

Full Length Research Paper

An application of probit analysis to factors affecting small-scale farmers' decision to take credit: a case study of the Greater Letaba Local Municipality in South Africa

T.O. Sebopetji^{1*} and A. Belete²

¹Department of Land Affairs, South Africa.

²Department of Agricultural Economics, University of Limpopo, South Africa.

Accepted 23 June, 2009

Based on primary data collected in the Greater Letaba Local Municipality from 73 small-scale farmers in the 2006 season, this study used the probit modelling approach to analyse the influence household characteristics have on farmers' decision to use credit. The model predicted 84.93 per cent of the sample correctly. The results revealed that farming experience, gender and marital status have positive significant effect on farmers' decision to use credit. In contrast, farmers' age, education level and membership to farmers' association had negative significant effect. The study recommends training on the benefits of farm credit among both borrowers and non-borrowers in rural areas. Most borrowers were male-headed and these imply that targeting female-headed households will most likely improve their likelihood of taking credit. It is recommended that the full rollout of Micro Agricultural Finance Institutions of South Africa (MAFISA) and the imminent implementation of the Communal Land Rights Act (CLARA) will ease the collateral problems of these categories of farmers.

Key words: Small-scale farmers, decision, credit, probit analysis.

INTRODUCTION

South Africa has a dual agricultural economy, with both well-developed commercial farming and subsistence farming in the remote rural areas. Majority of this subsistence farmers are not part of the mainstream agriculture and practice subsistence agriculture in the overcrowded semi-arid areas in the former homelands. Subsistence farming is characterised by low production, poor access to land, poor access to inputs, infrastructure, information and most importantly poor access to credit for production requisites.

Markets in rural areas are often constrained by inadequate property rights and high transaction costs. Despite these problems, some small-scale farmers have managed to produce food for own consumption and the market (Ortmann and King, 2006). Credit is an important instrument for improving the welfare of the poor directly through consumption smoothing that reduces their vul-

vulnerability to short-term income. It also enhances productive capacity of the poor through financing investment in their human and physical capital (Okurut et al., 2004). Access to credit is regarded as one of the key elements in raising agricultural productivity (DBSA, 2005).

Agricultural credit in South Africa

Generally, developing countries established parastatal institutions with the aim of channelling credit to small-scale farmers (Machethe, 2004). Similarly, in South Africa, the Land and Agricultural Bank of South Africa (Land Bank) and the Agricultural Credit Board were established to serve commercial farmers with small-scale farmers served by parastatals in the former homelands. The collapse of such parastatals left small-scale farmers without access to credit services. While the Land Bank's mandate was broadened to accommodate those previously excluded from its services, the bank continues to concentrate on lending to established commercial farmers

*Corresponding author. E-mail: tosebopetji@dla.gov.za.

leaving small-scale farmers with access credit in the form of land reform grants (DBSA, 2005).

The realisation of insufficient progress made in improving access to credit by small-scale farmers prompted the government to establish the Micro-Agricultural Finance Institutions of South Africa (MAFISA) (DBSA, 2005). The Scheme is supposed to address credit needs of small-scale farmers while the Land Bank concentrates on lending to established commercial farmers (AGRITV, 2006).

The launch of MAFISA pilot project is considered as a great initiative as its objectives were:

- (a) To test delivery systems and channels.
- (b) To identify problem areas for solution prior to full roll-out.
- (c) To determine the acceptability of terms in the market.
- (d) To obtain information on performance for future business case projections (National Department of Agriculture (NDA, 2006).

Unfortunately the full rollout of MAFISA became a nightmare. It was noted that in respect of MAFISA, the Department of Agriculture faced major challenges. Disbursement of MAFISA loans had started late, and there had been an interruption due to suspension by the Land Bank and expiry of the pilot agreements. Further challenges included lack of capacity, delayed establishment of accreditation committees, prolonged process lead-times, reliance on over-worked extension offices and a need to change the mindset of end users, to address interest rates and address difficulties in accessing financial services (Parliamentary Monitoring Group (PMG), 2008).

A study in Limpopo Province by Spio (2002) found that the difference in productivity between borrowers and non-borrowers is due to both the use of credit and the pre-existing inherent characteristics of small-scale farmers. The difference measures up to 40% of which 21% is due to credit. Thus, credit can increase the output of a randomly selected farmer by 21%. This assertion is supported by the study in Zimbabwe by Rukuni and Eicher (1994) which shows small-scale farmers doubled maize and cotton production in the 1980s when finance, extension and marketing services were provided. Mushunje and Belete (2001) also found that the provision of training and financial services through credit is important to increase efficiency of resource-poor farmers.

According to French (2007), farm household is the level at which most resources allocations are made. A central factor affecting investment, production and conservation decisions is the farmers' level of control over his land. A farmer with secure tenure is more likely to think of long-term production and conservation activities. The problem of security of tenure or ownership of communal land is supposed to be addressed by the Communal Land Rights Act 11 of 2004 (CLARA) which aims is to provide legal security of tenure by transferring communal land to communities.

Farmers with lack of collateral in terms of land and other assets normally access credit through informal lenders who normally charges higher interests and thus relatively lower profits to borrowers. Most borrowers choose informal financial services because of easy access, variable loan sizes, flexible repayment schedule, personal guarantees, convenience and very short period needed to obtain loan approval (Larson et al., 1994).

Thus, the problem of access to affordable credit by small-scale farmers remains the major problem affecting their production capacity and level. Although servicing this category of farmers has been difficult and costly, credit extension to these farmers should by all means be prioritised. Opportunities exist for lending institutions to serve this category of farmers.

Objectives of the study

The main objective is to analyze socio-economic characteristics that may influence farmers' decision about whether or not to use credit. This study included both information from the borrowers and non-borrowers to avoid the problem of losing valuable information and selectivity bias. Bagi (1983) argues that conventional methods of estimating the demand for credit used information from only those farmers who have actually used credit and neglected those who have not borrowed, thereby not accounting for farmers' initial decision about whether or not to borrow, and consequently valuable information wasted.

METHODOLOGY

The study area and data collection

The study was undertaken in the Greater Letaba Local Municipality (GLLM), one of the Limpopo province's 27 local municipalities which falls under Mopani District Municipality (see Figure 1 for a location map of the study area). There are approximately 79 rural villages within the municipal area and 94% of the people live on state land under custodianship of Traditional Authorities in rural villages (Integrated Development Plan, IDP 2007). The GLLM is the leading area in terms of agriculture, forestry, tourism and small scale mining in the province. It is the largest producer of tomatoes in the southern hemisphere through the ZZ2 tomato estate (MOPANI, 2006).

A structured questionnaire was used to collect information on farmer-household socio-economic characteristics that were considered to be affecting the small-scale farmers' decision on whether or not to take credit. The characteristics include amongst others the following: size of arable land in hectares; farmers' age in years; number of years of formal education; gender, marital status; membership of farmers' associations; farming experience in years; off-farm income; farm-income in Rand per annum; and the number of visits by agricultural extension officers in the year.

Small scale farmers were identified first and then randomly selected for personal interviews. Simple Random Sampling Technique was used taking into consideration cost implications and other relevant factors such as the extent of the study area. The study concentrated on short-term credit, thus cross-sectional data

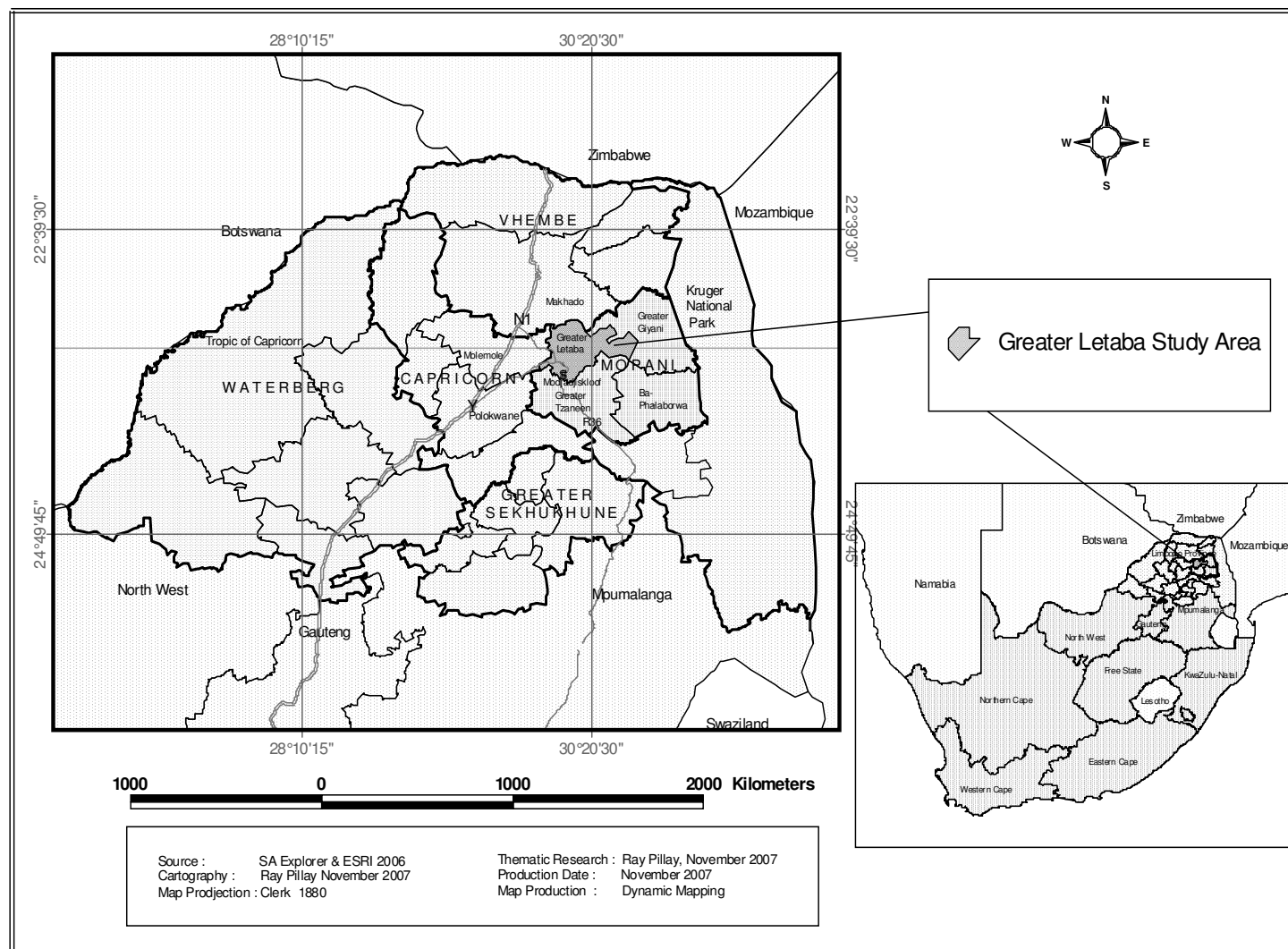


Figure 1. Location map of the Greater Letaba Study area in the Mopani District Municipality, Limpopo Province.

was used. The advantage of simple random sampling is that it is simple and easy to apply when small populations are involved rather than for large populations (ABS, 2005).

Socio-economic characteristics of households

A total of 73 farmers were involved in the study, 57 were non-borrowers and 16 were borrowers. Table 2 summarizes socio-economic characteristics of the households. The average age of the household head in the sample is 53 years, with that of borrowers being 47 years compared to 55 years for the non-borrowers. {All the farmers in the sample cultivated on communal land (have no title deeds to the land), thus land cannot be used as collateral for loans.

Overall, non-borrowers' education level is 50% higher than that of borrowers. This implies that non-borrowers may be having enough off-farm income and thus no need for them to borrow. All of the borrowers were males and 24% of the sampled non-borrowers were female. Overall, 81% of the sampled households were married while 93% of borrowers were married compared to 77% of the non-borrowers. The overall farming experience is 14 years compared to 18 years for borrowers and 12 years for non-borrowers.

From pooled data, as summarized in Table 2, the overall average size of arable land is 6 hectares and is equal to the averages for both borrowers and non-borrowers at 6 hectares. It should be noted that although the farmers farmed on communal land, each farmer had permission to occupy a given size of land. The average farm income for borrowers is higher compared to that of non-borrowers. This is consistent with other findings (example, Spio, 2002).

Overall, 17% of non-borrowers had off-farm income compared to 13% of borrowers. This makes sense as non-borrowers had higher education level compared to borrowers and which may imply that non-borrowers have better jobs and thus higher off-farm income than borrowers. Thus, households with more off-farm income are less likely to borrow. This does not imply that access to credit is not a problem to non-borrowers. Overall, 82% of the sampled households were member of certain farmers' association, with an average of 68% for borrowers and 84% for non-borrowers.

Binary probit model

According to Nagler (2002), probit model constrains the estimated probabilities to be between 0 and 1 and relaxes the constraint that

Table 1. Farmer-household characteristics affecting farmers' decision about whether or not to use credit.

Y_i	Small-scale farmers' decision to use credit (dependent variable) which takes the value of 1 if the farmer used credit, 0 otherwise
x_1	Size of arable land in hectares
x_2	Farmers' age in years
x_3	Number of years of formal education
x_4	Gender; 1 if a farmer is a male, 0 otherwise
x_5	Marital status; 1 if married, 0 otherwise
x_6	Membership of farmers' associations; 1 if a farmer is member, 0 otherwise
x_7	Farming experience in years
x_8	1 if a farmer has off-farm income, 0 otherwise
x_9	Family size (number of people in the household) at the time of interview
x_{10}	Farm-income in Rand per annum
x_{11}	Number of visits by agricultural extension officer of the previous year

the effect of the independent variable is constant across different predicted values of the dependent variable. This is normally experienced with the Linear Probability Model (LPM). The probit model assumes that while we only observe the values of 0 and 1 for the variable Y , there is a latent, unobserved continuous variable Y^* that determines the value of Y . The other advantages of the probit model include believable error term distribution as well as realistic probabilities (Nagler, 1994). Thus, for this study the probit model is preferred and used.

We assume that Y^* can be specified as follows:

$$Y_i^* = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki} + v_i$$

And that:

$$Y_i = 1 \text{ if } Y^* > 0$$

$$Y_i = 0 \text{ Otherwise.}$$

Where x_1, x_2, \dots, x_k represent vector of random variables, β represent a vector of unknown parameters and v represent a random disturbance term (Nagler, 2002).

Model specification

The probit model specified in this study to analyze farmers' decision about whether or not to use credit can be expressed as follows:

$$Y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + v$$

The definitions of variables are shown in Table 1.

RESULTS AND DISCUSSION

Empirical results

Overall, the model predicted 84.93 per cent of the sample correctly. The coefficients of x_2 (farmers' age), x_3 (number of years of formal education), x_4 (gender), x_6 (membership of farmers' association) and x_5 (marital status) are statistically significant at 10% level while x_7 (farming experience) at 5% level. Table 3 shows the results of the binary probit regression coefficients of factors affecting farmers' decision about credit. In this table, a positive sign on the variable's coefficient indicates that higher values of the variable increase the odds that a small-scale farmer uses credit and vice versa.

The results show that farming experience, gender and marital status have significant positive effect on the farmers' decision to use credit and the number of visits by agricultural extension officer and off-farm income had insignificant positive effect. This implies that targeting experienced small-scale farmers will most likely improve the odds that they use credit and thus provide an opportunity for the marginalised groups such as women-headed households.

Conversely, the numbers of years of formal education, membership of a farmer to an association, size of arable

Table 2. Averages for some of the demographic, social and income levels of the sampled households /farmers.

Variable	Total (73)	Borrowers (16)	Non-borrowers (57)
Farmers' age (years)	53	47	55
Number of years of formal education	6	3	6
Gender (%)	80% male 20% female	100% male 0% female	77% female 23% male
Farming experience in years	14	18	12
Size of arable land (ha)	6	6	6
Off-farm employment (%)	16%	13%	17%
Marital status	81% married	93%	77%
Average farm income (R)	R50 320	R26 688	R23 632
Membership of farmers' association	82%	68%	84%

Source: Survey 2006.

Table 3. Binary Probit regression coefficients of factors affecting small-scale farmers' decision whether or not to use credit.

Variable	Estimated coefficients	Standard errors	t-ratios	Probability
x_1	-0.028067	0.033208	-0.845193	0.3980
x_2	-0.048838**	0.020951	-2.330998	0.0198
x_3	-0.138966**	0.068007	-2.043413	0.0410
x_4	1.210824**	1.059342	1.142997	0.2530
x_5	1.090860**	1.037531	1.051399	0.2931
x_6	-0.835758**	0.594190	-1.406549	0.1596
x_7	0.073303*	0.040179	1.824444	0.0681
x_8	0.312150	0.742965	0.420141	0.6744
x_9	-0.000643	0.077597	-0.233918	0.9934
x_{10}	-2.40E-06	1.02E-05	-0.233918	0.8150
x_{11}	0.009457	0.021584	0.438155	0.6613
Number of observations at one:			16	
Number of observations at zero:			57	
Log likelihood:			-24.09014	
Cases predicted correctly (%):			84.93	
** Significant at 10% level				
* Significant at 5% level				

Source: Survey 2006.

land and the farmers' age have significant negative effect on farmers' decision to use credit. The implication is that the chances of a small-scale farmer taking credit decreases with age, number of years of formal education and the size of arable. This makes sense for this study area

and those with a similar setting as a highly educated small-scale farmer would have enough money to finance production requisite to farm such land occupied in terms of a permission to occupy or freehold (no need for capital for purchasing the land and hence the recommendation

for short term credit for production requisites.

Concluding remarks

The results of this study have implications for implementation of support programmes and services intended for small-scale farmers in rural areas such as our area of study. The fact that gender and farming experience have significant positive influence on farmers' decision to use credit suggest that support services should be targeted to needy and experienced farmer for instantaneous impact. In addition, support services such as Micro Agricultural Finance institution of South Africa (MAFISA) should be sensitive to gender as in most cases women and other vulnerable groups are the most marginalised. Targeting female farmers in this area or similar for this kind support will most likely lead positive response to the use of credit as most of the credit adopters were found to be of male sex. The involvement of this category of farmers will most likely improve their production level and efficiency and thus job creation and food security improved.

Production credit is recommended as there are little possibilities of long term financing as most of the land in the area is communal and therefore without title deeds. However, the imminent implementation of the CLARA will most likely rescue the small-scale farmers' problem of lack of collateral.

Finally, mergers among small-scale farmers are recommended as they will most likely improve production capacity and creditworthiness than when farmers work individually. These mergers are enticed by Co-operative Incentive Scheme (CIS) offered by the Department of Trade and Industry which aims to address high cost of working capital to allow effective market entry, lack of access to finance; lack of participation in the formal economy by co-operatives, in particular those owned by black persons (especially those in rural area), women, persons with disability and youth and the low or non-participation on current incentive programmes (DTI, 2007). Thus, small-scale farmer requires intensive extension services and training to ensure exploitation of these opportunities.

FUTURE RESEARCH

This study used cross-sectional data from a relatively smaller study area. Although the study area is small, the framework of the analysis could be used as a tool or instrument for behaviour analysis in larger areas and could be applicable for areas with similar settings. It could be interesting if a similar study in a broader area can be done using panel data. Using panel data could provide an insight into the different levels of output in relation to credit use over a period of time. In addition, a profit or income maximizing loan amount at different levels of farm land under utilisation in a specific area could easily be determined.

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