Scientific Research Publishing

Theoretical Economics Letters, 2023, 13, 1434-1462
https://www.scirp.org/journal/tel
ISSN Online: 2162-2086
ISSN Print: 2162-2078

Impact of Agricultural Credit on Productivity

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How to cite this paper: Zabatantou Louyindoula, H., Bouity, C. A., & Owonda, F. (2023). Impact of Agricultural Credit on Productivity. *Theoretical Economics Letters, 13,* 1434-1462.
https://doi.org/10.4236/tel.2023.136081

Received: September 2, 2023
Accepted: December 8, 2023
Published: December 11, 2023

Abstract

The aim of this article is to analyze the impact of agricultural credit on agricultural productivity in the Congo. This work finds its affiliation in the neoclassical theory developed by Gurley and Shaw (1967). Then McKinnon (1973) to achieve this objective, we used the ESR model estimated by the maximum likelihood method to take account of selectivity and endogeneity problems. The results obtained show that, on average, the effect of agricultural credit on agricultural productivity is 92.2%; in other words, the majority of farmers who have obtained agricultural credit have a high probability of improving their productivity. These results also show that literacy rate, group membership and age influence access to agricultural credit. These results confirm the hypothesis formulated in this work, insofar as they support the view that access to agricultural credit increases productivity.

Keywords

Agricultural Credit, Productivity

1. Introduction

The first two points of this introductory section present the context and rationale for the study, followed by the problem statement. The third and fourth points are devoted to the definition of the objective and the hypothesis.

1.1. Background and Justification

Agriculture is one of the most important sectors in most developing countries, and is the main source of jobs, income and food for the world's population. Essentially, agriculture comprises crop production, livestock breeding, forestry and fishing. It involves the production of food, feed, fiber and other goods through

the systematic cultivation and harvesting of plants and animals (Iganiga and Unmhilin, 2011). Agriculture can be carried out on a small peasant scale or on a large scale. Unfortunately, agriculture is less privileged in some developing countries. And, very often, it is very difficult to grant credit to farmers in these countries to improve their productivity. Credit plays a crucial role, facilitating the modernization of agriculture and encouraging the participation of farmers in the development process. Not only can credit eliminate financial constraints, but it can also encourage the adoption of new technologies that would otherwise be more slowly accepted (Mohsin, Ahmad and Anwar, 2011). Credit is the use or possession of funds and services without immediate payment. It can take the form of borrowed money or agricultural credit, which includes trade credit and bank credit. Agricultural credit can therefore take a variety of forms, such as seeds, deferred payment fertilizers, the use of tractors, labor, storage facilities, and so on. The term credit also means the ability to borrow (Adewale et al., 2022).

Agricultural credit is one of many credit instruments used to finance agricultural transactions, including loans. These types of financing are tailored to the specific financial needs of farmers, which are determined by planting, harvesting and marketing cycles. Short-term credit finances operating expenses, medium-term credit is used for agricultural machinery and long-term credit is used to finance real estate (Adeboya and Adeola, 2008). This is an important financial support that farmers can obtain to bridge the gap between their income and their expenses in the field. It is an important instrument that enables farmers to control the use of working capital to improve their productivity and income. Thus, credit is an essential ingredient in the agricultural sector's growth strategy (Mohsin, Ahmad and Anwar, 2011).

The impact of agricultural credit on productivity is controversial, despite the fact that 40% of the world's population depends on agriculture (World Bank, 2022). Although important in economic development, agricultural development encounters constraints in access to credit often justified by asymmetric information and collateral on the part of farmers (Enuameh et al., 2015). Indeed, commercial banks, which account for 87% of all loans in developing countries, devote just 5% of their portfolio to agribusiness (WTO, 2014). Finance plays an important role in increasing agricultural production and encourages small and medium-sized enterprises SMEs to invest or overcome initial financial barriers to purchase inputs such as seeds and fertilizers.

In general, farmers have unique characteristics: they have low incomes, few savings and low-quality agriculture. In the case of the majority of farmers, their families leave behind a meagre surplus and consume mainly what they produce. They are unable to meet gross financing needs for production and development from their available resources. Adverse weather conditions further aggravate the situation, making farmers increasingly poor (Mohsin, Ahmad and Anwar, 2011). In the Congo, the agricultural sector is an important component of the econo-

my, with farmers producing over 70% of the staple foods available in the country, and 30% of the working population dependent on this sector (FAO, 2021). However, Congolese agriculture is mainly composed of peasants, the majority of whom live in rural areas and practice subsistence farming with an average landholding of less than five hectares. Farmers face problems of low productivity and inadequate access to logistical support and inputs.

In the Congo, farming is more common among people with a low level of education, limited access to useful information and to the market, and no access to credit. The inaccessibility of credit for these farmers prevents them from acquiring the inputs they need to increase their production, which in turn limits their access to credit.

Agricultural development requires an adequate and timely supply of essential agricultural inputs. The investment capacity of the majority of our farmers is low, as they are poor and cannot afford to meet the growing demand for improved seeds, recommended doses of fertilizer, rental of farm machinery, etc. The impact of agricultural credit on productivity is the subject of much controversy, both theoretical and empirical.

The impact of agricultural credit on productivity is the subject of much controversy, both theoretically and empirically.

From a theoretical standpoint, the notion of productivity is of interest because it can be used to assess the level of performance and income in a sector or a country.

The concept of productivity was used in the 18th century by physiocrats to describe the ability to produce. There are two opposing approaches to explaining the impact of agricultural credit on productivity: the Keynesian approach, based on state financing, and the Neoclassical approach, based on private financing: the Keynesian approach to rural financing policy was based on strong state intervention, and emphasized the "agricultural credit" function. According to these models, rural and agricultural underdevelopment was analyzed as the result of the inability of poor peasants to save and invest. Credit was then used as a development lever to boost agricultural production, technical change and the financing of innovation. In contrast, neo-classical economists Gurley and Shaw (1967) and McKinnon (1973) launched a theoretical critique of the financial repression that characterized Keynesian financing policies. These neo-classical economists advocated liberalizing the financial system through the concept of "deepening the financial system", based on lifting constraints on the financial system and disengaging the state. In fact, the difference between these two theories lies in the fact that the former concludes that rural financing through agricultural credit can be achieved through state intervention, whereas in the latter, the aim is no longer to inject credit into agricultural production, but to build a rural financial market that provides sustainable access to financial services by linking agents with financial resources with those who need them.

Empirically, we have the work of (Ogbuabor and Nwosu, 2017; Nnamocha

and Eke, 2015; Agunuwa et al., 2015) argue that agricultural credit has positive impacts on productivity.

Conversely, authors such as (Njeru et al., 2016; Khan et al., 2013; Hayakawa et al., 2020; Agbodji & Johnson, 2021; Diallo et al., 2020; Nwaru and Onuoha, 2010; Nwaru et al., 2010), support the opposite thesis.

1.2. Interest of the Subject

The thematic interest of our work is both theoretical and empirical. Theoretically, it sheds light on the economic theories that analyze the link between agricultural credit and productivity. Empirically, it provides a better understanding of the role of economic policy in improving agricultural productivity and production in the Republic of the Congo.

For the relevance of this study, it helps to explain to Congolese authorities the involvement of agricultural credit in the process of economic development, in general; and to clarify the importance of credit in increasing agricultural productivity.

1.3. Issues

According to the World Bank (2008), an increase in agricultural GDP is around four times more effective in reducing poverty than an increase in GDP from any other sector. This sector has also been identified as having played a major role in the economic successes of East and Southeast Asia (European Investment Bank, 2016). All these virtues recognized in the agricultural sector have, moreover, only been possible thanks to the involvement of governments and the support of the private sector, whose respective financial contributions have been decisive (Doligez and Gentil, 2000). And yet, in Africa, agriculture does not benefit from substantial financial support. The share of public spending devoted to this sector in the majority of countries is still low, far from the Maputo commitments setting this share at 10% of total public spending (AfDB, 2016).

Despite its many assets and potential, in terms of hectares of arable land, rainfall and a hydrographic network favorable to agriculture, the Congo is still facing a major agricultural productivity problem. The problem of agricultural productivity remains a major concern for the authorities. This phenomenon can be explained by difficulties in accessing agricultural credit. Indeed, the volume of credit granted to farmers is generally made up of small amounts intended to settle cash flow problems, rather than to finance the acquisition of inputs, farm machinery and improve human capital.

Farmers' access to credit remains low (less than 10% in the Congo, according to the agricultural sector survey).

Despite government efforts to support farmers by improving the business climate, which enables financial players to subsidize the agricultural sector in order to increase productivity, expectations are unfortunately not being met.

This set of concerns brings us back to the following central question: What

impact does agricultural credit have on productivity?

1.4. General Objective

The aim of this work is to analyze the impact of agricultural credit on productivity in the Congo.

1.5. Hypothesis

This study supports the hypothesis that access to agricultural credit has a positive impact on productivity.

1.6. Organization of Work

The remainder of this work is structured around five (04) main points. These are the introduction, the literature review in section I, the research methodology in section II, the interpretation and discussion of the results in section III, and the conclusion and recommendations in section IV.

1.7. Scope of Work

This work is in the field of agricultural policy. It is based on data from an agricultural sector survey (ESA) carried out in Congo in 2011, with 2961 respondents.

2. Literature Review

In this section, we will deal with three essential points: the conceptual review, the theoretical review and the empirical review.

2.1. Conceptual Review

We will define the essential concepts, in particular agricultural credit and productivity.

2.1.1. Concept Definitions

Crédit Agricole is organized into local caisses, which form the basis of the Group's mutualist organization. The local caisses hold most of the capital of the regional caisses, the cooperative societies and banks of the group as a whole. The regional caisses, for their part, control the majority of the capital of Crédit Agricole, which is listed on the stock exchange.

Miller (1975) defines credit as a means of facilitating the temporary transfer of purchasing power from one individual or organization to another. Credit provides the basis for increased production and efficiency through the specialization of functions. Furthermore, Aluko (1981) defines credit as a monetary or financial aspect of capital resources. As for Adegeye and Dittoh (1985), they defined credit as the process of gaining control over the use of money, goods and services in exchange for a promise to repay at a later date.

There are three types of credit: short-term, medium-term and long-term.

Day-to-day loans are for less than a month, while short-term loans are for a maximum of two (2) years. Medium-term credit is granted for a period of two (2) to five (5) years. Finally, long-term credit is granted for a period of more than five (5) years.

Productivity can be total or partial. When it is total, the estimated return is measured in relation to all inputs that contribute to production growth, such as capital, labor, materials and land. The resulting estimate is called "total factor productivity". When partial, it is measured as the return on a single factor of production, by relating the volume of output to the quantity of that single factor. Several factors can affect the level of productivity: economic factors, the social environment and the institutional framework.

Productivity is the ratio between output and the factors of production used. It is calculated as follows: Productivité = Production/(factors of production).

Many factors can affect productivity, including:

- Capital investment in technology and equipment;
- Capital investment in facilities;
- Economies of scale;
- Knowledge and skills of the workforce resulting from training and experience;
- Technological change;
- Work methods and procedures;
- Systems;
- Supplier quality and reliability;
- Management quality;
- Legislative and regulatory environment.

We will describe these four types of productivity in more detail in the following sections.

2.1.2. Capital Productivity

Capital productivity is the ratio between output and the quantity of capital used to produce (Productivité = Output/(Quantity + capital)).

Changes in capital productivity indicate the extent to which production can be increased by reducing welfare costs, costs taking the form of unrealized consumption. Capital productivity is a partial measure of productivity, reflecting the joint influence of a wide variety of elements.

2.1.3. Labor Productivity

Labor productivity, for its part, is the ratio between output and the quantity of labor supplied (Productivité = Output/Quantity of labor).

Labor productivity in gross output accounts for labor requirements per unit of (material) production. It reflects the evolution of the technical coefficient of labor by branch of activity and can contribute to the analysis of labor requirements by branch. The gross output indicator, in particular, requires price indices only for gross output, and not for intermediate factors, as is the case for the val-

ue-added indicator. Labor productivity is a partial measure, reflecting the combined influence of a large number of factors. It is easy to confuse it with technical evolution, or with the productivity of the individuals who make up the working population. In addition to labor productivity, the agricultural sector is also concerned with land productivity.

2.1.4. Land Productivity

Agriculture is a sector in which land is a very important production factor. Land productivity is the ratio between production and the Area of land used to produce (Productivité = Production/Area).

Quesnay (Eltis, 1975), a landowner, notes that by incurring higher costs, such as purchases of oxen, horses, plows, and manure, the land is better cultivated with less labor and thus enables its owner to acquire a greater product. From this observation, he deduced the "theory of agricultural surplus". Turgot (Brewer, 1987), on the other hand, established that land provides diminishing returns as less fertile land is cultivated. Malthus (1798) took up this argument, speaking of the "limited productive power of land".

2.1.5. Overall Productivity of Production Factors

Having defined the productivity of capital, the productivity of labor and the productivity of land, we finally turn to the overall productivity of the factors of production. Overall productivity of the factors of production or multifactor productivity is the ratio of output to the total value of the means of production used (Productivité multifactorielle = Output/(labor + capital).

It is commonly said that "the challenge of productivity had become a challenge of measuring it". This is because productivity is difficult to measure and can only be measured indirectly, i.e. by measuring other variables and calculating productivity. This measurement difficulty stems from the fact that inputs and outputs are not only difficult to define, but also difficult to quantify.

However, the way inputs and outputs are measured can provide different measures of productivity. Disadvantages of productivity measures have been the disparity of measurement by fixed expenses, as well as the inability of productivity measures to account for changes in quality (for example, output per hour may increase, but the defect rate may soar).

2.2. Theoretical Review

2.2.1. Theoretical Approaches Based on the Economics of Public Finance (State) Keynesian Theory

It is based on the theory of state financing of the economy developed by Keynes to resolve the Great Depression of 1929. Keynesian theory stipulated that rural financing policy models relied on state action. This state intervention emphasized the usefulness of rural credit for a target group that lacked collateral or could not afford high interest rates. These models analyzed rural and agricultural underdevelopment as the result of poor peasants' inability to save and invest,

and above all to have the collateral to meet the conditions for access to credit. Thus, Keynesian theory emphasized public financing as a mechanism for inducing technical change to finance innovation and develop agricultural production when the target is poor. This theory concludes that rural financing via agricultural credit through state intervention can alleviate the conditions of the conventional system, enabling the rural population to access (Napo & Adjande, 2019). Despite the constraints of guarantees and relatively high interest rates, the lack of water control and production and marketing outlets are factors limiting the financing of agricultural production by banks and other microfinance institutions (MFIs).

2.2.2. Theoretical Approaches Based on Private Financing (Private Sector) Neo-Classical Economic Theories

It is based on the theory of private-sector financing of the economy. In this case, three groups of actors identified in the logic of financing agricultural production are banking and non-banking institutions, NGOs and associations. However, in the Congolese context, non-banking financial institutions, NGOs and associations, as well as a few international organizations, finance agricultural production. Moreover, neoclassical economic theories form the basis of private financing of the economy. This research focuses on the financing of agricultural production by non-bank financial institutions (the case of microfinance institutions) (Niyongabo, 2008). Neoclassical theorists advocated liberalization of the financial system through the construction of a rural financial market that provides sustainable access to financial services by linking agents with financial resources with those who need them, following the concept of "deepening the financial system", which is based on the lifting of constraints on the financial system and the disengagement of the state (Napo & Adjande, 2019). This disengagement of the state and economic liberalization has thus prompted the development of microfinance through the granting of agricultural credit, which has induced the development of agricultural production and improved the added value of their exports Ololade and Olagunju (2013). This approach is supported by a large number of theories, namely the theory of change, the theory of agricultural surplus, theories of risk, and Becker's theory of human capital. Theories of change reconstruct the often complex causal relationships and interactions that lead an intervention to have an impact. They are sometimes also referred to as "program theory" (Rogers, 2008). This reconstruction is based on hypotheses derived from empirical knowledge, and these hypotheses can then be tested in surveys. They enable us not only to assess whether an intervention instrument, in this case agricultural credit, is effective, but also to understand how these impacts occur. To our knowledge, such theories have rarely been used to analyze the impact of agricultural credit on its beneficiaries. This theory is briefly explained here. The focus of the study is the beneficiary of agricultural or para-agricultural credit, who manages economic activities. Access to credit induces direct and indirect impacts, as well as numerous expected return and cumulative

impacts, especially if the period considered concerns not just a single credit cycle but several, and if the use of net benefits over time is taken into account. The first expected direct effect is the extension of the activity for which the credit is taken: this growth may be "homothetic" (more surface area, inputs and labor; more raw materials to process and market, inputs and labor) or accompanied by a change in the level of performance thanks to technical changes (better mastery of the technical itinerary or process) or even technological changes (change in the type of equipment, technique, market, etc.). Income from the activity can also affect the beneficiary's other activities (growth, substitution), and in total, these changes over several years affect the accumulation of capital, knowledge, technologies, economic and social ties, and thus the total income of the production unit.

Indeed, theories of change reconstruct. They are also supported by Arthur Lewis (1954), inspired by classical political economy. He supports the hypothesis that, in the long term, capital accumulation depends on the share of profit in relation to wages and land rent. When this share increases, accumulation accelerates and the country develops. Lewis proposes a thesis in which putting surplus agricultural labor to work generates increasing profits. The analysis starts from the dualism of economies, which is the central feature of developing economies: a traditional subsistence agricultural sector with a structural surplus of labor coexists with an emerging modern capitalist sector. The agricultural transition is based on structural factors affecting demand. Improved agricultural productivity leads to lower agricultural production costs, which in turn leads to lower relative agricultural prices. The labor surplus theory is based on two key assumptions: This surplus induces wage stability as long as the surplus is not reabsorbed; marginal labor productivity is zero in the traditional sector. These assumptions are open to criticism. The very hypothesis of a labor surplus is undermined in certain regions where the seasonal nature of agricultural work leads to slack periods, which are not always periods of underemployment. In fact, labor must be available for periods of high activity. Instead, this surplus could be seen as a genuine reservoir of manpower for periods of intense activity (harvests, etc.). Factor endowment (human and physical capital) is indeed important, as suggested by the following theorem: "for a given value of product price ratio, an increase in the capital/labour ratio leads to an increase in the output of the most capital-intensive sector relative to the least intensive sector. Conversely, a decrease in the capital/labour ratio generates a relative decrease in the ratio between the two sectors. Martin and Alston (1994) even postulate that capital accumulation is the predominant element in explaining relative agricultural decline, even more so than relative price trends or technical progress. Supply-side factors are not the only ones: public policies also play an important role, as they can influence sectoral growth rates through general equilibrium mechanisms.

As far as theories of risk in economics are concerned, there is a certain consensus on the theoretical framework for analyzing risk: expected utility. It relates

the utility of decision-makers to their risk aversion in order to explain their economic behavior. Some authors have questioned the theory's weaknesses, and others have tried to find an alternative to this paradigm, but to this day, expected utility is still the dominant theoretical framework in economics. This theoretical framework has two approaches: the positive and the normative. The positive approach focuses on the individual, and attempts to explain why he or she makes decisions. It therefore analyzes the farmer's perception of risk and his risk management strategies in relation to his socio-economic variables. The normative approach is a rational risk analysis method based on the assumptions that the farmer always perceives the risk, that he is fully aware of it, and that he is well aware of the probabilities of its occurrence, as well as its economic consequences. This method is generally applied through mathematical models and economic theorems. With this approach, the decision-maker's utility curve can be revealed. It is important to note that the two approaches are not opposites, but complementary. For the purposes of this study, the positive approach has been selected.

And finally, Becker's human capital theory, which explains the positive relationship between extension and agricultural productivity, has its origins in the pioneering work of Becker's human capital critics (Becker, 1964). For this author, the better educated an individual is, the more skills and talents he possesses that enhance his productivity when working for himself or for others. Conversely, for Arrow (1973), educational attainment does not improve labor productivity; he sees it as a filter for access to higher education. Spence (1973) agrees with Arrow (1973) that educational attainment has nothing to do with labor productivity. Arrow (1973) emphasizes learning by doing. For this author, technology can be disseminated to the many by the few, i.e. the highly educated. The only alternative to improving their agricultural productivity is to provide support through regular monitoring by technical agents.

2.2.3. Other Liberal Approaches Based on the Impact of Agricultural Credit on Productivity

From a liberal perspective, the conception of the farm is similar to that of the firm in Coase's vision [1937], i.e. an entity that operates in a market where it is supposed to maximize its profit from a rational use of its factors of production. In contrast to previous approaches, which argued that the specific characteristics of a sector made responses to market signals insufficient to explain its dynamics, here farmers, like other actors, contribute to the general interest. As entrepreneurs, they pursue their own interests; private ownership of the means of production and "freedom" of choice characterize them. This vision takes no account of history, rules or relationships outside the market, whether social or family-based. Economists from the World Bank and Yale University (Singh, Squire and Strauss, 1986), proposed to model the behavior of agricultural households, under the postulate of rationality and using the mathematical tools associated with the development of this neoclassical current. The idea is to design a model

in which the agent must jointly solve two maximization programs: a consumer program (he maximizes his "utility" under a budget constraint); an entrepreneur program (he maximizes his profit under a factor endowment constraint). In addition to consuming and saving, the farm household makes choices concerning the time it chooses to allocate to either "work" or "leisure". In these early models, markets are assumed to be perfect and decisions are "separable" or recursive. Many developments have been made since then. de Janvry et al. (1991), for example, assess the consequences of the fact that farm households, particularly in developing countries, face incomplete or missing markets. This work makes it possible to situate and analyze the well-being of farm households, to assess the effect of different policies on agricultural production, and to provide information (elasticity of farm household consumption and production, for example) for macroeconomic models such as computable general equilibrium models. The farm household models thus constructed provide a conceptual framework for many agricultural economists. They are intended to make it easier to understand farmers' production and investment decisions in terms of their household's needs and resources. Conversely, they should explain the consumption and saving behavior of farm family members in relation to their production goals.

2.3. Empirical Review

2.3.1. Empirical Work on the Determinants of Gender Differences in Productivity

Discriminatory analysis of agricultural productivity between men and women can be explained by differences in access to agricultural inputs, land tenure security, access to credit, human and physical capital, and informal and institutional constraints affecting farm management and the marketing of agricultural produce.

With regard to credit, most studies find that agricultural productivity gaps are to the disadvantage of women, and credit may appear to be a factor in explaining these gaps. Palacios-López and López (2015) analyze gender productivity gaps in Malawi and find that 29% of these gaps can be explained by differences in access to credit. Mukasa and Salami (2015) looked at Nigeria and Tanzania and also found low agricultural productivity in plots managed by women. They believe that one of the obvious reasons for this is their susceptibility to frequent credit constraints.

A contrario, and even if this is rare, the difference in agricultural productivity can sometimes be in favor of women. According to these authors, women maize farmers have higher technical efficiency than men. They believe that the credit constraints they face tend to have a positive effect on their technical efficiency. As for Samson and Obademi (2018), they also found that in Nigeria, women microcredit recipients were as efficient as men in terms of agricultural productivity.

Beyond the credit channel, human capital may be an explanatory channel for the difference in productivity between men and women. The work of Croppenstedt et al. (2013) indicates that one of the main factors explaining differences in

productivity and access to resources is education. Indeed, the role of education in the difference in productivity between men and women can be explained by the adoption of improved technologies. For example, Kumar & Siddharthan's (1994) study of data from Zambia indicates that the low level of adoption of improved seeds and fertilizers by female-headed households is partly explained by their low level of education. Subsequently, using data from Kenya, Alene et al. (2008) show that the maize yield gap in Kenya disappears if women acquire the same level of education and access to land as men. In the same vein, Quisumbing (1996) also shows that in Kenya, if women acquire the same level of education and inputs as men, their agricultural yields will increase by 22%.

In Burkina Faso, most studies on agricultural productivity are either determinant analyses or impact analyses. Udry (1996), in a gender analysis of productivity, found on data from 1981 to 1985 that plots controlled by women had significantly lower yields attributing the discrepancy to higher labor and fertilizer inputs on plots controlled by men. Wouterse (2011) looked at the role of education and found strong positive returns for educated women, while men's education was associated with greater inefficiency. As for Theriault et al. (2016a, 2016b, 2016c), their gender analysis was limited to the question of the adoption of performance-enhancing strategies.

2.3.2. Empirical Work on the Impact of Bank Loans on Productivity

Theoretical analyses have led to the emergence of empirical evidence. Ogbuabor and Nwosu (2017) analyzed the impact of agricultural credit on agricultural productivity in Nigeria over the period 1981-2014. To this end, they used the error correction model (ECM) and the conclusions of their studies reveal that in Nigeria agricultural credit contributes to raising the level of agricultural productivity. This confirms, again in the case of Nigeria, the conclusions of Agunuwa et al. (2015) obtained using the OLS method, which highlight the existence of a positive relationship between agricultural credit and agricultural productivity.

In contrast, Nnamocha and Eke (2015) put the conclusions of Ogbuabor and Nwosu (2017), Agunuwa et al. (2015) into perspective by showing, on the basis of an ECM applied in Nigeria over the period 1970-2013, that agricultural credit only affects agricultural production in the long term. In the same vein, from an ECM, that agricultural credit in Nigeria has a positive and insignificant effect on agricultural production; a result contrary to those obtained not only by Ogbuabor and Nwosu (2017), Agunuwa et al. (2015). Indeed, agricultural credit has a positive and significant influence on agricultural supply in Nigeria, provided there is a loan guarantee fund.

To this end, he used the sur (Seemingly Unrelated Regression) method to estimate a profit function. His analysis shows that credit is an important stimulus contributing to the development of the agricultural sector in this country. Chisasa and Makina (2013) also analyzed the impact of agricultural credit on agricultural production in South Africa over the period 1970-2009. To this end, they

used the Cobb-Douglas production function, which they estimated using the ordinary least squares (OLS) method. Their analyses show that in South Africa, agricultural credit has a positive and significant effect on agricultural production. Specifically, a 1% increase in agricultural credit leads to a 0.6% increase in agricultural production, all else being equal. In his study on the impact of institutional credit on agricultural production, and based on Granger's causality analysis, Ahmad (2011) showed that agricultural credit has two impacts on agricultural production: a direct effect that is positive and insignificant, and a positive and significant indirect effect. The author explains this by the fact that credit does not act as such, directly, on agricultural production, but rather through the intermediary of the machinery, seeds and other inputs it enables to be acquired.

Ahmad's (2011) findings were confirmed, also in the case of Pakistan. And, unlike Ahmad (2011), these authors used Johansen's cointegration technique. Taking a comparative approach, IBE (2014) analyzed the respective effect of bank financing and public financing on agricultural supply in Nigeria. The results of his analyses reveal that these two types of financing have opposite impacts: bank credits have a positive and significant influence on agricultural productivity, unlike public funds, whose effect is positive and insignificant.

2.3.3. Empirical Work on the Impact of Various Credits on Productivity

As for Theriault et al. (2016a, 2016b, 2016c), their gender analysis was limited to the question of the adoption of yield-enhancing strategies. None of these studies highlighted the contribution of socio-economic factors in explaining differences in agricultural productivity.

For authors such as (Diallo et al., 2020; Agbodji & Johnson, 2021; Akudugu, 2016; Khandker and Koolwal, 2014; Guirkinger and Bourcher, 2008), the results of their work show that the virtues of agricultural credit improve agricultural productivity.

On the other hand, those obtained by (Njeru et al., 2016; Khan et al., 2013), conclude a limited, even neutral effect of credit on productivity. Finally, other works even see a negative effect (Hayakawa et al., 2020; Agbodji & Johnson 2021). Diallo et al. (2020) provide empirical evidence on the need to promote agricultural credit in production. They show that farmers accessing credit have 37.32% higher production than their counterparts. In the same vein, Ali et al. (2014) find that lifting credit constraints leads to an improvement in agricultural productivity of at least 17%. Equating credit with access to financial services and farm size as a proxy for scale of production, Akudugu (2016) reveals a significant relationship between credit from formal and informal sources and agricultural production. He further shows that the interactions informal credit with farm size; formal and informal credit with farm size have a positive and significant effect on production.

In their study of credit constraints and productivity, Guirkinger and Bourcher

(2008), using the Endogenous Switching Regression (ESR) model, conclude that the output of constrained households is determined by their endowments of productive assets. In addition, they find that formal credit constraints have a negative impact on the efficiency of resource allocation. These main findings reflect the importance of credit in farmers' performance. However, limited or neutral impacts of credit on agricultural productivity have been highlighted in the literature. A growing body of work shows that credit does not contribute to increased agricultural productivity Nwaru and Onuoha (2010). Njeru et al. (2016) find that there is no significant difference in fertilizer use and yield between farmers with and without access to credit. Nwaru and Onuoha (2010), using a multinomial logit, find that non-credit farmers outperform credit beneficiaries.

Seck (2021) interprets this result as a sign of an inappropriate lending system. The underperformance of farmers who received credit is also highlighted by Khan et al. (2013). They explain this result by the high interest rate, the delays generally noted in setting up credit and the cumbersome administrative procedures. As for the negative impact of credit on productivity, Nakano and Magezi (2020) are categorical. According to their findings, improved access to credit is not sufficient to increase technology adoption by small farmers and lead to higher agricultural productivity and welfare.

Agbodji & Johnson (2021) distinguish, in their analysis, impacts according to credit type. Specifically, they show a negative impact of cash credit on maize productivity versus a positive effect of credit in kind. The precariousness and low purchasing power of small-scale farmers explain these results. In the absence of sufficient savings and due to extreme poverty, small-scale farmers sell off their harvests, even if it means later resorting to cash loans to meet basic needs such as housing, health and education. As a result, the loans obtained by these farmers are not used to acquire other production factors such as improved seeds.

2.3.4. Lessons from the Literature Review

In view of the mixed results observed in the literature, the issue of the role of credit in agricultural performance is still topical. This study therefore contributes to enriching the available literature on the impact of access to credit on agricultural productivity. However, as far as the Congo is concerned, although there is a body of literature on the problems of the agricultural sector, few studies use econometric techniques to analyze the impact of agricultural credit on productivity. The results of the empirical studies reviewed, which are contradictory, cannot be transposed to the case of the Congo. Consequently, a country-specific study is required. To this end, this research makes a contribution to the literature on the impact of agricultural credit on productivity, by highlighting the relative contribution of socio-economic factors and, more specifically, by supporting the hypothesis that agricultural credit has an impact on productivity.

3. Methodology

3.1. Presentation of the Model

The regime-switching model describes the set of "states of the world" which are formally distinct from one another, but which are candidates at each moment to explain the economic phenomenon under study. It should be noted that, in this framework, the model's non-linearity arises from the fact that break dates are assumed to be unknown and estimated endogenously. Moreover, the more regimes considered, the greater the non-linearity: if k regimes ($k \geq 2$) simultaneously characterize markets, sectors or countries ($m \geq 1$), the model reflects a total of km regimes: four configurations of disequilibrium result from two markets (goods, labor) with excess supply or demand, and the consideration of three countries with two possible cyclical situations in each (high and low conjunctures) leads to the identification of eight economic configurations for the group. Moreover, regime-switching models are particularly well suited to studying the asymmetric dynamics exhibited by multiple macroeconomic variables. Business cycle asymmetries can take the form of deepness when real cycle troughs are more pronounced than peaks, and steepness when real cycle contractions (depression, unemployment) are more rapid and abrupt than expansions. A third type of asymmetry highlighted concerns differences in curvature between peaks and troughs (sharpness). Clearly, the linear model is unable to describe these asymmetries, which are better captured by a Markov model with asymmetrical transition probabilities or a threshold model such as STAR or SETAR. The increasingly frequent analysis of economic phenomena characterized by structural breaks has been at the root of the boom in regime-switching econometrics since the early 1970s. Although the literature offers remarkable state-of-the-art studies of particular classes of models, it lacks an overview of these approaches from a comparative perspective. In our view, a more global approach would enable us to better understand the suitability of each type of model for the types of economic problems under study, as well as the articulation between models beyond their relative specificities. Such was the motivation behind the present work, which we confine to the study of discrete change models. In this sense, we will not discuss asset price models with stochastic changes in continuous-time regimes. As our object is to model structural change, we restrict ourselves to models incorporating an explicit or implicit change mechanism.

This section describes the empirical approach used to analyze the impact of access to credit on agricultural productivity and the extent of productivity loss due to non-access to financial services by Congolese farmers. The specific aim is to assess the differences in productivity between producers with and without access to credit. Estimating the impact of access to credit poses two methodological problems, namely unobserved heterogeneity and sample selection bias (Ali and Deininger, 2012). To control for these potential problems of selection and unobserved heterogeneity, we apply the regime-switching regression model

to estimate the factor returns of farmers with and without access to credit (Ali and Deininger, 2012; Guirkinger and Boucher, 2008; Lokshin and Sajaia, 2004; Freeman et al., 1998). In the first stage, a probit model is used to estimate the determinants of farmers' access to credit based on a number of socio-economic and credit variables identified as theoretically likely to influence whether or not they have access to credit. Secondly, productivity model regressions are applied separately according to whether or not the farmer has access to credit. Concretely, let's consider d_i^* as a latent variable that defines the status of producer i with or without access to credit and y_i his productivity level. The linear regression model with regime switching is specified as follows:

$$Y_i = \begin{cases} Y_{1i}^a = \alpha^a X_i + \beta^a Z_i + \mu_{1i}^a & \text{si } d_i = 1 \\ Y_{0i}^n = \alpha^n X_i + \beta^n Z_i + \mu_{0i}^n & \text{si } d_i = 0 \end{cases} \quad (1)$$

$$d_i^* = yX_i + \delta W_i + \vartheta_i \quad (2)$$

$$d_i^* = \begin{cases} 1 & \text{si } d_i^* > 0 \\ 0 & \text{si } d_i^* \preceq 0 \end{cases} \quad (3)$$

where a and n in superscript denote credit access and non-credit access status respectively. In Equation (3), the binary variable d_i takes the value 1 if the latent variable d_i^* in Equation (2) is strictly positive; this corresponds to the situation where the producer has access to credit. Otherwise, the binary variable d_i takes the value 0, implying that the farmer has no access to the credit market. Equations (1) and (2) represent a vector of variables likely to influence both the state of access to credit d_i^* and productivity y_i, such as the producer's characteristics (age, gender, level of education, etc.). W_i is a vector of variables that do not directly influence the producer's productivity, but which are involved in access to credit, such as whether the producer has taken specialized training. Z_i designates the set of variables that only affect the farmer's productivity without having any influence on the possibility of having access to credit or not, such as hired or family labor, inputs (fertilizers, improved seeds, etc.). α, β, γ and δ are parameters to be estimated. The error terms in both regimes ($\vartheta_i, \mu_{1i}^a, \mu_{0i}^n$) are assumed to follow a trivariate normal distribution with mean zero and covariance matrix equal to Ω. Unobserved factors affecting the selection regime could also affect farmer productivity. Lee (1978) and Maddala (1983) note that the error terms μ_i and ϑ_i may be correlated and render the estimators derived from the application of ordinary least squares (OLS) inconsistent. To deal with this problem posed by the regime-switching regression model, the selection and productivity equations are estimated simultaneously using the full-information maximum likelihood method. This method has the advantage of obtaining robust standard error estimates, unlike methods that proceed in stages by estimating the equations separately (Guirkinger and Boucher, 2008; Petrick, 2004; Lee, 1978). Under the assumptions made about the distributions of the error terms in Equations (1) and (2), and according to Lokshin and Sajara (2004), the log likelihood function

of the regression model with regime switching is given by:

$$nL = \sum_i \left\{ d_i \left[\ln\left(F\left(n_{1i}\right)\right) + \ln\left(f\left(\mu_{1i}^a/\sigma_1\right)/\sigma_1\right)\right] + \left(1-d_i\right)\left[l_n\left(1-F\left(n_{2i}\right)\right) + l_n\left(f\left(\mu_{0i}^n/\sigma_2\right)/\sigma_2\right)\right]\right\} \quad (4)$$

where (.) is a cumulative normal distribution function, (.) is a normal density distribution function and:

$$n_{ji} = \frac{\left(yX_i + \delta W_i\right) + \rho_j \varepsilon_i^j/\sigma_j}{\sqrt{1-\rho_j^2}}, \text{ with } \quad j = 1,2 \quad (5)$$

with $\rho_1 = \sigma_{1V}^2/\sigma_v\sigma_1$ the correlation coefficient between ϑ_i et μ_{1i}^a; $\rho_2 = \sigma_{2v}^2/\sigma_v\sigma_2$ the correlation coefficient between ϑ_i et μ_{0i}^n, avec σ_{1v} et σ_{2v} respectively the covariances of ϑ_i and μ_{1i}^a, ϑ_i and μ_{0i}^n. σ_v, σ_1 et σ_2 represent the respective standard deviations of ϑ_i, μ_{1i}^a et μ_{0i}^n. The results of estimating Equation (4) using the full-information maximum likelihood method will be used to determine the potential productivity gains or losses resulting from the elimination of access to agricultural credit, or the level of productivity that could be achieved by farmers without access to credit if the barriers to access to credit were lifted. The procedure will therefore involve estimating $\Delta y_i = y_{1i}^a - y_{0i}^n$ for farmers without access to credit. Using Equations (1) and (2) and following Guirkinger and Boucher (2008), the expected value of the productivity differential Δy_i conditional on the state of no access to credit (d_i = 1) is given by:

$$E\left(\dot{\Delta} y_i/d_i = 1\right) = \left(\hat{\alpha}^a - \alpha^n\right)X_i + \left(\hat{\beta}^a - \beta^n\right)Z_i \quad (6)$$

where $\hat{\alpha}$ and $\hat{\beta}$ are parameters to be estimated from the linear regression model with regime switching. The higher the value of the differential forecast, the greater the loss of productivity due to non-access to credit. If this is the case, then it would be urgent to put in place a system to correct the problems of credit market imperfections, in order to improve access to financial services for small-scale farmers. The estimation of the various models just described will be preceded by a descriptive analysis of any links between the main variables in the study. This descriptive analysis is the subject of Section 4.

3.2. Representation and Description of Variables

3.2.1. Definition of Variables

Gender: This is a qualitative variable which helps us to analyze or understand gender inequalities. It shows whether groups or farming households run by men are more efficient than those run by women, and whether men find it easier to obtain credit.

Age: This is a quantitative variable that has a major impact on the workforce, since a young workforce contributes to production.

Education: A qualitative variable, it has a positive impact on productivity, as

people with a high level of education are more likely to obtain credit.

Group membership: Belonging to a group or cooperative facilitates access to credit, as groups and cooperatives collaborate better with financial institutions than individuals. And this has a positive impact on productivity.

Number of fields owned: The more fields a farmer owns, the easier it is to diversify crops and improve productivity.

Beneficiaries of services and advice provided by agricultural structures: Farmers who receive advice from an authorized service often have no problem applying for credit.

3.2.2. Presentation of Variables and Expected Signs (Table 1)

Table 1. Variables and expected signs.

Variables	Expected signs
Age	+
Gender	–
Education	+
Number of fields owned	+
Beneficiaries of services and advice provided by agricultural structures	+
Access to credit	+
Labour	+
Group membership	–

3.2.3. Data Source

The data we use for the analyses are those from the Agricultural Sector Survey (ESA) carried out in Congo in 2011 by the Ministry of Agriculture, Livestock and Fisheries (MAEP). The overall objective of this survey was to obtain reliable and relevant data on agricultural production, with a view to contributing to the finalization of the second generation of the Poverty Reduction Strategy Paper (PRSP), monitoring the achievement of Congo's 2008 Poverty Reduction Strategy and the Millennium Development Goals (MDGs).

In addition, data were collected via the questionnaire on agriculture and the questionnaire on household member characteristics. The number of households surveyed throughout the territory was 2961. The description of the ESA base indicates that men farm more than women (62.23%). Young people aged between 15 and 35 are in the minority (12.53%), while adults aged between 36 and 65 are in the majority (87.47%). With regard to groups, we note that out of 371 young people counted in the database, 53 belong to a group, i.e. 14.28% of young people who choose to belong to a group, while 21.71% of adult farmers choose to belong to a group. As far as credit is concerned, 2.97% of adults have obtained credit, compared with 1.61% of young people. Conversely, young people are more likely to adopt new technologies such as fertilization (44.20%), unlike adult

farmers (34.5%).

3.2.4. Descriptive Statistics

Descriptive statistics for the various variables used are summarized in the table below. It can be seen that the average age of the farmers surveyed, the average number of fields owned, the average volume of production and average agricultural productivity represent 49.19 years, 1.73 hectares, 2.78 tonnes and 1.26 tonnes respectively.

The dispersion around the mean (standard deviation) of the variables (farmers' age, number of fields owned, production volume and agricultural productivity) are 13.54; 1.46; 1.33 and 4.50 respectively.

The percentage of farmers with access to agricultural credit is very low (3.69), compared with 96.31 for those without. As a result, farmers receive less agricultural credit.

These data show that men are more involved in this activity than women, representing 66.06% and 33.95% respectively, and that the majority of these farmers belong to a group. Those belonging to a group represent almost 75.21%, and the largest number of these farmers have a secondary 2nd level education (37.45%), followed by those with primary education and those with no education (25.30% and 18.03% respectively).

Few farmers (24.96%) benefit from services and advice than those who don't (75.04%).

These statistics tell us that this sample is made up more of farmers whose main source of seed is self-production, with 83.96%.

This section is devoted firstly to the presentation of the test on the difference in means, and secondly to the presentation of the results and the economic discussion (Table 2).

Table 3 presents the difference-in-means test between those with access to agricultural credit and those without, according to their socio-demographic characteristics. This test is used to determine whether or not the mean of a series of measurements differs from a theoretical or fixed value. Table 4 shows that the distributions: level of education, beneficiaries of advice and services, workforce, number of fields owned and surface area are significant. In fact, farmers with access to credit are better educated, benefit more from advice and services, use more labor, and have more acreage to cultivate than farmers without access to agricultural credit. This result justifies the use of an impact assessment model, in the case of our analysis.

1) Analysis of the effect of agricultural credit on productivity

The result of the ESR estimation method shows that the model is significant, that the K coefficients (unobservable factors) have the same sign and are significant at the 10% threshold, suggesting that those who have agricultural credit do not do so on the basis of their comparative advantages.

The results obtained suggest that, on average, the effect of farm credit on

Table 2. Descriptive statistics for selected variables.

Variable name	Observations	Percentage
Gender		
Male	1004	66.06
Female	516	33.95
Age	1340	48.19[a] (13.54)[b]
Number of fields owned	1517	1.73[a] (1.46)[b]
Group membership		
Yes	1141	75.21
No	376	24.79
Literacy		
Without instruction	273	18.03
Primary		25.30
Secondary cycle 1	383	37.45
2nd secondary	567	14.60
Higher education	221	4.62
Beneficiaries of services and cons		
Yes	460	24.96
No	1483	75.04
Seed source		
Self-production	793	83.92
Exchange	10	1.06
Multiplication center	3	0.32
Donation		0.85
Purchase	8	83.92
Access to credit		
Yes	68	3.69
No	1776	96.31
Production volume	1841	2.78[a] (1.33)[b]
Agricultural productivity		1.26[a] (4.50)[b]

Source: Author's calculation based on ECOM 2011 data; [a]mean; [b]standard deviation.

agricultural productivity is 92.2%; in other words, the majority of farmers who have obtained farm credit have a high probability of improving their productivity. This result prompts a number of comments. Firstly, it reflects the commitment of the Congolese government and its various development partners through their different programs. Among many others, we will focus on three programs:

Table 3. Difference-in-means test.

Variables	Access to agricultural credit		Diff
	Access: Yes	Access: No	
Education	1.79	1.61	−0.175*
Group membership	0.60	0.75	0.154**
Beneficiaries of advice and services	0.44	0.24	−0.19***
Labour	0.75	0.71	−0.03**
Number of fields owned	1.47	1.32	0.843**
Area	0.89	0.62	−0.59***
Agricultural productivity	0.40	1.30	0.89**

Variable name	Observations	Percentage
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Continued

Access to credit		
Yes	68	3.69
No	1776	96.31
Production volume	1841	2.78[a] (1.33)[b]
Agricultural productivity		1.26[a] (4.50)[b]

***$p < 0.001$, ** $p < 0.05$, * $p < 0.1$. Source: Author's STATA 14 results.

Table 4. Effect of agricultural credit on productivity.

	Treated	Untreated	Mills	ATE
sex	0.446*	−0.260		
	(0.268)	(0.222)		
level	3.513**	0.280		
	(1.771)	(0.239)		
Alphabet	18.83	0.198		
	(14.87)	(0.598)		
Group	13.91**	0.421		
	(7.066)	(0.289)		
Beneficiaries of services/advice	0.0612	0.211		
	(0.155)	(0.182)		
Workforce	−0.923	0.182		
	(0.608)	(0.289)		
Age	−2.699*	0.0111		
	(1.383)	(0.0414)		
age2	0.0283*	−2.54e−05		
	(0.0145)	(0.000433)		
Number of fields owned	−0.142	−0.131		
	(0.169)	(0.0875)		
K	41.83**	4.791		
	(21.33)	(4.100)		
rho_1-rho_0			37.04*	
			(22.01)	
E (Y_1-Y_0)@X				92.07**
				(46.79)
Constant	114.5*	−0.921		
	(61.50)	(0.871)		
Comments	1000	1000	1000	1000

**$p < 0.05$, *$p < 0.1$.

Firstly, the program to support the development of commercial agriculture (PDAC), which has helped improve the competitiveness of locally-produced foods by reducing transaction costs and improving connectivity between peri-urban or rural areas and growth markets.

According to the World Bank (2021), this project has reached over 360,000 beneficiaries, 51.30% of whom are women, and has helped to double the yield of certain food crops. Other achievements include the rehabilitation of 1301 km of rural tracks from the north to the south of the country, the construction of 41 market infrastructures and the provision of considerable support for 910 micro-projects. Secondly, the Fonds de soutien à l'agriculture (FSA), whose mission is to support players in the agricultural and livestock sectors by granting loans. This program was aimed at companies incorporated under Congolese law, identified through the authorized services set up in the country's 12 departments. The minimum amount to be granted to beneficiaries was 2 million CFA francs. These funds enabled the government to secure financing for farmers, which was not the case in previous years.

And finally, the project to support the revival of the agricultural sector, supported by the French Development Agency (AFD) and implemented by the Ministry of Agriculture, Livestock and Fisheries (MAEP) over a 4-year period.

Table 5. Selection equation (access to agricultural credit).

Iteration 0: log likelihood = −174.077
Iteration 1: log likelihood = −166.8055
Iteration 2: log likelihood = −166.39343
Iteration 3: log likelihood = −166.39241
Iteration 4: log likelihood = −166.39241

Probit regression Number of obs = 996
LR chi^2 (8) = 15.37
Prob > chi^2 = 0.0524
Log likelihood = −166.39241 Pseudo R^2 = 0.0441

Access	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
alphabet	−0.495	0.311	−1.590	0.111	−1.103	0.114
marital status	−0.004	0.103	−0.040	0.970	−0.206	0.198
MO	0.035	0.184	0.190	0.848	−0.326	0.396
Group	−0.384	0.154	−2.490	0.013	−0.687	−0.082
sex	−0.011	0.167	−0.060	0.949	−0.337	0.316
level	−0.098	0.098	−1.000	0.317	−0.289	0.094
age	0.076	0.046	1.660	0.098	−0.014	0.165
age2	0.001	0.000	−1.660	0.097	−0.002	0.000
_cons	−2.454	1.147	−2.140	0.032	−4.702	−0.206

(Running parametric_normal en estimation sample); Bootstrap replications (50).

The project aims to increase Congo's food resilience and support economic development, while helping to diversify the economy.

The positive effect of agricultural credit on productivity confirms the earlier findings of Ogbuabor and Nwosu (2017), who asserted that in Nigeria, credit contributes to raising productivity levels. Similarly, Ogbuabor and Nwosu (2017) in Senegal, also indicated that credit positively affects productivity.

All these programs and projects have contributed to increasing productivity, while providing financial and material support to farmers. Hence, agricultural credit can have a positive effect on productivity.

2) Analysis of the determinants of access to agricultural credit

The analysis of the determinants of access to agricultural credit reveals that, in the context of this work, characteristics such as age, literacy and group membership are significant at the 1% threshold.

With regard to age, the results obtained show that farmers' age influences access to agricultural credit. In fact, in terms of sensitivity, age has a positive effect, i.e., it has an increasing rate. Thus, all other things being equal, if age increases by one year, the probability of a farmer benefiting from agricultural credit increases by 0.1%.

These results show that as farmers' age increases, so does their chance of accessing agricultural credit. This can be explained by the fact that a farmer's age evolves proportionally with his or her farming experience. The latter found that the older farmers are, the more efficient they become at generating income from production. This enables farmers to access agricultural credit.

Group membership has a negative influence on access to agricultural credit, with a significant probability at the 5% level. The more you belong to a group, the less likely you are to benefit from agricultural credit.

This result indicated that a farmer who is a member of a group or a group of farmers is less likely to access agricultural credit (**Table 5**).

4. Conclusion and Recommendations

4.1. Conclusion

In view of the foregoing, we can say that agricultural productivity in developing countries (DCs) remains low and below the attainable potential in these countries. Low productivity is a threat to food security in these countries. One of the factors behind this low productivity rate is farmers' poor access to financial services such as agricultural credit.

The question of the effect of agricultural credit on productivity is a challenge for the Republic of the Congo. To this end, the country has adopted and implemented several programs and projects to promote the agricultural sector and increase productivity.

The aim of this paper is to analyze the effect of agricultural credit on productivity. We began with a descriptive analysis of the variables selected, using the Agricultural Sector Survey (ESA) database.

Using an ESR model estimated by the maximum likelihood method to take account of selectivity and endogeneity problems, the results obtained show that, on average, the effect of agricultural credit on agricultural productivity is 92.2%; in other words, the majority of farmers who have obtained agricultural credit have a high probability of improving their productivity.

These results also show that literacy rate, group membership and age influence access to agricultural credit.

These results confirm the hypothesis formulated in this work, insofar as they support the view that access to agricultural credit increases productivity.

4.2. Recommendations

Analysis of the effect of access to agricultural credit on productivity will enable us to formulate relevant recommendations aimed, firstly, at setting up a state-owned agricultural bank that can assist farmers in granting credit. Secondly, to put in place appropriate policies to encourage young people to take up farming as a means of increasing production. To prevent agriculture from becoming a credit bog, and perpetuating previous failures, put in place a genuine strategy for monitoring and evaluating the loans granted. And finally, to promote genuine agricultural entrepreneurship (training, financing, settling farmers).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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