







An analysis of personal and managerial characteristics of Peruvian smallholders as an alternative approach to improve their financial inclusion

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Submitted: 10/13/2025; Accepted: 05/18/2026; Published: 06/03/2026.

ABSTRACT: Access to financing is a significant challenge that affects the limited financial capacity of the agricultural sector, as well as the limited adoption of technologies and technical models by small-scale farmers. This circumstance gives rise to diminished sectoral productivity, most severely in developing countries such as Peru. In order to address this gap, the study examined the influence of individual and business characteristics on the financial behaviour of small-scale Peruvian farmers, both with and without access to credit. Therefore, a survey was implemented and administered to a sample of 198 small-scale Peruvian farmers from various regions throughout the country. The analytical procedure for the data was estimated in a Multiple Indicators Multiple Causes model (MIMIC), which is used to analyze the relationships between observed variables and latent variables. The findings of this study underscore the significance of implementing innovative assessment interventions to enhance financial decision-making skills and facilitate access to financial instruments among the rural and agricultural population of Peru.

Keywords: financial behaviour; financial inclusion; smallholders; MIMIC.

Análise das características pessoais e gerenciais dos pequenos produtores peruanos como abordagem alternativa para melhorar sua inclusão financeira

RESUMO: O acesso ao financiamento é um desafio significativo que afeta a capacidade financeira limitada do setor agrícola, bem como a adoção restrita de tecnologias e de modelos técnicos pelos pequenos agricultores. Tal circunstância resulta em uma diminuição da produtividade setorial, mais acentuada em países em desenvolvimento, como o Peru. Para abordar essa lacuna, o estudo examinou a influência das características individuais e empresariais sobre o comportamento financeiro de pequenos agricultores peruanos com e sem acesso ao crédito. Para tanto, foi realizada uma pesquisa com uma amostra de 198 pequenos agricultores peruanos, provenientes de diversas regiões do país. A análise dos dados foi realizada por meio de um modelo de Múltiplos Indicadores e Múltiplas Causas (MIMIC), utilizado para investigar as relações entre variáveis observadas e latentes. Os resultados deste estudo ressaltam a importância de implementar intervenções inovadoras de avaliação para aprimorar as habilidades de tomada de decisão financeira e facilitar o acesso da população rural e agrícola do Peru aos instrumentos financeiros.

Palavras-chave: comportamento financeiro; inclusão financeira; pequenos agricultores; MIMIC.

1. INTRODUCTION

The global economy is inextricably linked to the agricultural sector, which serves as a primary source of food for supply chains and is a significant contributor to employment opportunities in rural communities. However, the agricultural sector in developing countries, which is predominantly comprised of small and medium-sized producers, is distinguished by relatively low levels of productivity, largely due to the limited utilization of technology. In accordance with the findings of previous studies, the scarcity of financial resources has been identified as a significant barrier to the implementation of technological improvements and the enhancement of productivity in the

agricultural sector (BALANA; OYEYEMI, 2022; BENNI, 2022). In addition, the World Bank (2018) pointed out the importance of the expansion and strength of an ecosystem of financial institutional support, which could focus more on reducing the gap that most smallholders face when trying to have access to finance. In this sense, insufficient access to finance would be a critical obstacle that determines the low capitalization of the sector, as well as the low incorporation of technologies and technical models in smallholders in the agricultural sector, leading to the low productivity of the sector.

In their analysis of the financial ecosystem in rural areas of developing countries, Conning; Udry (2005) pointed out

that the availability of financial options may influence decisions related to agricultural operations, crop selection, and the choice to invest in high-risk but potentially lucrative new technologies or infrastructure to stimulate their development. Furthermore, Boucher; Guirking (2007) highlighted the coexistence of informal and formal credit sectors in developing countries, despite significant interest rate differentials. They emphasized that informal lenders have superior access to local information, enabling them to offer financial services to individuals excluded from the traditional financial sector. While Phiri et al. (2018) highlight the importance of information for enhanced and sustainable agricultural productivity, they also identify challenges associated with access to information by smallholders in developing countries, which are often linked to financial constraints among farmers. Similar challenges have been found for smallholders accessing other types of information, such as innovativeness (RAMOS-SANDOVAL et al., 2016), and climatic (BLAZQUEZ-SORIANO; RAMOS-SANDOVAL, 2022). Consequently, there is a pressing need to gain a deeper understanding of financial services in diverse contexts, particularly for smallholder farmers in developing countries.

The financing of the primary agri-food sector and rural development in Latin America has demonstrated the potential of financial inclusion as a means of addressing a range of significant challenges for this sector. De Ollouqui; Fernández (2017) posit that financial inclusion has a significant impact on risk management in the context of confronting climate change. Moreover, they contend that the integration of low-income groups from rural communities into the economic market engenders a favorable outcome, manifesting in the reduction of poverty and inequality within the region. Nonetheless, increasing credit accessibility in rural areas may have unexpected effects on smallholders, improving their economic development. In a case study, Escobal et al. (2015) identified that programs designed to stimulate production and access to credit to transform the economy of Latin American territories did not necessarily result in the stimulation of productivity on family farms in rural areas. Instead, they prompted a shift towards export-oriented agriculture, which primarily benefited large-scale commercial production in rural areas and exposed them to the volatility of international commodity markets, in alignment with this.

Benni (2022) emphasized that innovative financial market instruments, including self-assessment psychometrics instruments (KLINGER et al., 2013) and emergent technological actors such as FinTech (BENAMI; CARTER, 2021), have the capacity to function as innovative social elements. These instruments have the potential to alleviate several barriers that currently limit access to financial services for rural and vulnerable actors in the agricultural sector. In the context of innovative solutions, Agri-FinTech has been identified as a pivotal element in enhancing the livelihoods of smallholders in developing countries (RAYHAN et al., 2024). In the domain of psychometric tools for credit scoring assessments, extant research has identified its potential to augment the utilization of SME loans in the short-term (ARRÁIZ et al., 2018). Consequently, a comprehensive understanding of the role played by all actors in the sector is imperative to develop competitive mechanisms, products, and financial services and to gain a deeper insight into the supply and economic demand of the rural agricultural sector.

In the case of Peru, Ghezzi (2021) points out that agricultural financing remains a pending challenge in the Peruvian economy, considering that less than 10% of producers in rural family agriculture cover their demand for financing, either by public or private entities. Trivelli (2021) identifies the issue of agricultural financing as a structural problem, driven by costs associated with administration and operations, as well as the inherent risks faced by smallholder farmers in Peru. Additionally, the geographical location of bank branch infrastructure in Peru may become an obstacle to farmers' access to information about financial services (Ramos-Sandoval; Lara, 2023), which may also influence their demand for credit, which has been decreasing in recent years (RAMOS-SANDOVAL; MENDIBURU-DÍAZ, 2024). There is a significant and urgent need to allocate financial resources towards the agricultural sectors of developing countries, such as Peru, in order to ensure their long-term resilience against financial information asymmetry (ZHAO et al., 2021), climate extreme adversities (SAQUIB et al., 2016; BLAZQUEZ-SORIANO; RAMOS-SANDOVAL, 2022) or poverty alleviation (PENG et al., 2021; PING et al., 2022). These long-standing barriers necessitate the implementation of innovative strategies to facilitate the reduction of financial access disparities among Peruvian farmers. Consequently, to improve the financing of the Peruvian agricultural sector, the implementation of diverse tools through collaboration with both banking (e.g., public banks, micro-finances) and non-banking entities (e.g., lenders, Fintech) is needed.

In a revised conceptualization of financial inclusion, Trivelli and Caballero (2018) posit that the capacity of users to repay credit that aligns with their financial requirements should be considered in addition to the mere provision of access to financial accounts. Further research is required in order to evaluate the potential efficacy of novel approaches designed to facilitate access to financial services for rural smallholders in Peru. Therefore, to address this knowledge gap, the present study proposes to examine the extent to which the financial behaviour of smallholders with and without access to credit may be influenced by individual and enterprise characteristics. To this end, a MIMIC model was implemented to explore the influence of multiple causes (socio-demographic and farmer management characteristics) on latent variables, such as effective financial decision-making (EFM), self-control (SCR), and attitude towards money (ATM).

The rest of the paper is organized as follows. Section 2 presents a concise overview of the existing literature on financial and borrowing behaviour. Section 3 outlines the data and methodology employed in the paper. The empirical results are presented in Section 4 and discussed in relation to the literature in Section 5. Finally, Section 6 offers a concluding summary of the paper.

2. LITERATURE REVIEW

2.1. The financial and borrowing behaviour

According to Perry and Morris (2005), financial behaviour is defined as the management of a person's savings, expenditure, and budget. According to Rahman et al. (2020), the financial behaviour of individuals can be understood as the capacity to maintain equilibrium between income and expenditure. This balance is further characterized by the promptness of bill payments and the consideration of a savings buffer. Conversely, Rabbani (2023) posited that

borrowing behaviour describes the patterns and habits individuals exhibit concerning borrowing credit. Therefore, financial and borrower behaviour may affect planning, management and control of financial resources, whether considered from an individual or a broader perspective.

In this regard, Xiao's (2008) approach to financial behaviour indicates that individuals with low incomes are more concerned with regular financial management, including cash, savings, and credit. Whereas Mwirigi et al. (2024) pointed out that the comprehension of borrower behaviour is vital in developing countries' societies since credit availability promotes economic growth at both micro- and macro-economic levels. In this regard, several factors influence financial and borrowing behaviour-making processes, which can be understood by examining various aspects of their decisions. These include loan application behaviour (ADUSEI; ADELEYE, 2020), loan repayment behaviour (BANERJEE, 2013; GEHRIG et al., 2020), social and cultural factors (MCNAIR et al., 2016; YAZDANPARAST; ALHENAWI, 2017; NAYAK et al., 2024) and psychological factors (DLUGOSCH et al., 2017; GANBAT et al., 2021; HANSSON; SOK, 2021; DHAMI et al., 2022).

In line with this, McNair et al. (2016) observed that psychological factors play a significant role in predicting individuals' financial and borrowing behaviour during periods of financial strain after controlling for socio-demographic variables and money management practices. Similarly, Yazdanparast; Alhenawi (2017) proposed that an individual's attitude may diverge from their actual intention to engage in specific financial actions, while Davies et al. (2019) observed that individual psychological factors exert influence over borrowing behaviour, although not to the same extent as sociodemographic factors. The observed diversity of the results may be attributable to the intricate interplay between individuals and their surroundings, a hypothesis that is corroborated by prior findings, which indicate a noteworthy correlation between psychological and socio-demographic variables (KLINGER et al., 2013; DLUGOSCH et al., 2017; HANSSON; SOK, 2021; RAHMAN et al., 2020; MWIRIGI et al., 2024).

2.2. Financial alternative approach to improve financial inclusion

The issue of credit scoring has been a focal point for researchers seeking to enhance the efficacy of financial decision-making processes. Klinger et al. (2013) highlighted that psychological factors have been shown to possess a comparable predictive capacity to the metrics generally utilized by financial institutions to evaluate an individual's capacity to repay loans. Conversely, Dlugosch et al. (2017) examined the potential of personality assessments as a tool for a credit score model to inform lending decisions towards entrepreneurs. In addition, Duman et al. (2023) identified the utilization of psychometric testing data as a promising approach for credit lending decisions, thereby contributing to research on the methods of selecting appropriate borrowers. In light of these previous findings, it is of critical importance to ascertain the factors that inform individuals' decisions to apply for loans, particularly in developing countries where access to credit within formal systems is constrained.

Furthermore, conventional credit scoring models are generally derived from socio-demographic variables to

enhance the efficacy of prediction concerning credit decisions. Sifrain (2020) emphasized that the development of a credit scoring model involves the utilization of numerous variables, ranging from socio-demographic to financial characteristics. Rahman et al. (2020) indeed identified a relationship between socio-demographic factors and financial behaviour. Nevertheless, Ganbat et al. (2021) posit that discrepancies in loan repayment behaviour are predominantly attributable to personal and internal characteristics, as opposed to demographic and financial factors. Therefore, it is crucial to comprehend financial behaviour to make well-informed lending decisions, which may potentially bolster financial inclusion and alleviate poverty.

2.3. Determinants of demand for credits in the agricultural sector

Producers, particularly small-scale farmers, as well as agro-industrial companies, face persistent challenges due to the constrained accessibility of financial services, agricultural information, and other extension services (IFC, 2018). Furthermore, farmers with limited access to credit were more likely to utilize reduced levels of input in production compared to those without such constraints. Therefore, digital finance driven by innovation and expanding financial services to excluded areas is a promising solution for financing constraints in agriculture and accelerating agricultural modernization (DEVI et al., 2026; FU; GUO, 2025).

In addition, enhanced agricultural credit facilities could assist farmers in making more informed managerial decisions regarding the optimal level of input, thereby enhancing their profitability (ZULFIQAR et al. 2021; BALANA; OYEYEMI, 2022; BONNKE et al., 2022). Therefore, given the barriers faced by the Peruvian agricultural sector, and more particularly by smallholders, to get access to credit, it is imperative to encourage the advancement of novel approaches to developing services and products to facilitate access to the financial system.

In this regard, Arraiz et al. (2018) pointed out that scoring information is the most useful indicator in assessing loan applications from individuals with comprehensive credit histories and behaviours, as these individuals could develop a robust credit history through the utilization of credit. Nonetheless, Benni (2022) highlights that one of the most significant obstacles encountered by smallholders who are prospective financial system users is the absence of precise and detailed information regarding their credit behaviour. Consequently, the financial constraints experienced by smallholders are likely to be more pronounced than those encountered by the farm industry, at least in part, due to the prevalence of information asymmetries among smallholders, which are less prevalent on medium and large-scale farms.

Hansson; Sok (2021) studied the perceived impediments to business development among Swedish farmers with a focus on the impact of personal values and personality types. Their analysis identified excessive regulations, financial constraints, marketing challenges and resource acquisition as the most restrictive factors perceived by farmers. In line with this, other works identified, as main barriers to getting access to financial resources, the farmers' characteristics in terms of managing resource skills (HILGERT et al., 2003; RAMOS-SANDOVAL; MENDIBURU-DÍAZ, 2024), layout and geographical location (RAMOS-SANDOVAL; LARA,

2023), farmers' technological skills (SARFO et al., 2023), and options for farm succession (ZHAO et al., 2021).

Focusing on financial behaviour, Saqib et al. (2016) emphasized the significant influence of socioeconomic factors on farmers, along with their risk perception and attitude, on the adoption of agricultural credit. Furthermore, the findings indicated that lower subsistence farmers demonstrated an enhanced capacity to obtain credit in the aftermath of a disaster, despite the limited access to credit that they typically experience. Regarding specific socioeconomic variables, Zhao et al. (2021) highlighted that individuals with higher levels of education demonstrate enhanced abilities in comprehending credit policies, procedures, and information, exhibit greater flexibility in their thinking and have a tendency to engage in superior borrowing practices. In line with this, Jiang et al. (2025) pointed out that the household head's education level has a positive effect on smallholder farmers joining cooperative models to overcome credit difficulties and implement effective strategies. Furthermore, Zhang; Wang (2021) indicated an increase in conservatism amongst farmers in rural areas with advancing age, leading to a decline in credit requirements. Ping et al. (2022) pointed out that the farmer's age has a negative effect on the ability to obtain wealth through labor in the future; furthermore, the weaker his abilities to repay a credit. In addition, recent studies have identified education, marital status, farm size and the gender of the household head as key factors in the empowerment of agricultural households (KAPOOR; SHUSHMA, 2024). Therefore, in order to reduce information asymmetries in the demand for credit and reduce the risks associated with borrowers and banks, it is important to consider individual differences among farmers and the role of socio-demographic factors in the development of financial systems.

3. 3. METHODOLOGY

3.1. Participants and procedure

The sampling method employed was non-probabilistic by convenience (BAKER et al., 2013), with a view to keeping the proportionality criterion applied to ensure respondents from each natural region of the country, given the heterogeneity of farmers at the national level. Furthermore, a non-probability sampling technique was employed due to the restricted accessibility of the study population (GALLOWAY, 2005).

According to data from the most recent National Agricultural Census (CENAGRO, 2012), 97% of the agricultural population is classified as smallholder farmers, with the Highlands and Amazonian regions demonstrating the highest concentrations of agricultural units and the most extensive areas of permanent agricultural land. Conversely, the coast exhibits the second-highest density of agricultural units per natural region. Furthermore, the results of the National Agricultural Survey (ENA, in its Spanish acronym) suggest that between 2018 and 2024, only around 10% of agricultural producers nationwide applied for some form of credit, a figure which has been in decline, from 10.9% to 9.1% respectively (INEI, 2025).

Therefore, the survey that was prepared for this study was conducted at the national level across the three natural regions of Peru (coast, highlands and jungle), encompassing a range of departments across the country. In order to facilitate mobility and to count on a deep understanding of

the agricultural and livestock area of each region, the interviewers belonged to these regions. The surveys were conducted in person between July 2023 and June 2024. A total of 198 smallholders completed the survey, with the geographical representation as follows: Coast (Lima=31), Highlands (Cajamarca=2; Junín=75; Pasco=1) and Jungle (Amazonas=89). As demonstrated in Figure 1, 63% of respondents in this sample indicated that they had not had access to credit in the last 12 months (Figure 1a). While 37% of respondents indicated that they had had access to credit (Figure 1b), this was distributed across the three natural regions under evaluation.

To ascertain the statistical power based on sample size, the G*Power test (MacCallum et al., 1996) was conducted. Accordingly, an F-test was performed for multiple regressions with 7 predictor elements. The resultant power value of 0.988 for the study's sample size (n = 198) was indicative of an acceptable score for a MIMIC model.

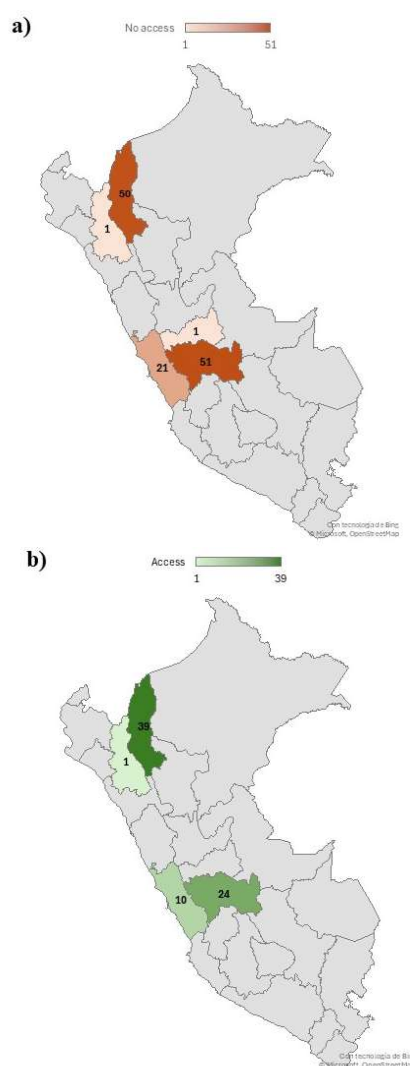


Figure 1. Data collection of Peruvian farmers at the national level who applied for credit. a) $Credito_{non-acesso} = 124$; Amazonas = 50, Cajamarca = 1, Junín = 51, Lima = 21, Pasco = 1.

b) $Credito_{acesso} = 74$; Amazonas = 39, Cajamarca = 1, Junín = 24, Lima = 10. Source: Author's own elaboration.

Figure 1. Coleta de dados de agricultores peruanos em nível nacional que solicitaram crédito. a) $Crédito_{sem-acesso} = 124$; Amazonas = 50, Cajamarca = 1, Junín = 51, Lima = 21, Pasco = 1.

b) $Crédito_{acesso} = 74$; Amazonas = 39, Cajamarca = 1, Junín = 24, Lima = 10. Fonte: Elaboração do autor.

3.2. Survey characteristics

The study employed a survey based on an instrument designed by Ganbat et al. (2021), which assessed psychometric parameters related to psychological factors among entrepreneurial microcredit applicants. The questionnaire comprised six factors that were hypothesized to influence financial behaviour, including: (a) effective financial decision-making (EFM), (b) self-control (SCR), (c) conscientiousness (CON), (d) selflessness and giving attitude (SGA), (e) neuroticism (NRT), and (f) attitude towards money (ATM). The points awarded for each item response were calculated within the range of -2 to 2.

3.2.1. Translation and pilot testing

The survey was translated and adapted to ensure its validity and reliability when used in a different cultural and linguistic context (MUNIZ et al., 2013). The process involved forward translation by a certified bilingual translation service (Crimson Interactive Pvt. Ltd. – <https://www.enago.com/es/>), followed by a back-translation by one of the authors, to achieve a harmonized version.

In order to ascertain the reliability of the factors included in the adapted version of the survey, it is important to collect data from a small sub-sample of the population for which the test is intended prior to the operational validation phase (ELOSUA et al., 2014). A pilot with 10 farmers was conducted to evaluate the internal consistency of the factors using Cronbach's alpha (α). The empirical evidence justifies the selection of only three factors from the questionnaire for use in this study (EFM; SCR; ATM). Preliminary methodological studies indicate that, in the context of initial validation phases, constructs exhibiting values below 0.60 demonstrate inadequate internal consistency among items and a constrained capacity to consistently measure the proposed theoretical construct (TABER, 2017; HAIR et al., 2019). In this regard, during the process of adapting and validating the questionnaire for this study, we proceeded to eliminate items with poor reliability prior to the final administration in order to improve the instrument's psychometric accuracy and stability (OVIEDO; CAMPO-ARIAS, 2005). Specifically, the scale factors such as conscientiousness ($\alpha = 0.356$), selflessness and giving attitude ($\alpha = 0.419$), and neuroticism ($\alpha = 0.161$), were excluded based on exhibiting lower-than-average reliability (internal consistency; $\alpha < 0.6$). The final version of the instrument is in Data availability section.

3.3. Data and methods

3.3.1. Effective Financial Decision-Making (EFM)

The ability of individuals to make economically efficient decisions may significantly influence the risk behaviour of borrowers in the context of credit management (ÖZŞAHİN et al., 2018; DAVIES et al., 2019). The original instrument comprised 21-items ($\alpha = 0.583$); nonetheless, following the conduction of pilot tests to evaluate the instrument, it was decided to retain a 14-item scale ($\alpha = 0.691$) in order to guarantee internal reliability.

3.3.2. Self-Control (SCR)

The individual's practice of self-control could potentially demonstrate a significant influence on the repayment of financial obligations in a punctual manner (AMERIKS et al., 2007; HEIDHUES; KÓSZEGI, 2010). The initial

instrument comprised 16 items ($\alpha = 0.558$), following the conduction of pilot tests. The resultant instrument was then reduced to a 12-item scale ($\alpha = 0.614$) in order to guarantee internal reliability.

3.3.3. Attitude Toward Money (ATM)

A positive attitude towards money among individuals may be associated with a reduced probability of default in the context of borrower-lender transactions (FURNHAM et al., 1994; TANG et al., 1995). Following the conduction of pilot tests to evaluate the instrument, it was determined that the original scale should be maintained at 25-items ($\alpha = 0.715$).

3.3.4. Socio-Demographic Characteristics

Sociodemographic characteristics are defined as the aggregate of social and demographic factors, being the most frequently employed metric (VO et al., 2021). The farmer participants' sociodemographic characteristics were classified into four categories: age, gender, marital status, and educational level, following previous research works in the literature (PING et al., 2022; KAPOOR; SHUSHMA, 2024; JIANG et al., 2025).

3.3.5. Farms Organizational Characteristics

Organizational characteristics may be defined as features originating from the management model adopted by the organization, through its organizational structure, and from the company culture embodied in its members and relationships (RAHMAN et al., 2020). In line with this, the variability of farm management practices gives rise to a significant concern regarding the characteristics of the individual farmers in question, which must be considered when developing strategies for addressing these issues. Further to socio-demographic characteristics, the features of farmer management were tested as predictors in the model in three categories: exploitation type, associativity and farming experience.

3.4. Statistical analyses

3.4.1. Confirmatory Factor Analysis - CFA

CFA is a significant analytical instrument in the context of components within psychometric evaluations. Prior to the assessment of the overall adequacy of the model, a prerequisite is the evaluation of its model suitability. Consequently, the CFA was employed to verify the number of underlying dimensions of the instrument (factors) and the pattern of item-factor relationships (factor loadings) (BROWN, 2015).

3.4.2. Multiple Indicators Multiple Causes - MIMIC model

The MIMIC model is a type of structural equation model (SEM) that helps to study relationships between a latent variable and both its observed indicators and multiple causal predictors. This is with the objective of quantifying latent constructs that cannot be directly observed, such as socioeconomic status, health quality, or environmental sustainability (JÖRESKOG; GOLDBERGER, 1975; BOLLEN, 1989). Furthermore, Chaudhuri; Chowdhury (2012) proposed the utilization of the MIMIC model as a substitute for other semi-parametric stochastic frontier models.

The parameters of the MIMIC model are typically estimated using maximum likelihood estimation (MLE),

which seeks to maximize the probability of observing the sample data given the specified model (BOLLEN, 1989). In conducting this investigation, the analytical procedures entail the estimation of SEM parameters through the application of an MLE approach to perform the two main components of MIMIC: the measurement and structural models. These were analyzed using the AMOS software package (BYRNE, 2010). Accordingly, the MIMIC model offers a robust framework for the analysis of latent variables, in this case: effective financial decision-making (EFM), self-control (SCR), and attitude towards money (ATM), which are influenced by multiple causes (socio-demographic and farmer management characteristics) and measured by multiple indicators. MIMIC models represent an extension of confirmatory factor analysis (CFA), which employs demographic variables to predict item-level and latent variable mean differences (KLINE, 2015).

Figure 2 illustrates the conceptual modeling of the proposed MIMIC model. The left side of the diagram shows the exogenous covariates: age, gender, marital status, level of education, type of exploitation, associativity and farming experience. A circle represents the latent constructs EFM, SCR and ATM. The arrows pointing from the exogenous covariates to the latent construct indicate that these variables predict EFM, SCR and ATM.

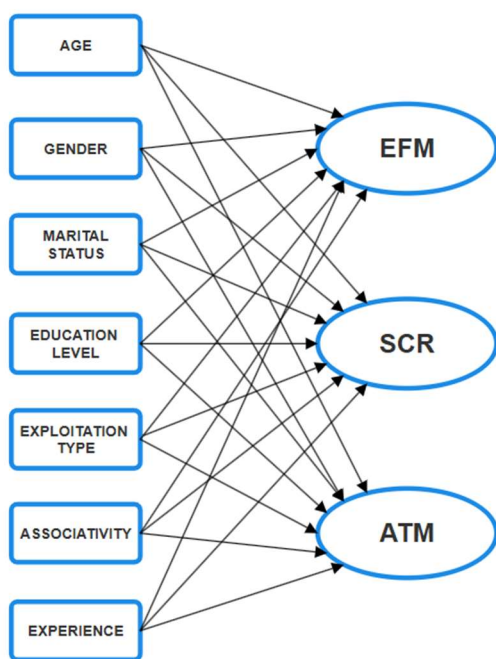


Figure 2. Conceptual MIMIC model. EFM=Effective Financial Decision-Making; SCR=Self-Control; ATM=Attitude Towards Money.

Figura 2. Modelo conceitual MIMIC. EFM = Tomada eficaz de decisões financeiras; SCR = Autocontrole; ATM = Atitude em relação ao dinheiro.

4. RESULTS

4.1. Descriptive analysis

4.1.1. Peruvian smallholders with and without access to credit

The results presented in Table 1 are based on the responses of 198 farmers from diverse regions of Peru who participated in the survey between July 2023 and June 2024. With regards to gender, the sample comprises 116 men

(59%), with an average age of over 45 years. The most prevalent marital status is single (52%), followed by married (41%). Agriculture is the most significant economic activity, with 77% of respondents identifying as agricultural smallholders, while only 23% as livestock producers. Regarding the associativity of the producers, 60% indicated that they do not belong to any association. Additionally, regarding experience, the greatest share of farmers was located in the range between one and two decades of farming experience. These patterns remained consistent when analyzing sub-samples of farmers who declared they had, or had not, in the last 12 months, access to credit.

Table 1. Overview of the socio-demographic characteristics of farmers.

Tabela 1. Descrição geral das características sociodemográficas dos agricultores.

Characteristics	Total n=198 (%)	Credit _{access} =74 (%)	Credit _{non-access} =124 (%)
Age			
≤ 45 years	82 (41)	32 (43)	50 (40)
> 45 years	116 (59)	42 (56)	74 (60)
Gender			
Male	116 (59)	45 (61)	71 (57)
Female	83 (41)	30 (39)	53 (43)
Marital status			
Single	102 (52)	39 (53)	63 (51)
Married	81 (41)	30 (40)	51 (41)
Other	15 (7)	5 (7)	10 (8)
Education level			
No registered studies	6 (3)		
Primary	49 (25)	0 (0)	6 (5)
Secondary	100 (51)	12 (16)	37 (30)
Technical	22 (11)	45 (61)	55 (44)
University	21 (10)	7 (9)	15 (12)
Type			
Agriculture	152 (77)	56 (76)	96 (77)
Livestock	46 (23)	18 (34)	28 (33)
Associativity			
Association	38 (19)	16 (22)	22 (18)
Cooperative	21 (11)	8 (11)	13 (10)
Committee	20 (10)	8 (11)	12 (10)
None	119 (60)	42 (56)	77 (62)
Experience			
< 10 years	40 (20)	10 (14)	30 (24)
≥ 10 years	64 (32)	26 (35)	38 (31)
≥ 20 years	53 (27)	22 (29)	31 (25)
> 30 years	29 (15)	11 (15)	18 (15)
Other	12 (6)	5 (7)	7 (5)

4.1.2. Financial behaviour of Peruvian smallholders

The farmer's financial behaviour factors were measured in points awarded for each item response calculated within a range of (-2) to (2) to the EFM, SCR, and ATM. The mean rating of each scale indicates a high level of item ratings, with a mean score of 2. Intermediate levels of performance are indicated by a mean score of 1, while low performance is indicated by a mean score ranging from -2 to -1. The results in Table 2 show that farmers' scores on the financial behaviour factors were predominantly medium, both for farmers with and without access to credit.

Factor loading. The descriptive statistics corresponding to each item that measures effective financial decision-making (EFM), self-control (SCR) and attitude towards money (ATM) can be found in Table 3. The identification of the item can be found in Annex X. The factor loadings are crucial for

understanding the meaning and validity of each latent construct and for determining which observed variables are strongly associated with each factor, with a range of values from -1 to +1 (BROWN, 2015).

Table 2. Level of frequency for EFM, SCR & ATM.
Tabela 2. Nível de frequência para EFM, SCR e ATM.

Factor	Level	Credit _{access} = 74	Credit _{non-access} = 124
EFM	High	30%	35%
	Medium	61%	55%
	Low	9%	10%
SCR	High	22%	16%
	Medium	56%	67%
	Low	22%	17%
ATM	High	4%	3%
	Medium	75%	82%
	Low	21%	15%

(%) =Frequency. Source: Author's own elaboration.
(%) =Frequência. Fonte: Elaboração do autor.

Table 3. Descriptive Statistics and Factor Loadings for EFM, SCR & ATM.
Tabela 3. Estatísticas descritivas e cargas fatoriais para EFM, SCR e ATM.

Variable	Item	Mean	SD	Standard loading	
EFM ($\alpha = 0.691$)	EFM1	0.39	1.444	0.347	
	EFM3	0.23	1.499	0.323	
	EFM4	0.17	1.624	0.751	
	EFM5	1.14	1.328	0.436	
	EFM6	0.67	1.484	0.363	
	EFM7	0.57	1.509	0.557	
	EFM10	1.16	1.356	0.556	
	EFM11	1.09	1.255	0.237	
	EFM12	0.91	1.157	0.542	
	EFM13	1.17	1.100	0.675	
	EFM15	1.52	1.134	0.384	
	EFM18	0.59	1.467	0.252	
EFM19	-0.21	1.151	0.311		
EFM20	1.05	1.444	0.588		
SCR ($\alpha = 0.614$)	SCR1	0.51	1.011	0.216	
	SCR2	-0.20	1.431	0.461	
	SCR4	1.71	0.622	0.486	
	SCR6	0.37	1.573	0.578	
	SCR8	0.91	1.422	0.511	
	SCR9	0.77	1.750	0.775	
	SCR10	0.57	1.420	0.693	
	SCR11	0.83	0.923	0.446	
	SCR12	1.17	1.175	0.045	
	SCR13	-1.29	0.750	0.192	
	SCR14	1.66	0.873	-0.071	
	SCR15	1.34	0.938	0.453	
	ATM ($\alpha = 0.715$)	ATM3	0.48	1.156	0.362
		ATM5	0.55	1.120	0.269
		ATM6	0.39	1.220	0.395
ATM7		-0.58	1.067	0.147	
ATM9		0.83	1.175	0.402	
ATM10		0.42	1.205	0.580	
ATM11		0.80	1.047	0.614	
ATM12		0.39	1.240	0.719	
ATM13		0.03	1.270	0.336	
ATM14		0.71	1.168	0.550	
ATM15		0.86	1.293	0.570	
ATM16		0.32	1.342	0.296	
ATM17		1.13	1.153	0.545	
ATM20		0.88	0.995	0.463	
ATM21		0.64	1.325	0.263	
ATM23	0.59	1.234	0.456		
ATM24	0.69	1.137	0.651		
ATM25	1.61	0.650	0.122		

α =Cronbach's alpha.

4.2. Survey characteristics

Before the execution of the current CFA, correlation analysis was conducted with a view to establishing the association between the study's variables. Figure 3 provides a comprehensive overview of the interrelationships between all model variables. The psychometric factors were mutually correlated (EFM, SCR and ATM), and most of the socio-demographic and organizational characteristics also exhibited a certain degree of intercorrelation.

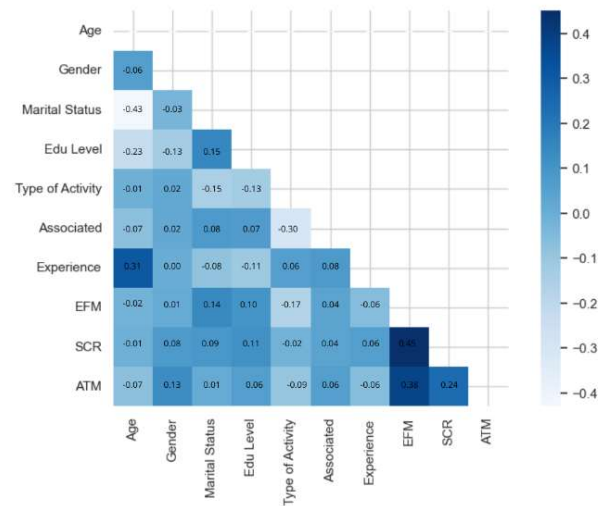


Figure 3. Correlations Among Main Study Variables.
Figura 3. Correlações entre as principais variáveis do estudo.

The confirmatory factor analysis (CFA) was conducted on the pooled sample from the farmers' financial behaviour to test a model comprising three CFA factors. The following statistics were used to assess the overall goodness of fit of the models: the chi-square (χ^2) goodness of fit statistic (with a p -value <0.05), the comparative fit index (CFI), and the Tucker-Lewis fit index. The non-normed fit index (TLI or NNFI), the root means square error approximation (RMSEA), its 90% confidence interval (90% CI), and the standardized root mean square residuals (SRMR) were used for evaluation. The measurement model demonstrated an adequate fit in the pooled sample: $\chi^2=464.027$; $p=0.008$; CFI=0.90; TLI=0.89; RMSEA=0.030; SRMR=0.064. For CFI and TLI, values greater than 0.9 were considered indicative of optimal fit. Conversely, both RMSEA and SRMR values should be less than 0.08 to indicate an acceptable level of fit (BROWNE; CUDECK, 1993; KLINE, 2005).

4.3. MIMIC model

Once the CFA has confirmed that the latent construct model was tested, the adequate fit to the data and the observed items effectively measure the latent constructs: EFM, SCR, and ATM (Table 4). In MIMIC models, the interpretation of standardized coefficients is that of effect sizes. Coefficients falling between 0.1 and 0.3 are indicative of a 'small' effect size, while coefficients within the range of 0.3 and 0.5 are associated with a 'medium' effect size, and coefficients exceeding 0.5 are representative of a 'large' effect size (KLINE, 2015). The EFM factor revealed that marital status has a small negative influence ($\beta_{non-credit} = -0.266, p < 0.05$) on the effective financial decisions of farmers who had not accessed credit.

Furthermore, regarding the SCR factor, it showed for farmers who had accessed credit, that age has a medium and positive influence ($\beta_{credit} = 0.324, \rho < 0.01$) while marital status has a small negative influence ($\beta_{credit} = -0.269, \rho < 0.05$) over their self-control. In addition, educational level

shows a large and positive effect ($\beta_{non-credit} = 0.513, \rho < 0.000$) for farmers who did not have access to credit. Nevertheless, the various factors posited in the ATM factor have no impact on the farmer's attitude towards money, with and without access to credit.

Table 4. Multiple Indicator and Multiple Causes (MIMIC) Model with Credit Access as Exogenous Covariate.

Tabela 4. Modelo de múltiplos indicadores e múltiplas causas (MIMIC) com acesso ao crédito como covariável exógena.

Variables		Model Fit	Over sample MIMIC _n = 198	Credit _{access} = 74	Credit _{non-access} = 124
Causes	Indicators	Measures	β	β	β
Gender			0.004	0.202	-0.077
Age		$X^2 = 123.671$	0.097	-0.001	0.209
Marital Status		$\rho = 0.176$	-0.195 (*)	-0.156	-0.266 (*)
Education Level	EFM	CFI = 0.944	0.087	0.095	0.028
Type		TLI = 0.931			
Associativity		RMSEA = 0.025	-0.091	-0.056	-0.096
Experience		SRMR = 0.059	-0.012	0.084	-0.030
Gender			0.107	-0.033	0.093
Age		$X^2 = 92.002$	0.182 (**)	0.324 (**)	0.070
Marital Status		$\rho = 0.169$	-0.201 (**)	-0.269 (*)	-0.077
Education Level	SCR	CFI = 0.934	0.270 (***)	0.175	0.513 (***)
Type		TLI = 0.914			
Associativity		RMSEA = 0.028	0.072	0.016	0.165
Experience		SRMR = 0.057	-0.113	-0.013	-0.027
Gender			0.288	0.237	0.291
Age		$X^2 = 169.576$	-0.121	-0.170	-0.098
Marital Status		$\rho = 0.020$	0.035	0.031	0.114
Education Level	ATM	CFI = 0.925	0.013	0.160	-0.018
Type		TLI = 0.904			
Associativity		RMSEA = 0.037	-0.111	-0.159	-0.053
Experience		SRMR = 0.060	-0.015	0.136	-0.116
Gender			0.012	0.095	-0.079

EFM = Effective Financial Decision-Making; SCR = Self-Control; ATM = Attitude Toward Money. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

EFM = Tomada de Decisão Financeira Eficaz; SCR = Autocontrole; ATM = Atitude em Relação ao Dinheiro. * $p < 0,05$. ** $p < 0,01$. *** $p < 0,001$.

5. DISCUSSION

To our knowledge, this is the first study conducted in Peru to evaluate the personal and managerial characteristics exhibited by Peruvian smallholders, with the aim of determining the factors that influence their financial behaviour using a psychometric approach. We used data from a survey that was adapted and administered to a sample of Peruvian smallholders across the country.

The findings of the present study demonstrated that financial behaviour in farmers can be understood through the lens of a psychometric approach. These results confirm that factors influencing Peruvians' financial behaviour can be understood by examining psychological aspects of their decisions (DLUGOSCH et al., 2017; GANBAT et al., 2021; HANSSON; SOK, 2021; DHAMI et al., 2022; DUMAN et al., 2023; RAMOS-SANDOVAL; MENDIBURU-DÍAZ, 2024). Consequently, this study suggests the potential for a paradigm shift in the understanding of the financial behaviour of smallholder farmers in the Peruvian context. In contrast, the multiple causes model, which assesses the effect of personal and managerial characteristics of smallholders, exhibited a different scale of association, since any managerial characteristic proposed showed an effect on the financial behaviour of farmers.

The present finding is in alignment with the conclusions of other studies, which identified that farmers' managerial skills could act as a constraint rather than a direct incentive

to accessing financial resources (HILGERT et al., 2003; BALANA; OYEYEMI, 2022; PING et al., 2022).

On the other hand, the study revealed that the majority of the personal characteristics examined had no significant effect on the effective financial decision-making (EFM) process among the Peruvian smallholders, except for marital status. Furthermore, analysis reveals a negative and significant impact of smallholder marital status on the group in the sample that does not receive credit. In this regard, Kapoor; Shushma (2024) has indicated that marital status may influence an individual's involvement in various economic activities. Indeed, since Saquib et al. (2016) demonstrated that being unmarried negatively affects credit accessibility, particularly among families in the agricultural sector, as family members can provide labor for the farm, encouraging good financial behaviour. This is relevant to the current study, given that most of the respondents are unmarried.

In accordance with the preceding findings, the gender of the respondents was found to be a non-significant factor. This observation is in line with those of Ping et al. (2022), who identified that the head of household has only a minor relationship with the farmer household's capacity to obtain credit.

Regarding the behavioural characteristics of self-control (SCR) exhibited by smallholders, they had a significant effect in relation to the age, marital status and education level of the

respondents. In accordance with the test analyses, the results indicate that the SCR in farmers who receive credit is positively associated with their age, while it is negatively associated with their marital status. The predominant respondents in this sample were adults over the age of 45, which is a significant factor that has contributed to this outcome. Nonetheless, previous research has indicated that an individual's age has a negative effect on her ability to access credit (ZHANG; WANG, 2021; PING et al., 2022). Therefore, from an innovative perspective in relation to eligibility for accessing credit in the agricultural sector, age has been found to have a positive effect on SCR as a characteristic of financial behaviour, which would consequently contribute to ensuring repayment of credits. In addition, the findings of earlier research suggest that being unmarried could exert a detrimental influence on the financial behaviour of farmers, thereby impeding their capacity to repay (SAQUIB et al., 2016; KAPOOR; SHUSHMA, 2024). This observation is in accordance with the findings of the present study, which has identified a negative correlation between marital status and SCR.

Conversely, amongst farmers who do not receive credit, education level has been demonstrated to have a significant positive effect on SCR behaviour. In this regard, Zhao et al. (2021) highlighted that householders' education levels were positively correlated with enhanced abilities to comprehend credit and a tendency to engage in superior borrowing practices. Jiang et al. (2025) have indicated that the education level of the household head has a positive effect on the capacity of smallholders to implement effective strategies to cope with credit difficulties. In accordance with this, it is crucial to acknowledge that most respondents held a secondary education qualification, which may have a substantial impact on their SCR behaviour, potentially resulting in a reduction in their comprehension of credit policies and procedures and possibly diminishing their motivation to engage with financial information in comparison to holding a higher level of education.

Nevertheless, the findings from the present study indicated that the personal and managerial characteristics measured for the smallholder behaviour exhibited no significant effects concerning their attitude toward money (ATM). This finding contradicts the results of previous research, which has indicated that socioeconomic structures influence financial attitudes (SAQIB et al., 2016; RAHMAN et al., 2020; ZHAO et al., 2021). Given the distinctive nature of the sample surveyed in this study, it is plausible that local cultural practices inherent to the agricultural sector may have influenced the respondents' interpretation of the scale items and response categories. In addition, this may be considered consistent with the results of Balana; Oyeyemi (2022), who argue that the low rate of participation of farmers in the credit market is not necessarily indicative of a supply-side problem, but rather may also be indicative of a demand-side problem more related to characteristics such as credit aversion. In this regard, Peruvian rural farming communities may possess a divergent comprehension of financial concepts, financial security, and economic decision-making. This discrepancy does not emerge from individual factors but rather from contextual factors such as collective family practices, seasonal income variability, and financial behaviours geared toward subsistence.

5. CONCLUSIONS

The results of this study emphasize the significance of innovative assessment interventions in enhancing financial decision-making skills and facilitating access to financial instruments among rural and agricultural Peruvian's population. Traditional models based on personal and managerial characteristics may not fully explain financial decision-making in the smallholder population, indicating the need for more behavioral and contextual approaches.

The capacity of smallholders to demonstrate responsibility and expertise in debt management, as indicated by financial behaviour, could serve as a reliable eligibility criterion for public and private financial institutions in the design of agricultural credit programs. Consequently, research findings in the field of education have revealed a pressing need for targeted financial literacy initiatives. Furthermore, credit access programs should consider non-traditional household structures as a positive factor for responsible borrowing. It is recommended that these efforts be made to encourage stakeholders to prompt public policies that simplify credit-related material, with the objective of boosting access to credit from the perspective of the supply of financial services, but also from a demand-side perspective, focusing on strengthening the financial skills of farmers.

Regarding the instrument validation process, the results indicate that the original questionnaire, which included all psychological questions, was not successfully applied to explain payment behaviour among a population with specific characteristics, such as farmers. Therefore, in this study, we used only three of the six scales from the original questionnaire. In line with this, given that the construct equivalence across cultural and occupational groups is a critical issue in cross-contextual research, in this study, we were unable to confirm that socioeconomic structures or local managerial practices shaped financial attitudes. Consequently, future research should implement additional validation procedures, including qualitative cultural adaptation, to ensure adequate construct representation in the Peruvian agricultural context.

6. REFERENCES

- ADUSEI, M.; ADELEYE, N. Credit information sharing and non-performing loans: The moderating role of creditor rights protection. *International Journal of Finance and Economics*, v. 27, n. 4, p. 4756-4769, 2020. <https://doi.org/10.1002/ijfe.2398>
- AMERIKS, J.; CAPLIN, A.; LEAHY, J.; TYLER, T. Measuring self-control problems. *American Economic Review*, v. 97, n. 3, p. 966-972, 2007. <https://doi.org/10.1257/aer.97.3.966>
- ARRÁIZ, I.; BRUHN, M.; STUCCHI, R. Psychometrics as a tool to improve credit information. *The World Bank Economic Review*, v. 30, S67-S76, 2017. <https://doi.org/10.1093/wber/lhw016>
- BAKER, R.; BRICK, J. M.; BATES, N. A.; BATTAGLIA, M.; COUPER, M. P.; DEVER, J. A.; GILE, K. J.; TOURANGEAU, R. Summary report of the AAPOR task force on non-probability sampling. *Journal of Survey Statistics and Methodology*, v. 1, n. 2, p. 90-143, 2013. <https://doi.org/10.1093/jssam/smt008>

- BALANA, B. B.; OYEYEMI, M. A. Agricultural credit constraints in smallholder farming in developing countries: Evidence from Nigeria. **World Development Sustainability**, v. 1, e100012, 2022. <https://doi.org/10.1016/j.wds.2022.100012>
- BENAMI, E.; CARTER, M. R. Can digital technologies reshape rural microfinance? Implications for savings, credit, & insurance. **Applied Economic Perspectives and Policy**, v. 43, n. 4, p. 1196-1220, 2021. <https://doi.org/10.1002/aep.13151>
- BENNI, N. **El fortalecimiento de la inclusión financiera digital en zonas rurales y agropecuarias - recomendaciones para América Latina y el Caribe**. Roma: FAO, 2022. 70p. Available online: <https://doi.org/10.4060/cc2877es>
- BLAZQUEZ-SORIANO, A.; RAMOS-SANDOVAL, R. Information transfer as a tool to improve the resilience of farmers against the effects of climate change: the case of the Peruvian National Agrarian Innovation System. **Agricultural Systems**, v. 200, e103431, 2022. <https://doi.org/10.1016/j.agry.2022.103431>
- BOLLEN, K. A. **Structural equations with latent variables**. John Wiley & Sons, 1989. 514p. <https://doi.org/10.1002/9781118619179>
- BONNKE, S. M.; NGUEZET, P. M. D.; BIRINGANINE, A. N.; JEAN-JACQUES, M. S.; MANYONG, V.; BAMBA, Z. Farmers' credit access in the Democratic Republic of Congo: Empirical evidence from youth tomato farmers in Ruzizi plain in South Kivu. **Cogent Economics & Finance**, v. 10, n. 1, 2022. <https://doi.org/10.1080/23322039.2022.2071386>
- BOUCHER, S.; GUIRKINGER, C. Risk, wealth, and sectoral choice in rural credit markets. **American Journal of Agricultural Economics**, v. 89, n. 4, p. 991-1004, 2007. <https://doi.org/10.1111/j.1467-8276.2007.01009.x>
- BROWN, T. A. **Confirmatory Factor Analysis for Applied Research** (Methodology in The Social Sciences Series). 2nd ed. The Guilford Press, 2015. 462p.
- CENAGRO. **Censo Nacional Agropecuario 2012**. Lima: Instituto Nacional de Estadística e Informática. Available online: <https://proyectos.inei.gob.pe/microdatos/>
- CHAUDHURI, K.; CHOWDHURY, T. Financial performance evaluation: a structural equation approach. **Journal of Emerging Market Finance**, v. 11, n. 1, p. 1-36, 2012. <https://doi.org/10.1177/09726527110110010>
- CONNING, J.; UDRY, C. Rural financial markets in developing countries. In: EVENSON, R. E.; PINGALI, P.; SCHULTZ, T. P. **The Handbook of Agricultural Economics**. New Haven, CT: Yale University, Economic Growth Center, 2005. 89p. vol. 3 (Center Discussion Paper, 914). Available online: <http://www.econ.yale.edu/~egcenter/http://ssrn.com/abstract=756965http://www.econ.yale.edu/~egcenter/research.htm>
- DAVIES, S.; FINNEY, A.; COLLARD, S.; TREND, L. **Borrowing Behaviour: A systematic review**. Bristol: University of Bristol / Standard Life Foundation, 2019. 74p. Available online: <http://www.bristol.ac.uk/media-library/sites/geography/pfrc/pfrc1901-borrowing.pdf>
- DE OLLOQUI, F.; FERNÁNDEZ, C. **Financiamiento del sector agroalimentario y desarrollo rural**. Banco Interamericano de Desarrollo, 2017. 44p. Available online: <http://www.iadb.org>
- DEVI, J. A.; DEVI, K. U.; VANI, C. S.; UMAR, S. N. Role of digital technologies in enhancing financial inclusion of farmers in Guntur, Andhra Pradesh. **Millennial Asia**, 0(0), 2026. <https://doi.org/10.1177/09763996261416091>
- DHAMI, S.; ARSHAD, J.; AL-NOWAIHI, A. Psychological and social motivations in microfinance contracts: Theory and evidence. **Journal of Development Economics**, v. 158, e102912, 2022. <https://doi.org/10.1016/j.jdeveco.2022.102912>
- DLUGOSCH, T. J.; KLINGER, B.; FRESE, M.; KLEHE, U. C. Personality-based selection of entrepreneurial borrowers to reduce credit risk: Two studies on prediction models in low- and high-stakes settings in developing countries. **Journal of Organizational Behaviour**, v. 39, n. 5, p. 612-628, 2018. <https://doi.org/10.1002/job.2236>
- DUMAN, E.; AKTAS, M. S.; YAHSI, E. Credit Risk Prediction Based on Psychometric Data. **Computers**, v. 12, n. 12, e248, 2023. <https://doi.org/10.3390/computers12120248>
- ELOSUA, P.; MUJICA, J.; ALMEIDA, L. S.; HERMOSILLA, D. Procedimientos analítico-rationales en la adaptación de tests. Adaptación al español de la batería de pruebas de razonamiento. **Revista Latinoamericana de Psicología**, v. 46, n. 2, p. 117-126, 2014. [https://doi.org/10.1016/s0120-0534\(14\)70015-9](https://doi.org/10.1016/s0120-0534(14)70015-9)
- ESCOBAL, J.; FAVARETO, A.; AGUIRRE, F.; PONCE, C. Linkage to dynamic markets and rural territorial development in Latin America. **World Development**, v. 73, p. 44-55, 2015. <https://doi.org/https://doi.org/10.1016/j.worlddev.2014.09.017>
- FU, X.; GUO, C. Digital inclusive finance and the construction of agricultural modernization. **International Review of Economics & Finance**, v. 102, e104332, 2025. <https://doi.org/10.1016/j.iref.2025.104332>
- FURNHAM, A.; KIRKCALDY, B. D.; LYNN, R. National attitudes to competitiveness, money, and work among young people: first, second, and third world differences. **Human Relations**, v. 47, n. 1, p. 119-132, 1994. <https://doi.org/10.1177/001872679404700106>
- GALLOWAY, A. Non-Probability Sampling. In: KEMPF-LEONARD, K. (Ed.). **Encyclopedia of Social Measurement**. Elsevier, 2005. p. 859-864. <https://doi.org/10.1016/B0-12-369398-5/00382-0>
- GANBAT, M.; BATBAATAR, E.; BAZARRAGCHAA, G.; IDER, T.; GANTUMUR, E.; DASHKHOROL, L.; ALTANTSATSRALT, K.; NEMEKH, M.; DASHDONDOG, E.; NAMSRAI, O. E. Effect of psychological factors on credit risk: A case study of the microlending service in Mongolia. **Behavioural Sciences**, v. 11, n. 4, e47, 2021. <https://doi.org/10.3390/bs11040047>
- GEHRIG, S.; MESOUDI, A.; LAMBA, S. Banking on cooperation: an evolutionary analysis of microfinance loan repayment behaviour. **Evolutionary Human Sciences**, v. 3, e2, p. 1-23, 2021. <https://doi.org/10.1017/ehs.2020.64>
- GHEZZI-SOLÍS, P. E.; **Cómo fortalecer el Agrobanco y el financiamiento agropecuario: Una visión productivista**. San José, C.R.: Instituto Interamericano de Cooperación para la Agricultura (IICA), 2021. 50p.

- Available online: <https://hacerperu.pe/wp-content/uploads/2023/05/Comofortalecerelagrobancoyelfinanciamientoagropecuario-PieroGhezzi.pdf>.
- HAIR, J. F.; BLACK, W. C.; BABIN, B. J.; ANDERSON, R. E. **Multivariate data analysis**. 8th ed. Cengage Learning, 2019. 834p.
- HANSSON, H.; SOK, J. Perceived obstacles for business development: Construct development and the impact of farmers' personal values and personality profile in the Swedish agricultural context. **Journal of Rural Studies**, v. 81, p. 17-26, 2021. <https://doi.org/10.1016/j.jrurstud.2020.12.004>
- HEIDHUES, P.; KOOSZEGI, B. Exploiting Naïvete about Self-Control in the Credit Market. **American Economic Review**, v. 100, n. 5, p. 2279-2303, 2010. <https://doi.org/10.1257/aer.100.5.2279>
- INEI_Instituto Nacional de Estadística e Informática. - (2025). **Productores Agropecuarios - Principales Resultados de la Encuesta Nacional Agropecuaria (ENA), 2018-2019 y 2022-2024**. Lima, Perú. 2025. Available online: <https://www.gob.pe/institucion/inei/informes-publicaciones/6879473-productores-agropecuarios-principales-resultados-de-la-encuesta-nacional-agropecuaria-ena-2018-2019-y-2022-2024>
- INTERNATIONAL FINANCE CORPORATION. **Handbook: Digital Financial Services for Agriculture**. World Bank Group, 2018. 236p. Available online: <https://www.ifc.org/en/insights-reports/2018/dfs-agriculture>
- JIANG, C.; HAO, W.; WANG, T.; ZHANG, Y. Leveraging agricultural production trusteeship to enhance agricultural production efficiency, promote sustainable agricultural practices, and optimize resources: empirical evidence from China. **Frontiers in Sustainable Food Systems**, v. 9, e1532013, 2025. <https://doi.org/10.3389/fsufs.2025.1532013>
- JÖRESKOG, K. G.; GOLDBERGER, A. S. Estimation of a model with multiple indicators and multiple causes of a single latent variable. **Journal of the American Statistical Association**, v. 70, n. 351a, p. 631-639, 1975. <https://doi.org/10.1080/01621459.1975.10482485>
- KAPOOR, S.; SHUSHMA, H. Investigating the agricultural finance sources, access and the factors affecting its demand. **Journal of Innovation and Management**, v. 1, n. 1, e1, 2024. <https://doi.org/10.1177/ijim.241272314>
- KLINGER, B.; CASTRO, L.; SZENKMAN, P.; KHWAJA, A. Unlocking SME Finance in Argentina with Psychometrics. Inter-American Development Bank (IADB), 2013. 37p. (Technical Note, 532). Available online: <http://www.iadb.org>
- MA, H.; LI, G.; LIU, R.; SHEN, M.; LIU, X. The personal credit default discrimination model based on DF21. **Journal of Intelligent & Fuzzy Systems**, v. 44, p. 3907-3925, 2023. <https://doi.org/10.3233/JIFS-212780>
- MACCALLUM, R. C.; BROWNE, M. W.; SUGAWARA, H. M. Power analysis and determination of sample size for covariance structure modeling. **Psychological Methods**, v. 1, n. 2, p. 130-149, 1996. <https://doi.org/10.1037/1082-989X.1.2.130>
- MCNAIR, S.; SUMMERS, B.; DE BRUIN, W. B.; RANYARD, R. Individual-level factors predicting consumer financial behaviour at a time of high pressure. **Personality and Individual Differences**, v. 99, p. 211-216, 2016. <https://doi.org/10.1016/j.paid.2016.05.034>
- MUÑOZ, J.; ELOSUA, P.; HAMBLETON, R. K. Directrices para la traducción y adaptación de los tests: segunda edición. **Psicothema**, v. 25, n. 2, p. 151-157, 2013). <https://doi.org/10.7334/psicothema2013.24>
- MWIRIGI, D.; FEKETE-FARKAS, M.; LAKNER, Z. A Bibliometric Analysis of Borrowers' Behaviour. **Journal of Risk and Financial Management**, v. 17, n. 3, e111, 2024. <https://doi.org/10.3390/jrfm17030111>
- NAYAK, N. C.; MAHAKUD, J.; MAHALIK, M. K.; JENAMANI, M.; SAMAL, A.; SEN, S.; MOHANTY, A. R. (What determines financial inclusion? A household-level investigation in rural Odisha, India. **Journal of Social and Economic Development**, v. 26, n. 3, p. 888-906, 2024. <https://doi.org/10.1007/s40847-023-00302-8>
- OVIDEO, H. C.; CAMPO-ARIAS, A. Aproximación al uso del coeficiente alfa de Cronbach. **Revista Colombiana De Psiquiatría**, v. 34, n. 4, p. 572-580, 2005. <https://www.redalyc.org/pdf/806/80634409.pdf>
- ÖZŞAHİN, M.; YÜRÜR, S.; COŞKUN, E. A field research to identify psychological factors influencing the debt repayment behaviour in Turkey. **Emerging Markets Journal**, v. 8, n. 2, p. 1-9, 2018. <https://doi.org/10.5195/emaj.2018.156>
- PENG, Y.; REN, Y.; LI, H. Do credit constraints affect households' economic vulnerability? Empirical evidence from rural China. **Journal of Integrative Agriculture**, v. 20, n. 9, p. 2552-2568, 2021. [https://doi.org/10.1016/s2095-3119\(20\)63557-2](https://doi.org/10.1016/s2095-3119(20)63557-2)
- PERRY, V. G.; MORRIS, M. D. Who is in control? the role of self-perception, knowledge, and income in explaining consumer financial behaviour. **Journal of Consumer Affairs**, v. 39, n. 2, p. 299-313, 2006. <https://doi.org/10.1111/j.1745-6606.2005.00016.x>
- PHIRI, A.; CHIPETA, G. T.; CHAWINGA, W. D. Information behaviour of rural smallholder farmers in some selected developing countries: A literature review. **Information Development**, v. 35, n. 5, p. 831-838, 2018. <https://doi.org/10.1177/0266666918804861>
- PING, L.; XIAOSONG, S.; JINZHAO, L. Research on farmers' household credit behaviour and social capital acquisition. **Frontiers in Psychology**, v. 13, e961862, 2022. <https://doi.org/10.3389/fpsyg.2022.961862>
- RABBANI, N. Financial conditions and borrowing behaviour of university students during the COVID-19 Pandemic: Evidence from Bangladesh. **Sustainability**, v. 15, n. 19, e14123, 2023. <https://doi.org/10.3390/su151914123>
- RAHMAN, M.; AZMA, N.; MASUD, M. A. K.; ISMAIL, Y. Determinants of indebtedness: Influence of behavioural and demographic factors. **International Journal of Financial Studies**, v. 8, n. 1, e8, 2020. <https://doi.org/10.3390/ijfs8010008>
- RAYHAN, M. J.; RAHMAN, S. M. M.; MAMUN, A. A.; SAIF, A. N. M.; ISLAM, K. M. A.; ALOM, M. M.; HAFIZ, N. FinTech solutions for sustainable agricultural value chains: A perspective from smallholder farmers. **Business Strategy & Development**, v. 7, n. 2, e358, 2024. <https://doi.org/10.1002/bsd2.358>
- RAMOS-SANDOVAL, R.; LARA, R. Geographic data science for analysis in rural areas: a study case of financial services accessible in the Peruvian agricultural sector. In: SILHAVY, R.; SILHAVY, P. (Eds.). **Artificial**

- intelligence application in networks and systems – CSOC 2023. Lecture Notes in Networks and Systems, vol. 724, Springer, 2023. p. 246-259. https://doi.org/10.1007/978-3-031-35314-7_24
- RAMOS-SANDOVAL, R.; MENDIBURU-DÍAZ, C. Why do small farmers have less access to credit? a microdata analysis of the Peruvian case. *Nativa*, v. 12, n. 2, p. 215-225, 2024. <https://doi.org/10.31413/nativa.v12i2.16758>
- RAMOS-SANDOVAL, R.; GARCÍA-ÁLVAREZ-COQUE, J. M.; MAS-VERDÚ, F. (2016). Innovation behaviour and the use of research and extension services in small-scale agricultural holdings. *Spanish Journal of Agricultural Research*, v. 14, n. 4, e0106-e0106, 2016. <https://doi.org/10.5424/sjar/2016144-8548>
- SAQIB, S. E.; AHMAD, M. M.; PANEZAI, S.; ALI, U. Factors influencing farmers' adoption of agricultural credit as a risk management strategy: the case of Pakistan. *International Journal of Disaster Risk Reduction*, v. 17, p. 67-76, 2016. <https://doi.org/10.1016/j.ijdr.2016.03.008>
- SARFO, Y.; MUSSHOFF, O.; WEBER, R. Farmers' awareness of digital credit: Does financial literacy matter? *Journal of International Development*, v. 35, n. 8, p. 2299-2317, 2023. <https://doi.org/10.1002/jid.3774>
- SIFRAIN, R. Does Psychometric Testing in Microfinance Actually Work? - The Case of Sogesol. *Journal of Financial Risk Management*, v. 9, n. 3, p. 278-313, 2020. <https://doi.org/10.4236/jfrm.2020.93016>
- TABER, K. S. The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Research in Science Education*, v. 48, n. 6, p. 1273-1296, 2017. <https://doi.org/10.1007/s11165-016-9602-2>
- TAN, Y.; HU, W. Social capital, family wealth and normal credit rationing to famers. *Financial Forum*, v. 22, p. 37-49, 2017.
- TANG, T. L.-P. The development of a short Money Ethic Scale: Attitudes toward money and pay satisfaction revisited. *Personality and Individual Differences*, v. 19, n. 6, p. 809-816, 1995. [https://doi.org/10.1016/S0191-8869\(95\)00133-6](https://doi.org/10.1016/S0191-8869(95)00133-6)
- TRIVELLI, C. *Finanzas agropecuarias desafío pendiente en la agenda agraria en Perú*. Lima: Instituto de Estudios Peruanos, 2021. 35p. <https://doi.org/10.2499/p15738coll2.134248>
- TRIVELLI, C.; CABALLERO, E. *¿Cerrando brechas?: las estrategias nacionales de inclusión financiera en América Latina y el Caribe*. Lima: Instituto de Estudios Peruanos, 2018. 114p. Available online: <https://doi.org/10.2499/p15738coll2.134248>
- VO, H. H.; MIZUNOYA, T.; NGUYEN, C. D. Determinants of farmers' adaptation decisions to climate change in the central coastal region of Vietnam. *Asia-Pacific Journal of Regional Science*, v. 5, n. 2, p. 327-349, 2021. <https://doi.org/10.1007/s41685-020-00181-5>
- WORLD BANK. *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. The World Bank Group, 2018. 151p. Available online: <https://documents1.worldbank.org/curated/en/332881525873182837/pdf/126033-PUB-PUBLIC-pubdate-4-19-2018.pdf>
- XIAO, J. J. Applying behaviour theories to financial behaviour. In: XIAO, J. J. (Ed.). *Handbook of Consumer Finance Research*. New York, NY: Springer, p. 69-81, 2008. https://doi.org/10.1007/978-0-387-75734-6_5
- YAZDANPARAST, A.; ALHENAWIB, Y. Personality and borrowing behaviour: An examination of the role of need for material resources and need for arousal traits on household's borrowing decisions. *Financial Services Review*, v. 26, n. 1, p. 55-85, 2017. <https://doi.org/10.61190/fsr.v26i1.3296>
- ZHANG, A.; WANG, S.; LIU, B.; LIU, P. How fintech impacts pre- and post-loan risk in Chinese commercial banks. *International Journal of Finance and Economics*, v. 27, n. 2, p. 2514-2529, 2022. <https://doi.org/10.1002/ijfe.2284>
- ZHAO, Q.; SHEN, Y.; LI, C. Credit behaviours of rural households in the perspective of complex social networks. *Complexity*, v. 2021, 9975856, p. 1-13, 2021. <https://doi.org/10.1155/2021/9975856>
- ZULFIQAR, F.; SHANG, J.; ZADA, M.; ALAM, Q.; RAUF, T. Identifying the determinants of access to agricultural credit in Southern Punjab of Pakistan. *GeoJournal*, v. 86, n. 6, p. 2767-2776, 2021. <https://doi.org/10.1007/s10708-020-10227-y>

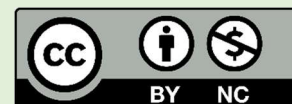
Acknowledgements: We acknowledge the Universidad Tecnológica del Perú for their support in conducting this study, which was made possible through the Project Fund P-2023-LIM-01. Additionally, this work has been partially supported by the Spanish Ministry of Science and Innovation under the research project PID2020-117792RA-I00.

Authors' contributions: R.R.S.: conceptualization; methodology; investigation or data collection; data curation; formal analysis; resources; writing (original draft); writing (review and editing); supervision; funding acquisition. A.B.S.: conceptualization; validation; writing (original draft); writing (review and editing). J.C.T.: investigation or data collection; resources; writing (original draft); writing (review and editing). Y.F.Y.A.: investigation or data collection; resources; writing (original draft); writing (review and editing). All authors read and agreed to the published version of the manuscript.

Funding: Universidad Tecnológica del Perú, under the Research Directorate No. RR-N°0068-2025/R-UTP.

Data availability: The authors will share data from the study upon reasonable request to the corresponding author. The final structured questionnaire is available at: <https://cuestionarioagropecuario.netlify.app/>

Conflict of interest: The authors declare that they have no conflict of interest.



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