Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5, 278-291
2024
Publisher: Learning Gate
DOI: 10.55214/25768484.v8i5.1686

Debt to fececam and profitability of agricultural farms in Benin

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Abstract: In Benin where microfinance as a community development tool has experienced rapid emergence in recent decades, microcredit is seen as the best financial alternative to allow the poorest to access capital through support and support for local structures . It is thanks to this situation that the Fécécam network (Fédération des Caisses d'Epargne et de Crédit Agricole Mutuel), the oldest and the most important in terms of membership at the national level, was restructured to allow several farms farmers to benefit from microcredits. But, after a few years of activities with this institution , several farmers suffered enormous losses, thus causing unpaid bills in the network's portfolio . The main objective of this study is to report on the factors which determine the profitability of said microcredit on farms in Benin, even if it means facilitating the repayment of microcredits received . Thus, from samples constituted for the sectors: cotton, soya, corn and cassava, we have shown, using the generalized method of moments, that debt negatively affects the profitability of most sectors, at the same time, linear and non-linear manner. To this end, in order to ensure the effectiveness of the credits obtained, it is necessary to review the structure of the credits, their granting procedures and the amounts allocated, while ensuring that the tax charges are not very high.

Keywords: *Farmer, Guarantee, Microcredit, Profitability, Taxation.*

1. Introduction

In Benin where microfinance as a community development tool has experienced rapid emergence in recent decades, microcredit is seen as the best financial alternative to allow the poorest to access capital through support and support of local structures (Aklassato , 2010; (Sossa , 2011; (Dahoun *et al.* , 2013). More precisely, it is the success and reputation revealed by the uses of microcredit which have aroused the interest, expansion and proliferation of microfinance institutions in the country. This competitive environment will, more or less, force the Fécécam network (Fédération or Faïtière des Caisses d'Epargne et de Crédit Agricole Mutuel - the oldest and most important in terms of membership at the national level) to be more determined in order to adapt and defend its leading position in the market. Therefore, in order to consolidate its achievements, Fécécam has adopted new reforms since 2016 and strengthened its penetration strategy, especially in agricultural sectors with high economic potential (such as cotton, soya, corn, etc.) . It is thanks to this restructuring that several producers benefited from significant financial assistance. But, after a few years of activity, the institution suffered poor performance, due to its credit activities. Indeed, the quality of the portfolio has observed a continuous deterioration for around eight years: unpaid debts increased from 3% to 8% over the period 2018-2023. Several borrowers are no longer able to meet their commitments due to the losses they suffer in the exercise of their activities. The majority, moreover, are unable to supply their households throughout the year without a lean period lasting an average of 8.5 weeks per year (Sagbo et *al* , 2018). However, the Fécécam network has a particular interest in demonstrating its importance in the Beninese agricultural system, a provider of employment and a creator of wealth (Aïfa , 2017). Indeed, if it is admitted that farms are the main customers of Fécécam and that their economic and financial viability is

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essential for the survival of this institution, there is therefore reason to be interested in their profitability; it is necessary to question their ability to cover their operational costs, in particular their financial expenses in order to generate sufficient profits for their development. However, according to the literature, profit is influenced by various factors, including the credit obtained (Jensen and Meckling , 1976; Miller, 1977; Goddard *et al.* , 2005; Kebewar , 2012) . Therefore, the analysis of the economic activity of these agricultural operations in order to determine the essential factors which influence their results, becomes necessary. This is what justifies the title " Debt to Fécécam and profitability of agricultural operations in Benin". The main objective of this study is to report on the factors which determine the profitability of the credits granted to producers by Fécécam ; even if it means that the latter reimburse them under the required conditions. Indeed, identifying the factors on which the financial profitability of the credits put in place depends can help minimize the risks of non-payment in order to guarantee the stability and sustainability of Fécécam , and by extension, the survival of agricultural operations. To achieve this, we organize the reflection around three main axes, the first of which presents Fécécam . The next axis defines the fundamental concepts and presents the state of previous scientific knowledge. The third axis carries out an econometric examination of the situation of agricultural operations, based on relevant information and analyzes the results.

2. Presentation of Fécécam Benin

Before tackling the actual analysis of the profitability of farms benefiting from microcredits, the focus of this research, it is important to provide an overview of Fécécam , the institution responsible for implementing said credits.

2.1. History of Fécécam Benin

The Network of Local Caisses of Crédit Agricole Mutuel (Clcam) and Regional Caisses of Crédit Agricole Mutuel (Crcam) governed by decree No. 77-37 of February 25, 1977, was at its creation coordinated by the former Caisse Nationale de Crédit Agricole (Cnca), mixed economy banking company created by Ordinance No. 75-59 of August 22, 1975, successively amended by Ordinances No. 76-31 of June 11, 1976 and 77-37 of September 26, 1977. After a few years of activities marked by the strong interference of the State in its management and the general financial crisis that the Beninese economy had experienced, the CNCA was liquidated in 1987. However, given the significant capital confidence enjoyed by the Clcam and the commitment shown by the grassroots populations, the network was rehabilitated, with the assistance of the PTF (Technical and Financial Partners) and the Beninese State. This assistance was marked by the creation of the Federation of Savings Banks and Crédit Agricole Mutuel of Benin (Fécécam) on July 7, 1993, the revision and adoption of the organic texts of the Network and the transformation of Crcam into a Regional Union of Clcam (Urclcam). Restructured and strengthened by the provision of new capital [1], this network of savings and credit cooperatives is reorganized to make local mutual agricultural credit banks (Clcam), counters operating in districts and municipalities (Aïfa , 2023) . The main purpose of these counters is to collect the savings of their members and grant them loans. Indeed, if these practical arrangements have enabled the Network to improve some of its financial aggregates, including in this case the volume of deposits and credits, the equity capital, on the other hand, has been seriously eroded due to the skyrocketing number of unpaid debts. . Hence the development of a new recovery plan commissioned by the Ministry in charge of Microfinance , in June 2007, with the aim of cleaning up the financial situation of the network, which subsequently became the Faîtière des Caisses d'Epargne et of Crédit Agricole Mutuel (Fécécam).

[1] This restructuring aimed to consolidate the achievements (membership, savings, credit, training, computerization, etc.) of the first phase and was marked mainly by recovery and strengthening plans for the Network and the bringing into compliance of the statutes and internal regulations of the entities with the provisions of Law No. 97-027 of August 8, 1997 regulating Mutualist Institutions or Savings and Credit Cooperatives.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5: 278-291, 2024
DOI: 10.55214/25768484.v8i5.1686

This institutional transformation had, among other consequences, the adoption of certain guiding measures including: the merger of the Regional Unions which became the Regional Technical Delegations at the Apex by decree 0001MMFEJFPME/DC/CTJ/CTPMF/SA and the redefinition of the object of Clcam. Since 2016, Clcam has become a savings and credit cooperative (Coopec), that is to say a group of natural and/or legal persons with legal personality, with variable capital, based on the principles of union, solidarity and mutual assistance, and whose main purpose is to collect the savings of its members and to grant them credits. As such, the Clcams are now installed in the Municipalities and Districts which have the capacity, in this case those with the required economic potential. The enthusiasm that these measures aroused among the population encouraged the expansion of the Network in peripheral areas and a renewed interest in the credits granted by the institution. Indeed, agricultural credit, after having lost much of its importance in the Fécécam portfolio, is regaining a certain place (Sagbo et *al* ., 2018).

2.2. Recent Situation of Credit Activities

Fécécam is the largest direct agricultural credit organization (except input credits for cotton) in Benin. Fécécam , created in 1977, alone represents more than 50% of the microcredit offer in Benin. It has numerous subsidiaries at the rural level and a long tradition of small and medium volume agricultural credit for small and medium farmers (Sagbo et *al* ., 2018). The credit offer is quite diversified and includes loans for micro-investment (market shift), operating loans, campaign loans as well as loans for women. In this varied set, we distinguish several categories of credits which are: agricultural credits for cash crops (cotton, pineapple, soya, cashew), agricultural credits for food crops (cereals, tubers), credits for fishing, credits for breeding, etc.

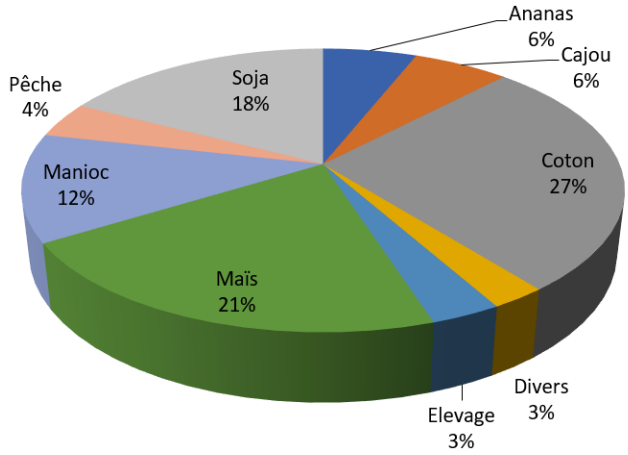

Figure 1.
Distribution of microcredits according to purpose.
Source: Féccam (2023).

As shown in Figure 1, the current structure of credits at Fécécam Benin is largely dominated by crop production which alone accounts for more than 90% of the total. It is relatively predominant in Cotton, but at the same time, other speculations are also remarkably financed. Next come credits for fishing and credits for livestock, with 4.09% and 3.20% of total credits respectively. Finally, various activities (crafts, processing, commerce, etc.) only account for around 3%. This configuration is a reflection of the rural economy of Benin, where unlike the fishing and livestock sub-sectors which are the prerogative of a few regions of Benin, the plant sub-sector is widely spread across the entire national territory. It also denotes the center of interest that the rural sector represents for this network which devotes most of its funding to it. But, at the same time, repayment difficulties continue to arise. Since, inequalities are increasing among the ranks of producers: only 37% of beneficiaries are satisfied with the

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ISSN: 2576-8484
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food situation of their household from a quantitative and qualitative point of view (Sagbo , 2018). The main reason would be the lack of profitability, or even profitability. This state of affairs is, without a doubt, one of the causes of non-repayment of credits; since it prevents "borrowers" from meeting their daily expenses,.

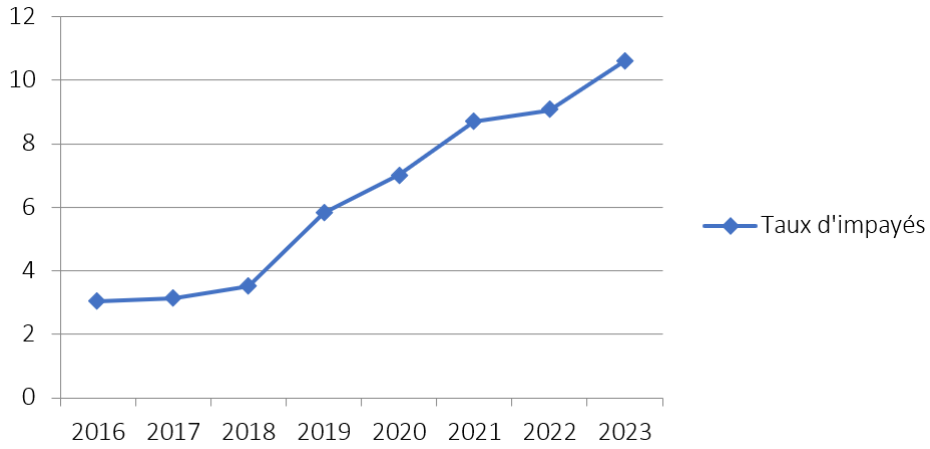

Figure 2.
Recent situation of unpaid debts at Fécécam Benin.
Source: Féccam (2023).

As shown in Figure 2, unpaid debts represented on average 7% of credits granted during the reference period. However, to see clearly, this relatively low rate hides a problem when we look at its evolution over time. Indeed, from 2016 to the present day, this rate has continued to increase year after year, undoubtedly reflecting a trend of poor performance, which ultimately risks jeopardizing the viability of the network. This growing trend in the rate of unpaid bills raises questions about the survival of farms, and by extension that of the network. Indeed, as indicated by several authors (Honlonkou et *al.* , 2001; Ahouangbo , 2006; Azokly , 2010), unpaid debts generally affect the sustainability or even the survival of MFIs . They prevent them (IMFs) from satisfactorily implementing their credit policy, the main source of their productive resources.

3. Conceptual Clarification

In order to make the development more comprehensive and avoid possible confusion, it seemed necessary to clarify certain key concepts contained in this study. From this perspective, it is important to address theoretical information that helps to understand the concepts: microcredit and profitability.

3.1. Concept of Microcredit

Microcredit can be considered as a small amount loan, repayable over a short period, to an entrepreneur or an individual who cannot meet the conditions to access traditional bank loans. It was born following the exclusion of poor people from benefiting from traditional bank loans due to not being able to produce acceptable guarantees (voukeng , 2016).

By its definition, the concept of microcredit covers four essential characteristics relating to: the amount (low), the duration (short term), the cost (financial charges) and the target; target that some consider to be its reason for being (Ndiaye , 2002; Swain ; 2007; Sylli 2020 ;, Wafaa Tani ; 2020) . As such, Dalay -Harris (2006) describes microcredit as "the development of a new strategy to combat poverty in the world, by offering unsecured loans to people living in extreme poverty".

Indeed, microcredit activity is beneficial to the community (and especially to the poor) at the local level where it makes it possible to induce qualitative transformations likely to create opportunities,

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markets, in short an economic network. In villages in particular, microcredit activity greatly benefits the local economy, through the knock-on effect that it is likely to produce in sectors as diverse as agriculture, crafts and small businesses. .

Servet (2006) defines microcredit as "small amount loans granted to groups of solidarity borrowers or to individual borrowers by institutions which can be non-governmental organizations, banks, or public programs ". From this perspective, as Aklassato (2008) points out , the loans granted by Clcam are microcredits. Moreover, this definition by Servet (2006) is perfectly illustrated with these loans whose main beneficiaries are farmers, to whom credits are granted whose amount does not exceed 1,000,000 FCFA , for a period of repayment of up to one year.

In short, microcredit is a loan of relatively small amount and is therefore distinguished from a charity. It has a cost that its beneficiary must bear. As such, it is necessary that it be profitable for the latter.

3.2. Concept of Profitability

The term profitability comes from the word profit which means "excess of revenue over expenses". It is a positive result obtained by an organization, generally a company, after carrying out a set of activities or operations during a period.

Several authors have looked at the notion of profit. Say (1840), makes the difference between profit and interest. The author explains that profit remunerates the service provided by the entrepreneur who has the merit of bringing together in the same hand in a timely manner (which is appreciable because the thing is rare) capacities, capital and risk-taking.

For Schumpeter (1912), profit is the result of the execution of new combinations. "Without evolution, no profit; without profit, no evolution." Along the same lines, Frank Knight deepens the idea of a profit as a counterpart that the entrepreneur earns " (Schumpeter, 1933) . The author considers that "these are the rewards offered by capitalist society to the happy innovator. But the quantitative importance of this element, its volatile nature and its function in the process from which it emerges, place it in a particular category" (Schumpeter, 1912)

François Perroux explains that "The role of the entrepreneur or more precisely his function consists of assessing the final usefulness of objects. It satisfies social needs in the order of their importance and provisionally fixes prices." In this way, profit would be the counterpart of the good satisfaction provided to social needs.

Without obscuring the existence of profit, Marx (1872) dwells much more on its origin. According to him, labor is the only factor bringing added value to the raw materials which were used to produce the good or service sold, capital having no part in the creation of wealth. "The capitalist exploits the worker by pocketing a profit taken from the wages paid."

All these considerations, however, have a certain similarity in that profit measures the financial gain resulting from an economic activity; that is to say, the margin of the income from the sale of a product over the cost of its production in capital investment . In other words, profitability can be understood by an economic surplus (or margin) obtained between the revenues and expenses of an operation. In this case, this is the operating result which is calculated by deducting from the turnover the charges relating to intermediate consumption, staff remuneration, depreciation and interest paid for financial costs. The profitability of a company is then analyzed by its ability to generate a positive result through its activity.

4. Literature Review

The literature on the analysis of profitability as a function of debt is relatively scant and ranges from theoretical foundations to empirical work. The results vary depending on the specification of the profit function and the estimation methods considered.

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4.1. Theoretical Anchoring

Studies on the relationship between debt and corporate profitability can be classified into three categories: signaling theory, agency theory and the influence of taxation (Kebewar , 2012).

Signaling theory suggests that debt, in a situation of asymmetric information, is positively correlated with profitability (Kebewar , 2012).

This theory starts from the principle of the existence of asymmetric information between the different market players, in this case the creditors and the managers (who also have more information). It is based on the need to find solutions and mechanisms that promote the normal functioning of markets through "signals", which would make it possible to inform and guide the various agents with a view to rational, efficient and effective decision-making. optimal.

Through this theory, Ross (1977) called into question the neoclassical analysis of pure and perfect competition where the market is supposed to convey transparent and symmetrical information. The author finds the work of Modigliani and Miller (1958) which assumes that investors have perfect knowledge of companies' activities unrealistic. It presents, therefore, a new analytical framework based on information asymmetry that allows analyzing and correcting common behaviors and aspects that hinder the correct and adequate functioning of the market economy. Indeed, if in a market one of the two actors has better information, the latter, due to its rational nature, will seek to maximize its utility. To this end, it would be ready to develop behaviors which are likely to create distortions in the market which they would make less efficient.

In his analysis based on the used car market, Akerlof (1970) explains that information asymmetry causes situations of moral hazard and adverse selection between borrowers and lenders. Which, according to Stiglitz and Weiss (1981), leads to an increase in the interest rate of the loan, since lenders cannot know the quality of the debtors. This then results in poor market dysfunction, the improvement of which requires the use of credible signals. These are supposed to reveal to lenders, via valuable information transmitted to them, the true value of borrowers (Leland and Pyle , 1977).

Like signal theory, agency theory draws its foundation from the critique of neoclassical analysis which considers the existence of information symmetry between agents on the market. This theory highlights the risk born from the contradiction of interests between different actors of the company, on its result objective. Indeed, when each agent in the economic and financial life of the company seeks, within a certain rationality, to maximize their interests before those of others. (Charreaux , 1998), this results in behavioral divergences which result in agency costs. From a perspective of effectiveness and efficiency, the company will seek to minimize these costs. Hence the need to link the various stakeholders in the company through contracts. The agency theory therefore covers any "contractual" relationship between two parties, such that the situation of one depends on an action of the other: the party which acts is the agent, the affected party is the principal. Jensen and Meckling (1976). The existence of an agency problem is therefore associated with uncertainty, the imperfect observability of the agent's efforts and the costs of establishing and executing contracts" (Charreaux , 1987). This theory, which is based on contractual relationships, also applies to the financial sector. "The directors of these kinds of companies being the stewards of the money of others rather than of their own money, one can hardly expect them to bring to it that exact and careful vigilance which the partners of a company bring. often in the handling of their funds. » (Smith, 1776).

Seeking to illustrate this theory, Jensen and Meckling (1976) relied on the example of shareholders and managers within a company. To this end, they consider managers whose vocation is to manage the company in the interests of shareholders as the latter's agents. However, these two categories of actors have "different utility functions and act in such a way as to maximize their respective utility". This divergence of interest is accentuated by the difference in risks incurred. The shareholder may lose his contributions. The manager runs the risk of losing his job and his value on the job market. It is therefore in their interest to undertake business.

This relationship thus described is also observable in the financial sector where the company considered as *agent* , borrows capital from its banker who is in the role of *principal*. In this case, the latter

Edelweiss Applied Science and Technology
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bears the control costs called *monitoring costs* . The company, for its part, incurs expenses, called *branding costs* . These expenses are likely to give your partner (banker) confidence. Finally, both parties bear a residual cost (*residual loss*) or opportunity cost to the extent that their interests diverge (difference between the result of the agent's action and the optimal behavior for the principal). Jensen and Meckling (1976) show that the agency costs of debt arise due to asset substitution. According to these authors, the debt contract encourages shareholders to invest in a suboptimal way, that is to say they invest in very risky projects, hoping to benefit from the resulting net profits. This critical behavior risks compromising the repayment of debts to the creditor, who, to protect himself, will demand a higher return on the funds lent. This higher yield negatively affects the profitability of the company. As a result, the use of debt causes agency costs of debt which reduce the profitability of companies (Kebewar , 2012).

Finally, the influence of taxation on profitability through debt is mixed and generally depends on the finance law in force in the economy. Indeed, if the financial costs arising from the debt contract are deductible, the more the company goes into debt and consequently increases its profitability. Then, we can predict a positive relationship between tax and profitability (Kebewar , 2012).

On the other hand, "the integration of the personal income tax called into question the tax advantage generated by debt" (Miller, 1977).

Furthermore, De Angelo and Masulis (1980) find that tax deductions not linked to debt reduce the attractiveness of debt. According to these authors, these tax deductions can be a saving substitution. Hence "the neutrality of the capital structure on enterprise value. » (Kebewar , 2012).

4.2. Summary of Some Empirical Work

Although studies on the subject remain few in number, research has focused on the relationships between debt and profitability. The analysis is carried out on various sectors of the economy and the methodological approach and the results differ from one author to another and, sometimes, depending on the scope of experimentation.

Goddard *et al.* (2005) studied the influence of debt on company profitability. In their methodological approach, the authors used the GMM method which is based on a panel of 12,508 companies in the manufacturing and service sectors belonging to five European countries: Belgium, Spain, France, Italy and the United Kingdom. United, during the period 1993-2001. The results of this study revealed that the debt ratio (represented by the ratio of long-term debt to equity) is negatively correlated with profitability. In addition, they found that the "company size" factor had a negative influence on profitability.

Carrying out an econometric specification based on double least squares (DMC) and ordinary least squares (OLS) methods on a sample of 7,548 American commercial banks over the period 1990-1995, Berger and Bonaccorsi (2006) demonstrated that profitability is sensitive to the structure of companies' permanent liabilities, in this case to foreign capital. They also point out that the causal link between debt and profitability is non-linear, with a concave shape (almost in the shape of the letter U upside down), showing an unstable relationship between the two variables. Indeed, under the effect of the positive evolution of the debt ratio, the value of profitability gradually increases to reach a maximum level before regressing to its initial position. This means that the influence of debt on profitability is unstable, both increasing and decreasing. Furthermore, continuing their analysis of the problem, the authors found no inverse effect of profitability on the capital structure. On the other hand, they found a negative impact of size and risk on profitability.

Following these authors, Weill (2008) studied the nature of the relationship that exists between debt and corporate profitability. For this purpose, based on a sample of 11,836 industrial companies distributed between seven European countries: Germany , Belgium, Spain, France, Italy, Norway and Portugal, over the period 1998 -2000, the author used maximum likelihood analysis as a methodological approach and produced divergent results depending on the country. he finds a positive correlation in four countries (France, Belgium, Germany and Norway), a negative correlation in two countries (Italy

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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and Spain) and a non-significant relationship in Portugal. This variability of results is explained, according to the author, by the impact of the institutional framework which varies depending on the country. He nevertheless believes that the two factors that can have a significant influence on the profitability of companies are: bank credit for these companies and the effectiveness of the legal system in the country. Continuing his analysis by taking into account the control variables (size, stock, guarantee and short-term debt), he arrived at the results according to which "guarantee and stock are negatively correlated with profitability in all countries ; but that size and short-term debt affect profitability differently depending on the country, sometimes positively and sometimes negatively. »

Margaritis and Psillaki (2010), for their part, analyzed the relationship between the capital structure and the profitability of companies in both directions, based on a sample of 5,146 French companies in the sectors: textiles, chemicals and the manufacturing industry. strong growth (computers and Research and Development) over the period 2002-2005. Noting that family businesses are more profitable than other businesses and using quantile regression as a methodological approach, the authors reached the conclusion that debt positively influences profitability and vice versa.

Analyzing the effect of capital structure on profitability, from a sample of 9136 French companies spread over seven sectors taken over the period 1999-2006, using a dynamic panel study, according to the generalized method of moments (GMM), Kebewar (2012) showed that there is heterogeneity in behavior between said sectors. The empirical analysis revealed three groups of sectors: "for the first group (industrial, energy and service), capital structure has no impact on profitability. The second group contains only the transport sector, it is the group where debt negatively affects profitability in a linear manner. The last group (agri-food, construction and commerce) is characterized by the presence of a negative effect in a linear and non-linear manner. » (Kebewae , 2012).

5. Econometric Analysis

This phase is devoted to the development of the empirical analysis model. In order to find the relevant elements which justify the profitability of the microcredits granted by Fécécam , via Clcam , to farmers, we collected information from the files of beneficiaries located at Fécécam . This information was cross-checked with beneficiaries based on a field survey. Unable to take into account all borrowers in the network, samples of one hundred individuals per selected sector were made. This selection is based on the importance of the relative weight of the sectors in the Fécécam credit offer (see graph 1). Thus, the sectors: Cotton (27.15%), Corn (21.20%), Soya (18.37%) and Cassava (12.31%) were retained for the econometric specifications. Indeed, these sectors, namely two cash crops (Cotton and Soya) and two food products (Corn and Cassava) alone represent around 80% of the whole.

5.1. Methodological Approach

To estimate the effect of microcredit on the profitability of beneficiaries, we adopted an empirical model. In the economic literature, the traditional version of the profitability function which takes into account debt, takes into account several other variables such as the size of the organization, sales, total assets or liabilities on the balance sheet, guarantee , taxes, growth opportunity (Goddard et al. 2005; Weill, (2008); Margaritis and Psillaki , 2010; Kebewar , 2012). As for the present case, we will draw inspiration from the Kebewar model (2012) which defines the profit function (Prof) according to the factors: debt (D), guarantee (Gar), tax (tax) and growth of activity (Crois). Either :

$$Prof_t = f\ (D_t, Gar_t, Impôt_t, Crois_t)(1)$$

This model, represented by equation (1), calls for two specification variants in order to attest to its robustness.

We note, first of all, the linear form which makes it possible to analyze the impact of debt on the profitability of agricultural operations and which is worded as follows:

$$Prof_t = \beta_0 + \beta_1 D_t + \beta_3 Gar_t + \beta_4 Impot_t + \beta_5 Crois_t + \varepsilon_t(2)$$

Next comes the non-linear analysis of a quadratic function which takes into consideration the squared "debt" factor in its expression, and which is defined as follows:

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ISSN: 2576-8484
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$Prof_t = \beta_0 + \beta_1 D_t + \beta_2 D_t^2 + \beta_3 Gar_t + \beta_4 Impot_t + \beta_5 Crois_t + \varepsilon_t$(3)

Where, Prof, D, Gar , Impôt and Crois represent respectively the profitability ratios, the amount of credit obtained compared to total assets, the amount of the guarantee compared to total assets, the amount of taxes levied by the municipality compared to profit before tax, the rate of change in turnover. The parameter t refers to the individual studied.

Consequently, the profit functions of individual t in sector i are stated as follows:

Linear form: $Prof_{ti} = \beta_0 + \beta_1 D_{ti} + \beta_3 Gar_{ti} + \beta_4 Impot_{ti} + \beta_5 Crois_{ti} + \varepsilon_{ti}$(4)

Nonlinear form: $Prof_{ti} = \beta_0 + \beta_1 D_{ti} + \beta_2 D_{ti}^2 + \beta_3 Gar_{ti} + \beta_4 Impot_{ti} + \beta_5 Crois_{ti} + \varepsilon_t$(5)

We recall here that the null hypothesis of the linearity test consists of testing: (H0: $\beta_2 = 0$). If this is rejected, we admit the existence of non-linearity between debt and profitability. According to agency theory, the effect of debt on profitability is positive when ($\beta_1 > 0$ and $\beta_1 + 2\ \beta_2 D_t > 0$). But, at a given level of the "debt" variable, this effect starts by being negative. We then witness a quadric relationship such that the specification between debt and profitability is non-monotonic, that is to say both positive and negative. Indeed, this relationship is negative when the following condition is met: $D_t < -\beta_1 / 2\beta_2$. In other words, the link between debt and profitability is *" bell "* shaped , when: $\beta_2 < 0$).

endogeneity problems may exist due to possible causality between exogenous variables, particularly at the level of the debt variable) towards the dependent variable (profitability). In this case, it does not seem efficient to adopt traditional econometric methods such as: ordinary least squares (OLS), fixed effect and quasi-generalized least squares, which present scientific inadequacies. To overcome these shortcomings, we adopt the panel generalized method of moments (GMM) as suggested by Arellano and Bond (1991), and later developed by Arellano and Bover (1995) and Blundell and Bond (1998). Indeed, the use of this method makes it possible to resolve, among other things, problems of simultaneity bias, reverse causality (especially between debt and profitability), etc., and also offers the advantage of controlling the specific individual and temporal effects.

Indeed, not only does this method (GMM) resolve the endogeneity problem at the level of the "debt" variable, it also does so concerning other explanatory variables (by using a series of instrumental variables generated by the delays of variables) (Kebewar , 2012).

In addition, it must be added that the panel (GMM) method has another advantage, it generates the instruments from the explanatory variables; which is not the case with other traditional instrumental variable methods such as (2SLS and 3SLS), which require the choice of theoretical instrumental variable correlated with the explanatory variables and not correlated with the residual, which is difficult to find.

5.2. Results and Comments

A sample of (1000) agricultural operations (chosen at random), distributed as follows: having taken out credit, between the period 2018-2023, was constituted from their loan forms at Fécécam . The information concerning the above variables (D, Gar , Tax, Crois, etc.) was collected on these sheets and was then cross-checked by a survey of beneficiaries.

The estimates following the GMM method were made, in two stages, using the procedure (XTABOND2) on the software (STATA).

The results of the estimations following the Generalized Moments method (GMM) are summarized in the following table:

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5: 278-291, 2024
DOI: 10.55214/25768484.v8i5.1686

Table 1.
Determinants of the profitability of cotton, soya, corn and cassava farms.

Explanatory variables	Prof1 (Cotton)		Prof2 (Soy)		Prof3 (Corn)		Prof4 (Cassava)	
D_t	-0.078*	0.422***	-0.04	0.374***	-0.106	0.137	-0.085	-0.299
	(-1.7)	(3.43)	(-1.63)	(3.23)	(-1.47)	(0.79)	(-0.76)	(-0.64)
D_t*2		-0.323***		-0.345***		-0.187		0.126
		(-3.05)		(-2.83)		(-1.12)		(0.31)
Gar_t	0.025*	0.047***	0.019	0.045***	0.031	0.037**	0.067**	0.035
	(-1.91)	(-3.57)	(-1.51)	(-2.78)	(-1.53)	(-1.97)	(-2.41)	(-0.52)
Tax	-0.056***	-0.060***	-0.049***	-0.052***	-0.081***	-0.099***	-0.057**	-0.039
	(8.11)	(8.55)	(7.23)	(7.19)	(3.81)	(4.54)	(2.34)	(1.18)
Believe	0.040***	0.042***	0.033***	0.036***	0.067***	0.056***	0.061***	0.053**
	(3.29)	(3.82)	(2.68)	(3.22)	(2.62)	(2.68)	(3.34)	(2.07)
Constant	0.227***	0.068*	0.234***	0.056	0.105**	0.031	0.095	0.164
	(6.15)	(1.89)	(5.64)	(1.38)	(2.56)	(0.63)	(1.39)	(1.32)
Number operating	100	100	100	100	100	100	100	100
p-value sargan statistic	0.59	0.37	0.69	0.451	0.91	0.96	0.33	0.97
P-value AR(2)	0.16	0.13	0.36	0.29	0.14	0.14	0.26	0.38

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5: 278-291, 2024
DOI: 10.55214/25768484.v8i5.1686

On closer inspection, our estimates are all valid. First, the Hansen test does not allow us to reject the hypothesis of validity of the lagged variables in level and difference. Then, there is no second-order autocorrelation of the errors of the difference equation (AR2). This is attested by the second-order autocorrelation test of Arellano and Bond (1991) which does not allow the hypothesis to be rejected. absence of second-order autocorrelation. Finally, and for the sake of robustness, the model estimated by the GMM method, in one step and in two steps, converges towards the same trends. All of the above then demonstrates the robustness of the results.

Furthermore, looking at the regression parameters, we note that:

- Microcredit affects profitability in a linear, negative manner in all four sectors. However, in a non-linear manner, it has a negative effect on the sectors: Cotton, Soya and corn. This is not the case for the cassava sector which presents a positively non-linear relationship. This paradoxical relationship is certainly explained by the fact that, of all these agricultural speculations, only cassava presents not only a relatively longer operating cycle and has a multifunctional advantage.
- The guarantee variable (Gar) positively affects the profitability of all the farms studied. This positive influence (of the guarantee on profitability) teaches us that farmers are more motivated by the guarantees required by Fécécam . This kind of reaction can be motivated by the fact that, to protect themselves from the realization of their guarantees, farmers are active in achieving good results. Moreover, in villages where tradition still remains heavy, the failure to repay a debt is analyzed from a sociological point of view as an infamous and shameful fact of society. Thus, to avoid being exposed to this type of ignominy and dishonor, many borrowers work to make their debts profitable so as not to appear the laughing stock of their compatriots. This sociological context undoubtedly explains the positive influence that the guarantee has on profitability;
- The coefficient of the tax variable is significant and negative for all sectors. This means that companies with high tax payments have a fairly low level of performance.
- the growth opportunity (Crois) positively affects the profitability of the agricultural sectors studied. This means that farms achieve more profitability when they have more growth opportunities.

As recommendations, the Fécécam authorities must work to carefully study the repayment capacity of each borrower before setting up microcredit, which must be followed with rigor and determination. This is essentially the role of Loan Officers. In addition, any microcredit offered must necessarily be accompanied by a guarantee in order to avoid the bad faith which characterizes certain unscrupulous borrowers. Fécécam must remain inflexible in the strict application of its procedures and guarantee policy.

In addition, municipal authorities must ensure the application of the "fair tax" with regard to agricultural operations. Indeed, too heavy a burden on local taxation could result in farmers becoming disaffected; which can negatively affect municipal budgets.

6. Conclusion

In this study, we were interested in the determining factors of the profitability of farmers in Benin who took out loans from Fécécam Benin via Clcam . The main objective being to analyze in a particular way the effect of debt on the behavior of the profit generated by the exploitation which relates to it, it was observed that this variable (debt) affects it negatively, both linearly and non-linearly. But, in addition to debt (D), the empirical analysis also showed that other factors determine profitability. This is the case of the variable Gar (guarantee) whose influence on profitability is positive, showing that the requirement for guarantees in terms of debt is beneficial for the profitability of agricultural holdings, undoubtedly due to the motivation that it arouses in the farmer. This result, while being in contradiction, with those of Deloof (2003, from Nucci And *al.* (2005), from Rao et *al* (2007), de Zeitun

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5: 278-291, 2024
DOI: 10.55214/25768484.v8i5.1686

and Tian (2007), de Weill (2008) and de Nunes et *al* . (2009), converges with those of Himmelberg And *al* . (1999), Majumdar and Chhibber (1999) and Margaritis and Psillaki (2007). On the other hand, the study showed that taxation (Tax) inhibits the profitability of farmers. This kind of reaction is contrary to that observed by Zeitun and Tian (2007) in a study devoted to Jordan.

At the end of this study, it is recommended, in order to ensure the effectiveness of the microcredits granted, that Fécécam Benin reviews their structures, their granting procedures and the amounts allocated. Likewise, local authorities must ensure that the tax burdens borne by farmers are not so high as to result in losses in the exercise of their activities.

In addition, the study could have gained in stereotyping if it had had the possibility of taking into account all the sub-sectors (agriculture, livestock, small processing, crafts, etc.) of Fécécam's clientele. Further research could approach the analysis with a view to generality.

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Appendices

Appendix 1.
Evolution of the unpaid rate at Fécécam.

Année	Taux
2016	3,05
2017	3,12
2018	3,5
2019	5,83
2020	7,01
2021	8,69
2022	9,06
2023	10,61

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 5: 278-291, 2024
DOI: 10.55214/25768484.v8i5.1686

Appendix 2.
Distribution of Fécécam's credit offering (2023).

Objet	**Taux**
Ananas	6,02
Cajou	6,13
Coton	27,15
Divers	2,53
Elevage	3,2
Maïs	21,2
Manioc	12,31
Pêche	4,09
Soja	17,37
Total	100

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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DOI: 10.55214/25768484.v8i5.1686