REVISTA INVECOM
ISSN en línea: 2739-0063

Strategies to improve financing and productivity in agriculture: a systematic review

Estrategias para mejorar el financiamiento y la productividad en la agricultura: una revisión sistemática

Received: 22/04/2026 - **Accepted:** 06/07/2026

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Abstract

This study aimed to analyze how agricultural clusters facilitate access to financing and contribute to increased productivity among small-scale farmers. A literature review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, enabling the systematic identification, selection, and synthesis of scientific evidence on agricultural clusters, credit access, and rural financial development. The bibliographic search was performed in the Scopus and SciELO databases, considering studies published in English and Spanish between 2018 and March 2025. The inclusion criteria comprised indexed scientific articles, empirical, experimental, quantitative, qualitative, mixed-methods studies, and literature reviews related to agricultural producers, clusters, financing, and productive competitiveness. Editorials, review articles, non-peer-reviewed studies, and documents unrelated to the analyzed variables were excluded. The review comprised 19 quantitative studies, 2 qualitative studies, 6 mixed-methods studies, and 3 literature reviews. A total of 473 initial publications were identified, including 253 from Scopus and 220 from SciELO. After removing 86 duplicates and applying the eligibility criteria through title, abstract, and full-text screening, 30 studies were selected for the final analysis. The findings demonstrated that agricultural clusters strengthen cooperation among producers, facilitate access to credit, promote technological adoption, and enhance productivity. It is concluded that the integration of associative strategies, innovation, and public policies contributes to financial inclusion and sustainable development among small-scale farmers.

Keywords: agricultural cluster, agricultural credit, financial development.

Resumen

El presente estudio tuvo como objetivo analizar cómo los clústeres agrarios facilitan el acceso al financiamiento y contribuyen al incremento de la productividad en pequeños agricultores. Se desarrolló una revisión de literatura bajo los lineamientos del método PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), permitiendo la identificación, selección y síntesis de evidencia científica sobre clústeres agrícolas, acceso al crédito y desarrollo financiero rural. La búsqueda bibliográfica

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se realizó en las bases de datos Scopus y SciELO, considerando estudios publicados en español e inglés entre 2018 y marzo de 2025. Se incluyeron artículos científicos indexados, investigaciones empíricas, experimentales, cuantitativas, cualitativas, mixtas y revisiones de literatura relacionadas con productores agrícolas, clústeres, financiamiento y competitividad productiva. Se excluyeron editoriales, reseñas, estudios sin revisión por pares y documentos que no guardaban relación con las variables analizadas. La revisión comprendió 19 estudios cuantitativos, 2 cualitativos, 6 mixtos y 3 revisiones de literatura. Se identificaron 473 publicaciones iniciales, de las cuales 253 correspondieron a Scopus y 220 a SciELO. Tras eliminar 86 duplicados y aplicar los criterios de elegibilidad mediante la revisión de títulos, resúmenes y textos completos, se seleccionaron 30 estudios para el análisis final. Los resultados evidenciaron que los clústeres agrarios fortalecen la cooperación entre productores, facilitan el acceso al crédito, impulsan la adopción tecnológica y mejoran la productividad. Se concluye que la integración de asociatividad, innovación y políticas públicas contribuye a la inclusión financiera y al desarrollo sostenible de pequeños agricultores.

Palabras clave: clúster agrario, crédito agrícola, desarrollo financiero.

Introduction

Agricultural producers face considerable difficulty obtaining credit, hampered by a lack of collateral that banks deem acceptable, by the informality in which many operate, and by the high interest rates typically applied, constraints that curtail their capacity to invest in technology and, by extension, undermine their competitiveness. Associative arrangements are similarly hindered by mutual distrust and by the challenges involved in building groups perceived as genuinely effective, a shortfall that costs producers substantial potential gains. Addressing these problems would require policies that expand access to credit and equip agricultural cooperatives with the functions needed to operate effectively.

Globally, access to credit remains one of the greatest challenges farmers face: only about 30% of producers in developing countries have access to formal credit, which leaves most unable to invest (Banco Mundial, 2021). Roughly 40% of smallholder farmers, moreover, fail to meet bank requirements because they lack collateral or a credit history (Haryanto et al., 2023). Although government programs exist, only 15% of rural farmers obtain long-term credit, a shortfall that further erodes their competitiveness (Banco Mundial, 2021).

Associative strategies improve both market opportunities and access to financing, since participation in cooperatives strengthens farmers' bargaining power and can lead to better prices and higher incomes (United Nations Conference on Trade and Development, UNCTAD 2021). Even so, only 25% of farmers in developing countries actively participate in associations, held back by mistrust and a lack of institutional support (Sanabria & Salgado, 2023).

In Latin America, financing remains a critical problem: more than 40% of smallholder farmers in countries such as Mexico and Brazil lack access to formal credit (Comisión Económica para América Latina y el Caribe et al., 2021). While 25% of producers do secure financing at competitive rates, most face barriers that put them at a disadvantage relative to larger producers (González & Robles, 2022). Cooperatives have played a key role across the region, with participation reaching 40% in countries such as Colombia, Brazil, and Peru; however, only 20% of these associations receive adequate financial support, which limits their impact (Ministerio de Desarrollo Agrario y Riego, 2021).

In Peru, only 30% of farmers have access to formal credit, and a lack of collateral together with widespread informality remain significant barriers (Ministerio de Economía y Finanzas, 2024).

Despite the existence of government programs, more than 50% of producers fail to meet eligibility requirements. Associativity has nonetheless been key to improving agricultural competitiveness, with 35% of farmers now integrated into cooperatives; only 15% of these, however, have the structure and financing needed to operate effectively (Ministerio de Desarrollo Agrario y Riego, 2021). A lack of training and

institutional support continues to limit their expansion, despite their potential to strengthen market access (Mendoza, 2021).

Agricultural clusters likewise facilitate the transfer of knowledge and financing, raising productivity by as much as 20% over five years through the integration of producers and technology (López, 2022). Coordination among government, academia, and industry is, moreover, essential to optimizing the sector's sustainability (Tique & Barrientos, 2023). Agricultural informality, however, continues to hinder access to credit and thereby constrains producers' financial development (Tique & Barrientos, 2023). Credit and associativity are, in turn, decisive factors in agricultural productivity, yet strict requirements and insufficient collateral limit investment in technology and productive improvements (Mendoza, 2023). Public policies that ease access to credit and foster cooperation could accordingly strengthen the sector, improve its competitiveness, and contribute to its long-term economic sustainability (Mendoza-Vela, 2021; Ministerio de Desarrollo Agrario y Riego, 2021).

This research draws on cluster theory, credit-access theory, Amartya Sen's theory of economic development, and associativity theory to make sense of economic and social development within the agricultural sector. Cluster theory, developed by Michael Porter, holds that the geographic concentration of firms fosters competitiveness, innovation, and productive coordination (Pillihuamán, 2024) by facilitating collaboration, knowledge exchange, cost reduction, and productivity gains (Lomsadze, 2023). Credit-access theory, in turn, maintains that monetary funds stimulate investment and growth, while information asymmetry limits the participation of actors with fewer resources (Akerlof, 1970). For Sen, development consists in expanding human capabilities and freedoms (Alkire, 2016). Finally, agricultural associativity fosters cooperation among producers seeking financing, inputs, and market access (Mendoza-Vela, 2021).

This article addresses financing and associativity in the agricultural sector, seeking to understand how clusters enable financing for smaller or lower-capacity farmers and how they help raise these same farmers' productivity. Credit makes it possible to optimize production processes, acquire quality inputs, and enhance competitiveness; barriers such as insufficient collateral, high interest rates, and limited awareness of available financial options, however, persist.

Methodology

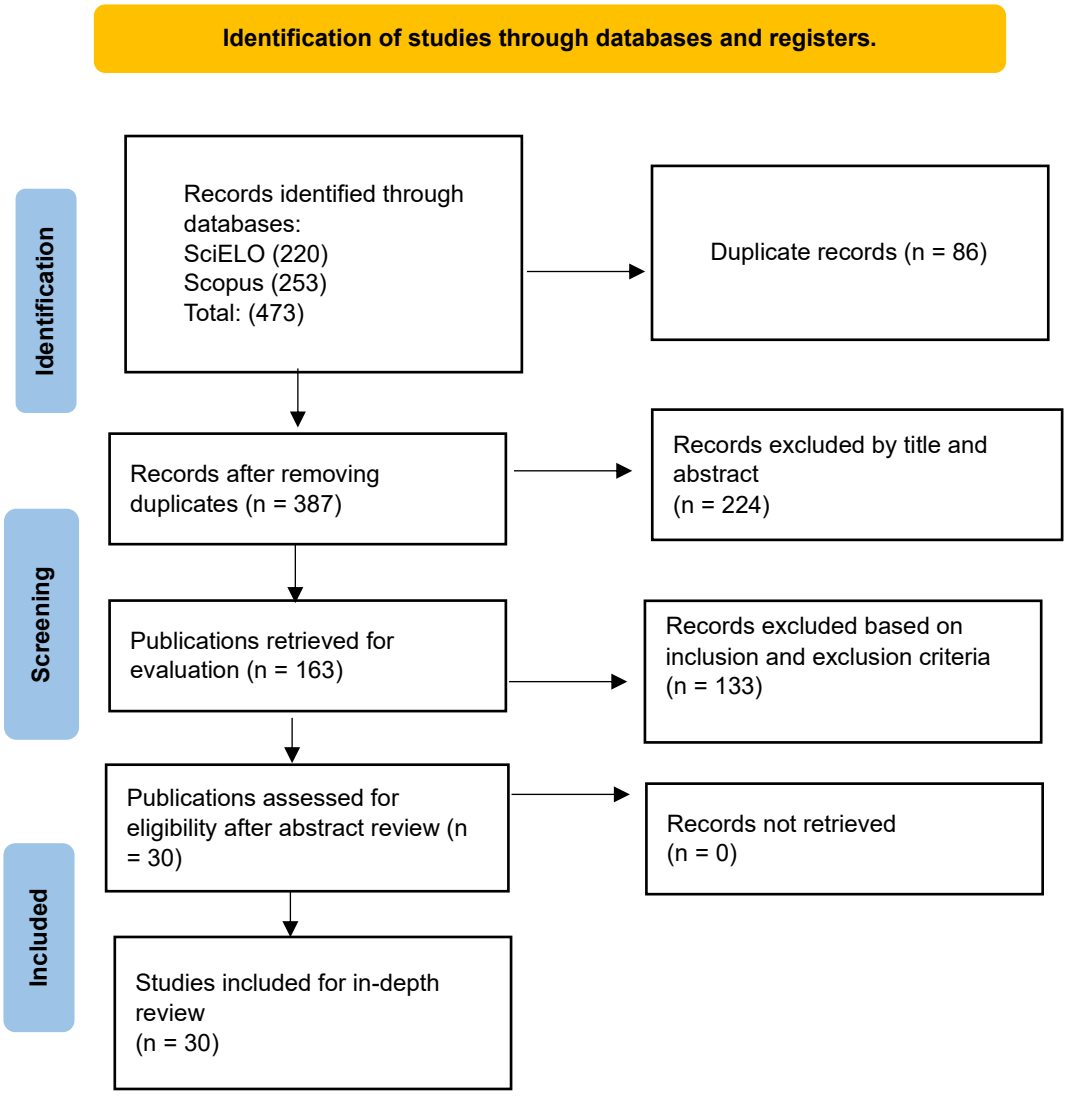
This study takes the form of a literature review, drawing together and analyzing prior research on the topic through an exhaustive search intended to synthesize the search and selection process clearly and precisely. The research sought to examine how clusters facilitate access to financing and contribute to increased productivity among small-scale farmers

Studies on agricultural producers published in English or Spanish between 2018 and March 2025 were included. Eligible works comprised indexed, empirical, experimental, quantitative, qualitative, and mixed-methods studies, along with literature reviews addressing clusters, credit access, and agricultural financial development. Editorials, reviews, and non-peer-reviewed studies were excluded. The review ultimately comprised 19 quantitative studies, 2 qualitative studies, 6 mixed-methods studies, and 3 literature reviews.

The literature search was conducted in the Scopus and SciELO databases, chosen for their recognized academic quality, their open-access nature, and the breadth of peer-reviewed literature they offer. The search terms used included agricultural cluster, credit access, financial development, agricultural producers, rural financing, agricultural economics, financial institutions, and productive competitiveness. The search strategy combined Boolean operators AND and OR through equations such as: “agricultural cluster” AND “credit access” AND “financial development”; “agricultural cluster” OR “credit access” OR “financial development”; along with specific combinations of credit access, financial development, and agricultural cluster. The literature selection process unfolded in two phases: the first consisted of screening titles and abstracts to identify candidate studies, and the second involved a full-text review to verify compliance with the established criteria.

The relevance of each study was determined by reviewing titles, abstracts, and full texts against the inclusion and exclusion criteria. A total of 473 studies were identified: 253 in Scopus and 220 in SciELO. After removing 86 duplicates, 387 publications remained. Following an abstract review, 163 articles were selected for final evaluation; 133 of these were subsequently excluded for failing to meet the established criteria, leaving 30 studies that were ultimately included in the analysis.

Figure 1. *Diagram of the study selection process.*



Results

After applying the criteria, 30 full publications were selected for analysis, as shown in Table 1.

Table 1. *Matrix of selected studies.*

No.	Author	Article title	Methodology	Country	Year	Database
1	Gidelew et al.	Impact of Cluster Farming on Rural Food Security in Ethiopia	Quantitative	Ethiopia	2024	Scopus
2	Otsuka & Ali	Strategies for Transforming Agricultural Clusters into Agro-Industrial Clusters	Literature review	Pakistan	2020	Scopus
3	Zeleke & Wordofa	Benefits of Cluster Farming for the Household Economy of Smallholder Farmers in Ethiopia	Literature review	Ethiopia	2024	Scopus
4	Nawaz & Avetisyan	Rural Credit Market Imperfections and Their Influence on Climate Change Adaptation in Pakistan	Quantitative	Pakistan	2025	Scopus
5	Ertunç et al.	Clustering Approaches for Land Valuation and Consolidation	Quantitative	Turkey	2021	Scopus
6	Joffre et al.	The Role of Clusters in Technology Adoption in Vietnam's Aquaculture Sector	Mixed methods	Vietnam	2020	Scopus
7	Nakano & Magezi	Microcredit and Rice Productivity in Tanzania: Impact on Technology Adoption	Quantitative	Tanzania	2020	Scopus
8	Caruso et al.	A New Methodology for Credit Risk Assessment through Mixed-Data Clustering	Mixed methods	Germany	2020	Scopus
9	Wang et al.	A Performance-Based Portrait Model of Farmers	Quantitative	China	2023	Scopus
10	Li et al.	Relationship between Credit Ratings, Repayment Willingness, and Credit Default	Quantitative	China	2024	Scopus
11	Shano & Waje	Impact of Microcredit on Agricultural Technology Adoption in Ethiopia	Quantitative	Ethiopia	2024	Scopus
12	Lu et al.	Financial Literacy and Its Relationship with Credit Default	Quantitative	China	2024	Scopus
13	Kimaro et al.	Cooperative Irrigation Farming and Its Relationship with Food Security	Literature review	Ethiopia	2024	Scopus
14	Witinok-Huber & Radil	Impact of Gender and Geography on Access to Agricultural Resources	Mixed methods	Liberia	2021	Scopus
15	Sánchez & Sánchez	The Avocado Cluster in Mexico: Sustained Growth through Production and Market Development.	Mixed methods	Mexico	2021	Scielo

16	Tongo & Soplin	Assessment of the Sustainability of Livestock Production Systems in the Province of Oxapampa, Pasco, Peru.	Quantitative	Peru	2022	Scielo
17	Paccioretti et al.	Development of Software for Mapping Spatial Variability in Agriculture and the Environment.	Quantitative	Argentina	2020	Scielo
18	Aquino et al.	Multivariate Characterization of Tarwi (Lupinus mutabilis Sweet) Producing Farms in the Mantaro Valley, Peru.	Quantitative	Peru	2018	Scielo
19	Ayaviri-Nina et al.	Microcredit in Livestock and Agricultural Activity: A Study from the Territorial Development Approach.	Mixed methods	Ecuador	2022	Scielo
20	Rojas et al.	Agricultural Production Factors in the Economic Growth of the Pasco Region during the Period 2012-2022.	Qualitative	Peru	2024	Scielo
21	Ferrer et al.	Effect of Financing on the Semi-Ecological Production and Commercialization of Cacao (Theobroma cacao) in Leoncio Prado, Peru.	Quantitative	Peru	2023	Scielo
22	Rivera-Acosta & Xiuchuan	The Impact of Agricultural Credit on Banana cultivation in Valle del Cauca, Colombia.	Quantitative	Colombia	2023	Scielo
23	Chavez et al.	Factors Influencing the Income of Farming Families in Amazonas, Peru.	Quantitative	Peru	2022	Scielo
24	Amaya	Agriculture and Agro-Industry in the Osa Peninsula: The Historical Construction of a Territorial Project.	Qualitative	Costa Rica	2023	Scielo
25	González & López	Credit for Smallholder Maize Producers in the Lake Regions of Michoacán.	Quantitative	Mexico	2024	Scielo
26	Huacchillo et al.	Financial Management and Its Impact on Financial Decision-Making.	Mixed methods	Peru	2020	Scielo
27	Loor et al.	Financial Education for the Economic Development of the Wood Craft Sector in Chone, Ecuador.	Quantitative	Ecuador	2024	Scielo

28	Cervantes-Mendoza	Training and Financial Management of Micro and Small Enterprises.	Quantitative	Peru	2024	Scielo
29	Urdaneta et al.	Causal Relationships between Private-Sector Bank Credit, Total Deposits, and Gross Domestic Product in Ecuador.	Quantitative	Ecuador	2024	Scielo
30	Colachagua Oré et al.	Impact of Microcredit on the Economic Growth of the Junín Region, 2013-2017.	Quantitative	Peru	2023	Scielo

Table 1 presents the 30 selected studies: 16 from SciELO and 14 from Scopus. Quantitative research predominates, with 19 articles, followed by six mixed-methods studies, three literature reviews, and two qualitative studies. Most were published in 2024 and relate primarily to Peru and Ethiopia. Taken together, this methodological and geographic diversity provides evidence of how associativity, microcredit, technological innovation, and financial management contribute to strengthening agricultural productivity.

Table 2. *Contributions of the analyzed articles.*

Study components	**Grouped authors**	**Contribution to agricultural clusters**	**Contribution to agricultural credit access**	**Contribution to financial development**
Cluster, productivity, and food security	Gidelew et al. (2024); Zeleke & Wordofa (2024); Shano & Waje (2024); Tongo Pizarro & Soplin Villacorta (2022); Chavez Espinoza et al. (2022)	Clusters strengthen agricultural efficiency, raise income levels, bring production systems together, and further improve agricultural efficiency.	Access to credit favors participation in clusters as well as technology adoption and improved production conditions.	Commercialization, the effective use of income, and sustainability in leveraging productive potential are all pathways that contribute to rural economic development.
Cooperation, associativity, and productive organization	Otsuka & Ali (2020); Joffre et al. (2020); Kimaro et al. (2024); Aquino et al. (2018); Ayaviri-Nina et al. (2022); Amaya Rodríguez (2023)	Collaboration among producers, processors, and cooperatives strengthens networks, builds trust, promotes more sustainable practices, and organizes	Associative structures allow for better negotiation, training, and access to financing for small-scale producers.	Cooperatives and associations reduce risk exposure, generate sustainable income, and bring dynamism to rural financial development.

		agricultural activity.		
Credit access and rural financial inclusion	Nawaz & Avetisyan (2025); Ertunç et al. (2021); Nakano & Magezi (2020); Li et al. (2024); Ferrer Tarazona et al. (2023); Rivera-Acosta & Xiuchuan (2023); Urdaneta Montiel et al. (2024); Colachagua Oré et al. (2023)	Financial inequalities, together with accurate land valuation, microcredit, and organized participation, all shape the sustainability of clusters.	Affordable credit, improved credit ratings, better interest rates, and strategies tailored to smallholder farmers are all needed.	Financial inclusion, microcredit, and improved credit policies will drive productivity, economic growth, and quality of life.
Technology, credit assessment, and production management	Caruso et al. (2020); Wang et al. (2023); Paccioretti et al. (2020); Rojas Victorio et al. (2024)	Production-based classification, farmer analysis, and digital management result in better organization of both farming areas and agricultural clusters.	Risk assessment, digital tools, infrastructure, and technology improve access to agricultural credit.	Digitalization strengthens profitability, efficiency, financial stability, and the economic viability of the agricultural sector.
Financial literacy, training, and business sustainability	Lu et al. (2024); Huacchillo Pardo et al. (2020); Loor Rodríguez et al. (2024); Cervantes-Mendoza (2024)	Financial training and capacity-building both steadily improve cluster management and increase participation in agricultural markets.	Financial education broadens access to financing, reduces knowledge gaps, and improves credit decisions.	Financial planning reduces default rates and increases profitability, sustainability, and the adoption of sound business practices in the rural world.
Competitiveness, equity, and agricultural business models	Witinok-Huber & Radil (2021); Sánchez Valdés & Sánchez Rodríguez (2021); González Pérez & López Paniagua (2024)	Monitoring service delivery, business integration, and rural financing all increase agricultural competitiveness.	Gender disparities, financial exclusion, and dependence on credit all persist as obstacles to sustaining the sector's growth.	Equitable access to resources, capital, and investment contributes to regional economic and financial development.

Discussion

The evidence reviewed suggests that strategies for improving agricultural financing and production must combine productive organization, credit access, financial training, and technological innovation. Pursued together, these elements allow agricultural clusters to strengthen the ties among producers, processors, and traders, generating economies of scale and securing better negotiating conditions with financial institutions (Otsuka & Ali, 2020; Nawaz & Avetisyan, 2025). Their outcomes remain contingent, however, on trust, internal governance, and institutional support, since grouping production alone cannot guarantee either access to financing or a sustained rise in productivity.

Associative work helps lower transaction costs, spread risk, and provide collective access to markets, inputs, and technical assistance. Gidelew et al. (2024) link cluster farming to improved economic conditions and food security, while Joffre et al. (2020) argue that interaction and trust favor technology adoption. Kimaro et al. (2024) and Amaya (2023) show that cooperative organizations foster shared resource management. The diversity of farming units documented by Aquino et al. (2018), however, suggests that such strategies must be tailored to each group's productive and territorial characteristics.

Barriers nonetheless persist, including insufficient collateral, informality, high interest rates, and credit terms poorly adapted to agricultural cycles. Ertunç et al. (2021) similarly stress the importance of organization and land valuation, a view shared by Urdaneta et al. (2024), Lu et al. (2024), Ferrer et al. (2023), and Sánchez and Sánchez (2021), who likewise consider the availability of financing and sound management decisive for the sector's performance. Expanding the credit supply without accounting for production cycles, climate risk, and commercialization opportunities could therefore increase debt rather than improve productivity.

Microcredit offers an alternative for small-scale producers, although its effects are not uniform. Nakano and Magezi (2020) and Shano and Waje (2024) note that it can facilitate technology adoption, though the impact depends on where the resources are directed and on the producer's own capabilities. González and López (2024) and Rojas et al. (2024) similarly find that financial and productive limitations persist. This underscores that credit proves most effective when paired with technical support, manageable repayment terms, and stable market access.

Regarding productivity, Zeleke and Wordofa (2024) contend that clusters can raise both incomes and the broader rural household economy. Witinok-Huber and Radil (2021), by contrast, warn that variables such as gender and geographic location generate disparities in resource access. Colachagua et al. (2023) and Rivera-Acosta and Xiuchuan (2023) similarly link credit to economic growth and agricultural development, while Chavez et al. (2022) point to productive factors as drivers of household income. Financing, accordingly, contributes more to productivity when it is directed toward profitable investments and accompanied by sound, sustainable commercial strategies (Tongo & Soplin, 2022).

Financial education also plays a highly important role. Huacchillo et al. (2020) find that improved financial management supports better decision-making, while Lu et al. (2024) establish a link between financial knowledge and default rates. Cervantes-Mendoza (2024) and Loor et al. (2024), for their part, stress the need to train small-scale producers to plan investments, manage debt, and avoid over-indebtedness, which means that financial inclusion must extend beyond mere credit access to encompass training that responds to the actual needs of rural communities.

Digitalization, in this respect, opens new opportunities for assessing farmers who lack collateral or a credit history. Caruso et al. (2020) propose clustering techniques for risk analysis, Li et al. (2024) highlight the usefulness of credit ratings, and Wang et al. (2023) contribute models based on productive performance. Paccioretti et al. (2020) likewise demonstrated that specialized software can be enhanced through agricultural planning. These tools may open the door to greater access to financing, but they require reliable data, connectivity, and transparent criteria capable of preventing new forms of exclusion.

In sum, the studies reviewed show that there is no single way to overcome agriculture's financial and productive limitations. The best outcomes emerge from combining clusters, cooperativism, tailored credit, financial education, technical assistance, and technology. Differences in methods and geographic context nonetheless limit how far these results can be generalized. Future research will therefore need to determine which combination of strategies produces sustainable effects depending on crop type, territorial conditions, and the characteristics of small-scale producers.

Conclusions

Agricultural financing has undergone significant change through cooperative models, digital services, and new approaches to borrower assessment. Clusters strengthen negotiating power, expand access to credit, and drive economies of scale and market expansion; farmers who cannot provide collateral or demonstrate a credit history, however, remain excluded from the system because of structural barriers, limited banking infrastructure, and low rates of technology adoption. Financial education, accordingly, stands out as a decisive, if intangible, factor in improving resource management. Future research should examine the long-term effects of clusters and digital financing, as well as the potential applications of blockchain and smart contracts for secure and efficient credit management.

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