment because they can use income from the off- farm income generating activities to support loan repayment. Farm size variable had the expected negative sign; significant at 5% and elastic (Table 2). This is consistent with the findings of Oladeebo and Oladeebo (2008); in Nigeria where they observed that as farm size increase loan repayment also increases. Increasing farm size by one acre would decrease the likelihood of loan repayment default by 40.4%. This may be due to the fact that increase farm size results in marketable surplus which increase earnings from the farm hence make funds available for repayment of credit. As expected, cash crop variable was found to have negative coefficient which is significant at 1%. Farmers who cultivate cash crop have about 99.1% lower likelihood of loan repayment default as compare to their counterparts who do not cultivate cash crop. This is attributed to the fact that farmers who cultivate cash crop are commercially oriented and produce for market hence tend to earn higher income which support loan repayment.

The coefficient for Amount of loan variable is also negative and significant. The result suggests that in terms of amount of loan, the higher the loan amount, the lower the probability for default. This is because with higher loan amount the farmer would be able to purchase all the necessary inputs to increase productivity and consequently increase earnings which can be used to repay loan. This result is in contrast with the finding of Sharma and Zeller (1997) which examines repayment performance beneficiaries of group-based credit programmes in Bangladesh. However, it supports the finding by Jimenez and Saurina (2004) who found repayment to be positively correlated with loan amount. Increasing the amount of loan offered to the farmer by one Ghana Cedis decreases the likelihood of loan repayment default by 0.26%.

The coefficient for repayment period is negative and significant at 10% level. One month increase in loan repayment period decreases the likelihood of loan repayment default by 65.5%. This gives an indication that

Table 1. Description of explanatory variables used in the model.

Variable	Symbol	Unit of measure	Frequency/Means	Standard deviation
Repayment default	Y	Binary	0=165;1=209	0.598
Gender	GEN	Binary	0=123; 1=251	0.427
Years of schooling	YEDU	Years	6.5 years	5.033
Age	AGE	Years	44.62	8.909
Off farm income activities	OFFINCO	Binary	0=265; 1=109	0.439
Distance	DIST	Kilometres	1.35	9.789
Farm size	FSIZE	Acres	3.8	12.630
Type of crops grown	TCROP	Binary	0=90; 1=284	0.3147
Loan amount	AMLON	Ghana Cedis (Gh¢)	378	14.740
Repayment period	REPAY	Months	8.4	3.627
Household size	HSIZE	No. of persons	6.4	3.127
Training	TRAIN	Binary	0=201; 1=173	0.4522

Table 2. Probit estimate of determinants of loan repayment default by farmers.

Variable	Coefficient	P-Value	Marginal effect	Average elasticity
Gender	1.2014	0.3997	0.5063	0.629
Years of schooling	-1.153	0.6371	-0.7364	-17.046
Age	0.0907	0.4253	0.6559	51.743
Off-farm income activities	-1.8530**	0.0321	-0.9650	-0.521
Distance	0.0907	0.1503	0.5063	4.032
Farm size	-1.0178**	0.0402	-0.4045	-2.891
Type of crops grown	-15.2253***	0.0043	-0.9919	-1.395
Loan amount	-10.2254**	0.0415	-0.9918	-694.260
Repayment period	0.0154*	0.0545	0.0062	0.113
Household size	-0.4776	0.3119	-0.1898	-1.898
Training	-1.5738***	0.0001	-0.9670	-0.828
Constant	0.0817	0.8050	-	-
Number of observations		374		
Log likelihood		39.0401		
Restr. log likelihood		-108.6294		
McFadden R-squared		0.6806		
LR statistic (11 df)		239.1788***		

The asterisks indicate level of significance *** is significant at 1%, ** significant at 5% and * is significant at 10%.

the probability to default is lower the longer the repayment period. This is due to the fact that with longer repayment period farmers do not sell during the glut period. They could store their produce and wait for better price which increase earning and their repayment capacity. The finding supports the argument that cash flow in part determines the debt-servicing capacity of borrowers (Ledgerwood, 1999).

The coefficient for Training variable is also negative and significant at 1% probability level. This finding compares favourably with the results of Roslan and Karim (2009). They found that training reduces loan repayment default among microcredit beneficiaries in

Malaysia. This shows that borrowers that have training organised by the lenders have about 96.7% lower probability to default in loan repayment compared to those borrowers who did not undergo any training.

Conclusion

The results obtained in this study revealed that engagement in off farm income generating activities has the potential to reduce loan repayment default. Similarly increase in farm size decrease the probability of repayment default by the farmers respectively.

In addition, farmers who grow cash crops are less likely to default on loan repayment.

This study also discovers that the loan characteristics influence loan repayment delinquency. The result suggests that, the larger the size of the loan, the lower the probability of repayment default. Similarly increase in repayment period the more likely it is that farmers would not default in loan repayment.

Furthermore, the study found that training is also an important determinant of loan repayment default. The analysis shows that borrowers that did not have any training from the lenders have a higher probability to default compared to those borrowers who had some training.

A strategy that aimed at encouraging farmers to increase farm size is recommended as a policy option for decreasing loan repayment default among farmers in Ghana. In addition cash crop cultivation should be promoted among the farmers so as to improve their earnings and reduce loan repayment default. Furthermore, as engagement in off-farm income generating activities significantly reduces loan repayment default. It is recommended that lenders in collaboration with the Extension Department of the Ministry of Food and Agriculture (MoFA) should come out with an educational package that will encourage farmers to undertake off-farm income generating activities.

Given that loan amount and repayment period significantly influence loan repayment default lenders should offer an amount that would enable farmers to purchase the required inputs at the required level for optimum yield. Also they should offer them repayment period that would not force the farmers to sell at low prices immediately after harvest when prices are low, this would enable them improve their earning, and consequently reduce loan repayment default. Furthermore, lenders should endeavour to train loan beneficiaries to improve upon loan repayment. Since loan amount and repayment period have significant effect on loan repayment default more work needs to be done in order to carefully assess the optimal level of loan and repayment period that would improve loan repayment among farmers.

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