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Determinants of rice farmers' access to credit in Benin: A case study of the municipality of Glazoue

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This study aims to identify the factors that limit the accessibility of rice farmers to credit in Benin. Data were collected from 120 randomly selected rice households in the municipality of Glazoue. The logit dichotomous model was used to analyze the data and various statistics were produced for this purpose using the Stata 13 software. The results of prediction model show that the model has a high predictive power and the explanatory power giving by the value of the Pseudo χ^2 of McFadden (60.85%) show that more than 60% of the explanatory variables of the model make rice farmers' access to credit easier to understand. Literacy (P <0.001) and the part of income from rice in the monthly income of the rice farmer (P <0.001) had a positive effect on the rice farmer's capacity to have access to credit. Rice as the main speculation in terms of income (P <0.001) and household size (P <0.001) had a negative effect on access to credit. In order to facilitate rice farmers' access to agricultural credit, particular emphasis should be placed on the level of literacy of farmer, his monthly income from rice production, the size of his household and his main crop. This study recommends that the actors adapt to the service offering of microfinance to the socio-economic conditions of rice farmers to enable them to access credit and increase rice production. This would help to meet the demand for rice, and, in turn, contribute to the reducing food insecurity in Benin.

Key words: Determinant, access to credit, rice production, Benin.

INTRODUCTION

Agriculture is the main source of growth for developing countries and helps reduce poverty and preserve the environment (World Bank, 2008). In Benin, agriculture accounts for about 75% of the total population and contributes significantly to the creation of value added (29.89% of GDP in 2008) and nearly 80% of export currencies (PSRSA, 2011). Since the 1960s, the government of Benin has invested in the development of canal irrigation schemes in order to intensify food crop production and reduce food insecurity (Nonvidé faced with the scarcity of financial institutions (banks), decentralized financial services (DFS) are becoming an indisputable resource to serve the rural world in financial services. It is important to note that despite the progress made in the past two decades, access to financing in developing countries remains a major problem (Kacem

and Zouaril, 2013). New Rice for Africa (NERICA) was developed by the Africa Rice Center by crossing high-yielding Asian rice (*Oryza sativa* L.) with locally adapted African rice (*Oryza glaberrima* Steud.). Community-based seed production of NERICA varieties was introduced in a village in central Benin in 2006 through seed dissemination projects. It was reported that high-adoption rates of these varieties were mainly due to high demand by development projects for seed dissemination, and to incentives (that is, selling the rice seed at a higher than local market price to a local extension service) for farmers to grow NERICA varieties (Yokouchi and Saito, 2017).

According to Nonvide (2018), irrigation offers important opportunities for enhancing crop yield and production in developing countries. Also, the future security of the supply of rice for food in Africa depends on improving the level of local production to achieve self-sufficiency. In order to cope with the existing gap between production and actual demand, combining a high level of rice blast tolerance and a high-yield potential is necessary (Yelome et al., 2018).

In Benin, rice producers face enormous funding challenges. However, according to Sossou (2014), important constraints limit the development of the rice sector in Glazoué among which we can mention the lack of microcredit. The difficulty of access to financial services for farmers is one of the main obstacles linked to agricultural development in Benin (Sossou, 2014). According to Singbo and Nouhoeflin (2012), producers are often poor, not because of the size of their farms, but because of lack of access to institutional services. According to Lesaffre (2000), the short-term global financing of the agricultural sector is 14% in developing countries (UEMOA). On the other hand, in the tertiary sector, overall financing amounts to 79.18% (Sossa, 2011). Thus, to answer this problem of financing in the rice sector is to find very adapted financing mechanisms with very convenient means of granting.

In Benin, the microfinance sector has experienced significant growth with the creation of several credit institutions, cooperatives and mutual savings companies and the establishment of agricultural financing mechanisms in rural development projects and programs (Sossou, 2014). These institutions often fail to meet the demand for credit from agricultural people. This forces them to adopt credit rationing, which is an element that directly or indirectly affects the efficient use of credit and therefore has a negative impact on its performance.

Despite the efforts of microfinance institutions to serve the farming community, they do not have access or have difficult access to financial services. This is because there is reluctance related to the supply of credits. These are repayment prospects that are not secured due to weather conditions, low yields, or the unstable socio-economic environment (Deveze, 2000). With a sub-equatorial climate, the commune knows two rainy seasons a small and two dry seasons including a small one too. The average annual rainfall is 959.56 to 1255.5 mm; the average temperature varies between 24 and 29°C. The relief is marked by the presence of plateaus (200 to 300 m), dominated by hills in places (Sokponta, Gomé, Camaté, Tankossi, Tchatchégou, Thio, Ouèdèmè, Assanté and Aklampa), which constitutes tourist assets. Hydrography is formed on one hand by a major watercourse Ouémé River which waters the commune at the villages of Aklampa, Bethel, Riffo and part of the district of Zaffé and small local watercourse (Adoué, Kotobo, Trantran, Tehoui, Antadji, Tchololoé, etc.) which encourage the development of off-season market gardening and artisanal fishing activities. There are also several types of soils, the most important of which are: white sandy soils suitable for growing cassava, groundnut and groundnuts; the black sandy soils found locally and suitable for all crops; stony soils that are generally poor.

With regard to the rice potential offered by the municipality of Glazoue, with a total area of 9456 ha and agro-ecological conditions favorable to rice production, rice farmers are limited to their financial power of production if only for sustenance. Faced with this situation, it is important to think of an external or internal financing mechanism that can reliably support rice farmers with the aim of intensifying rice production. To the best of our knowledge, prior research has not yet systematically examined such a mechanism, the issue addressed in this article. The econometric approach is used in this study to better tailor the determinants of rice farmers' access to credit in Benin. The paper first presents a brief description of the conceptual framework and methodology of the study, then analyses and discusses the determinants of rice farmers access to credit in Benin and draw some policy implications.

METHODOLOGY

Data collection

The data was collected in the municipality of Glazoue. This town was chosen because of its strong rice potential and many rice farmers who live there. The selection of rice farmers surveyed was conducted randomly in 9 villages in the commune (Figure 1). A total of 120 rice farmers were surveyed. This size is function from the available number of rice farmer in each village of Glazoue. In each village, the random method was used to select the rice farmer producers. The data was collected using a structured interview guide designed for this purpose. The data collected were related to the socio-economic characteristics of the respondents, the evolution of rice production, the use made of rice production, and access to credit for rice production. Table 1 shows the sample size in the study area.

Data analysis

To analyze the data, the methodological approach, both statistical and econometrics, were adopted. This approach made it possible to use tools such as tables, graphs, and an econometric model. The

Figure 1. Zone study area.

Table 1. Sampling by the village.

District	Village	Number	Proportion (%)
Ouèdème	Kpota	18	18
	Yagbo	12	12
	Kpakpaza	8	08
Kpakpaza	Sowé	19	19
	Yawa	09	09
Thio	Abèssouhoué	06	06
Gomé	Gomé	15	15
Sokponta	Sokponta	20	20
Magoumi	Masso	13	13
Total		120	100

tables and graphs were made with the Excel 2010 software. Also, the descriptive statistics were used. The latter made it possible to characterize rice producers and their farms through the calculation of means (measurement of central tendency) and standard deviations (measurement of dispersion) as well as relative frequencies. For econometric analysis, the logit model was used. Table 2 groups together the description of the variables used in this model.

Model specification

To analyze the determinants of access to credit for rice farmers in the commune of Glazoué, econometric modeling was used. In fact, econometric analysis proposes several methods that make it possible to explain the decision-making behavior of individuals through the use of direct choice models. The most used models are discriminant analysis, Probit models, Logit models and linear probability models. The linear probability models, although frequently used in econometrics because of their simplicity in the application (estimation by the MCO) nevertheless present enormous theoretical deficiencies. Indeed, they lead to the construction of probability density taking values outside the interval [0, 1], which is meaningless. Thus, several authors advise against the use of these models (Griffith et al., 1993; Njankoua, 1999; Koua, 2007).

Indeed, two linked multifactorial analysis techniques generally used in studies of choice, are the Logit and Probit models. Both models use a variety of farm and farmer characteristics (which may be continuous or discrete) to predict the likelihood of choice (Maddala, 1983). The functional difference between these two models is that Logit assumes that the dependent variable follows by a logistic distribution while the Probit assumes a normal cumulative distribution (Koua, 2007). For most analyses, the interpretation of

Table 2. Description of variables.

Variable	Description
Dependent variable	
Credit	Access to credit 1=Yes, 0=No
Independent variable	
Sex	1=Woman, 0=Male
Age	Quantitative variable (Years)
Alphaa	Literacy 1=Yes, 0=No
Spreven	Rice as the main income speculation, 1=Yes, 0=No
Partri	Part of rice income in monthly income (%)
Foriz	Training received in rice production, 1=Yes, 0=No
Nomef	Household size (Persons)
parven4	Part of sold production (%)

the data, although estimated by Logit or Probit, will be very similar. The differences appear only in the size of the distribution, that is to say, for individuals with a very or very low probability of access since the logistic function has a flatter curve. However, calculations are simpler in the case of Logit and more complex in the case of Probit. As part of the analysis of the determinants of access to credit, the model adopted is, therefore, the Logit dichotomous model. This choice is justified by the following:

(1) The variable explained in the context of the study is qualitative and dichotomous (having access or not having access);
(2) The Logit model facilitates the interpretation of the β parameters associated with the explanatory variables Xi according to Hurlin (2003);
(3) The Logit model does not establish a linear relationship between dependent and independent variables and does not affect homoscedasticity; moreover, its use does not require a normal distribution of variables (Jera and Ajayi, 2008);
(4) THE Logit model is frequently used because of the interpretation of the exponential coefficient of a co-variable as an Odds Ratio.

"Odds Ratio" is the quotient:

$$\frac{P}{1-P} = \frac{P\left(Yi = \frac{1}{xi}\right)}{P\left(Yi = \frac{0}{xi}\right)} = e^{xi\beta}$$

where P is the probability that a rice farmer has access to credit; Yi is the dependent variable whose value is 1 or 0; and xi the explanatory variables.
  OR (xi) is the ratio of luck under xi:

(1) The Logit model shows that the log of the odds ratio follows the linear model xiβ. The interpretation of β is as follows: For a qualitative variable, there is β times more chance that the event yi = 1 is realized or not realized;
(2) In the specific case of this study, the Logit model was used by Pitipunya (1995) and Fujimoto and Jahroh (2010), respectively to analyze the determinants of crop diversification on rice fields in Thailand and on the diversification of fish and vegetables in irrigated rice fields in Sumatra, Indonesia.

Description of the model and validity test

In order to explain the decision of the rice farmer on the choice of

the access or not to the credit, one supposes that the rice grower is placed in front of two exclusive choices represented by a random utility (U1 for the choice to have access to the credit and U0 for the choice of not having access to credit). Consider the dependent qualitative variable credit. The two methods it can take are conventionally codified 1 and 0, that is, Credit = 1 if the rice farmer has access to credit and Credit = 0 if the rice farmer does not have access to credit.
  The choice to access credit depends on the following explanatory variables listed. So the probability for the rice farmer to have access to credit is:

$$Pi\ (CREDIT = 1) = F(\beta_1 + \beta_2 sex + \beta_3 age + \beta_4 alpha + \beta_5 spreven + \beta_6 partri + \beta_7 foriz + \beta_8 nomef + \beta_9 parven4$$

Noting β the vector of the coefficients, X the vector of the explanatory variables and P the vector of the probabilities, we have in matrix form:

Pi = P (CREDITi) = 1/Xi = F(Xiβ)

F being the distribution function associated with the probability distributions.

Validity test

The tests and their rules of decision are explained according to the description of Doucouré (2005).

Global significance test (model quality)

As in the case of linear regression models with continuous dependent variable, Fisher's test is performed to see overall significance of the model. To test the significance of one or more model coefficients in the case of models with qualitative variables, we referred to the test on the LR Likelihood Ratio. Thus, the following hypotheses have been tested:

H0: wrong model
H1: good model

Decision rule

The LR statistic follows a Chi-square law with k degrees of freedom;

Table 3. Description of the respondents.

Variable	Modalities	Access to credit	No. access to credit	All
Sex	Woman	37.84	32.61	35.83
	Man	62.16	67.39	64.17
Literacy	Yes	21.62	73.91	41.67
	No	78.38	26.09	58.33
Rice as the main income speculation	Yes	66.22	58.70	63.33
	No	33.78	41.30	36.67
Training on rice production	Yes	68.92	95.65	79.17
	No	31.08	4.35	20.83

with k the number of explanatory variables. We will reject H0 if the critical probability is less than 5%.

Hosmer-Lemeshow test

This test makes it possible to assess the quality of the adjustment made. Thus, the following hypotheses have been tested:

H0: good adjustment
H1: bad adjustment

Decision rule

H0 is accepted if the value of the corresponding probability is greater than 5%. Otherwise, H0 is rejected.

Evaluation of the predictive power of the model

Here, the percentage of correct predictions is calculated, that is, the percentage of cases where the observed value is equal to the predicted value. Also, the percentage of the contrary cases (false predictions) is calculated.

Decision rule

Since the percentage of false predictions is low (close to 0), the prediction power is high.

Evaluation of the explanatory power of the model (pseudo R squared of McFadden)

The McFadden R-square is the analog of R squared in the case of linear regression. It is still called the pseudo R squared. It allowed appreciating the explanatory power of the model. Thus, a high value (close to 1) means that the model has good explanatory power.

Evaluation of the discriminating power of the model (ROC curve)

In order to construct the prediction model, it is of interest to examine its discriminating power. This examination was done by calculating the area below the Receiver Operating Characteristic (ROC) curve or efficiency characteristic curve. The area under this curve was used to assess the accuracy of the model to discriminate accessing and non-accessing to credit. Discrimination is exceptional when the OCR area ≥ 0.9.

Significance test of the coefficients of the explanatory variables

The following hypotheses were tested:

H0: $\beta_i = 0$
H1: $\beta_i \neq 0$

Decision rule

H1 is accepted when the critical probability is less than 5%. It is rejected in the opposite case

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The description of the respondents is shown in Table 3 that 64.17% of men are surveyed against 35.83% of women. These results show that the majority (67.39%) of men have access to credit for agricultural production. In terms of informal education, only 41.67% of respondents are literate. Of those rates with literacy training, only 21.62% do not have access to credit. Rice is the main income speculation for more than 60% of respondents, of whom more than 58% have access to credit for rice production. In terms of capacity building, descriptive statistics show that 79.17% of the respondents were trained in rice production. Training in rice production is a factor that has facilitated access to credit because more than 95% of those trained in rice production had access to credit for rice production.

Table 4 shows that the population with access to credit is relatively young. The size of households in this population is on average six inhabitants against eight for

Table 4. Distribution of age, household size and income according to access to credit.

Variable	Access to credit	
	No	Yes
Age	46.14±11.32	44.46±8.98
Households size	8.31±3.97	6.59±1.51
Part of the income from rice in monthly income	30.48±2.10	50.13±2.75
Part out of 100 sold	57.3±2.99	65.9±0.91

Table 5. Results of the logistic model regression.

Dependent variable: Credit
Estimation method: Maximum likelihood (logit binary model)
Sample size: 120

Variable	Coef	Std. Err	P-value
Constant	0.63	2.06	0.76
Sex	-1.20	0.76	0.11
Age	-0.04	0.03	0.22
Literacy	3.08***	0.96	0.00
Rice as the main income speculation	-5.39***	1.61	0.00
Part of rice income in monthly income	0.81***	0.27	0.00
Training received in rice production	-0.04	1.09	0.96
Household size	-1.13***	0.28	0.00
Part of sold production	0.36	0.22	0.10
Pseudo $\chi 2$:	0.61		
LR Statistics (ddl=8) :	97.22	LR Probability	0.00
H-L Statistics :	6.30	H-L Probability	0.61
% of correct prediction:	86.67	% of incorrect prediction	13.33
Discrimination power of the model:		0.95	

***$P<0.001$.

those who do not have access to credit. The part of income from rice production in the monthly income of the farmer is about 50% for those who have access to credit unlike those who do not have access to credit which is about 30%. This result shows that rice production generates subsequent income for those who have access to credit because it makes it easier for them to spend on production. Similarly, farmers who have received credit sell more than 65% of their production against an average of 57% for those who do not have access to credit.

Results of econometric modeling

The estimation of the logit model with the Stata 13 software gives the results which are shown in Table 6. The results of the logit estimation of the model show the probability of the LR statistic of 0.00. This value, much

less than 0.05 makes it possible to affirm that the model is globally significant at the 1% level. The probability statistic of Hosmer-Lemeshow (HL) test at the 5% level is 0.61; which is greater than 0.05. Thus, the model presents a quality of fit that is good.

The prediction model is as shown in Figure 3 and shows that 86.67% of the predictions are correct and only 13.33% are incorrect. This result makes it possible to accept the hypothesis according to which the model has a high predictive power.

The value of the pseudo R^2 of McFadden which makes it possible to appreciate the explanatory power of the model gives a value of 0.6085 or 60.85%. This means that more than 60% of the explanatory variables make rice farmers' access to credit easier to understand. The evaluation of the discriminating power of the model involves the calculation of the area delimited by the ROC curve. In the case of the logit model of this study, the area delimited by the ROC curve is 95.56%, which
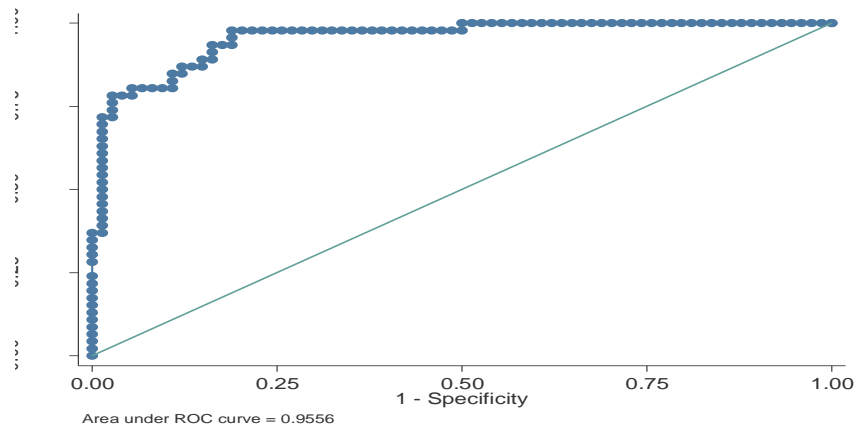
Area under ROC curve = 0.9556

Figure 2. ROC curve.

Table 6. Odds-Ratio and Marginal Effects

Variable	Odds-ratio		Marginal effects	
	Odds-ratio	P-value	dy/dx	P-value
Sex	0.302	0.114	-0.131	0.117
Age	0.958	0.225	-0.004	0.244
Literacy	21.726	0.001***	0.383	0.005
Rice as the main income speculation	0.005	0.001***	-0.765	0.000
Part of rice income in monthly income	2.292	0.002***	0.078	0.014
Training received in rice production	0.953	0.965	-0.005	0.965
Household size	0.322	0.000***	-0.106	0.005
Part of sold production	1.428	0.105	0.034	0.088

***$P<0.001$.

reflects an exceptional discriminating power (Figure 2).

The test used to test the significance of the coefficients is the Likelihood Ratio Test (LRT). Thus, the analysis of the results in Table 6 shows that the coefficients of four variables are significant at the 1% level. These are the variables literacy, rice as the main speculation in terms of income, share of rice income in monthly income and household size. Gender, age, training received in rice production and share of products sold are not significant.

The marginal effects and odds-ratios of the continuous variables were calculated at the mean of the data and for the dummy variables, a value of 0 was used if the mean is less than 0.5 and a value of 1 was used if the average is greater than or equal to 0.5 (Banerjee, 2008).

Analysis of logit model regression results

The value of the probability that tested the null hypothesis that all the coefficients of the explanatory variables are zero is significant at the 1% level. This leads to the conclusion that the model is globally significant at the 1% level. The Hosmer-Lemeshow test shows the existence of a good quality of the fit of the model. This means that the difference between observed and predicted variables is not significant. In addition, the McFadden pseudo R^2 value is 60.85%, which means that the variation of the dependent variable, access to credit, is explained at 60.85% by the variation of the explanatory variables. Similarly, the percentage of incorrect predictions (13.33%) is very low compared to that of correct predictions (86.67%), which makes it possible to say that the model has a very high power of prediction.

On the other hand, in a linear model (Logit in the case of this study), the parameters of the variables are not directly interpretable. But according to Doucouré (2005), the most important is the sign of the coefficients that indicate whether the associated variable influences the probability upward or downward.

Thus, the results of the coefficient estimation reveal that literacy and the share of rice income in monthly income increase the chances of having access to credit. However, there is a deficit in that having rice as the main speculation in terms of income and household size decreases the chance of having access to credit. The odds-Ratio and marginal effects results will be interpreted

```
Classified    |       D              ~D       |      Total
_____|_____|_____

        +     |       37              7       |        44
        -     |        9             67       |        76
_____|_____|_____

     Total    |       46             74       |       120


Classified + if predicted Pr(D) >= .5
True D defined as credit != 0
_____

Sensitivity                        Pr( +| D)      80.43%
Specificity                        Pr( -|~D)      90.54%
Positive predictive value          Pr( D| +)      84.09%
Negative predictive value          Pr(~D| -)      88.16%
_____

False + rate for true ~D           Pr( +|~D)       9.46%
False - rate for true D            Pr( -| D)      19.57%
False + rate for classified +      Pr(~D| +)      15.91%
False - rate for classified -      Pr( D| -)      11.84%
_____

Correctly classified                              86.67%
_____
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Figure 3. Predictive power of the model.

independently to highlight the impact of each exogenous variable on the exogenous variable.

Literacy

Literacy is an important factor to have access to credit for agricultural production. The regression coefficient for this variable is 3.078 and a P-value of 0.001. This variable is significant at the 1% level. This result means that the fact that the farmer is literate increases the chances of having access to credit for rice production by 21.72 times. Thus, the econometric analysis shows that the level of literacy of the credit applicant is a significant factor for access to credit. More the applicant is alphabetized, more likely he is to obtain credit from financial services.

This result confirms those of Evans et al. (1999), which showed that low literacy levels affect the decision of the credit grantor. It can be concluded that literacy is a criterion for selecting credit applicants. However, the descriptive analyzes reveal that the highest access rate is observed in the category of literates (73.91%). The most important consideration here is to have a qualifier to have access credit. The basic qualifier for a credit applicant is to be literate. This implies a strong negotiating capacity and a spirit of discernment. For Eloundou et al. (2013), a high level of literacy is an asset for women who can play the role of leaders or leaders of groups and even act as

true intermediaries between the rural world and external partners. But illiteracy creates a dependency on others who may limit the potential power of action of an individual.

Rice as the main speculation in terms of income

The regression coefficient of the rice variable as the main income speculation is -5.38 with a probability of 0.001. This means that this variable negatively and significantly influences the possibility of having access to credit for rice production at 1% level. In addition, Table 3 shows that those who have rice as the main income speculation do not have access to credit (66.22%). This can be explained by the fact that the income from rice when it is taken as the main speculation is really considerable so that the farmer no longer needs to apply for credit. In other words, if the farmer produces his rice and has sufficient added value to meet the other expenses, he no longer needs to go to a financier to apply for credit. In this case, it can be self-financing. This is explained by the negative sign of this variable in the logit model.

Part of rice income in monthly income

The level of the part of income in monthly income has a

positive influence and is significant at the 1% level of access to credit for rice production. Thus, the part of rice income in the monthly income of the farmer increases the chances of having access to credit for rice production by 2.29 times with a probability of 0.002. The marginal effect estimated at -0.78 implies that an increase of 0.002 USD of income from rice will increase the probability of having access to credit for rice production of 0.78%. Thus, the probability of having access to credit is an increasing function of income from rice production.

When the farmer's income is growing or stable, the repayment of credit is guaranteed. Nowadays, microfinance institutions do not give credit to anyone and anyhow in Benin. The credit applicant must show a guarantee worthy of the name and validly represented.

Household size

The regression coefficient for the household size variable is -1.13 with a gain of 0.000. These results imply that the household size variable influences negatively and significantly the possibility of having access to credit for rice production at a 1% level. The marginal effect estimated at -0.106 implies that an increase of one unit of the producer's household size decreases the probability of having access to credit for rice production by 0.106%. In other words, it should be noted that the effect of household size has been anticipated to be negative whereas it is positive in reality. As a result, the effect of household size on productivity depends more on the quality and skills of household members than on the size of the household (Bamba et al., 2014). If they have a certain level of education and proven experience in rice production, it will help the head of the household to perform better. In many cases, the family workforce (which is the largest) is often made up of women and children who are not often experienced or have not attained a high level of education. These results confirm those of Fall (2009) who showed that size is a datum that informs both the level of family burden and the potential of agricultural labor available within a household. Thus, size acts differently depending on these two considerations. The first aspect justifies the search for higher incomes to meet the needs of the family and thus influences attempts to intensify production. Eloundou et al. (2013) have shown that the importance of the number of people living in a household can be explained by two phenomena: age of union and early sexual intercourse in rural areas. Indeed, this trend is not limited only to parents and children, but also extends to cousins and grandparents. In their study, women with more than 8 people in their household are much more members belonging to a microcredit institution. Thus, this high representativeness of members can be attributed to the fact that households with more "mouths to feed" are forced to find sources of safe, available and continuous money loans for family members.

Conclusion

Rice farmers face several factors limiting their access to factors of production in general and specifically to financial services. The purpose of this study was to identify and analyze these factors. Literacy, the part of income from rice in the farmer's monthly income, rice as the main income speculation and household size can be considered as the main factors limiting rice farmer's access to services of microfinance institutions in rural areas. For easy access of rice farmers to agricultural credit, this study recommends that actors adapt the service offer of microfinance to the socio-economic conditions of rice farmers in order to enable them to access credit and increase their rice production, which would help meet the demand for rice and, by extension, contribute to reducing food insecurity in Benin.

Whatever the scientific value given to this document, we must recognize that it has certain shortcomings. Indeed, most of the data used in this study come from field surveys. Given the imperative of time related to the requirements of the available financial means, all the producers of the municipality were not met. In addition, the data were collected by single passage where the respondents' memory is used. It should also be noted that the mistrust shown by some respondents in the provision of information has been a serious handicap for access to qualitative data and other quantitative data. However, the similarities, or even the repetitiveness of some information obtained from several respondents, make it possible to grant relative reliability to all of these collected data. Also, throughout the data collection phase, our constant concern has been to minimize, as much as possible, the gaps in reality. Despite these constraints in the field and these limits, the analysis of the data recorded throughout this study provides a better understanding of the functioning of the shrimp industry in Benin, through the value chain.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests

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