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Factors affecting the access to credit in the North East of Benin

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Financing agriculture is a key issue in rural development. Despite the efforts of the government to make credit services available and affordable in most of the rural areas, access to credit among smallholder farmers remains low. This paper analyzes the determinants of credit access by farmers in the North East, Benin. Primary data were collected frxom one hundred and twenty respondents randomly selected and interviewed through structured questionnaire. A Logit model was specified to identify the relationships between access to credit and selected farmers' socio-economic characteristics. Following this, the marginal effects of the selected farmers' socio-economic characteristics on the probability to access credit were estimated. The analysis revealed that access to credit among smallholder farmers is determined by the number of years of schooling, literacy, membership, guarantor, collateral and interest rate. For each additional year of schooling, the likelihood of access to credit was found to increase by 3.9% while literacy in the local language was found to increase the likelihood by 10.9%. Membership of farmers' cooperatives was found to increase the likelihood of access to credit by 31% while having a guarantor increases this likelihood by 18.9%. However, the availability of collateral decreases the likelihood of credit access by 12.4% while credit with high interest rates decreases it by 11.7%. Thus, to improve rural farmers' access to credit, governments and non-governmental organizations should promote education, literacy and cooperative membership among farmers. Moreover, financial institutions should also play a key role by keeping interest rates for loans at a low level.

Key words: Smallholder farmers, credit, determinants, logit, Benin.

INTRODUCTION

Agriculture plays a fundamental role in the economy of many countries in the world, particularly in developing countries where most of the population depends on agriculture-based activities for their livelihoods. In Benin, agriculture contributes to about 35.9% of the country's gross domestic product (GDP) and employs up to two thirds of the active population (RPSA, 2014; FMI, 2012). Despite this prominent role, smallholder farmers are still

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predominant with low levels of productivity which could impede the progress of the country due to its estimated population growth of 3.5% (INSAE, 2015). One of the factors driving this situation is limited access of smallholder farmers to appropriate means.

Agricultural credit has been reported as an effective tool for sustainable agricultural development in several places in the world. It is the case of the study of Girabi and Mwakaje (2013) in Tanzania for example who found that agricultural credit has a positive impact on smallholder farmers' productivity as it enables them to access inputs such as fertilizers, improved seeds and to hire labor when needed. Similar observations have been made in Brazil by Feijo (2001) who also found that there was a positive effect on the lives of farmers who have access to credit facilities, based on the measurement of productive growth of their main crops. In Malawi, Zeller et al. (1998) concluded that membership to credit programs had a sizable effect on agricultural income while in Pakistan, Mahmood et al. (2013) also observed that, in the livestock sector, credit availability increased family income per month by 181%. In Bolivia, McNelly and Christopher (1999) found that incomes were increased where access to credit and the education levels of mothers were higher. These studies have shown how access to credit can be a powerful tool to increase farmers' productivity and wellbeing. Indeed, agricultural credit enhances productivity and improves standards of living by breaking the vicious cycle of poverty that small-scale farmers are prone to (Ololade and Olagunju, 2013; Akudugu, 2012).

However, despite this positive effect of agricultural credit in improving farms productivity as well as farmers' wellbeing in general, in many places in the developing world, access to credit is still low. It is the case in Benin where access to credit is particularly limited among farmers (Sossou et al., 2014; Sossa, 2011) with little known on the reasons of this situation. Drawing from these facts, this study has been initiated to investigate the determinants of access to credit in the North East of Benin to help policy makers formulate proper policies that will consider the positive factors and mitigate the negative factors.

MATERIALS AND METHODS

Study area

This study was conducted in the district of Nikki in the North East of Benin (Figure 1). Benin is located in West Africa with a population estimated at 10.88 million in 2015. Its latitude ranges from 6°30′ N to 12°30′ N and its longitude from 1° E to 3°40′ E. Nikki district in

the region was selected for three main reasons: (1) firstly because of its prominent contribution to food crop farming in the region, and in the country, (2) secondly because the United Nation Development Program implemented a pilot credit program for smallholder farmers in this region from 2009 to 2014; (3) thirdly because of the diversity of its population which includes all the sociocultural groups of the North East region of the country.

Data source and sampling procedures

In total, 120 respondents were randomly selected and interviewed for the study. Primary data on the features of the credit scheme (e.g. interest rate) and socio-economic characteristics of farmers (e.g. education, literacy, etc.) were collected by a household survey conducted through structured questionnaires. Table 1 shows the distribution of the sample size.

Both descriptive statistics and econometric methods were used to analyze the primary data. Descriptive statistics helped to describe the respondents' socio-economic characteristics whereas the determinants of credit access among the farmers were assessed, using the binomial logit regression model. The marginal effects of the explanatory variables have been estimated using the delta method in Stata 11, software.

Method of analysis

For binary dependent variable, Logit or Probit regression model can be used as regression model to identify the relationship between the dependent variable and the set of explanatory variables (Hoetker, 2007; Erdem, 2009; Fox, 2010). Although, the two models yield similar results, the advantages of the logit regression model are its heteroskedasticity consistency, the simplicity of the method, and the easiness it offers for the results interpretation (Erdem, 2009).

Accordingly, the Binomial Logit regression model was used in this study to determine factors affecting farmers access to credit in Benin. The model is based on the following specification:

$$Y = f(X) \tag{1}$$

In this equation, Y is the dependent variable which represent farmer's access to credit and X the set of explanatory variables. Y is equal to 1, when a farmer does have access to credit; and 0 otherwise. Following the theoretical considerations, whether the famers have access to credit (or not) could be explained by a set of socio-economic characteristics (farmers' age, sex, household size, educational level, farming experience, membership, marital status and the contact with an extension agent or not), and the features of the credit scheme (credit interest rates, whether or not they have guarantor, collateral or not). Table 2 presents the explanatory variables, their codes and expected nature of relationship on the farmers' decision to have access to credit based on the literature (Ololade and Olagunjun, 2013; Akudugu, 2012; Dzadze et al., 2012; Anyiro and Oriaku, 2011).

Following the previous considerations, let us denote access to credit, socio-economic characteristics, and characteristics of the credit scheme by *ACC*, *SOEC* and *CCR*, respectively. Thus, Equation (2) becomes:
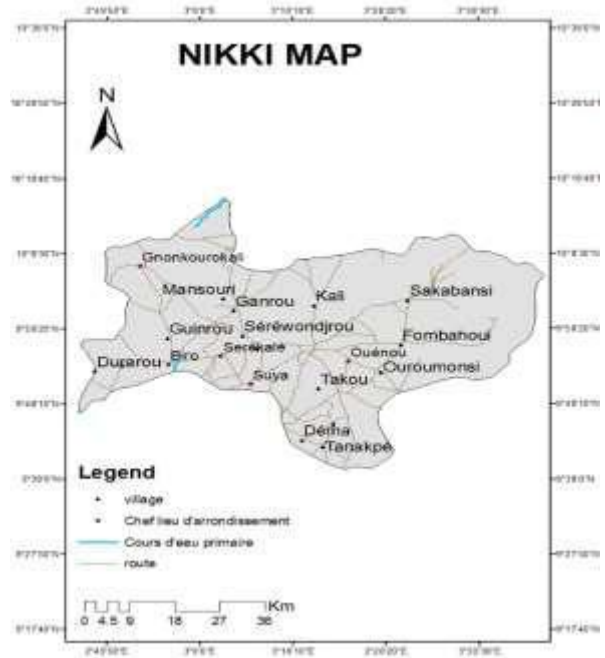
Municipality of Nikki

Figure 1. Study zone.

Table 1. Distribution of the respondents in the study area.

Administrative unit (district)	Villages	Sample size
Biro	Biro	30
Nikki	Sakabansi	45
	Nikki Centre	45
Total	3	120

Table 2. Prospective explanatory variables.

Variables types	Variables	Codes	Expected sign
	Age (years)	AGE	-
	Sex (1=male; 2=female)	SEX	+
	Marital status (1=married; 2=otherwise)	MAS	+
	Education (years)	EDU	+
	Literacy (1=yes; 0=no)	LIT	+
Socio-economic characteristics of farmers	Household size (number)	HHZ	-
	Farming experience (years)	EXP	±
	Membership to farmers' associations (1= member; 0=otherwise)	MEM	+
	Extension agent (1=yes; 0=no)	EXT	+
	Guarantor (1=have guarantor; 0=otherwise)	GUA	+
Characteristics of the credit scheme	Collateral (1=have collateral; 0=otherwise)	COL	+
	Interest rate (1=high; 0= low)	INT	-

More explicitly, Equation 3 can be expressed as:

$$ACC_i = \beta_o + \beta_1 AGE_i + \beta_2 SEX_i + \beta_3 MAS_i + \beta_4 EDU_i + \beta_5 LIT_i + \beta_6 HHZ_i + \beta_7 EXP_i + \beta_8 MEM_i + \beta_9 EXT_i + \beta_{10} GUA_i + \beta_{11} COL_i + \beta_{12} INT_i + e_i \quad (3)$$

In Equation 3, β are the coefficients or parameters to be estimated; and e is the error term. The parameters β were estimated by using a maximum likelihood (ML) method through a Logit regression model. Let us set π_k the probability that the k-th farmer has access to credit. It is assumed that π_k follows a standard logistic distribution function depending on independent variables which are the vector of predictors X_i. Accordingly, π_k is expressed as follow:

$$\pi_k = Pr(\quad\quad) = [\quad\quad(\quad\quad)] \quad (4)$$

β_i is a vector of unknown parameters to be estimated. Only the sign of the parameter estimates gives the direction of a change for each of the explanatory variables of the probability of a farmer having access to credit (Y=1). Yet, the parameter estimates from models alone do not hold any economic meaning. To assess the effect of a unit, change of independent variables on the probability of the farmers having access to credit, the marginal effects were estimated. Stata 11 software was used for the data analysis.

RESULTS AND DISCUSSION

Socio economics characteristics of the farmers

Table 3 summarized the descriptive statistics of the respondents' socio-economic characteristics. The table reveals that seventy-six percent (76%) of the respondents were male as compared to 24% female respondents. This could be explained by the fact that, agriculture in most of developing countries is dominated by male farmers (Yegbemey et al., 2014). In addition, male farmers in developing countries have more access to agricultural resources (Kokoye et al., 2017). The average age of the respondents was 40.57 years with eighty-eight percent of farmers (88%) being married.

The descriptive statistics also revealed that the average household size among the farmers is nine (9) members which is higher than the national average household size of seven (7) people (SNCA, 2008). Although, a higher household size (large family) could increase farmers' poverty status (Ololade and Olagunju, 2013), in the study area on the contrary, it is a key source of labor that helps support the respondents in their activities.

Regarding education, local language education is more readily promoted in the study area as compared to formal education. Indeed, fifty-three percent (53%) of the respondents attended local language education against forty-one percent (41%) for formal education. Meanwhile, among those who attained formal education, the average years of schooling is five (05) years. This low level of formal education among smallholder farmers observed in the study area is common in rural areas and confirms the findings of researchers (Dzadze et al., 2012; Olorunsanya et al., 2009).

The average number of years of farming experience of the respondents was 25.48 years, indicating an experienced population in farming activities. Almost all the respondents had agricultural activities as their primary occupation (99%). This indicates that crop farming is the main economic activity of the farmers and the largest employer of labor in the study area. However, forty-three percent (43%) of the farmers had a secondary occupation. Secondary activities are essential for the respondents as they enable them to have an additional income during non-farming periods.

Binomial logit regression analysis

Table 4 presents the estimation results from the Logit model. In addition, several goodness-of-fit measures are reported. The first one is the pseudo-R squared and the second, the Likelihood ratio Chi-square which is an estimation of how well the model classified respondents correctly based on estimated probabilities. The likelihood ratio Chi-square of 79.95 with a p-value of 0.0000 tells us that our model is statistically significant.

Table 4 shows that out of the twelve variables, six were significant for credit access among farmers. These factors are formal education, local language education, membership, guarantor, collateral and interest rate. These factors could be divided in two groups: those with positive effects on the probability of smallholders' farmers having access to credit, which include formal education, local language education, membership and guarantor, and those which have negative effects on this probability collateral and interest rate.

Farmers with formal education have the ability to understand the credit scheme and their terms and conditions (Hananu et al., 2015). This could justify the positive effect of education. This finding corroborates the results of Dzadze et al. (2012), Akudugu (2012), Bakhshoodeh and Karami (2008), Thaicharoen et al. (2004), Etonihu et al. (2013) and Hananu et al. (2015) who observed that being educated favors farmers' access to credit. The positive effect of membership on credit access could be explained by the fact that in the study area, memberships is one of the key requirements for getting credit from credit institutions. This requirement helps the institutions prevent cases of credit default or credit non-repayment among farmers. Mohammed et al. (2013) also examined the influence of farmer based organization (FBO) on access to credit. They found that FBO's social capital homogeneity, network connection, level of trust, collective action and the respect for contract had positive significant effect on access to credit. Hananu et al. (2015) in their study of factors affecting agricultural credit demand in Northern Ghana, revealed that group membership explained that formation of economic and social associations helps to improve credit access given the existence of joint guarantee by associations members. The positive effect of having a guarantor on farmers' access to credit is also consistent with the finding of Kacem and Zouari (2013) who reported the absence of

Table 3. Socio-economic characteristics of survey respondents.

Qualitative variable	Frequency	Percentage
Primary occupation		
Agricultural activities	118	99
Non-Agricultural activities	02	01
Secondary Occupation		
Secondary activities occupant	43	36
No secondary occupant	77	64
Educational Level		
Formal education	49	41
Local language education	64	53
Marital Status		
Married	106	88
Unmarried	14	12
Gender		
Male	91	76
Female	29	24
Quantitative variables	**Mean**	**Standard deviation**
Age	40.57	0.86
Educational level	5.55	0.40
Farming experience	25.48	0.87
Household size	9.37	0.45

Table 4. Logit estimate of the factors affecting access to credit.

Variables	Coefficient	Standard Errors	z	P>|z|
Age	-1.21	1.45	-0.01	0.993
Gender	0.41	0.78	0.53	0.596
Marital status	-0.26	0.36	-0.73	0.467
Education	0.38***	0.14	2.79	0.005
Literacy	1.05*	0.63	1.68	0.094
Household size	0.03	0.09	0.33	0.738
Farming experience	1.21	1.46	0.01	0.993
Membership	2.98***	0.74	4.03	0.000
Extension agent	-0.26	0.68	-0.39	0.698
Guarantor	1.81**	0.80	2.27	0.023
Collateral	-1.19*	0.71	-1.68	0.093
Interest rate	-1.12*	0.58	-1.94	0.052
Constant	15.89	2.18	0.01	0.994
Number of observations		120		
Pseudo R²		0.50		
LR Chi squared		79.95		

*10% level of significance; ** 5% level of significance; ***1% level of significance.

guarantor as one of the main barriers for rural people access to credit. The negative effect of having collateral on credit access among farmers suggests that the requirement of having collateral might hinder the demand for credit. This could be explained by the fact that farmers who have collateral have more assets and can self-fund

Table 5. Estimated marginal effects of the explanatory variables.

Variables	dy/dx	Delta-method Std. Err.	z	P>|z|
Age	-0.126	15.177	-0.01	0.993
Gender	0.043	0.081	0.53	0.595
Marital status	-0.027	0.037	-0.73	0.463
Education	0.0397	0.013	3.10	0.002
Literacy	0.109	0.062	1.76	0.078
Household size	0.003	0.009	0.33	0.738
Farming experience	0.126	15.177	0.01	0.993
Membership	0.310	0.053	5.82	0.000
Extension agent	-0.028	0.071	-0.39	0.697 -
Guarantor	0.189	0.077	2.44	0.015
Collateral	-0.124	0.071	-1.74	0.082
Interest rate	-0.117	0.057	-2.05	0.040

their production without credit. Therefore, avoid paying interest rate on the credit. According to Okojie et al. (2010), the lack of collateral limit rural women's access to credit from formal institutions. Studies of Ololade and Olagunju (2013) revealed that the requirement of collateral does not have significant effect on farmers' access to credit in Nigeria, Oyo State. The negative effect of interest rate suggests that credit scheme with high interest lower the probability of having access to credit. This result is quite consistent with many studies which found that farmers are reluctant to credit scheme with higher interest rate (Ibrahim and Aliero, 2012; Ololade and Olagunju, 2013).

Table 5 shows the estimated marginal effects of the explanatory variables on the likelihood of farmers having access to credit. This table demonstrates that for every additional year of education, the probability of farmer's having access to credit rises by 3.9%. Being literate in the local language increases the probability of having access to credit by 10.9% while being a member of an association increases the likelihood of having access to credit by 31%. This finding may be explained by the idea that knowing how to read and write in the local language helps farmers to plan their farming activities while being a member of an association enables them to satisfy one of the key loan access requirements of farmer's microfinance institutions in the area. In addition, having a guarantor was found to increase the probability of having access to credit by 18.9%. However, having collateral decreases the likelihood of credit access by 12.4% and credit with high interest rates decreases it by 11.7%. This could be explained by the fact that, in the study area, farmers tend to avoid loans due to concerns over repaying the loan with interest.

CONCLUSIONS AND RECOMMENDATIONS

In this paper, the authors have analyzed the determinants

of access to credit among smallholder farmers in the North East Benin, using a Logit model. The results analysis has revealed that access to credit by smallholder farmers is determined by education, literacy, membership, guarantor collateral and interest rate. Being educated, literate in the local language, belonging to farmers' cooperatives or having a guarantor increases the probability of farmers' access to credit while having collateral or a high interest rate decreases this probability. Thus, for rural farmers to have greater access to credit, governments and non-governmental organizations should promote education, literacy among farmers as well as their organization in cooperatives. Moreover, to ensure that any credit obtained may be manageable for the farmers, financial institutions should provide loans with low interest rates.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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