

Determinants Of The Choice Of Agricultural Financing Models Implemented By Decentralised Finance In Northern Benin

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Résumé : Le financement agricole en Afrique subsaharienne reste dominé par des analyses centrées sur l'accès au crédit comme variable binaire, au détriment d'une compréhension des mécanismes qui orientent les producteurs vers un modèle de financement spécifique. Cette étude comble ce déficit analytique en examinant simultanément les déterminants socio-économiques, les dynamiques sociales intrafamiliales et les mécanismes institutionnels des systèmes financiers décentralisés (SFD) qui influencent le choix du modèle de financement agricole dans le Nord-Bénin. L'étude s'appuie sur une enquête menée auprès de 585 producteurs agricoles, bénéficiaires ou non de financement, sélectionnés par échantillonnage raisonné 04 communes du Nord-Bénin. Les données collectées ont été analysées à l'aide d'un modèle Logit Multinomiel permettant de comparer le modèle individuel et groupé. Les résultats montrent que le sexe constitue le déterminant le plus discriminant : les hommes ont neuf fois plus de chances que les femmes d'opter le modèle de financement individuel. Le mode d'acquisition foncière, les garanties disponibles et les revenus agricoles segmentent davantage les bénéficiaires entre les deux modèles institutionnels. L'expérience de prêt antérieure révèle une dynamique relationnelle complexe : une ancienneté modérée favorise le modèle de financement groupé, tandis qu'une longue trajectoire bancaire réduit paradoxalement le recours au modèle de financement individuel. Ces résultats plaident pour des politiques de financement rural différenciées, tenant compte des trajectoires institutionnelles et des inégalités patrimoniales structurelles.

Mots clés : financement agricole, systèmes financiers décentralisés, modèle Logit Multinomiel, modèle de financement groupé, Nord-Bénin.

Abstract : This study identifies the socio-economic, institutional and psychological determinants that influence agricultural producers' choice between individual and grouped financing models offered by decentralised finance (DeFi) in Northern Benin, addressing a critical gap in rural finance literature that has focused primarily on access to credit as a binary outcome. A cross-sectional survey of 585 farm producers (with and without financing) was conducted across four municipalities in Northern Benin (Péhunco, Sinendé, Bassila and Banikoara) using purposive sampling. The collected data were analyzed using a multinomial logit model to compare the individual and group financing models. The results show that gender is the most significant determinant : men are nearly nine times more likely than women to opt for the individual financing model. The method of land acquisition, available collateral, and agricultural income further segment beneficiaries between the two institutional models. Previous lending experience reveals a complex relational dynamic : moderate tenure favors the group financing model, while a long banking history paradoxically reduces the use of the individual financing model. These results argue for differentiated rural financing policies that take into account institutional trajectories and structural wealth inequalities. These findings inform the design of differentiated rural financing policies that recognise institutional trajectories and structural wealth inequalities. DeFi should conceive financing models to producers' socio-economic profiles and systematically account for the relationship-lending dimension when assessing creditworthiness. Policymakers should address gender inequalities and collateral constraints to enhance financial inclusion in rural agriculture. This is the first comprehensive study of

determinants influencing producers' choice between competing DeFi financing models in Benin, integrating socio-economic factors, intra-family dynamics and institutional mechanisms. The study extends relationship lending theory to the context of group financing and reveals how accumulated soft information modifies the risk-rationing strategies of DeFi, advancing theoretical understanding of financial inclusion in sub-Saharan Africa.

Keywords : agricultural financing; decentralised finance (DeFi); Multinomial Logit model; financing model choice; microfinance ; Northern Benin ; financial inclusion.

LINTRODUCTION

Agriculture has always been seen as a key driver of global economic growth (World Food Programme, 2022; Sitko et al., 2024). It stands out for its ability to boost economies, alleviate poverty and consolidate the food security of the population (Ben Saad, Yangui, & Ouertani, 2025; Adamou & Ekodo, 2023; Food and Agriculture Organization of the United Nations [FAO], 2024). More specifically, it occupies an important place in developing countries, especially in sub-Saharan African countries (Abis & Brun, 2022; Adamou & Ekodo, 2023). At the macroeconomic level, the agricultural sector contributes to the improvement of overall economic growth (World Food Programme, 2022), reduces trade deficits (World Trade Organization, 2022) and increases household incomes and government revenues (FAO, 2024). At the microeconomic level, it has a direct impact on food (Gnedeka, Tobi, & Douvi, 2024), employment, especially of young people (Puchala & Piotrowska-Puchala, 2025), income, poverty alleviation (Agani, Zannou, Floquet, & Biaoou, 2024) and inequality (Lataste, 2025). However, despite its importance, agricultural activity in sub-Saharan Africa remains small-scale, with limited access to technological innovations, mechanization, monitoring, market information and agricultural financing (Gbedomon, Hougbo, & Thoto, 2023; Humuriza, 2023).

In this context, agricultural financing through Decentralized Finance (DeFi) appears to be a key instrument to support production, especially in rural areas where access to agricultural financing remains limited. In sub-Saharan Africa, access to formal agricultural finance is very limited, for less than 10% to 20% of smallholder farmers, leaving a large majority dependent on informal financing (World Bank, 2022). DeFi, through microfinance institutions, then developed several agricultural financing models. These are the warrantage credit, the agricultural season credit, the agricultural equipment credit, the marketing credit, the grouped credit and the credit benefiting from a partial guarantee from the National Fund for Agricultural Development (FNDA) (Ministère de l'Agriculture, de l'Élevage et de la Pêche (MAEP, 2020). These funding models can be grouped into two categories: the individual funding model and the grouped funding model. The individual financing model includes the production credit, crop loans and equipment loans models, intended for producers requesting individual loans. The grouped financing model includes ordinary grouping, village grouping, rural women, community and warrantage loans, for producers who form cooperatives to apply for a loan. For beneficiaries, these models cover working capital needs, finance productive investments, and support operating activities (Benaïcha & Bensetti, 2024). Thus, the financing of agricultural activities by DeFi is for paramount importance in various poverty reduction policies (Desneux, 2024; Doligez, Goïta, Mees, & Narh, 2024). However, it is clear that access to credit remains well below demand in sub-Saharan Africa, particularly for rural agriculture (Goudjo, 2023). Facilitating access to credit remains a challenge for farmers and constitute a barrier to the adoption of agricultural technologies developed through research (Goudjo, 2023).

To better inform policymakers, numerous studies have examined the determinants of participation in or access to financing, particularly in developing economies (Ninsiima, Migisha, Ndyabakira, et al., 2025). Other research, such as that of Zhang, Chen, and Hu et al. (2019), has looked at the conditions favouring the transition from bundled to individual credit, illustrating that the socio-economic characteristics of producers, their financial experience and their aversion to risk significantly influence their choices. In the Beninese context, existing research also remains fragmented, but does not examine the determinants of the choice of financing proposed by DeFi. It should be noted that the studies have primarily focused on the analysis of the determinants of access to agricultural credit, independently of agricultural financing models and in isolation, resulting in limited consideration of institutional and socio-economic interactions. Although the literature on rural finance is extensive regarding the comparative

performance of credit models and on the determinants choosing a particular model, very few studies analyse the factors that guide producers between individual and group financing. Therefore it is relevant to explore in an integrated of the socio-economic, institutional and psychological factors likely to influence producers' decision to opt for one financing models other another. Such an analysis would not only fill an important gap in the empirical literature on rural finance, but also provide useful insights to DeFi to adjust their financial products to the evolving needs of producers.

Our study makes three major contributions to the empirical literature on rural finance, the role of DeFi, and the determinants of access to and choice of financing models in rural areas, particularly in the agricultural context of developing countries. It also contributes to ongoing research on financial inclusion, the financing of family farms and the adaptation of financial instruments to the socio-economic and institutional realities of farms (FAO, 2024). The first contribution concerns the analysis of the determinants of the choice of agricultural financing models by producers proposed by DeFi. The originality of this research lies in the simultaneous examination of the socio-economic factors of producers, the characteristics of farms and the institutional constraints specific to DeFi, in particular the characteristics of the models proposed. This angle of analysis is still insufficiently explored in the empirical literature. Indeed, the majority of existing studies have focused mainly on the determinants of access to agricultural credit or on the effects of credit on production and incomes, without analysing the mechanisms that guide producers' choice between the different financing models (Missadji, 2022; Adjera, Djagoun, & Yabi, 2023; Goudjo, 2023). Based on data collected in northern Benin, our study provides new empirical evidence showing that the choice of financing model is highly dependent on the producer's track record with DeFi. The second contribution of this study focuses on the intra-family and social dynamics that influence the use of different agricultural financing models. In general, group lending is recommended when producers encounter difficulties in providing physical guarantees. This approach is based on the theory of "social capital" or "social guarantee" developed by Ghatak (1999), according to which social ties and group pressure can replace traditional material guarantees. Thus, the choice of a financing model is not neutral and may vary according to the gender, age and position of the producer within the household. The literature highlights that producers face specific constraints in terms of guarantees, land rights and decision-making power, which limits their access to certain formal financial instruments (Soglohoun, 2024; Mathurin & Mantsie, 2024; Kangatlam, 2025; Barry, 2026). The third contribution concerns the analysis of the institutional and operational mechanisms linking the characteristics of decentralized financial systems to the choice of agricultural financing models (Abdou & Azzaoui, 2023; Bédu, 2024; Zongo, 2024). The study shows that the choice of financing model is strongly influenced by factors related to the supply of credit, including collateral requirements, interest rates applied, flexibility of repayment terms as well as the technical assistance associated with the loan. In addition, the climatic risks and production hazards specific to agricultural activity encourage DeFi to favour schemes deemed less risky, such as group loans, which allow the risk of non-payment to be pooled. However, analysis gains in contribution by integrating the relational dimension of financing. When information is available on the producer's credit history, the relationship lending theory developed by Petersen and Rajan (1994) becomes relevant. According to this approach, the accumulation of "soft information" through repeated interactions between the lender and the borrower reduces the information asymmetry and modifies the terms of credit granting.

For example, producers with a long and ongoing relationship with an DeFi would be more likely to access individual credit with more flexible terms. The accumulated relational information would then reduce the need to have recourse to collective mechanisms of discipline and sanction specific to group credit. This perspective also makes it possible to qualify the conclusions of the information asymmetry model proposed by Stiglitz and Weiss (1981). Indeed, their theoretical framework, which is relatively static, emphasizes moral hazard and adverse selection leading to credit rationing. However, in a dynamic context where the lender-borrower relationship is long-term, the accumulation of soft information can mitigate these problems of asymmetry. Therefore, rather than refusing to grant credit, DFIs can favour group credit as a risk-sharing and management mechanism, before evolving into individual forms of financing as trust and information are consolidated.

The choice of financing models appears to be the result of a complex interaction between producers' strategies and MFIs' institutional constraints, in a context marked by high economic and climate vulnerability.

The objective of this study is to identify the explanatory factors for the choice of an agricultural financing model by producers in Northern Benin, while taking into account producers' perceptions of the different models proposed. Indeed, the use of a given

financing model is often based on subjective trade-offs linked to trust, previous experience, institutional constraints and the representations that producers have of existing systems, without the underlying determinants of these choices being clearly analysed. However, the scientific literature has mainly focused on the determinants of access to credit as a binary variable (access or non-access), neglecting the comparative dimension between different financing models as well as the role of perceptions in producers' decision-making process. This approach limits the understanding of the choice logics and behavioral dynamics underlying the adoption of a specific financial model. Thus, this study fills a double gap : (i) a lack of analysis on the determinants of the choice between competing models of agricultural financing and (ii) a weak integration of producers' perceptions as a central explanatory variable. It thus provides a relevant empirical and analytical contribution for the development of financial policies that are more adapted to the decision-making realities of rural producers in northern Benin. This study aims to examine the economic, informational and intentional reasons for the choice of financing models proposed by DeFi in a context of information asymmetry and major climate risk. Thus, understanding the explanatory factors for the choice of agricultural financing models would help to guide the various financial support policies for producers in the northern zone of Benin.

II.THEORETICAL FRAMEWORK OF THE STUDY

The analysis of the determinants of the choice of agricultural financing models in northern Benin is part of the information economy paradigm, where the choice of a credit model is dictated by the ability of actors to overcome market imperfections. This framework is primarily based on Akerlof's (1970) theory of information asymmetry which identifies adverse selection and moral hazard as the main barriers to credit granting, as the lender cannot perfectly assess the producer's reliability of. To circumvent these obstacles, financial institutions and producers turns to specific mechanisms for reducing uncertainty. On the one hand, Petersen and Rajan's (1994) theory of "relationship lending" shows that the choice of individual credit is based on the "soft information" accumulated through the duration and quality of the relationship between the producer and his institution (López-Espinosa, Mayordomo, & Moreno, 2017). This closeness reduces information asymmetry and promotes personalized access, often reserved for those with a history of trust or material guarantees. On the other hand, Ghatak's (1999) theory of joint liability explains the preference for group credit, where social capital and "social collateral" replace physical collateral. The group itself screens and monitors its members, making this model attractive to producers with strong social networks but low material assets. Finally, Stiglitz and Weiss' (1981) theory of credit rationing justifies the option of self-financing or refusal, when the conditions imposed by the DeFi (rates, guarantees) create an insurmountable barrier for the borrower.

To operationalize this analysis, the study abandons the assessment of intensity (amount) in favor of a discrete choice model, based on stochastic utility theory. This framework posits that the producer is a rational agent who evaluates the perceived utility of each financing option (Individual, Bundled, or None) and chooses the one that maximizes his their economic well-being under constraints. The analysis model adopted is the Multinomial Logit (LMN), which is particularly suitable for dealing with qualitative dependent variables with several exhaustive and mutually exclusive modalities. Unlike the Cragg model or the Double Hurdle, the Multinomial Logit makes it possible to simultaneously identify the probabilities of choosing one financing method over another. In this model, the independent variables are selected in coherence with the aforementioned theories. For example, social capital and membership in farmers' organizations test Ghatak's hypothesis on grouped credit, while the seniority of the banking relationship and the size of assets test Petersen and Rajan's hypothesis on individual credit. Perception factors, such as trust in peers or fear of over-indebtedness, complement the model to capture the subjective dimension of the decision-making process. Ultimately, this approach based on discrete choice makes it possible to understand the profound trade-offs made by producers in northern Benin between the flexibility of individual credit and the collective security of grouped credit, in a context of structural rationing of the financial supply.

III. METHODS AND TOOLS

3.1. Presentation of the study environment

The study was conducted in four municipalities in northern Benin : Péhunco, Sinendé, Bassila and Banikoara. These communes were selected because of their agricultural importance and the strong presence of microfinance institutions. Péhunco, located in the department of Atacora, stands out for its agricultural dynamism and its proximity to strategic commercial areas. Sinendé, a municipality in Borgou, remains largely marked by a high level of agricultural activity. Bassila, in the Donga, offers a great agroecological diversity, while Banikoara, in the Alibori, is one of the municipality's major agricultural hubs, particularly for cotton cultivation. Figure 1 below shows the geographical location of the study municipalities.

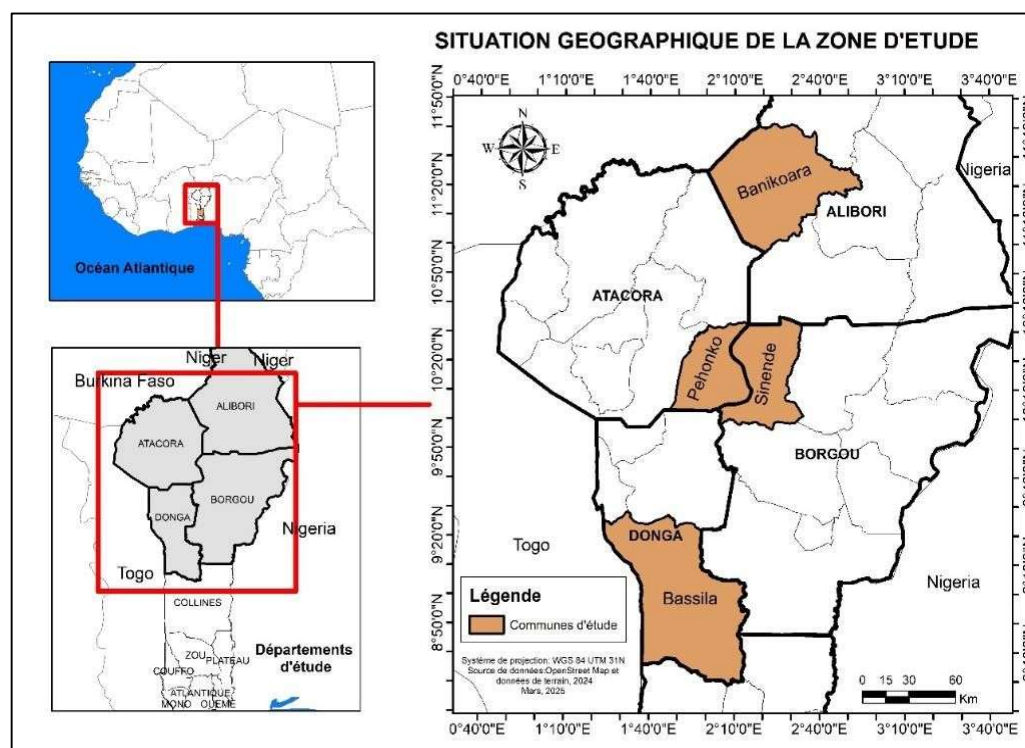


Figure 1 : *Geographic location of the study area*

In the northern zone, DeFi have a particularly developed network branch of agencies. This region remains the largest agricultural production area in Benin, which means that this area receives the largest number of financing granted by microfinance institutions in the agricultural sector.

3.2. Sampling and data collection

The research units consist of agricultural producers, regardless of whether they have received agricultural financing. To establish the sampling frame for sampling, a comprehensive inventory of the Decentralized Finance (DeFi) operating in the study area was conducted. Particular attention was paid to institutions with at least ten years of experience operating in the study area. This selection criterion is based on the premise, widely recognized in the literature, that an institution's longevity is generally an indicator of stability, reliability and availability (Kipesh, 20213). Moreover, the focus on these DeFi stems from their significant

involvement in agricultural financing. The DeFi identified continue to be vibrant, robust and valued by local communities. This demonstrates their solidity and integration into the local socio-economic structure. Once the institutions had been identified, the list of beneficiaries was taken from each DeFi. This database subsequently simplified the establishment of the sample size, determined using Schwartz Cochran's (1977) formula, which is frequently used in empirical research to ensure statistical representativeness, both in quantitative and qualitative terms (Cochran, 1997).

Schwartz's formula looks like this:

$$N = \frac{Z^2 * p(1 - p)}{e^2}$$

With **N** which represents the total sample size;

Z the confidence level according to the reduced centered normal distribution, here the confidence level is 99% with $Z = 2.576$;

e corresponds to the margin of error allowed (here 5%);

p represents the proportion of agricultural finance recipients in the study areas. Based on the information collected from the DeFi selected for the study, 11,255 beneficiaries of financing were counted out of a total of 34323 beneficiaries of agricultural financing for the whole of the northern zone, i.e. a rate $p = 32.8\%$. On this basis, the sample size was calculated at 585 producers to be surveyed. The latter were distributed among the four study municipalities according to the relative weight of each municipality: 182 producers for Banikoara, 120 for Pehunco, 154 for Sinendé and 129 for Bassila.

The selection of participants was carried out using purposive sampling. A total of 585 producers who received or did not receive agricultural financing were surveyed. Table 1 illustrates the proportion of producers surveyed by municipality.

Table 1: *Number of beneficiaries and non-recipients of agricultural financing surveyed*

Municipalities	Number surveyed	Proportions
Sinendé	154	17.4 %
Banikoara	182	31, 11 %
Pehunco	120	20, 51 %
Bassila	129	22,05 %
Total	585	100

The questions relating to the determinants of the choice of the financing model were developed according to the Delphi method. This method consists of iteratively consulting a panel of researchers or experts in the field of study in order to bring out a set of questions or variables to evaluate the key factors influencing funding choices. Each round of consultations makes it possible to collect, refine and then validate the opinions of the experts, which guarantees the relevance and reliability of the variables chosen for the survey. In this case, the literature was consulted through a literature review resulting from the work of theorists in the field such as Maitreesh Ghatak, Mitchell A. Petersen & Raghuram G. Rajan and Joseph E. Stiglitz & Andrew Weiss,. The work of contemporary researchers has also been explored, includingetc.... All of this work made it possible to build the survey based on the work of experts in the field. In addition, the pilot phase of the study provided an opportunity to obtain the views of financial institutions and producers on the factors that could influence the choice of an agricultural financing model. The table 2 below provides information on the variables that have been selected.

Table 2: *Summary of the study's the main variables*

Categorization	Variables
1. Dependent variables	Individual Funding Model (Yes/No) 1.1 Pooled Funding Model (Yes/No)
	Independent variables
Borrower's socio-professional and demographic characteristics	- Gender -Household size, Main activity, Age, Marital status, etc.
farm Size	- Area of the holding in hectares - Number of employees
Borrower eligibility criteria for each model	- Warranty: Nature/description, Security Value, Retained Value
Savings and credit habits (experience)	Lending Experience
Loan experience	Number of years of loan experience

3.3. Empirical Data Analysis Model

The operationalization of the theoretical framework lies in the approach aimed at identifying the factors that influence the choice of agricultural producers in Northern Benin between the different financing options available. The analysis is rooted in the Random Utility Theory (RUM). It is assumed that an agricultural producer i faces a set of *alternative* financing options (self-financing, individual and group financing model). The producer chooses option j that provides the highest level of utility. However, it should be noted that this choice of producer depends on the approval of the DFS, because the producers surveyed come from the DFS database, since it is necessary to have applied for credit to be included in the database. Thus the utility U_{ij} is modeled as follows:

$$ij = Xi \beta_j + \varepsilon_{ij}$$

Where:

- X_i represents the observable characteristics of the producer and his farm.
- β_j is the vector of the parameters to be estimated for each modality.
- ε_{ij} is the error term capturing the unobservable elements influencing the choice.

The Logit Multinomial model is chosen because the dependent variable is qualitative and has three unordered categories. The probability for a producer i to choose modality j is given by the formula:

$$P(Y_i = j | X_i) = \frac{\exp(X_i \beta_j)}{\sum_{k=1}^J \exp(X_i \beta_k)}$$

The coefficients β_j are then interpreted as the effect of a change in an explanatory variable on the log probability of choosing option j over the reference option.

The estimation of the parameters will be carried out by the Maximum Likelihood (ML) method. The validity of the model will be verified, the Likelihood Ratio test (LR test), the Independence of Irrelevant Alternatives (IIA) test and the Effects calculation.

The explanatory variables embedded in the vector X_i are selected in coherence with the theories of information, rationing, and social capital. They are distributed as follows:

Social Capital Variables (Hypothesis of Ghatak, 1999): They rely on the strength of local networks to compensate for the lack of material guarantees. In this study, they are captured by marital status, the number of adults in the household (labour and social support), and the date of membership in an organization or the length of time an account was opened. These factors favour the use of Group Credit, where peer pressure and joint responsibility reduce moral hazard.

Banking relationship variables (Hypothesis of Petersen & Rajan, 1994): They are based on the "soft information" generated by proximity to the institution. Variables such as loan experience, previous savings, and credit history (account opening date) build lender confidence. These elements should increase the likelihood of choosing Individual Credit, as a long-term relationship reduces information asymmetry without the need for collective guarantees.

Capacity and Signaling Variables (Stiglitz-Weiss Hypothesis, 1981): These determine the solvency of the producer and his resistance to rationing. This block includes farm area, productivity, educational attainment and number of employees. The way in which land is acquired and the presence of collateral (as well as its value) serve as signals of wealth. A high asset endowment and high productivity favour individual credit, while a low cash-flow or the absence of guarantees push producers towards group credit or self-financing.

Risk and Technical Specificities Variables : The type of crops (cotton, soybeans, rice, etc.) and the purpose of the credit (purchase of inputs, harvesting, storage) capture the nature of the production risk. For example, cotton cultivation, which is often better structured in Benin, could influence the choice of model differently compared to food crops. Demographic variables such as age and gender also make it possible to control for disparities in access related to gender or accumulated experience.

The table 3 below highlights the variables taken into account according to the variables used.

Table 3: Variables used

Variables categories	Explanatory variables	Nature	Expected sign	Theoretical justification / Logic
Socio-demographic profile	Age	Continue	+/-	Experience vs. Increasing risk Aversion.
	Gender (Ref: Male)	Qualitative	+ (Female)	Privileged access via microcredit (often grouped).
	Marital status (Ref: Married)	Qualitative	-	Stability perceived by lenders.
	Educational level (Ref: Elementary)	Qualitative	+	Human capital and management capacity.
Structure of the Farm	Total area	Continue	+	Production capacity and financing requirements.
	Agricultural workers number	Continue	+	Availability of family labour.
	Employees Number	Continue	+	Level of professionalization of the unit.

	Agriculture as the Main activity	Qualitative	+	Commitment and priority source of income.
	Productivity	Continue	+	Repayment capacity (Stiglitz-Weiss).
Land & Guarantees	Method of acquisition (Ref: Donation)	Qualitative	+/-	Land tenure security varies according to the mode.
	Warranties (Yes/No)	Qualitative	+	Reduction of information asymmetry (Akerlof).
Technical specifications	Crops type (Ref: Maize)	Qualitative	+/-	Specific risk and profitability (cotton, soybean, etc.).
	Purpose of the credit (Ref: Labour)	Qualitative	+/-	Allocation of funds (Inputs, Harvesting, Storage).
Banking Relationship & History	Lending experience	Qualitative	+	Moral hazard reduction (Petersen & Rajan).
	Savings	Qualitative	+	Signal of solvency and self-discipline.
	Account opening date	Qualitative	+	"Soft information" and loyalty (Relationship lending).

IV. RESULTS

4.1. Profile of beneficiaries of funding models

Analysis of Table 4 reveals differences in profile depending on the model adopted and the type of credit service requested. Producers use two main financing models through DeFi. The group financing model, which includes community credit, credit to village groups (VG, ordinary credit, credit to rural women and warrantage). The individual model which includes the equipment loan, the production credit and the crop credit.

Within the bundled model, community credit is widely available to women (72.72%), those with little education (45.45% have no formal education) and adults (35.45 years $\pm$ 9.41). The average total land area owned by beneficiaries of this service is 5.045 ha ($\pm$ 5.23), with 3.63 years ($\pm$ 1.21) of farming experience and an average sown area of 4.27 ha ($\pm$ 5.33). In contrast credit for smallholder farmers granted to men (91.66%) with a low level of education (61.11% with no formal education). These beneficiaries are 38.56 years old ($\pm$ 9.52) and own an average of 12.18 ha ($\pm$ 8.36) of land, with 11.33 years ($\pm$ 8.43) of experience and a sown area of 10.61 ha ($\pm$ 8.19). Ordinary credit, which accounts for 58.24% of beneficiaries, follows a similar pattern with 90.9% are men, 52.52% have no formal education, with an average age of 38.85 years ($\pm$ 9.22), with 10.71 years of experience in agricultural production and 6.62 ha ($\pm$ 7.31) sown on average each year. Credit for rural women, which is exclusively female, reveals a profile of beneficiaries with very low education (73.91% with no formal education), with an average age of 41.43 years ($\pm$ 9.21), owning only 3.5 ha of land ($\pm$ 2.03) and 4.69 years ($\pm$ 2.36) of experience, with a sown area of 2.91 ha ($\pm$ 1.47) per year. In the case of warrantage, although marginal (0.59% of cases), the profile is a male, uneducated, married, with an average total land area of 10 ha and a production experience of 25 years, for an average area sown of 9 ha.

For the individual financing model, 90.91% of equipment loan recipients are men, with a more varied educational background, an average age of 38.18 years ($\pm$ 8.05), an average available land area of 11.95 ha ($\pm$ 14.33), having 8.86 years ($\pm$ 7.39) of agricultural production experience and an average of 9.59 ha sown ($\pm$ 10.71) each year. Production credit, the most dominant in

this model (73.90%), is granted to men (88.05%) who are relatively well educated (49.75% with no formal education, but 24.87% with high school diploma or higher), aged 40.93 years (± 9.45), with a total available land area of 12.37 ha (± 23.09), with 11.39 years of production experience (± 8.50) and an average of 10.82 ha planted (± 21.93) per agricultural season. Crop credit follows a similar structure, with beneficiaries predominantly male (87.75%), 53.06% without formal education, and an average age of 37.97 years (± 8.55).

Statistical tests reveal significant differences between the financing models, especially the variables of gender ($\chi^2 = 12.648$, $p < 0.001$), total available land area ($p = 0.0113$), production experience ($p = 0.0471$) and area sown ($p = 0.0011$). In contrast, age ($p = 0.167$), marital status ($p = 0.8275$) and education level ($p = 0.0508$) did not show statistically significant differences between the models.

Table 4: *Characteristics of Funding Recipients*

Funding model	Type of loan	Gender	Education Level	Marital status	Age	Total available land area	Year of Experience Production	Cultivated area
Bundled Model	Community credit (6.47%)	F=72.72% M=27.27%	None=45.45%, Elementary=45.45%, High school=9.09%	Single=9.09% married=90.91%	35.45(± 9.41)	5.045 (± 5.23)	3.63(± 1.21)	4.27(± 5.33)
	Credit Grouping with GV (21.18%)	F=8.33% M=91.66%	None=61.11% Primary=27.77% Secondary=8.83% High=2.77%	Single=2.77% married=97.22%	38.56 (± 9.52)	12.18(± 8.36)	11.33(± 8.43)	10.61 (± 8.19)
	Standard credit (58.24%)	M=9.10% H=90.90%	None=52.52%, Elementary=29.29% Secondary=13.13%, High=5.05%	Single=19.19% Married=78.78% Widowed (w)=9, 2.02%	38.85 (± 9.22)	7.90(± 8.06)	10.717172	6.62(± 7.31)
	Credit Rural for Women's association	F=100%	None=73.91%, Primary=13.04% Secondary=8.69% High=4.34%	Single=8.70% Married=91.30%	41.43(± 9.21)	3.50(± 2.03)	4.69(± 2.36)	2.91(± 1.47)
	Warrantage	M=100%	None=100%	Married=100%	40.00(± 0)	10.00(± 0)	25.0(± 0)	9.00(± 0)

Fundin g model	Type of loan	Gender	Education Level	Marital status	Age	Total available land area	Year of Experienc e Productio n	Cultivated area
(0,59%)								
Individu al model	Equipmen t credit (8.09%)	F=9.09%	None=36.36%, Elementary=31.8 1%	Single=22.7%,	38.18(±8.0 5)	11.95 (±14.33)	8.86(±7.39)	9.59(±10.7 1)
		M=90.91 %	Secondary=13.63 % Superior=18.18%	Married=77.27 %				
	Productio n credit (73.90%)	F=11.94 % M=88.05 %	None=49.75% Elementary=25.3 7% Secondary=17.91 % Superior=6.96%	Single=10.45 %, Married=88.06 % Widowed=0.9 9%	40.93(±9.4 5)	12.37(±23.0 9)	11.39(±8.5 0)	10.82 (±21.93)
Crop credit (18.01%)		F=12.24 %, M=87.75 %	None=53.06%, Elementary=16.3 2%, Secondary=14.28 %, High=16.32%	Single=18.37 % Married=81.63 %	37.97(±8.5 5)	12.12(±12.2 0)	7.081(±3.9 8)	10.755102
Chi-square Test		X- squared = 12.648, df = 1, p- value = 0.000375 9	X-squared = 7.7762, df = 3, p- value = 0.05087	X-squared = 0.89151, df = 3, p-value = 0.8275	Pr(>F) =0.167	Pr(>F) =0.0113 **	Pr(>F) =0.0471**	Pr(>F) =0.0011**
significant at the 1% level (p< 0.01); ** significant at the 5% level (p< 0.05); * significant at the 10% level (p<0.1).								

Source : 2025 survey results, treatment by the author.

4.2. Determinants of the choice of agricultural financing models

4.2.1. Descriptive statistics of the explanatory variables for the choice of financing models

Analysis of Table 5 shows that women are represented in the grouped model (22.56%) as well as in the individual model (11.59%). In contrast, men predominate in both models, but more strongly in the individual model (88.41%). The level of education shows no statistically significant difference between the models ($p = 0.1608$). Regarding land acquisition methods, significant differences are observed, ($p < 0.001$). For example, 20.77% of the beneficiaries in the individual model acquired their land through purchase, compared to only 10.98% for the bundled model. However, it should be noted that acquisition by inheritance predominates. Similarly, land collateral (agricultural land) is more common among users of the individual model (27.05% versus 12.80%) ($p = 0.0238$), which reinforces the idea that beneficiaries of the individual model have more readily available resources to secure their loans.

In terms of criteria for choosing the model, accessibility and flexibility of the scheme are more often mentioned in the bundled model (15.95%) than in the individual model (8.78%) ($p = 0.0178$), highlighting that beneficiaries of the bundled model are more likely to seek flexible and accessible options. Conversely, the availability of collateral is a more common criterion among beneficiaries of the individual model (17.56%). Furthermore, agricultural income reveals a distinction between the two profiles, the highest income bracket (>1,000,000 CFA francs) is more prevalent in the individual model (16.43% compared to 5.49%), which is statistically significant ($p = 0.0423$).

Analysis in Table 6 shows significant differences between the models for several variables. The total land area available is on average significantly higher in the individual model (12.47 ha) than in the group model (8.09 ha), with a significant difference ($p = 0.0107$). Similarly, the total area under cultivation is significantly larger in the individual model (10.89 ha versus 6.88 ha) ($p = 0.0016$). The number of adults in the household is also higher in the individual model (4.07 adults versus 3.55) ($p = 0.0310$), which may reflect a larger family labor force and potentially a greater ability to manage individual loans.

In addition, the average number of external workers employed is much higher in the individual model. This result reinforces the idea that beneficiaries of the individual model have a more intensive production strategy, requiring more labor. On the other hand, the average age of the beneficiaries does not show a significant difference between the two models (39.17 years for the pooled model, 40.76 years for the individual model; $p = 0.1023$).

From the analysis of Tables 5 and 6, we can see that the bundled model is more accessible to women, small-scale producers, and beneficiaries with limited capital who are drawn towards model's flexibility.

In contrast, the individual model is characterized by beneficiaries with larger landholdings, more labor, better agricultural income, and more collateral to offer, which allows them to access more structured and potentially more substantial credit.

Table 5: *Description of the qualitative variables of the model*

Variables	Terms	Bundled Model	Individual model	Chi-square test
Gender	female	22,56%	11,59%	0,00716136
	Male	77,44%	88,41%	
Education Level	None	58,54%	50,24%	0,16079119
	Elementary	26,22%	25,12%	
	Secondary	10,98%	17,87%	
	Higher education	4,27%	6,76%	
Land acquisition methods				

Variables	Terms	Bundled Model	Individual model	Chi-square test
Gift	No	87,8%	84,54%	0,45399503
	Yes	12,2%	15,46%	
Purchase	No	89,02%	79,23%	6.0994E-05
	Yes	10,98%	20,77%	
Loan	No	93,9%	95,65%	0,60154204
	Yes	6,1%	4,35%	
Rental	No	95,73%	89,86%	0,05357652
	Yes	4,27%	10,14%	
Inheritance	No	20,12%	14,01%	0,15355366
	Yes	79,88%	85,99%	
Experience	1 to 5 years	57,93%	62,8%	0,37919559
	10 years or more	2,44%	3,86%	
	5 to 10 years	39,63%	33,33%	
Purpose of the credit	Purchase of agricultural inputs	56,1%	61,84%	0,46663787
	Production	6,1%	3,86%	
	Coverage of household expenses	2,44%	0,97%	
	Investments in equipment	35,37%	33,33%	
Garrantee				
Agricultural land	No	87,20%	72,95%	0,0238626
	Yes	12,80%	27,05%	
Agricultural equipment	No	93,29%	95,17%	0,75698386
	Yes	6,71%	4,83%	
Real estate	No	75,61%	61,84%	0,29135148
	Yes	24,39%	38,16%	
None	No	96,95%	99,03%	0,62704738
	Yes	3,05%	0,97%	
Parameter considered when choosing the model	Model accessibility and flexibility	15,95%	8,78%	0,01786706
	Refund conditions	42,33%	34,63%	
	Availability of collateral	6,13%	17,56%	
	Interest rate	35,58%	39,02%	

Variables	Terms	Bundled Model	Individual model	Chi-square test
Farm income	100 000 - 200000	20,73%	14,01%	0,04237277
	200 000 - 500000	43,29%	39,61%	
	50 000 - 100 000	4,88%	3,38%	
	500 000 - 1 000000	25,61%	26,57%	
	More than 1,000,000	5,49%	16,43%	

significant at the 1% level ($p < 0.01$); ** significant at the 5% level ($p < 0.05$); * significant at the 10% level ($p < 0.1$).

Source: 2025 survey results, treatment by the author.

Table 6: Description of the model's quantitative variables

Variables	Statistics	Bundled Model	Individual model	t-test	p-value
Total available area	Medium	8,090	12,469	-2.57	0,01068**
	Standard deviation	7,899	22,837		
Age	Medium	39,171	40,758	-1.64	0,10232
	Standard deviation	9,187	9,379		
Household	Number of adults	Medium	3,555	-2.16	0,03106**
		Standard deviation	2,129		
	Number of children	Medium	4,116	-1.79	0,07354
		Standard deviation	3,339		
Labor	Medium	0,933	1,522	-3.4	0,00075***
	Standard deviation	1,478	1,859		
Total area under cultivation	Medium	6,884	10,894	-2.17	0,00162***
	Standard deviation	7,275	21,671		

Source: 2025 survey results, treatment by the author.

4.2.4. Determinants of the choice of funding models

Table 7 presents the estimates of the Multinomial Logit model for the two financing alternatives (individual model and group model) relative to the reference option which is self-financing. The odds ratios (ORs), p-values and significance levels are reported for each explanatory variable. Before running the logit model, a one step-test of collinearity among the explanatory variables was performed.

Analysis of the results from the multinomial logit model reveals distinct decision-making profiles between producers opting for individual financing and those favoring the group model. Overall, both models present satisfactory indicators of fit quality: McFadden's pseudo- R^2 reaches 0.525 for the individual model and 0.575 for the grouped model, indicating the model's explanatory capacity. Wald's statistics ($\chi^2(34) = 1,041.15$ for the individual model; $\chi^2(15) = 1,115.32$ for the grouped model) confirm the overall significance of each of the estimated equations.

Table 7 : *Determinants of financing choice / Multinomial logit (N = 585)*

Explanatory variable	Individual model (ref.: self-financing)		Group Model (Ref.: Self-financing)	
	Odds Ratio	p-value	Odds Ratio	p-value
Socio-demographic profile				
Constant (Intercept)	0.002	<0.001***	121.057	<0.001***
Age	0.989	0,6638	0.962	0,0227**
Gender: Male (Ref.: Female)	9.295	0,0016***	0.619	0,1885
Education Level (Ref: None)				
Elementary	0.871	0,7700	0.774	0,4078
Secondary	0.782	0,6498	0.359	0,0121**
Higher	0.275	0,2560	0.364	0,0899*
Household and farm structure				
Number of adults in the household	1.333	0,0181**	1.055	0,4998
Number of children in the household	1.091	0,1653	0.978	0,6267
Number of employed workers	1.068	0,6787	0.914	0,3514
Total available area	0.947	0,1579	1.006	0,8696
Cultivated area	1.103	0,0437**	0.991	0,8101
Land Acquisition method (Ref: No)				
Donation	0.945	0,9401	0.497	0,1527
Purchase	9.571	<0.001***	0.461	0,0642*
Loan	2.170	0,3751	0.765	0,6855
Land rental	0.924	0,9141	0.260	0,0147**
Inheritance	5.159	0,0158**	0.286	0,0059***
Lending Experience (Ref.: 1-5 years)				
5 to 10 years	0.473	0,0874*	1.898	0,0280**
10 years and up	0.039	0,0314**	1.948	0,4140
Purpose of the credit (Ref.: Purchase of agricultural inputs)				
Production	0.000	0,9909	1.023	0,9706
Coverage of household expenses	0.000	0,9947	1.420	0,7289
Investments in Equipment	0.384	0,0336**	0.713	0,2431

Explanatory variable	Individual model (ref.: self-financing)		Group Model (Ref.: Self-financing)	
	Odds Ratio	p-value	Odds Ratio	p-value
Type of collateral (Ref.: No)				
Farmland	2.940	0,0207**	0.311	0,0026***
Agricultural equipment	1.407	0,6350	1.842	0,3101
Real estate	0.603	0,2792	0.474	0,0251**
None	0.985	0,9923	1.337	0,7637
Refund policy(Yes/No)	1.251	0,7527	0.459	0,0947*
Availability of collatera (Yes/No)	3.275	0,1405	0.196	0,0053***
Interest rate (Yes/No)	1.101	0,8936	0.533	0,1642
Agricultural income (Ref.: 100,000–200,000 FCFA)				
50 000 – 100 000	0.000	0,9910	0.690	0,5669
200 000 – 500 000	2.640	0,1376	0.834	0,6147
500 000 – 1 000 000	4.934	0,0260**	1.156	0,7319
Over 1,000,000	1.195	0,8490	0.262	0,0314**
Method of purchasing inputs (Ref.: Cash)				
Credit from an DeFi	0.167	0,0020***	0.601	0,2491
Grant	5.112	0,2700	0.327	0,2596
Training/support by DeFi (Yes/No)	2.423	0,0967*	1.254	0,5742
Model Statistics — Individual Model : Pseudo-R ² = 0.525; AIC = 287.17; Wald $\chi^2(34) = 1041.15^{***}$ Group model : pseudo-R ² = 0.575; AIC = 486.83; Wald $\chi^2(15) = 1115.32^{***}$ N = 385				
Note: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$. Odds ratios (ORs) are estimated by maximum likelihood. The reference modality is self-financing ($j = 0$). $OR > 1$ = positive effect on the probability of choosing the alternative; $OR < 1$ = negative effect.				

Source: 2025 survey results, treatment by the author.

Determinants of the choice of individual financing model

Gender is one of the most powerful determinants of the use of individual credit. With an Odds Ratio of 9.29 ($p = 0.0016$), men are nearly nine times more likely than women to choose this financing method over self-financing. This result reflects the structural inequalities in access that characterize agricultural credit markets in sub-Saharan Africa, where women are often excluded from individual credit mechanisms due to land constraints and restrictive social norms (Akerlof, 1970; Stiglitz & Weiss, 1981).

The method of land acquisition also reveals a decisive effect. Inherited land increases the likelihood of opting for individual credit by a factor of 5.16 ($p = 0.016$), which is consistent with the Stiglitz-Weiss reporting hypothesis: holding inherited land assets constitutes a credible solvency for the financial institutions. In the same logic, the purchase of land has a OR of 9.57 ($p < 0.001$), reinforcing the idea that a diversified and consolidated land assets portofolio significantly increases individual borrowing capacity. Conversely, producers with ten years or more of lending experience have a significantly less likely to opt for this model

(OR = 0.039; $p = 0.031$). This counterintuitive result can be explained by a form of financial saturation or by a reorientation towards other financing mechanisms after a long individual credit trajectory.

Household structure also has a positive influence : each additional adult in the household increases the probability of using individual financing by 1.33 times ($p = 0.018$). This relationship reflects the dual logic of the available labor as a signal of productive capacity and the family social network as an informal guarantee mechanism. In addition, agricultural incomes between 500,000 and 1,000,000 CFA francs increase the chances of opting for this model by a factor of 4.93 ($p = 0.026$), confirming that middle-income producers are the core target market of individual financing institutions.

Regarding collateral, pledging agricultural land is associated with an OR of 2.94 ($p = 0.021$), reflecting which reflects the central role of land collateral in securing individual loans. Investment in equipment as an purpose of the loan reduces the chances of using this model (OR = 0.38; $p = 0.034$), with the result that this type of financing is more oriented towards working capital needs. Using credit from an DeFi to purchase inputs significantly reduces the probability of choosing the individual model (OR = 0.17; $p = 0.002$), which may indicate that some producers already in credit relationships with DeFi prefer to maintain their existing contractual arrangements.

- *Determinants of the choice of the group financing model*

The pooled financing model responds to a significantly different decision-making logic, one that is more closed tied to socio-economic characteristics and forms of collective belonging. Age has a significant negative effect (OR = 0.962; $p = 0.023$), indicating that older producers tend to move away from group financing, likely due to a greater preference for financial autonomy or a stronger aversion to the joint liability that characterizes this financing model. Alternatively, because they are older, they have already had time to accumulate assets, especially land assets; which allows them to have collateral to secure individual loans.

Educational attainment is another determining factor : producers with a secondary level of education are 64% less likely than those with no schooling to opt for group credit (OR = 0.359; $p = 0.012$). This result is consistent with Ghatak's (1999) work on self-selection in credit groups: individuals with higher human capital tend to view the costs of mutual monitoring and joint liability as disproportionate to the expected benefits, and instead opt for bilateral arrangements.

The mode of land acquisition also substantially affects the use of group financing. Renting land reduces the chances of choosing this model by 74% (OR = 0.260; $p = 0.015$). Similarly, inheriting land reduces the chances of choosing this model group financing (OR = 0.286; $p = 0.006$): the financial security provided by inheritance reduces the need for risk pooling, making the individual option relatively more attractive.

Having 5 to 10 year lending experience significantly increases the probability of selecting the bundled model (OR = 1.898; $p = 0.028$). This relationship can be explained by a learning process regarding collective mechanisms: after a successful first loan experience, producers would be more inclined to participate in collective financing dynamics, in line with the peer trust hypothesis developed by Ghatak (1999). Furthermore, the availability of physical guarantees is associated with a sharp reduction in the chances of opting for group financing (OR = 0.196; $p = 0.005$). This result is consistent with the underlying logic of group credit: the absence of physical collateral is the main reason why producers turn to this model.

Regarding collateral, the ability to offer farmland as collateral reduces the chances of choosing the bundled model by 69% (OR = 0.311; $p = 0.003$), while the real estate guarantee reduces it by 53% (OR = 0.474; $p = 0.025$). These results confirm that group credit is primarily a substitute for collateral, used by producers whose assets do not allow them to access individual credit. This because producers with agricultural incomes exceeding 1,000,000 CFA francs are associated with a 74% reduction in the chances of opting for this model (OR = 0.262; $p = 0.031$), which reinforces the idea that the wealthiest producers naturally migrate to more individualized and less restrictive financing options.

The cross-sectional reading analysis of the two equations in the Multinomial Logit model reveals a pattern of structural substitution between the determinants of individual financing and those of grouped financing. Variables positively associated with

one models tend to be negatively associated with the other, indicating a pattern of rational trade-off on the part of producers between the two types of financing.

Land assets, whether inherited or purchased, constitute the main differentiating factor: they clearly steer producers towards individual credit, by providing them the solvency signals required by formal institutions. Conversely, the absence of collateral and modest incomes are the fundamental determinants of recourse to group credit, thus validating Ghatak's (1999) hypothesis that pooled credit functions as a financial inclusion mechanism for agents excluded from formal channels.

These results have important implications for agricultural financing policies in northern Benin. On the one hand, expanding individual credit necessarily involves securing the land rights of women and disadvantaged households. On the other hand, the consolidation of group credit requires special attention to beneficiary targeting, ensuring that the most vulnerable producers are not excluded in favor of those who already have banking experience or high social capital. Ultimately, neither of the two models alone can respond to the diversity of the financial profiles of agricultural producers in Northern Benin, thus advocating for a plural and differentiated financing offer.

V. DISCUSSION

5.1. Socio-economic and institutional determinants of the choice of financing models

The first contribution of this study aimed to simultaneously examine producers' socio-economic factors, the characteristics of their farms and the constraints specific to DeFi in determining the choice of a financing model. The results of the Multinomial Logit model provide a nuanced perspective on this point, which goes beyond binary analyses of credit access.

Gender is the most significant discriminant determinant in this regard. Men are nearly nine times more likely than women to choose individual credit over self-financing, a gap that does not stem from a stated preference, but reflects a long-documented structural exclusion in West African agricultural contexts. (Dossa & Miassi, 2018) described the same patterns in Ghana and Niger: women do not turn to group credit because they consider it suitable, but because individual credit channels are largely closed to them, due to the lack of recognized asset guarantees. This shift, from constraint to apparent choice, deserves to remain at the heart of the analysis, lest we otherwise risk confusing it with simple access.

Collateral and incomes reinforce this logic of segmentation. Pledging agricultural land increases the probability of opting for individual financing by nearly threefold, while significantly reducing the use of group credit. Intermediate farm incomes produce a similar effect. These results support the classic thesis of Stiglitz and Weiss (1981) on the role of collateral as a solvency signal, but they reveal a less debated aspect: it is the mode of land acquisition, inheritance, purchase, or rental, that functions as a signal in itself, regardless of the amount of land held. Land tenants find themselves in the most precarious position: unattractive to credit groups seeking to limit internal risk, they drift towards self-financing by default rather than by strategy.

5.2. Intrafamilial and social dynamics and the choice of the grouped model

The second contribution focused on the social and family mechanisms that influence the use of different models, in particular group credit. The results partially confirm Ghatak's (1999) theoretical hypothesis about self-selection in credit groups, while enriching it with less expected observations.

The effect of gender on the grouped model is, precisely, its absence: gender is not a significant determinant of the use of this model, which validates the idea that collective credit functions as a more equitable access channel for women producers. Joint liability of the group replaces individual collateral.

On the other hand, age and educational level introduce internal differences among potential beneficiaries of the grouped model. Each additional year of age slightly but significantly reduces the probability of using it. Older producers often have informal networks or their own resources that free them from the constraint of collective solidarity, a form of gradual financial empowerment that depends less on the institution than on accumulated experience. Secondary education, meanwhile, reduces the

chances of choosing the bundled model by 64%. This result is consistent with Ghatak's (1999) theory: individuals with higher human capital assess the costs of mutual monitoring differently and tend to prefer bilateral arrangements. However, caution must be exercised on this point, as secondary education remains uncommon in the sample and its effect could be partially confounded with other variables of economic capacity.

Household status and differentiated property rights complete this picture. The constraints specific to women producers regarding decision-making power and property rights, documented by Soglohoun (2024) and Mathurin and Mantsie (2024), find a direct empirical translation here: the lack of collateral does not lead to total exclusion from credit, but to a narrowing of the available options, which reduces group credit to the status of the only realistic alternative.

5.3. Institutional mechanisms, relationship lending and financing trajectories

The study's third contribution concerns the institutional and operational mechanisms through which the characteristics of the DeFi themselves influence the choice of financing model. The results on previous lending experience are the richest analytical material in this respect.

Five to ten years of experience with a DeFi increases the probability of choosing the bundled model by 90%. This result is well explained by the logic of the relationship lending theory developed by Petersen and Rajan (1994): repeated interactions between lender and borrower allow for the accumulation of soft information that reduces information asymmetry and alters the conditions for access to credit. Producers with a moderate history with the DeFi are recognized as reliable borrowers within collective mechanisms, though trust has not yet been sufficiently established to justify individual financing.

The result regarding long-term trajectories, ten years or more of experience, is more surprising, and perhaps the most interesting aspect of this study. Contrary to what one might expect, a long experience of borrowing reduces the probability of choosing an individual loan by 96%. Several interpretations are possible. This may be a saturation effect: producers who have taken out many individual loans diversify their arrangements. It may also reflect a deliberate shift towards mechanisms considered less restrictive on guarantees, after a long banking trajectory. This result does not contradict the hypothesis of a learning effect in financial inclusion advanced by (Mbaye, 2023), but it suggests that this learning does not necessarily lead to loyalty to formal individual circuits; it also opens up alternative paths.

This observation invites us to qualify the static model of (Stiglitz and Weiss, 1981). In a context where the lender-borrower relationship is long-term, the accumulation of relational information gradually alleviates the problems of adverse selection and moral hazard. Rather than credit rationing, we observe a differentiation in access terms depending on the phase of the relationship: group credit in the early years, a possible shift towards individual forms, and then diversification of arrangements as trust consolidates. The choice of financing model is thus less a one-time decision than a position in an institutional trajectory.

The collateral requirements, interest rates and flexibility of repayment terms specific to each DeFi are integrated into this relational dynamic. Climate risks and uncertainties of agricultural production also encourage DeFi to favour group credit as a risk-sharing mechanism, reinforcing the idea that the choice of financing model results from a complex interaction between producers' strategies and the institutional constraints of DeFi, in an environment marked by high economic and agroclimatic vulnerability.

VI. CONCLUSION

The objective of this study was to identify the determinants of the choice of financing choices among agricultural producers in Northern Benin between the individual model and the grouped model, based on a Multinomial Logit model. The results yield several insights, some of which confirm well-established hypotheses in the literature and others call for nuance view of conventional wisdom.

Gender remains the most discriminating determinant of use of individual credit, reflecting inequalities in access to land guarantees and productive assets that are not specific to the financial sector but are reproduced within. Land capital, through its mode of acquisition, in particular inheritance and purchase, directs producers towards distinct financing channels, according to a

solvency signal logic consistent with the hypothesis of Stiglitz and Weiss. Tangible collateral and high intermediate agricultural incomes reinforce this pattern of orientation towards individual credit.

The grouped model, on the other hand, responds to a different logic. It attracts younger, less educated producers, with no guarantees and with modest incomes, not because these characteristics make it more attractive in itself, but because access to individual credit is structurally closed to them. The loan experience over 5 to 10-year is an exception : it significantly increases the probability of opting for this model, indicating that an initial exposure to credit favors entry into collective schemes. This result partially validates the learning hypothesis put forward by Mbaye, while showing that this learning systematically does not lead to individual credit.

Two findings deserve special attention in public policy orientations results. First, tenants who own land, who lack real guarantees and are not well received in credit groups, constitute a doubly excluded population that is only marginally captured by standard analyses focused on formal access criteria. Second, producers with the most experienced in credit (ten years or more) are very unlikely to use the individual model, which could indicate a form of disengagement after a long formal credit trajectory, an avenue that deserves to be explored in longitudinal follow-up studies. Important questions remain open. This study focuses on the determinants of the choice of financing, but it does not measure the differentiated impact of the models on agricultural productivity or on the economic empowerment of women producers, two essential dimensions for assessing the real impact of rural financing mechanisms. A panel survey, combining data on financing choices and medium-term agricultural performance indicators, would permit to move beyond determinants to shed light on the effects. Future research should be directed toward this area.

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