



RESEARCH ARTICLE

PREFERENCE FOR CREDIT SOURCES IN RURAL AREAS: THE CASE OF SMALL RICE PRODUCERS IN CÔTE D'IVOIRE

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ABSTRACT

This study's goal is to investigate the socioeconomic variables that influence small-scale rice growers in Côte d'Ivoire's need for financing from various sources. The study assessed producers' choice of various credit sources, including banks, credit unions, people, and input suppliers, using a multivariate Probit model applied to data collected from a sample of 1429 producers acquired through multilevel stratified sampling in the departments of Korhogo, Ferké and Man in Côte d'Ivoire. The findings indicate that the choice of credit source is influenced by age, gender, the number of children in the household, the cultivation of cash crops, the value of farm equipment, off-farm activities, household income, contact with extension agent, the distance from town, the main activity, group membership, the level of technology applied to the plot, the ownership of livestock, the degree of self-consumption, the number of assets owned, and geographical location. These sources are substitutable from the producers' perspective. Policy makers should take into account the characteristics of the available and appropriate credit sources in order to develop a credit market suitable for all smallholder farmers.

KEYWORDS

Credit Sources; Small Producers; Credit Demand; Multivariate Probit.

1. INTRODUCTION

Balanced and sustainable economic and social development relies in its initial stages, on a strong agriculture. This implies the injection of very large amounts of capital, implying a rise in agricultural credit (Audrey et al., 2016). Thus, credit is essential to building a strong and supportive ecology for agricultural growth. Credit is a key element that might alleviate productivity difficulties and reduce severe poverty, boosting the development of self-employment in the rural agricultural and non-agricultural sectors, according to a (World Bank, 2017).

The agricultural industry in Côte d'Ivoire was subject to numerous economic policies both before and after independence, like to many other African nations. This importance is due to the roles played by the agricultural sector in the Ivorian economy. Food was meant to be the first thing it provided, followed by labour for other economic sectors, and then money was expected to be generated for the state budget. The 1980s, however, saw Côte d'Ivoire's Keynesian-inspired public financing model fall short as spending grew out of hand and the percentage of unpaid bills rose to 65%. (Djato, 2001). In order to give financial services to the unbanked, there was financial deregulation and the use of private financial institutions, particularly microfinance.

The goal of microfinance is to give households with restricted access to traditional financial institutions like banks with financial services (savings, loans, and microfinance credit). Nevertheless, years after its inception, the microfinance industry continues to fall short of the funding needs of the agricultural sector (N'bana et al., 2020). According to

microfinance organisations in Côte d'Ivoire place a greater emphasis on mobilizing savings than on offering credit, which can be nevertheless an appropriate way for agricultural development (Togba, 2012). Financial support for family farms has decreased as a result, particularly for key crops like rice.

The results of the ROPPA (Réseau des Organisations Paysannes et des Producteurs Agricoles de l'Afrique de l'Ouest) study (2014) indicated that a small percentage (12%) of the volume of credit allocated to all sectors of the economy went to agriculture and that only 2% of this volume was allocated to family farming (essentially campaign credits, maximum duration of a year). In addition, this study shows that of the total credits granted to the productive system, the microfinance institutions (MFIs) that are closest to family farms only allocate 23% of their credit portfolio to agricultural activities. Medium and long-term credit is granted by banks that are generally inaccessible to family farms. In most cases, family farms have difficulty accessing input financing, which affects production. The conditions of access to financing also do not allow them to make their activity profitable (ROPPA, 2018). As a result, the area under cultivation is decreasing. While the area devoted to rice production in Côte d'Ivoire had experienced a significant jump from 688,390 ha to 918,494 ha between 2013 and 2015, the area devoted to rice then declined for four consecutive years (805,644 ha), before rising slightly in 2019 (823,411 ha). The reasons for this decline are attributed to reduced support for inputs, improved seeds, and marketing difficulties (ADERIZ-CI, 2022).

This situation has led some producers to turn to informal credit. Often rightly or wrongly called "loan sharks," informal lenders present

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themselves as an alternative or last resort for financing family farming (Youan-Bi, 2016). Indeed, traditional societies have always lived with informal financial systems. These include tontines, loan sharks, etc. But the analysis of these practices is taking shape with studies conducted by some researchers and international institutions (Graham et al., 1987; World Bank, 2007). According to the formal financial system's restriction of credit is to blame for the growth and existence of informal finance (Stiglitz, 2000). They demonstrated that endogenous rationing happens as a result of formal lenders' limited knowledge and their usage of collateral to address the inherent moral hazard and adverse selection issues in lending operations. Those without enough collateral are involuntarily shut out of the credit market, but they can get loans from unregulated lenders who, because of their access to information, can replace collateral with information-intensive screening and monitoring. (Hoff et al., 1990).

The aforementioned information makes it abundantly evident that in order to address the issue of the mismatch between credit supply and demand, we must comprehend the variables that affect the producer's choice to request for credit as well as the sources they consult. Numerous scholars have argued that the lower trend in credit allocation to farm households is a supply issue, but it may really be a demand one. So, utilizing both qualitative and quantitative methodologies, this study aims to comprehend the sources of credit for small-scale producers in Côte d'Ivoire as well as the key variables that affect their desire for credit. More specifically, this study intends to accomplish the following two goals:

Specific objective 1: Identify the sources to which small producers turn to apply for credit.

Specific objective 2: To investigate the key elements that influence farmers' decision to apply for the many available sources of loan in the region.

The scientific contribution of this study is severalfold. First, we integrate

new explanatory variables to those existing in the literature. Second, we integrate qualitative methods into existing ones to better understand the results on this topic. Finally, we explore for Côte d'Ivoire the factors influencing the preference for existing credit providers after nearly ten years of socio-political crisis.

The findings of this study are anticipated to further understanding of the available loan sources in rural Côte d'Ivoire and the variables that influence producers' decision-making. The policy suggestions will also assist the government and financial institutions in addressing the problems found while creating financial innovations to sustainably offer loan services catered to farmers' demands (IFPRI, 2014).

2. MATERIAL AND METHODS

2.1 The Data

The baseline survey, which the World Bank undertook as part of the launch of the pilot project for the economic inclusion of small rice farmers in an inclusive value chain in Côte d'Ivoire, provided the data for this study. In three areas—the department of Man in western Côte d'Ivoire and the departments of Korhogo and Ferké in the north of the country—a total of 1,429 producers were polled in the 2020 campaign. These departments were chosen because of the 2002-2011 crisis that severely affected these areas. Stratified random sampling was used to identify villages and rice farms in each of the three production poles, using lists from the Côte d'Ivoire Rice Development Agency (ADERIZ-CI). The survey questionnaire takes into account the socioeconomic characteristics of producers and their households, the characteristics of their plots of land, activities, income, credit requests, existing and requested sources of financing, and much other information useful for our analysis. The variables used in this study are those generally used in the literature and other variables added based on field experience (see table 1).

Table 1: Study variables

Variables	Definition	Expected sign (+/-)
Age	Continuous variable	+
Sex (male=1)	dummy variable, male=1	+
Group membership	dummy variable, yes=1	+
<i>Level of Education</i>		
Primary	dummy variable, primary=1	+
Secondary	dummy variable, secondary=1	+
University	dummy variable, university=1	+
<i>Composition of the household</i>		
Number of children	Continuous variable	+
Number of youth	Continuous variable	-
Number of mature	Continuous variable	-
Number of old	Continuous variable	+
Contact with extension agents	Dummy variable, yes=1	+
Distance to what? Field? Village? Market?	Continuous variable	-
Livestock ownership	Dummy variable, yes=1	+
Land cultivated (ha)	Continuous variable	+
Improved technology application	Dummy variable, yes=1	+
Cash crops possession	Dummy variable, yes=1	+
Farm equipment value	Continuous variable	-
Total income	Continuous variable	+
Off-farm activity	Dummy variable, yes=1	+
Main job	Dummy variable, farmer=1	+
Self-consumption level	Continuous variable	-
Number of assets	Continuous variable	-
<i>Departments</i>		
Korhogo	Dummy variable, yes=1	+/-
Ferké	Dummy variable, yes=1	+/-
Man	Dummy variable, yes=1	+/-

Source: Author

2.2 The Analysis Model

We develop and evaluate a multivariate Probit model to determine the demand for credit and the relative relevance of the various sources of credit accessible to small rice growers in rural Côte d'Ivoire. Since producers can use a variety of financing options, there is a danger of

endogeneity due to the simultaneity of demand choices. In fact, there is a strong likelihood that the demand directed at traditional banks, informal lenders (individuals), and input supply firms is interconnected with the demand directed at credit cooperatives. In this context, skewed coefficients would result from the estimation of separate Probit models. We utilise a multivariate Probit with four independent variables that take

the value 1 when the producer has solicited the source and 0 if not to demonstrate the interdependence of the credit utilization modalities. Let S_1 be a latent denoting the likelihood that a producer will approach support and input suppliers; S_2 , a latent variable denoting the likelihood that a producer will approach unofficial lenders (individuals); S_3 , a latent variable denoting the likelihood that a producer will approach traditional banks and S_4 a latent variable denoting the likelihood that a producer will approach credit cooperatives. For people who did not apply to any sources, the excluded variable is for them. A set of observable traits X determines these variables. In accordance with Greene (2003, pp. 931–933), we apply the generic specification of the multivariate Probit to a quadrivariate Probit represented by a four equation system as follows:

$$\begin{cases} S_{i1} = a_1 X_{ij1} + \varepsilon_1 \\ S_{i2} = a_2 X_{ij2} + \varepsilon_2 \\ S_{i3} = a_3 X_{ij3} + \varepsilon_3 \\ S_{i4} = a_4 X_{ij4} + \varepsilon_4 \end{cases} \quad (1)$$

With: i representing the producer; X_i = Vectors of factors affecting the decision to seek or not seek a funding source; a_j = Unknown parameter vector ($j = 1, 2, 3, 4$) with the assumption that the error term will follow a quadrivariate normal distribution with mean 0 and variance 1. Here is the covariance matrix:

$$\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \end{pmatrix} \sim N \left[\begin{pmatrix} 1 & rho_{12} & rho_{13} & rho_{14} \\ 0 & 1 & rho_{23} & rho_{24} \\ 0 & 0 & 1 & rho_{34} \\ 0 & 0 & 0 & 1 \end{pmatrix} \right] \quad (2)$$

Where $rho_{12}, rho_{13}, rho_{14}, rho_{23}, rho_{24}$ are pairs of residuals $(\varepsilon_1, \varepsilon_2), (\varepsilon_1, \varepsilon_3), (\varepsilon_1, \varepsilon_4), (\varepsilon_2, \varepsilon_3), (\varepsilon_2, \varepsilon_4)$ et $(\varepsilon_3, \varepsilon_4)$. We can manage unobservable heterogeneity among funding sources using this model. In the presence of unobservables that influence loan application decisions across the four funding sources, the model is able to account for these effects. For example, if we assume that rho_{12} , represents the correlation coefficient between the residuals of the equation for demand to framing companies and informal credit and is significantly positive, then the unobservable characteristics that increase the probability of demand to framing companies are the same as those that increase the probability of demand to informal credit. On the other hand, if this coefficient is negative, the likelihood of demand for informal credit is decreased by the unobservable causes.

The maximum likelihood simulation (MLS) approach is used to estimate the four-equation simultaneous system. Here, we employ the Geweke-Hajivassilu-Keane (GHK) simulator. The multivariate normal distribution function may be represented using this technique as a sequence product of univariate normal distribution functions (Cappellari and Jenkins, 2003, 2006). In these circumstances, where both the number of random drawings and the number of observations goes to infinity, the simulated maximum likelihood estimator is consistent. As the number of random drawings rises along with the sample size, the simulation bias is therefore decreased to a very small level. The number of random drawings should, according to Cappellari and Jenkins (2003, 2006), be at least the square root of the sample size. In light of the 1429 data in our investigation, the choice of 38 draws enables us to estimate our parameters with confidence.

3. RESULTS

3.1 Descriptive Statistics

Table 2 below provides an overview of the respondents' characteristics. The table's interpretation demonstrates that there is a consistent distinction between credit applicants and non-applicants. The typical response is a 46-year-old guy male from a producer group who has never attended college. Non-credit applicants are much more involved in the producer group and have a higher level of education than applicants. Credit-seeking households have fewer individuals in their household than non-credit-seekers. This suggests that applicants face a labor shortage that they must compensate with wage labor, hence the need for credit. Credit applicants have less contact with the extension agent and less application of improved production technologies on their farms. In addition, they are better equipped and have more income than non-applicants. This would highlight the self-selection of applicants, as most credit institutions require often high collateral for a very poor farmer as is the case in our study area. Thus, a farmer who does not have sufficient farm equipment or income that could constitute sufficient collateral will prefer not to apply for credit. On average, non-applicants have more cultivated land, more livestock, more cash crops and more off-farm activity than credit applicants. This might suggest that these producers have sufficient cash inflows to support their activities. In addition, the average respondent is a professional farmer, consuming about 62.7% of his or her rice production and owning about 20 assets as wealth. Finally, the departments of Korhogo, Ferké, and Man, respectively, are home to around 32%, 38%, and 29% of respondents.

Table 2: Descriptive Statistics of the Study Variables

Variables	All (n=1429)	Non-applicant (n=1023)	Applicant (n=406)	Difference	P-value
Age	46.646	46.823	46.2	0.624	0.382
Sex (male=1)	0.915	0.899	0.956	-0.056	0.001
Group membership (%)	62.0	40.52	21.48	19.04	0.000
<i>Level of Education</i>					
Primary (%)	25.9	19.80	6.09	13.71	0.015
Secondary (%)	13.7	11.13	2.59	8.54	0.001
University (%)	0.6	0.49	0.07	0.42	0.317
<i>Composition of the household</i>					
Number of kids	2.833	2.632	3.34	-0.709	0.000
Number of youth	1.451	1.383	1.623	-0.24	0.002
Number of mature	1.295	1.268	1.365	-0.097	0.079
Number of old	0.237	0.253	0.195	0.059	0.048
Contact with extension agents (%)	40.3	25.75	14.56	11.19	0.000
Distance	25.784	25.540	26.398	-0.858	0.353
Livestock ownership (%)	42.3	26.80	15.54	11.26	0.000
Land cultivated (ha)	8.87	9.249	7.915	1.335	0.864
Improved technology application (%)	69.6	44.23	25.33	18.9	0.000
Cash crops possession (%)	64.6	42.27	22.32	19.95	0.000
Farm equipment value	122251.13	90091.644	203283.52	-113191.88	0.000
Total income	198196.06	159901.394	294687.29	-134785.9	0.002
Off-farm activity (%)	13.6	9.24	4.34	4.9	0.239
Main job (farmer=1) (%)	91.1	64.45	26.66	37.79	0.022
Self-consumption level	0.627	0.651	0.565	0.087	0.000
Number of assets	20.508	406	20.378	20.835	0.506
<i>Departments</i>					
Korhogo (%)	32.3	18.75	13.58	5.17	0.000
Ferké (%)	38.6	26.87	11.69	15.18	0.208
Man (%)	29.1	25.96	3.15	22.81	0.000

Source: Author

3.2 Sources of Credit

The survey revealed four existing sources of credit to which small-scale producers in our study area: management and input supply companies, individuals/tontines, banks and credit cooperatives. The first two sources are informal and the last two are formal. The main condition imposed by the management companies is a contract to sell paddy rice after the harvest, with repayment in kind (paddy rice), and that imposed by the individuals/tontines is fraternity or friendship, with repayment only in cash. As for banks and union credits, it is necessary to have at least three months of savings and these savings must represent at least one third of the amount requested, in addition to a guarantee. Only the credit granted by the framing/input supply companies could be in kind (inputs, mechanized services, etc.) or in cash, while the others granted only cash credits.

In terms of application trends, figure 1 shows us that the majority of men (52.32%) tend to apply for credit first to credit unions, then to input supply companies (24.74%), then to individuals (informal, 20.1%) and finally to banks (2.84%). On the other hand, the main sources to which women apply are credit unions (44%) and individuals (44%), and finally management and input supply companies (12%). No applications were made to banks. This suggests that women are much more likely to apply

for informal credit than men. In our sample, this is because most women feel that banking procedures are complex and that they are afraid of not being able to repay. In addition, many of them are poorly educated.

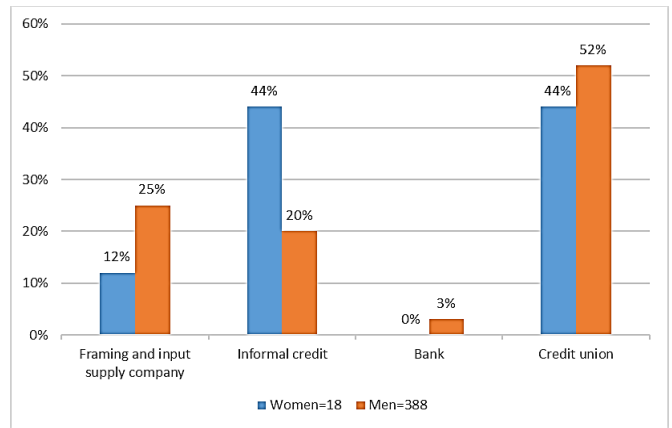


Figure 1: Credit sources by applicants

3.3 Factors Influencing Credit Source Preference

Table 3: Multivariate Probit result				
Variables	Framing and input supply company	Informal credit	Bank	Credit union
Age	-0.001 (0.008)	-0.000 (0.007)	0.041**(0.020)	0.012**(0.006)
Sex (male=1)	0.297 (0.384)	-0.040 (0.217)	3.619(331.885)	0.465**(0.215)
Group membership	0.084(0.146)	-0.231*(0.124)	0.024(0.310)	0.554***(0.111)
<i>Level of Education</i>				
Primary	-0.118(0.155)	-0.004(0.139)	0.282(0.327)	-0.069(0.114)
Secondary	-0.072(0.263)	0.112(0.195)	0.563(0.410)	0.055(0.161)
University	-3.817(876.233)	-3.820(551.399)	-3.178(1641.493)	-0.108 (0.651)
<i>Composition of the household</i>				
Number of kids	0.051(0.030)	0.056**(0.029)	0.036(0.069)	-0.001 (0.024)
Number of youth	-0.014*(0.049)	-0.002(0.047)	-0.016(0.122)	-0.019(0.037)
Number of mature	-0.093(0.082)	-0.059(0.078)	-0.317(0.215)	-0.042(0.061)
Number of old	-0.005(0.178)	-0.133(0.165)	-0.793(0.521)	-0.115(0.131)
Contact with extension agents	-0.006(0.128)	0.020(0.119)	0.315(0.288)	0.417***(0.096)
Distance	0.004(0.004)	-0.006(0.004)	-0.001(0.010)	-0.006*(0.003)
Livestock ownership	0.178(0.126)	0.357***(0.117)	-0.188(0.285)	-0.189**(0.096)
Land cultivated	0.000(0.001)	-0.016(0.016)	-0.032(0.034)	-0.000(0.001)
Improved technology application	0.355(0.248)	0.181(0.200)	-0.304(0.421)	0.412***(0.152)
Cash crops growing	1.036***(0.184)	0.011(0.139)	0.971**(0.462)	0.626***(0.114)
Farm equipment value	0.000***(0.000)	-0.000(0.000)	0.000(0.000)	0.000**(0.000)
Total income	-0.000(0.000)	0.000(0.000)	0.000*(0.000)	-0.000(0.000)
Off-farm activity	0.323*(0.172)	0.129(0.160)	0.083(0.359)	-0.036(0.135)
Main job	0.439*(0.240)	0.176(0.216)	-0.345(0.367)	0.398**(0.180)
Self-consumption level	0.259(0.220)	0.304(0.211)	-0.348(0.463)	-0.815***(0.161)
Number of assets	0.002(0.005)	-0.008(0.006)	0.001(0.012)	-0.013***(0.004)
<i>Departments</i>				
Korhogo	-0.093(0.142)	0.304**(0.144)	-0.036(0.325)	0.454***(0.116)
Man	-1.358***(0.407)	-0.188**(0.233)	-1.136**(0.574)	-0.147(0.166)
Constant	-3.589***(0.694)	-1.807***(0.515)	-7.245(141.230)	-2.701***(0.449)
Observation	1429			
Log likelihood	-1096.1149			
Significance of the model	Wald chi2(97) = 326.55 Prob > chi2 = 0.0000			
rho21	-0.146*			
rho31	-0.016			
rho41	-0.379***			
rho32	-0.086			
rho42	-0.170**			
rho43	-0.101			
Likelihood ratio test	rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0: chi2(6) = 42.4401 Prob > chi2 = 0.0000			

Source: Author

*** p<.01, ** p<.05, * p<.1; values in parenthesis represent standard errors.

The multivariate Probit was used to analyse the variables influencing the sources of credit that producers choose. The first source of credit is framing and input supply companies (S₁), the second source is individuals (S₂), the third source is banks (S₃) and the fourth source is credit unions (S₄). The excluded/base category includes individuals who have no credit applications. Table 3 above contains the results. We can justifiably estimate the multivariate Probit rather than four individual Probits using the (positive) likelihood ratio test. With a p-value < 0.00001, the independent null hypothesis (H₀) is rebuttable. The coefficients are moreover globally significant.

The categorical variables have a category as a reference for the interpretation. The coefficient associated with a category of a given variable therefore represents the impact of the change in the category concerned relative to the reference category on the probability of applying for funding from one of the funding sources. If the coefficient is positive and statistically significant, the likelihood changes. If the coefficient is negative, however, it will be modest and statistically significant. The interpretation of the coefficients is more difficult than it is for linear regression models because of the non-linearity of the probability. The coefficients cannot be understood as the result of the marginal effects of modifications to the explanatory factors on the relevant variable. So, all that is left are the coefficients' sign shifts and significance.

Table 3's findings show that not all of the variables that impact a person's preference for a credit source are the same. Age significantly influences the probability of applying to formal sources such as banks and credit unions, while gender significantly influences the probability of applying for union credits. Membership in a producer group has a negative and significant influence on the probability of applying for tontines, but a positive influence on credit union. The number of children significantly influences the probability of applying for informal credit (individuals). However, the number of young people in the producer's household increases, the likelihood of applying for credit from supply company decreases. Contact with extension agents significantly influences the preferences for union credits. Distance between the producer's home and the credit union significantly and negatively influences its preference. Having livestock raises the likelihood of applying for particular financing and decreases the preference for credit union. The degree of technology used positively and significantly influences the preference for credit unions. The cash crop growing significantly and positively influences the demand to supply companies, banks and credit unions, with different thresholds. The threshold is 1% for framing companies and credit unions and 5% for banks. The link is positive with respect to individuals but not significant. Farm equipment value significantly and positively influences the preference for supply company and credit union. Household income positively and significantly influences the preference for bank. Off-farm activities influence positively the preference for framing company. Main occupation significantly and positively influences the preference for framing company and credit union. Self-consumption significantly and negatively influences the preference for credit union. At the 1% level, the producer's total holdings have a negative and considerable impact on the likelihood that they will apply for credit unions. Credit demand is also influenced by geographic location.

We now reach the association between the various credit sources. Except for those between banks and framing and input supply firms (rho 31), banks and individuals (rho 32), and credit unions and banks (rho 43), the coefficients of the error terms are negative and significant. The significance of these coefficients justifies the use of a quadrivariate probit.

4. DISCUSSIONS

The probability of applying to banks and credit unions increases with age. However, shows that the probability of accessing formal institutions decreases beyond age 55 (Soro, 2014). This is in line with finding that age and credit demand have a quadratic relationship, suggesting that at intermediate ages, credit demand rises with age but falls as an individual gets older (Mpuga's, 2010). When the producer is male, there is a higher likelihood that they will apply to credit unions. This draws attention to the issue of women's financial exclusion, which is a major issue in Côte d'Ivoire's rural communities. This result is in agreement with suggestion that, in order to boost women's chances of getting finance and to make investments in agriculture, lending programs should focus more on women (Mpuga's, 2010).

The likelihood of applying to credit unions improves with group membership, but the likelihood of applying to individuals drops (informal credit). This result is contrary to those of (Samson and Obademi, 2018; Silong and Gadanakis, 2020). These authors found that membership in a group increases the probability of applying for semi-formal credit (NGOs,

social groups, etc.) because the producer is a member. However, in our study area, the groups advise against borrowing from individuals because their requirements are very restrictive in terms of repayment. These individuals require repayment in kind (bags of paddy rice) equivalent to an interest rate of 50% of the amount borrowed.

The likelihood of requesting informal credit rises when there are more dependent children living in the home. Producers who have a lot of kids run a higher danger of not paying back formal structures. Therefore, many producers choose to use other resources that have less stringent credit requirements. In addition, the number of young people living in the household symbolizes the potential labour force for the producer. The higher the number, the less likely the household will seek credit for work on the farm. The chance of applying to credit unions is favorably and considerably influenced by contact with extension agents. The found similar results but not significant (Silong and Gadanakis, 2020). In our study area, this is because extension agents also play an advisory role to producers in addition to their primary role.

The possibility of applying for credit declines with increasing distance between the producer's home and the credit union. This highlights the problem of improving the supply of microfinance in Côte d'Ivoire by reducing distance. The effect of cattle ownership is explained by the fact that in our study area, producers with livestock often seek loans for emergencies (a sick animal, livestock feed, etc.). Thus, they prefer to avoid the long procedures of formal institutions and turn to private individuals. With the degree of technology used on the farm, the likelihood of demand for credit unions rises. New cash is needed for the adoption of upgraded technology, and credit can provide it. The utilization of credit unions in our research region can be attributed to the cooperatives' ties with various providers of new technology (better seed, chemical fertilizers, pesticides, etc.), which allow farmers who apply for loans to acquire a full complement of production inputs. To benefit from these technologies, producers prefer to apply to them.

The effect of cash crop growing is justified by the fact that all sources of credit are favorable to producers who own cash crops, as they have several means of repaying the credit and the risk of delinquency is reduced, while the effect of the value of farm equipment is explained by the fact that owning farm equipment gives the producer some credibility with these sources, as it provides information on the level of mechanization of the farm and the professionalism of the producer. This result is consistent with those found by several authors (Dzadze and al., 2012; Akudugu, 2012; Chauke and al., 2013). The probability of applying to a bank increases with the level of the producer's income. This is particularly true given that the quantity of revenue is one of the key requirements for obtaining bank credit because it indicates the producer's capacity for repayment. This finding is in accordance with demonstration of the discriminatory nature of income, which shows that producers with higher incomes have easier access to loans from banks and microfinance institutions than those with lower incomes (Soro's, 2014).

The likelihood of demand for framing companies increases with off-farm activities. This is due to the fact that the diversification of activities reduces the financial and labour availability of the producer, who has no choice but to seek credit to meet farm demands. The likelihood of applying for credit from framing companies and credit unions increases when the producer respondent is a principal occupation farmer. This finding contrasts with that of who found that those employed in the business and administrative fields are more likely to ask for credit from moneylenders, government agencies, and commercial banks (Mpuga, 2010). Farmers do not have other sources of cash inflow to develop their activities. They therefore turn to these more credible and financially accessible sources of credit. The probability of applying to credit unions decreases with the degree of self-consumption. It reveals the producer's production orientation. The higher the degree of self-consumption, the more the producer produces only for family consumption and is therefore not interested in developing his farm. The effect of total assets is a manifestation of the producer's riches and his conviction that he does not require financing to carry out his business. This finding contrasts with that of who discovered a favorable impact on credit demand from all credit sources, particularly institutional ones (Mpuga, 2010). According to those who are richer have a higher chance of being approved for loan from official and semi-formal financial organizations, whereas those who are less fortunate must turn to informal sources (Mpuga, 2010).

The results indicate that producers located in the departments of Man tend not to seek any source of credit compared to producers located in Korhogo and the third department of the study which is Ferké. In reality, the department of Man suffered several harms during the socio-political crisis in Côte d'Ivoire between 2002 and 2011, including the looting and burning

of the Central Bank of West African States (BCEAO), which forced the closure of several microfinance institutions. Although financial services are returning, this has significantly decreased the availability of credit in the region and altered the behavior of producers who turned to government programs. In addition, according to information from the field, there has been an improvement in the supply of credit from credit institutions in the Ferké department. Indeed, credit agents travel to the villages to open accounts, raise awareness and allow producers to have access to credit even if they do not have all the required documentation (up-to-date identity card, etc.). All of this encourages local producers to submit a loan application. Producers in the Korhogo district frequently submit applications to private parties and credit unions. This implies that government targeted loan programs are essential for assisting people in rural regions and that these programs must work harder in this area (Mpuga, 2010).

Finally, we find that demand for credit unions is negatively and significantly correlated with demand from individuals and with the firm of supervision and input supply. This implies that the unobservable factors that influence demand for credit unions are negatively correlated with the unobservable characteristics that affect demand for individuals and input supply companies. We infer that there is interdependence between the different sources of credit. The probability of a producer's demand to one source of credit reduces the probability of using other sources. According to Soro (2014), in the presence of multiple sources of credit, individuals choose or are forced to choose one source of financing over another for a variety of reasons related to their socioeconomic characteristics. Therefore, it may be said that there is a relationship of substitution between these various sources of financing.

5. CONCLUSIONS

From the above, the study makes three important recommendations in three directions for agricultural development in rural areas of Côte d'Ivoire. First, for formal credit institutions, the study recommends improving and adapting the credit offer to the needs of clients and raising awareness among rural populations, especially women, which is essential for better financial inclusion throughout the country. In this context, new information and communication technologies as well as mobile banking are an important asset for the financial inclusion of a large part of the population. This improvement could involve revising the regulations of the formal financial sector (reduction of guarantees, adaptation of the repayment deadline to the production cycle, flexibility in the documentation for applications given the post-crisis context in Côte d'Ivoire, etc.) to encourage access by small producers.

Second, the study recommends the formation of producer groups. Commercial Interest Groups (CIGs) could be a good start before evolving into formal cooperatives. This will allow them to constitute solid guarantees and to benefit from good credibility in the eyes of credit institutions and even input suppliers who can accompany them in their production process. In addition, as a group, they can easily benefit from technology transfer, agronomic training and information sharing on existing opportunities.

Finally, the research suggests that the government, NGOs, and development partners support the establishment of inclusive value chains by implementing programs that make it simple and manageable for small producers to qualify for and obtain loans. The government should also improve extension initiatives and foster a climate that would encourage a flood of credit institutions to relocate to communities that have been decimated by the socio-political crises.

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APPENDIX

Appendices A: Multi-colinearity Test of Explanatory Variables

Table A : Variance Inflation Factor		
Variables	VIF	1/VIF
Age	2.312	.433
Sex	1.232	.811
Group membership	1.179	.848
Primary	1.269	.788
Secondary	1.353	.739
University	1.029	.972
Kids	1.273	.786
Youth	1.175	.851
Mature	1.723	.58
Old	1.892	.529
Contact with extension agents	1.123	.89
Distance	1.331	.751
Livestock ownership	1.159	.863
Land Cultivated	1.014	.987
Improved technology application	2.347	.426
Cash crops growing	1.213	.825
Farm equipment value	1.237	.808
Total income	1.149	.87
Off-farm activity	1.071	.934
Main job	1.099	.91
Self-consumption level	1.127	.887
Number of assets	1.296	.772
Korhogo department	1.71	.585
Man department	3	.333
Mean VIF	1.43	.

Source: Author

