
**RICE GROWERS' FINANCIAL CREDIT ACCESS IN BUGARAMA IRRIGATION
SCHEME IN RWANDA**

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ABSTRACT

This study assessed the factors affecting the access of rice growers in Bugarama marshland to financial credits. The data used were collected from a sample of 100 Rice growers using focus group discussion and structured questionnaire. The data collected permitted to estimate the log it model. SPSS was used for the estimation. The model estimation results showed that the interest rate, level of income, land size, age and costs of production including labour and fertilizers are the significant factors while education and farming experience do not really affect the access of farmers to financial credits. Furthermore, formal institutions remain the major source of credit for larger credit seekers when they comply with prior conditions of mostly valued assets for collateral, while informal sources of credit such as local money lenders serve small and short term credits to farmers who fail to comply with requirements of formal financial institutions. From policy side, the inclusion approach to strengthen farmers' associations and integrating them in value chain can increase the chance of accessing credit products such as group credit from formal sources. In addition, any financial credit provision that is targeting to supply credit in rural communities would customize the payback period by considering crop calendar if farmers' income depends on harvesting time and selling their produce.

Keywords: Participatory demonstration, simplest method, Honeybee, colony multiplication, Queen rearing, splitting

INTRODUCTION

In Rwanda, like in many other African countries, the agriculture sector plays a significant role in national economy, domestic food security and income realization by rural small scale farmers. The sector contributes to a third of the national Gross Domestic Product and employs about 70% of the country's labour force (MINAGRI, 2016). The government of Rwanda had recognized the importance of the sector through various national strategies such as Vision 2020, Economic Development and Poverty Reduction strategy, the National Agricultural Policy, as well as Strategic Plan for Agricultural Transformation and Crop Intensification Program. For instance, the country's targets for the agricultural sector growth rate was outlined in the strategies from 3.5 percent in 2005 to 8.6 percent by 2020(MINAGRI, 2016). Following the implementation of different strategies, the country recorded positive trend in agriculture production both cash and food crops where average annual growth rate from 2007 to 2015 food crops and exports crops increased at 5.8 and 5.0 percent respectively (MINAGRI, 2016). More specifically from 2008, the government of Rwanda had prioritized six food crops including rice, maize, beans, Irish potato

and wheat to reduce poverty under crop intensification program (CIP). The choice to include rice among prioritized crops was for its potential yield. In addition, the rice becomes a major commodity in the food baskets of rural and urban households in Rwanda as reported in EICV3 (Enquête Intégrale sur les Conditions de Vie des Ménages). The National Institute of Statistics of Rwanda (NISR) has reported that the mean share of harvest for CIP crops has increased from 11% to 16% between survey rounds (2001 and 2011) and rice alone has increased from 19,000 to 35,000 Metric Tons while commercialization of CIP crops has increased from 13% to 15%. Rice, beer banana and sorghum have relatively high shares sold at 47%, 39% and 32% respectively (NISR, 2012). Moreover, rural households in Rwanda spend annually more money (30,400 Frw) than urban households (20,660 Frw) on rice (MINAGRI, 2013).

Acknowledging existing similar studies, agricultural credit is one of the pre-requisites for farmers to increase farm output in the process of national agricultural development (Kuma and Sushila, 1987), the reality is not similar from developing to developed countries. Accessing to credit remains a challenge specifically for small and rural farmers in most of less developed countries. In rural areas of Rwanda- where nearly 92 percent of the poor families live, only 25 percent of the population has access to formal credit sources and only 3 percent accessed credit from operating commercial banks (NISR, 2006). The primary source of credit remains the informal sources: 73 percent of loan beneficiaries claimed to resort to relatives, friends and traders to access the credit (NISR, 2006). Access and availability to adequate, low cost credit and timely from formal sources has great importance especially to farmers and lead to secure food demand countrywide (Nizeyimana, 2008). And credit is an important tool for improving the livelihood of the poor families directly through consumption smoothening that reduces their vulnerability to short-term income (Samuel *et al.*, 2015).

In Rwanda, there is a political willing to improve commodity finance, but rice farmers are still facing little capital and most of them often undertake credit from financial institutions for purchase of inputs and had little or no understanding of cost implications of the trading deals with millers (MINAGRI, 2013). Alternative sources of credit both formal and informal sources play role of supplying credit to farmers but access to desired amount depends on complying to various factors. Therefore, this study aims to assess the determinants of rice growers' credit access in Bugarama irrigation scheme in Rusizi District.

MATERIAL AND METHODS

Study area and data source: The study was conducted in Rusizi District in Western Province of Rwanda. This District is one of the seven districts of Western province. It is bounded by the district of Nyamasheke to the North, Nyamagabe, and Nyaruguru to the East. It borders the country of Burundi in the South and Democratic Republic of Congo to the West. It has a surface area of 718.9 km² and a high population density of 390 people per km². The altitude of Rusizi is the lowest point of the country with 950 meters. Rice is major food crop produced in Bugarama

irrigation scheme located between four sectors of this District¹. The marshland comprises 1,800 hectares with around 4,167 farmers who are producing rice.

Primary data were collected with structured interview and focus group discussion that were administered to rice growers. Specific predictor variables were age, gender, and education, farming experience, plot size, cost of rice production, credit cost and family income. Cross-sectional data were collected from a total of 100 rice growers as respondents proportionally selected from four sectors namely Bugarama, Gikundanvura, Muganza and Nyakabuye sectors of Rusizi District.

Data analysis: The data collected were analyzed through binary logistic regression modelling technique with SPSS. The objective was to assess the determinants of accessing on credit among rice growers. The dependent variable is a dummy with zero or one depending whether a rice grower access to desired credit or not. However, independent variables were discrete or continuous.

The coefficients of logistic regression can be used to estimate odds ratios of each independent variable in the model (Gujarati, 2012), whereas, the term “logit” means the employ of natural logarithm of the odds (log odds) which indicates the probability of falling into one of two categories on some variables of interest (Wooldridge J., 2007). The logistic model is the extension of probit model which has a restrictive assumption that the error term has to be normally distributed (Johnston and Dinardo, 1997). It has advantage over probit because of its extreme flexibility and ease of the use from mathematical point of view and results in an expressive interpretation (Pindyck and Rubinfeld (1981). The model show the set of explanatory variables (X’s). The independent variable Y = 1 or 0 with Y=1 if the credit seeker (grower) accessed to credit from formal source and Y=0 otherwise. The cumulative logistic probability function *p* is expressed in both situations as follows:

$$p(y=1) = \frac{e^{\beta x}}{1 + e^{\beta x}} \text{ and} \dots \dots \dots (1)$$

$$p(y=0) = 1 - \frac{e^{\beta x}}{1 + e^{\beta x}} \dots \dots \dots (2)$$

$$\text{logit} [\theta(x)] = \log \frac{\theta(x)}{1 - \theta(x)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 \dots \dots + \beta_n x_n \dots \dots \dots (3)$$

The SPSS package performed to generate the odd ratios using the maximum likelihood procedure (Field A., 2005) from the question (3) as specified as:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 \dots \dots + \beta_n x_n \dots \dots \dots (4)$$

¹ www.rusizi.gov.rw

Where Y_i is a binary variable for the probability of access to credit or otherwise, while X_i are explanatory variables affecting the dependent variable of rice grower to access to credit. β_i is the unknown parameter that reflects the impact of the change in the variable X and Y_i which will be estimated by ϵ_i which is the error term and i can take values from 1,2,3,...,n as number of observations. Therefore the logit model is expressed by the following form:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \epsilon$$

Table 1: Description of Variables

Variable	Types and Description of variables in the model
Access to credit (y_i)	Dummy. 1= access to Agri.credit, 0= otherwise
Age (X_1)	Continuous (no of years)
Educational status (X_2)	Dummy (1= an educated person, 0= non- educated)
Gender (X_3)	Dummy (male or female)
Farming experience (X_4)	Continuous (no. of years)
Size of plots (X_5)	Continuous (ha)
Cost of production (X_6)	Continuous (Frw)
Family income (X_7)	Continuous (Frw)

Source: Kabayiza et al, 2018

RESULTS AND DISCUSSION

Socio-economic characteristics of rice growers

The statistical descriptions showed distribution of characteristics among respondents as illustrated in the table 2 where a large number of respondents are educated (73%), households headed by males (85%), married (95%) and belongs to active population (80%). Statistically, rice production is a major activity for the respondents (71%) with plots of less than one hectare in average (58%).

Table 2: Distribution of continues variables and summary of statistics (N=100)

Personal Characteristics	Categories				
		(Years)	<30	31-40	41-50
Age		(20.00)	(43.00)	(36.00)	(1.00)
Experience	(Years)	<10	10-20	>20	Total
		42	38	20	100
		(42.00)	(38.00)	(20.00)	(100.00)
Head of family		Male	Female		
		85	15		100
		(85.00)	(15.00)		(100.00)
Marital status		Married	Unmarried		
		95	5		100
		(95.00)	(5.00)		(100.00)
Education status		Illiterates	Literates		
		27	73		100
		(27.00)	(73.00)		(100.00)
Agriculture occupation status		Primary	Secondary		
		71	29		100
		(71.00)	(29.00)		(100.00)
Land holding	(Hectares)	≤1ha	>1ha	Average	
		58	42		100
		(58.00)	(42.00)		(100.00)

Annual income	(Rwandan francs In thousands)	<200 (34.00)	200-300 (21.00)	300-500 (35.00)	>500 (10.00)
		34	21	35	10

Source of credit	No of beneficiaries				Amount in thousand (Frws)
	<1Millin	>1 Million	Total	Percentage	
1. Formal institutions					20.650
People's Bank of Rwanda	8	9	17	(18.09)	(88.63)
Amasezerano Banking	3	0	3	(3.19)	(8.37)
Microfinance Inkingi	1	0	1	(1.06)	(3.00)
Total	12	9	21	(22.34)	(100.00)
2. Informal institutions					10.005
Commodity groups	42	0	42	(44.68)	(58.37)
Money Lenders	23	0	23	(24.47)	(33.69)
Friends & Relatives	8	0	8	(8.51)	(7.93)
					17.141

Total	73	0	73	(77.66)	(100.00)
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Source: Kabayiza et al, 2018

Though results showed that formal source of credits have higher potential of supplying large amount, but informal sources remained flexible for small scale rice farmers with 22.3% and 77.7% respectively. This is due to that credit seekers are unable to meet conditions including valued assets for collateral, high costs attributed to credit mainly interest rate, procedure and documents as well as payback period where farmers confess that formal institutions do not cooperate to correlate payback period and crop season. In such situation, informal money lenders and commodity groups take advantage to supply short term or seasonal credits to farmers where in most of cases being paid when selling their produce. The results also showed that People’s Bank which is operating in proximity areas, is providing service to rural communities more than other commercial banks (88.6%) which are limiting their operations in urban areas. Consequently, the lack of competition in providing financial services in rural areas leads to credit gaps. It was also noted that agricultural business plans are more preferred by formal sources than non-agricultural projects in the areas due to risks attributed to agricultural production. The results analysis presented in Table3 show that the gap between farmers applying for crop credits and other projects is still large and sometimes farmers prefer to present their business plans with intention of meeting requirements and higher chance from a bank and later deviate accessed credit among different uses which are also resulting in mismanagement and failure to repay after sometimes.

Table 3: Credit gaps from formal institutions

S. No	No. of Farmers applied for credit	No. of Farmers disbursed with credit
1. Crop credit	34	8 (23.53)
1. Other project credit	13	13 (100.00)
Total	47	21 (44.68)

Source: Kabayiza et al, 2018

By recognizing previous empirical studies, credit gap is defined as the difference between the loan applied for and the loan actually disbursed (Jain and Dan, 1981). This study showed that credit gap was due to difference in possession of collateral required by formal sources of credit. As result, large farmers who possess large size of plots from one to more hectares have higher chance of accessing credit than small ones. In addition, other projects (nonagricultural projects) win over agricultural ones due to attributed risks by credit suppliers.

Results of logistic model of accessing to credit

The primary data are used to estimate the logit regression model to assess the influence of explanatory variables on availing credit to rice growers in the study area. The factors used for the study were interest rate (R) in percentage, family income (Inc) in Rwandan francs, cost of cultivation (Co) in Rwandan francs, land holding size (L) in hectare, age (Ag) in years, education (Ed) in years and farming experience (Exp) in years. The choice of variables was based on prior group focus discussion with farmers in cooperatives where they were reported to be major factors influencing the chance of accessing on desired credit from different nearest commercial banks. A logit model output is specified on the basis of scatter diagrams. The estimated equation and the coefficients are as follows:

Y =	1.794	-0.405R**	-1.24 Inc**	+ 1.75Co*	+1.025L**	- 0.001Ag*
	(2.159)	(0.043)	(0.178)	(0.584)	(0.762)	(0.047)
			+0.019 Ed	+ 0.032Exp		
			(0.075)	(0.131)		

$\chi^2=6.729,$ P= 0.458 N=94

N.B.: Figures within the parentheses indicate the standard errors of the parameters above.

**= Significant at one percent level

* = Significant at five percent level

Following Tiefenthaler (1994), appropriateness of the model has been verified to capture all the relevant influence of explanatory variables and statistic test was done using likelihood ratios statistic or lambda (Following Hill, 1983). The Pearson chi-square (χ^2) is used to test for the goodness of fit in the model. The calculated χ^2 means the same thing as the likelihood ratio and its value is 6.729. This is less than the tabulated values (χ^2) of 18.48 and 14.07 at the 1% and 5% respectively. The estimated model is therefore found to be statistically significant at these levels. The default value (P) is another test of goodness of fit for the model. A default value P<0.15 and it indicates lack of fit. In this case P value is 0.458 for the model, thus the model is considered to be consistent.

In the functional analysis, the signs of coefficient are found as expected. The age and rice production related costs are significant at 5% and while other variables are significant at 1%. However, education and farming experience were not significant. The estimated coefficients reflected the effect of corresponding explanatory variables on the dependent variable. A negative coefficient indicates a positive (decreased) effect on getting credit and conversely, a positive coefficient indicates that an increase in corresponding variable, i.e. an increased possibilities of getting credit from formal institutions. The higher the interest rate charged on credit from formal institutions, the farmer found incredible for repayment and judged it as more costly, hence the farmer prefer to turn for informal sources. Similarly, it has found that the demand for rural agricultural credit is negatively influenced by interest rate and is inelastic, while the demand for credit is highly elastic to input and output prices (Sing, 2009).

On the other hand, when the level of family income is increasing, the farmers would like to use their own savings due to higher interest rate charged in formal sources which is opposing to previous results where the probability of accessing will increase with increase of the income or existing financial status (Samuel *et al.*, 2015). The higher cost of cultivation implies the need to apply for credit i.e. as long as farmers are unable to cover the costs for inputs they would look for credit. The land size is an important variable which influences both the amount of credit and acceptable as collateral for the institutions to get credit. Education and experience in rice production were less powerful in explaining the variation. The less influence experience in farming could be explained that rice production is more driven by level of capital where land lords are hiring casual farmers to work for them and sometimes without knowing practical works on farms. Since the dependent variable is assigned one if the respondent availed credit and zero otherwise, a negative sign on any variable means that the higher values of that factor decrease the probability that the farmer being approaching credit from formal institutions. A positive sign on parameter of a variable indicates that the variable will increase the likelihood of the applicant being availed credit from formal institutions.

CONCLUSION

The objective of this study was to assess factors affecting the access of rice growers to financial credits. Primary data were collected from 100 farmers operating in Bugarama irrigation scheme which is located between four sectors namely Bugarama, Gikundanvura, Muganza and Nyakabuye sectors of Rusizi District.

The study found that accessibility of credit for rice growers are significantly determined by level of age of growers, family income, size of land, costs of rice production, labour and interest rate charged by formal institutions and was found farming experience and education level are not significant. The informal institutions were major source of credit for rice growers in the area. It was found that crop projects are less financed compared to other projects (non-agricultural projects) in formal institutions due to the risks attributed to both personal socio economic factors and nature of agricultural farming. Beside of that informal sources of credits are taking advantage over formal ones due to flexibility on credit requirements and payback period because local money lenders and commodity buyers are

considering crop calendar in supplying money where farmers are allowed to pay at harvesting period when they sell their produce. The determinants of credit are associated with perceptions of farmers when applying for credit. The rice growers are discouraged by the high interest rate charged in formal sources credit. However, possession of large plot size is increasing the chance of getting credit as it stands for collateral, similarly the higher level of income increasing the chance of accessing to credit and decreasing defaulting. It was recommended that any inclusion approach to strengthen farmers' associations and integrating them in value chain can increase the chance of accessing credit products such as group credit from formal sources. In addition, any financial credit provision that is targeting to supply credit in rural communities would customize the payback period by considering crop calendar if farmers' income depends on harvesting time and selling their produce

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