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EXPLAINING CAPITAL STRUCTURE IN AGRIBUSINESS: evidence from farms, agricultural organizations, and research frontiers

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ABSTRACT

This article examined how the literature has explained capital structure in agribusiness, with an emphasis on the theories employed and the determinants of financing decisions in agricultural holdings and related organizations. To this end, a systematic literature review was conducted based on Scopus and Web of Science, analyzing a sample of 47 articles published from 2013 onward, whose interpretive core focused on studies centered on farms and farmers. The results indicated that the literature is theoretically plural, yet unevenly consolidated. Pecking Order Theory and Trade-Off Theory were the most recurrent approaches, while risk-based and optimal debt models gained relevance under conditions of uncertainty. The determinants of capital structure were organized into four interconnected dimensions: economic and financial variables, farm characteristics, financing conditions and the institutional environment, and human, organizational, and management factors. Financing decisions resulted from the interaction among these elements. The article contributed by integrating theoretical approaches, systematizing key determinants, and identifying gaps for future research.

Keywords: Financing determinants; Capital structure; Rural credit; Agricultural finance; Agribusiness.

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1 INTRODUCTION

Capital structure is a central financial issue in agricultural production because it shapes how farms and related agribusiness organizations finance operations, investment, and adaptation over time. In agriculture, this issue is especially consequential because financing decisions affect financial risk, access to credit, investment capacity, and business viability. Recent studies emphasize that, unlike large corporations with broader access to capital markets, most farms rely on a narrower set of financial resources, typically combining internal funds with short-term and long-term debt under conditions marked by production risk, seasonality, and limited access to external finance (Enjolras, Sanfilippo, & Soliwoda, 2021; West, Mugera, & Kingwell, 2021; Gostkowska-Drzewicka & Koralun-Bereźnicka, 2024).

These sectoral specificities make agricultural capital structure analytically distinct from the corporate settings in which most mainstream finance theories were originally developed. Agricultural firms are influenced not only by conventional determinants such as profitability, liquidity, growth opportunities, and asset structure, but also by factors such as production seasonality, land as a productive asset, family organization, exposure to climate and price volatility, and restricted access to capital market instruments (Gostkowska-Drzewicka & Koralun-Bereźnicka, 2024; Enjolras et al., 2021). In addition, recent evidence shows that financing choices in agriculture are associated with heterogeneous dynamics involving debt adjustment, risk balancing, savings behavior, and access to formal and informal credit, especially in contexts where farms operate with limited financial and technical resources (West et al., 2021; Adhikari & Khanal, 2023).

Although this literature has expanded, it remains fragmented in theoretical, empirical, and contextual terms. Existing studies are distributed across different countries, organizational forms, and analytical traditions, with stronger concentration in settings such as the United States and parts of Europe, while evidence from Brazil and other underrepresented contexts remains more limited. The field builds on foundational contributions such as Modigliani and Miller's (1958) irrelevance proposition, which provides a benchmark under perfect market conditions, as well as subsequent theoretical developments including trade-off theory, pecking order theory, and risk-based approaches derived from optimal debt and expected utility models. As a result, the literature has accumulated relevant empirical findings, but it still lacks a more integrated understanding of which theories have been mobilized in agricultural finance research and which determinants have been most consistently associated with capital structure decisions across

studies (Adhikari & Khanal, 2023; Enjolras et al., 2021; West et al., 2021).

This fragmentation creates a clear opportunity for systematic synthesis. Rather than treating agricultural capital structure as a straightforward extension of general corporate finance, there is a need to map how the literature has interpreted the problem in sector-specific terms, which explanatory traditions have been most influential, and which factors have received greater or lesser empirical attention. This is particularly important in a field where financing constraints, institutional arrangements, and productive conditions vary substantially across farms, cooperatives, and agricultural firms, making it difficult to infer cumulative patterns from isolated country studies alone.

Accordingly, this study aims to identify the main theories mobilized in studies of capital structure in agribusiness and to systematize the principal factors associated with its configuration in agricultural holdings and related organizations. To achieve this objective, the article develops a systematic review of the literature. The broader mapping covers agribusiness-related organizations, while the focused content analysis concentrates on studies centered on farms and farmers, organizing the evidence around the main theoretical approaches and determinant groups addressed in prior research.

This article contributes in three ways. First, it offers an updated synthesis of the theoretical lenses used to explain capital structure in agricultural contexts, clarifying how traditional corporate finance approaches have been adapted, extended, or challenged in this field. Second, it systematizes the main determinants examined in the empirical literature, allowing a more structured understanding of the economic, financial, productive, institutional, and behavioral factors associated with financing decisions. Third, it identifies areas of concentration and omission in the literature, thereby supporting a more precise future research agenda and providing a clearer analytical basis for discussions on agricultural finance, farm management, and sectoral policy.

2 METHODOLOGY

This study adopts a systematic literature review to identify, organize, and synthesize the academic production on capital structure in agribusiness. Systematic reviews are appropriate when the objective is to map an intellectual field in a transparent and replicable way, reducing arbitrariness in the identification, selection, and analysis of prior studies. In this study, the review was designed to consolidate the theoretical approaches mobilized in the literature and to systematize the determinants associated with capital structure decisions in agricultural

holdings and related organizations. The broader review therefore maps multiple organizational forms, whereas the interpretive core of the content analysis focuses on studies centered on farms and farmers. The review procedure followed the logic of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to support transparent study identification, screening, and selection (Moher, 2009), thereby contributing to a more comprehensive review process and reducing selection bias (Donato, 2019). The methodology is based on the framework used by Silveira (2023).

2.1 DATABASES AND SEARCH STRATEGY

The search was conducted in the Scopus and Web of Science databases on December 2, 2024. These databases were selected because they provide broad international coverage of peer-reviewed scientific production and are widely used in review studies in management, finance, and agribusiness. The same search logic was applied in both databases. In Scopus, the descriptors were searched in title, abstract, and keywords. In Web of Science, the search was conducted in abstracts.

The search terms were defined from a preliminary exploratory reading of studies already identified in the field, especially Enjolras, Sanfilippo and Soliwoda (2021). The strategy combined terms related to the agricultural context with terms associated with financing structure. The agricultural block included the expressions “Agriculture”, “Agricultural”, “Farm”, “Farmers”, “Agribusiness”, and “Rural”. This block was combined with the expressions “capital structure”, “funding sources”, “financial leverage”, “credit management”, and “informal credit” using the Boolean operators OR and AND. No temporal or subject-area filters were applied at the search stage in order to preserve breadth in the initial identification of potentially relevant studies.

The searches returned 661 records in Scopus and 412 in Web of Science, totaling 1,073 documents. All records were exported in BibTeX format and integrated into a single database in RStudio. After the removal of 341 duplicates, 732 unique studies remained for screening.

2.2 SCREENING, ELIGIBILITY, AND FINAL SAMPLE

The first screening stage was based on title reading. At this stage, studies clearly unrelated to capital structure, leverage, credit, financing decisions, or debt in agricultural settings were excluded. This step resulted in 187 articles for abstract screening. The abstracts

were then evaluated in two stages according to the review protocol presented in Table 1.

Table 1. Systematic literature review protocol

SLR stages	Activities	
Database searches and article selection	Defining descriptors; Database searches; Exporting sets of articles to BibText and composing the main database	
Article selection	Reading the abstracts	**Screening 1 (At least one topic)** • Agricultural credit • Financial leverage • Investment decision • Capital structure • Cost of capital • Debt
	Classification of articles based on central theme	**Screening 2 (at least one 'yes' answer)** 1. Is the article related to corporate finance theories, such as trade-offs and pecking orders? Is it related to capital structure decisions? 2. Does the article investigate the determinants of the use of financial leverage and debt capital? 3. Does the article explore the topic of capital structure in the context of risk management and financial performance? 4. Does the article address the topic from the perspective of decisions regarding available financing sources?
Content analysis	Complete reading of articles and extraction of information	**Information collected:** Theories investigated Determining factors Decision-making aspects Object of study

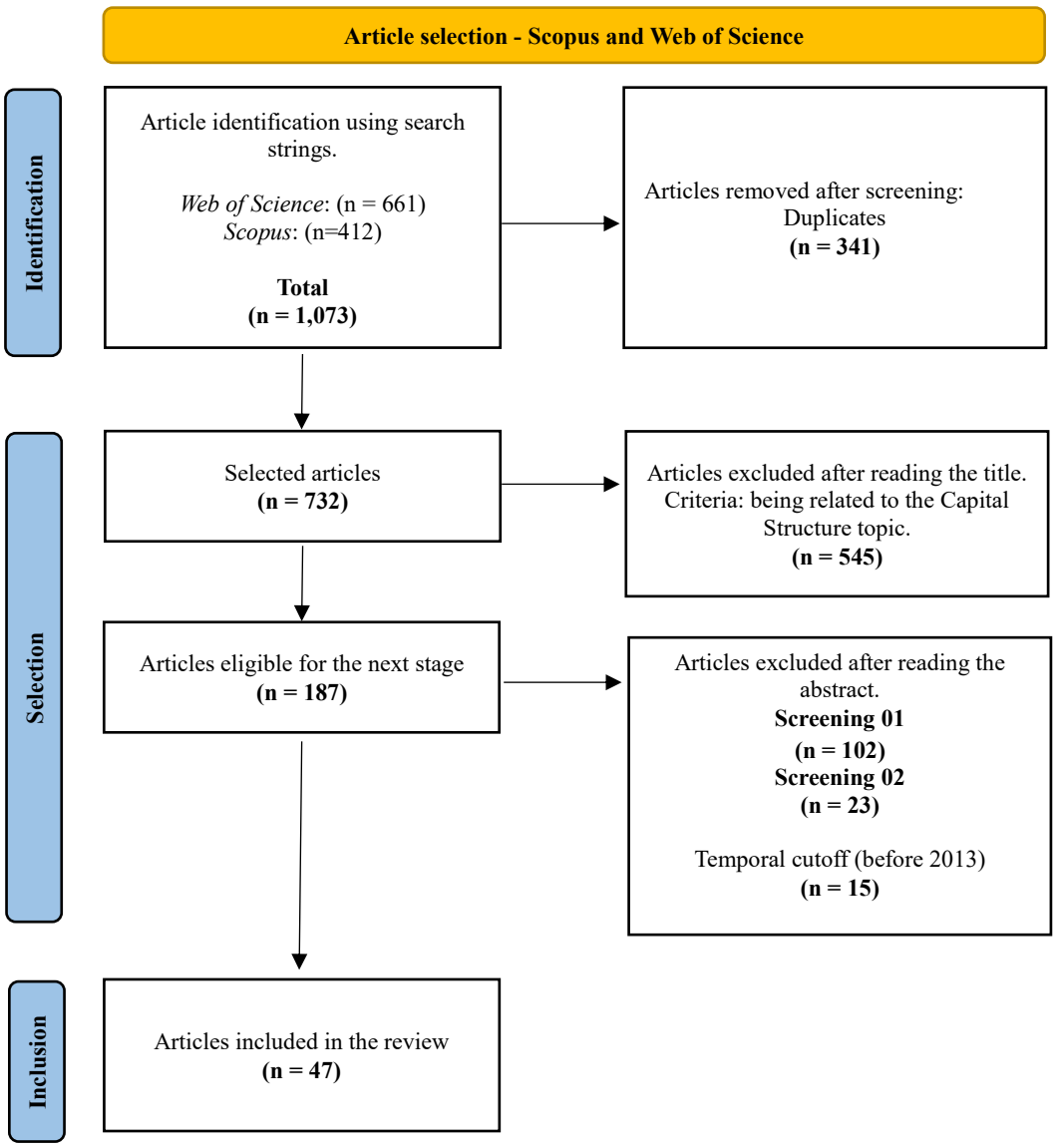
Source: Prepared by the authors.

In Screening 1, the study had to address at least one of the following topics: agricultural credit, financial leverage, investment decision, capital structure, cost of capital, or debt. In Screening 2, the article was retained when it met at least one of these conditions: it was related to capital structure decisions or corporate finance theories, it investigated determinants of leverage or debt use, it examined capital structure in connection with risk management or financial performance, or it addressed financing choices from the perspective of available funding sources. After this stage, 72 articles remained eligible for full assessment.

A temporal cut-off was then applied, restricting the final corpus to studies published

from 2013 onward. This decision was adopted to concentrate the analysis on contemporary literature, where the topic shows greater empirical density and stronger dialogue with recent developments in agricultural finance. The final sample comprised 47 articles. The complete identification and selection process is presented in the PRISMA flow diagram.

Figure 1. PRISMA flowchart for identifying and selecting publications on capital structure in agribusiness



Source: Prepared by the authors.

The 47 articles in the final sample were read in full. Data extraction combined descriptive and analytical dimensions. For each article, the following information was recorded: year of publication, journal, number of citations, keywords, geographic context, object of study, and authorship characteristics. In addition, the review extracted the main theoretical approaches

mobilized, the determinants examined, the variables associated with those determinants, and the decision-making aspects addressed in each study.

2.3 ANALYTICAL PROCEDURE

The analysis was conducted through systematic coding of the selected studies. First, the articles were classified according to the object of analysis and the theoretical approaches used to explain capital structure. Second, the empirical determinants identified in the studies were grouped into broader analytical categories to allow comparison across different organizational forms, countries, and research designs. This procedure made it possible to synthesize recurrent explanatory patterns while also identifying less explored dimensions in the literature. The analytical emphasis, therefore, was not restricted to counting publications, but extended to the interpretive organization of the evidence around theories, determinants, and decision-related dimensions of capital structure in agribusiness.

3 RESULTS AND DISCUSSION

Capital structure decisions are shaped by organizational context because different types of enterprises face distinct levels of information asymmetry, financial constraints, and institutional incentives, all of which are central to capital structure theories (Myers, 1984; Harris & Raviv, 1991). Against this background, the reviewed literature shows that the theoretical framework adopted tends to vary according to the type of organization analyzed, reflecting relevant structural and operational differences across enterprises.

The evidence summarized in Figure 2 reveals a clear pattern in the relationship between organizational type and theoretical approach. Studies focusing on publicly listed companies and on small and medium-sized enterprises, whether agricultural or non-agricultural, tend to rely predominantly on general corporate finance theories derived from the Modigliani and Miller framework and its extensions. As the focus shifts to organizations with greater institutional and operational specificity, such as cooperatives, associations, and especially farmers and farms, the range of theoretical approaches becomes more diverse. In these contexts, classical approaches continue to appear, but risk-based models and sector-sensitive frameworks gain greater relevance, reflecting the importance of production uncertainty, market volatility, and financing restrictions that are more typical of agricultural activity. The presence of studies

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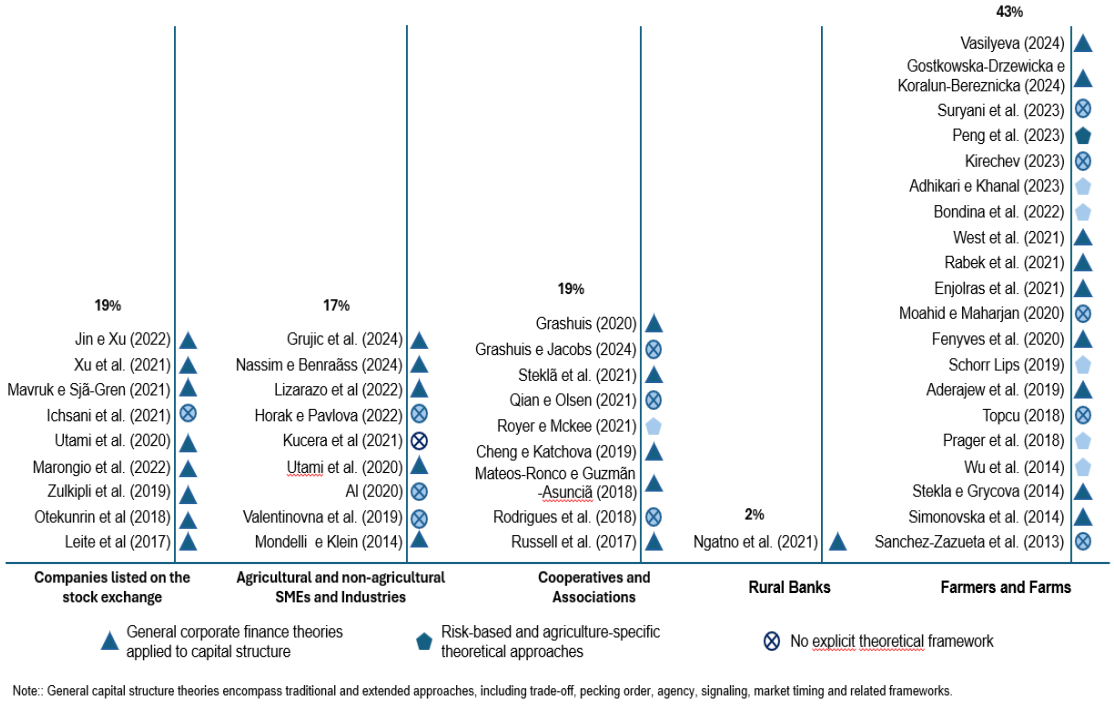
without an explicitly defined theoretical basis also suggests a degree of conceptual fragmentation, especially in segments closer to primary production, which indicates room for greater theoretical rigor in future research.

Figure 2. Distribution of publications across studied segments and corresponding theoretical approaches



Note:: General capital structure theories encompass traditional and extended approaches, including trade-off, pecking order, agency, signaling, market timing and related frameworks.

Source: Prepared by the authors.

To address the objective of this study, the broader mapping of the literature was complemented by a focused content analysis restricted to articles on farms and farmers, which represent 43% of the final sample. The integrated analysis of these studies was organized into two dimensions. First, the theoretical approaches and empirical models mobilized in the literature are examined. Second, the determinants of capital structure identified in the reviewed studies are analyzed and grouped into four categories: economic and financial variables, farm characteristics, financing conditions and institutional environment, and human, organizational, and management factors.

3.1 THEORETICAL APPROACHES AND MODELS USED

Research on agricultural capital structure draws heavily on theories originally developed in corporate finance, but not through simple transfer. The core farm literature adapts these

theories to settings marked by seasonality, biological risk, limited access to equity markets, and strong dependence on retained earnings, land, and debt. This adaptation is visible not only in farm business studies, but also in agricultural cooperatives, listed agribusiness firms, and related rural organizations, where capital structure is examined through profitability, asset structure, growth, leverage maturity, governance, and performance (Aderajew et al., 2019; Enjolras et al., 2021; West et al., 2021; Ichsani et al., 2021; Xu et al., 2021; Ngatno et al., 2021).

Within this literature, the two most recurrent theoretical references are the Pecking Order Theory and the Trade-Off Theory. In the farm-level literature, pecking order reasoning is especially visible where profitability, liquidity, and internal funds reduce reliance on borrowing, whereas trade-off reasoning becomes more relevant when the analysis turns to target leverage, debt maturity, and adjustment dynamics (Aderajew et al., 2019; Enjolras et al., 2021; Gostkowska-Drzewicka & Koralun-Bereźnicka, 2024; West et al., 2021). In the cooperative literature, the same theories remain central, but their relative explanatory power changes. Cheng and Katchova (2019) find broader support for the trade-off view in U.S. agricultural cooperatives, especially in short-term financial adjustments and in downturn conditions, whereas Mateos-Ronco and Guzmán-Asunción (2018) show that Spanish agricultural cooperatives are closer to pecking order logic because member-oriented pricing and restrictions on equity capital weaken self-financing and may increase recourse to debt.

A second theoretical stream places risk and optimal debt under uncertainty at the center of financing decisions. This stream includes the Collins-Barry tradition, the Risk Balancing Hypothesis, and related optimal debt models, which are more sensitive to agricultural conditions such as production risk, price volatility, risk aversion, and precautionary behavior. In this line, debt choice is not treated as a static balance-sheet outcome, but as a response to uncertainty and changing borrowing conditions. Peng et al. (2023) show that expected profitability, business risk, interest rates, prudence, and collateral requirements shape farmers' loan choices. Adhikari and Khanal (2023) show that perceived business risk affects the joint use of debt, savings, and debt-to-equity among small farms. Prager et al. (2018) likewise show that commodity price shocks intensify the use of short-term borrowing among more leveraged farms. A more prescriptive branch of this literature is visible in Kucera et al. (2021), Valentinovna et al. (2019), and Bondina et al. (2022), who treat capital structure as an optimization problem in which firms balance return on equity, credit absorption capacity, and financial risk.

A third stream shows that organizational form changes the theoretical meaning of capital

structure. This is especially clear in the cooperative literature, where debt cannot be interpreted independently of member rights, retained earnings, patronage, revolving funds, equity retirement, agency costs, and the distinction between allocated and unallocated equity (Royer & McKee, 2020; Russell et al., 2017). Grashuis (2019) shows that returns to debt and equity in farm producer organizations must be read alongside their ownership structure and profit distribution logic. Grashuis and Jacobs (2024) refine this line by distinguishing debt, allocated equity, and unallocated equity and by showing that recent cooperative finance research has moved beyond treating equity as a single category. Qian and Olsen (2020) further expand the discussion by linking capital structure to financial and risk management architecture in dairy cooperatives. Brazilian and Czech cooperative studies reinforce this point from different angles. Rodrigues et al. (2018) emphasize regional peculiarities in cooperative capital structure, while Steklá et al. (2015) analyze regional capital disparity and show that the relationship between capital structure indicators and profitability is weak in Czech agricultural cooperatives. These studies suggest that investor-owned firm theories remain useful, but they are insufficient unless adapted to collective ownership and member-oriented organizational design.

The theoretical treatment of capital structure in agriculture is therefore plural but uneven. In the stronger studies, theory structures the interpretation of determinants, financial dynamics, and organizational differences. In weaker or more peripheral contributions, theory appears more as a background vocabulary than as an analytical engine. This is visible in broader comparative studies that expand the conversation without directly explaining farm capital structure itself. Mavruk and Sjögren (2021) add a monitoring perspective based on locally biased owners and information asymmetry. Ngatno et al. (2021) introduce governance as a moderator of the leverage-performance relationship in rural banks. Al Dabbas (2023) separates operating leverage from financial leverage in non-agricultural firms, showing how adjacent literature can broaden the analytical repertoire even when they do not speak directly to farms. Overall, the reviewed studies suggest that agricultural capital structure is best understood not through a single dominant theory, but through a set of complementary approaches whose usefulness varies by organizational form, risk environment, and institutional setting.

3.2 DETERMINANTS OF CAPITAL STRUCTURE

Although the determinants of capital structure are discussed in broad analytical categories, the empirical literature operationalizes these factors through a wide range of

financial, structural, institutional, and behavioral indicators.

3.2.1 Economic and Financial Variables

Economic and financial variables form the main explanatory block in the literature on agricultural capital structure because they capture the most immediate conditions under which farms and related firms combine internal and external funding. Across the reviewed studies, the most recurrent dimensions are profitability, borrowing costs, asset composition, liquidity, internal financial capacity, debt maturity, and leverage adjustment over time. Their effects, however, are not uniform. Rather than operating as fixed determinants, these variables influence financing choices in ways that vary with organizational form, debt composition, production setting, and financial constraints.

3.2.1.1 Return and indebtedness

Profitability is one of the most recurrent determinants of capital structure in the agricultural literature, but its effect is clearly conditional. In farm-level evidence, higher profitability is often associated with lower leverage, which is consistent with the use of retained earnings as a substitute for external financing. This pattern appears in commercial crop farms analyzed by Wu et al. (2014), in agricultural firms from the Czech Republic, Poland, and Hungary analyzed by Fenyves et al. (2020), in Polish farms examined by Enjolras et al. (2021), and in Colombian agricultural firms analyzed by Arévalo Lizarazo et al. (2022). Similar evidence also appears in Brazilian agribusiness firms, where total indebtedness is negatively associated with ROA and ROE, especially among family firms (Leite et al., 2017).

This inverse association should not be treated as universal. Peng et al. (2023), using a discrete choice experiment, show that higher expected profitability increases farmers' willingness to borrow under specific loan conditions. Rábek et al. (2021) likewise argue that leverage may improve return on equity when the return on total capital exceeds the cost of debt. In the listed-firm literature, Utami et al. (2020) report that profitability and business risk are among the main variables associated with capital structure in Indonesian agricultural companies, while Otekunrin et al. (2018) find that profitability is positively associated with shareholder equity and negatively associated with long-term debt in Nigerian agriculture and agro-allied firms. Xu et al. (2021) further show that, in Chinese agricultural listed companies,

total leverage and short-term leverage are negatively associated with performance, whereas long-term leverage is not significant. These results suggest that profitability matters, but its direction depends on whether the analysis concerns observed leverage, borrowing propensity, debt maturity, or financial performance.

A further refinement comes from Jin and Xu (2022), who show that intellectual capital is negatively associated with leverage in Chinese agricultural listed firms and that profitability partially mediates this relationship. This finding is relevant because it suggests that the link between profitability and debt is not only direct. It may also operate through less tangible productive capabilities that strengthen internal financing capacity and reduce dependence on external funds. For this reason, return and indebtedness are better interpreted as part of a broader financial mechanism involving internal accumulation, firm capabilities, and debt composition, rather than as a simple one-directional relationship.

3.2.1.2 Cost of capital and leverage

The literature also indicates that capital structure decisions are sensitive to the comparative cost of financing sources. In the more conventional empirical studies, debt becomes attractive when its cost remains below the return generated by invested capital, which is the condition emphasized by Rábek et al. (2021) in their analysis of sugar beet producers. Sanchez-Zazueta et al. (2013) reach a related conclusion in semi-intensive shrimp farming, where financing decisions depend on repayment conditions, interest burdens, and liquidity pressures across the production cycle. Schorr and Lips (2019), as discussed in the reviewed literature, reinforce this logic by relating leverage in Swiss dairy farms to the opportunity cost of equity and to value-based performance measures.

A smaller but relevant normative stream develops this issue more explicitly by proposing bounded or optimal leverage ranges. Kucera et al. (2021) argue that the ideal debt ratio and the credit absorption capacity of agricultural enterprises can be estimated through the relation between EVA Entity and EVA Equity. Valentinovna et al. (2019) and Bondina et al. (2022) likewise treat capital structure as an optimization problem in which the best mix of own and borrowed funds must balance return on equity and financial risk. These studies are more prescriptive than explanatory, and their empirical bases are narrower than those of panel studies, but they are useful because they show that the cost of capital is often discussed in agriculture as a threshold problem rather than as a simple linear determinant.

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3.2.1.3 Asset structure, liquidity, and internal financial capacity

Asset structure is another recurrent explanatory dimension, but again the evidence is mixed and context dependent. In the Visegrad countries, Fenyves et al. (2020) found that a higher share of fixed assets was associated with lower leverage in Hungary, which goes against the common expectation that tangibility facilitates borrowing. Topcu (2018) contributes to the same discussion by showing that the balance between current and fixed assets matters for financial risk and profitability. In listed agricultural firms from Republika Srpska, Grujić et al. (2024) also show that short-term debt ratios are shaped by asset composition, profitability, and firm size, which reinforces the idea that asset structure affects not only leverage levels, but also the form in which liabilities are arranged.

The literature is clearer when it turns to internal financial capacity. West et al. (2021) show that prior-period cash flow and equity are negatively associated with the debt-to-asset ratio, indicating that farms with stronger internal resources reduce their reliance on debt. Enjolras et al. (2021), however, find that liquidity is not statistically significant in explaining indebtedness in Polish farms, even under relatively high average liquidity. Simonovska et al. (2014) also show that liquidity and capital intensity matter differently across firms with positive and negative sales growth, which suggests that short-term financial capacity interacts with business performance conditions. In Malaysian agricultural listed firms, Zulkipli et al. (2019) further show that both leverage-related and liquidity-related ratios help explain profitability, although not all proxies are significant. These findings suggest that liquidity and cash flow should be interpreted less as universally signed determinants of leverage and more as indicators of resilience, timing, and borrowing capacity under heterogeneous operating conditions.

A related point emerges in studies that connect internal resources with investment demand. Kirechev (2023) shows that Bulgarian farms often rely primarily on own capital and maintain positive net working capital, but still increase external financing when investment in land, machinery, and fixed assets accelerates. This means that strong internal capacity does not necessarily eliminate borrowing. In some contexts, it coexists with selective use of debt when expansion needs exceed internally generated resources.

3.2.1.4 Speed of adjustment of capital structure

A final economic-financial dimension concerns the speed with which farms return to

target leverage after deviations. Here the literature points to substantial cross-country heterogeneity. Aderajew et al. (2019) show that Dutch farms adjust gradually and, in most farm types, relatively slowly, which they attribute to high adjustment costs, limited access to specialized agricultural finance, and the predominance of small and medium-sized farm businesses. Their results also show substantial variation across farm types, with horticulture adjusting faster than dairy, field crops, and livestock farms.

Comparative evidence reinforces that adjustment speed depends on financial and institutional conditions rather than on a single agricultural logic. West et al. (2021) estimate a much faster adjustment process for farm businesses in Western Australia, while Enjolras et al. (2021) report intermediate annual adjustment rates for Polish farms. Simonovska et al. (2014) complement this view by showing that capital structure decisions in Macedonian farm companies are shaped by liquidity constraints, sales growth, and transition-market rigidities, which affect how firms move toward their desired financial position. Overall, the literature suggests that capital structure in agriculture is shaped not only by the determinants observed at a given point in time, but also by the pace at which farms can reconfigure debt in response to shocks, opportunities, and borrowing constraints.

3.2.2 Farm Characteristics

Farm characteristics shape capital structure because they affect collateral capacity, internal accumulation, and access to external finance. Across the reviewed studies, the most recurrent dimensions are farm size, land-related characteristics, and growth opportunities. Their effects, however, are not uniform. Rather than acting as fixed determinants, these characteristics influence financing choices in ways that vary across countries, production structures, and borrowing conditions.

Farm size is one of the most frequently examined characteristics, but the evidence is mixed. In Poland and Australia, larger farms tend to show higher indebtedness, which is consistent with greater collateral capacity and stronger lender confidence. Fenyves et al. (2020) report a positive effect only in the Czech Republic, with no significant relationship in Hungary and Poland. Aderajew et al. (2019) add an important nuance by showing that size also operates as a financing signal, since larger farms adjust more quickly toward target leverage and face lower adjustment costs. By contrast, the Bulgarian evidence suggests that larger farms often rely heavily on own capital, indicating that scale may increase financing capacity without

necessarily increasing dependence on debt.

Land-related characteristics show a similar pattern. In Poland, land is negatively associated with indebtedness, whereas in Indonesia larger landholdings increase the likelihood of obtaining formal credit. In Afghanistan, farm size and land size also matter because the amount of formal credit increases with farm size, and the probability of formal credit constraints decreases with farm size, which indicates that land-related scale affects not only leverage capacity, but also entry into more formal financing channels (Moahid and Maharjan, 2020). In addition, Wu et al. (2014) indicate that farms operating on owned land tend to exhibit higher leverage than those on leased land. More broadly, the reviewed studies suggest that land matters less as a single variable than as a combination of ownership, scale, and collateral quality.

Growth opportunities are more consistently associated with debt use. In Poland, growth positively affects indebtedness across farm specializations, and comparative European evidence shows a positive association between growth opportunities and both total and long-term debt. Fenyves et al. (2020) report a similar pattern in Hungary and Poland, where fast-growing firms are more likely to seek external finance. Aderajew et al. (2019) reinforce this point by showing that farms with higher growth opportunities exhibit much higher adjustment speeds, which suggests that expansion affects not only leverage levels, but also the pace at which farms move toward desired capital structures.

The literature is also more precise when growth is linked to the composition of debt. Prager et al. (2018) show that land acquisition is associated with higher levels of long-term debt, whereas expansion strategies that do not include land acquisition rely more heavily on short-term debt to finance operational needs. This suggests that expansion tends to increase borrowing when internal funds are insufficient to sustain investment, but the maturity of debt depends on the nature of the assets being financed. Peripheral evidence from listed agricultural companies also suggests that sales growth may affect capital structure (Ichsani et al., 2021).

Overall, farm characteristics matter because they connect productive structure to financial possibilities. Size, land endowment, tenure conditions, and growth prospects do not produce stable effects across contexts, but they consistently shape how farms combine internal resources, collateral, and external funding under different structural and institutional conditions.

3.2.3 Financing Conditions, Risk, and Institutional Environment

Financing conditions, risk exposure, and institutional arrangements shape agricultural capital structure by influencing both the availability and the cost of external funds. Across the

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reviewed studies, this dimension appears through four closely connected mechanisms: access to credit, collateral requirements, exposure to risk and volatility, and the role of subsidies, taxation, and broader policy environments. Rather than affecting leverage independently, these mechanisms alter lender perceptions, borrowing incentives, and the set of feasible financing strategies available to farms and related organizations.

3.2.3.1 Access to credit and financial markets

Access to credit is a central condition for agricultural investment and productive continuity, but it remains uneven across contexts. In agriculture, formal financing is often constrained by seasonality, production risk, collateral limitations, and weak integration into broader capital markets. Under these conditions, access to credit depends not only on financial performance, but also on spatial location, institutional coverage, previous credit experience, and the availability of alternative lending channels (Moahid and Maharjan, 2020; Suryani et al., 2023; Kirechev, 2023).

The Afghan evidence illustrates this pattern clearly. Moahid and Maharjan (2020) show that poorer and more remote households are less likely to access formal credit and therefore rely more on informal finance, which is often based on trust and interpersonal relationships. In Indonesia, Suryani et al. (2023) likewise show that formal credit access is stratified by borrower characteristics and resource endowment, especially land size, education, and prior credit experience. In more production-specific settings, Sanchez-Zazueta et al. (2013) show that financing is also shaped by operational liquidity requirements across the production cycle, which reinforces the idea that agricultural credit constraints are not only financial, but also temporal and organizational.

3.2.3.2 Collateral and asset tangibility

Collateral is one of the clearest mechanisms through which financing conditions affect capital structure. Because agricultural activity is exposed to both systemic and farm-specific risks, lenders tend to privilege borrowers who can pledge tangible assets, especially land and fixed assets. In this sense, asset tangibility matters not only because it may support leverage statistically, but because it lowers perceived lending risk and expands borrowing capacity (Aderajew et al., 2019; Gostkowska-Drzewicka & Koralun-Bereźnicka, 2024).

At the same time, the role of collateral is not uniform. Mondelli and Klein (2014) show that financing choices in agricultural production also depend on asset characteristics and redeployability, particularly when private equity and debt are compared. Peng et al. (2023), in turn, show that stricter collateral requirements reduce farmers' willingness to borrow, which means that collateral can expand credit supply from the lender's perspective while simultaneously reducing credit demand from the borrower's perspective. Collateral should therefore be understood as a selective gateway to finance rather than as a uniformly positive determinant of leverage.

3.2.3.3 Risk and volatility

Risk enters financing decisions in agriculture more directly than in many other sectors. Climatic instability, output price fluctuations, and changing market conditions can alter both the demand for debt and lenders' willingness to supply it. The reviewed studies show that this relationship is not unidirectional. In some cases, higher business risk induces caution and lower attractiveness of debt. In others, it intensifies short-term borrowing because farms need liquidity to absorb shocks (Peng et al., 2023; Prager et al., 2018).

This conditionality appears in several ways. Prager et al. (2018) show that more leveraged farms relied more heavily on short-term debt after commodity price declines, indicating that price shocks can intensify financial vulnerability. Peng et al. (2023) show that higher business risk reduces the attractiveness of debt in farmers' borrowing choices. Adhikari and Khanal (2023), however, find that higher perceived business risk is associated with greater use of debt, savings, and debt-to-equity among small farms in the United States. Topcu (2018) adds that imbalances between fixed and current assets weaken liquidity and debt-servicing capacity, thereby increasing financial risk. In cooperative settings, Qian and Olsen (2020) further suggest that financing decisions cannot be separated from risk management architecture, since liquidity, payout, and retained capital jointly affect financial resilience. Risk, therefore, is not simply a contextual background. It is part of the financing logic itself.

3.2.3.4 Agricultural subsidies, fiscal policy, and the macroeconomic environment

Institutional conditions also affect capital structure through subsidies, taxation, and broader macroeconomic settings. Public support may ease financing constraints, but the reviewed studies do not support a simple conclusion that subsidies always reduce leverage. In

some contexts, subsidies strengthen liquidity and support self-financing. In others, they coexist with rising external borrowing, especially when farms expand investment or current operations. The effect is therefore conditional on how support enters the balance sheet and how it interacts with borrowing incentives (Enjolras et al., 2021; Kirechev, 2023; Vasilyeva, 2024).

This conditionality appears clearly across settings. In Poland, Enjolras et al. (2021) show that liquidity and support do not translate into a strong leverage effect. In Bulgaria, Kirechev (2023) shows that subsidies are relevant for investment and current activity, but equity remains the main source of financing in several farm segments. In the Russian Far East, Vasilyeva (2024) finds a positive association between subsidies and bank borrowing, while also suggesting that subsidized credit may contribute to soft budget constraints. In Brazilian agribusiness, Marongio et al. (2022) show that the composition of debt is heterogeneous and that subsidized credit does not automatically imply a lower overall cost of capital.

Nassim and Benraïss (2024) reinforce this conditional interpretation by showing that public subsidies may also moderate the relationship between debt and performance rather than simply easing financing constraints. Horák and Pavlová (2022) further suggest that the financing of agricultural transition processes, such as circular economy initiatives, is also linked to subsidy design and broader policy orientation. Comparative European evidence likewise shows that tax burden and macro-regional context matter. In Central and Eastern Europe, taxation is negatively associated with debt and appears linked to a more interventionist sectoral environment, whereas in Western Europe asset tangibility and liquidity operate differently in relation to long-term borrowing (Gostkowska-Drzewicka & Koralun-Bereźnicka, 2024).

Overall, the literature suggests that financing conditions in agriculture are shaped by the interaction between lender requirements, risk exposure, and institutional design. Credit access, collateral, volatility, and public policy should therefore be interpreted as interdependent dimensions of financial constraint and opportunity, rather than as isolated determinants of leverage.

3.2.4 Human, Organizational, and Management Factors

Human, organizational, and management factors matter because financing decisions in agriculture are not shaped only by balance-sheet conditions. They are also influenced by household strategies, managerial characteristics, production diversification, and the way producers interpret risk, opportunity, and credit access. In this part of the literature, the main

contribution is not to replace economic and financial determinants, but to show that financing choices are embedded in household-level adjustments and managerial practices.

3.2.4.1 Diversification and household financial strategies

The evidence on diversification suggests that it affects financing decisions through more than one channel. In Afghanistan, non-agricultural income reduces participation in both formal and informal credit, which indicates that external income can function as a liquidity buffer that lowers the immediate need to borrow. In the same setting, crop diversity increases participation in credit markets, suggesting that productive diversification does not necessarily replace external finance and may coexist with borrowing needs (Moahid and Maharjan, 2020).

Evidence from small farms in the United States points in a different but complementary direction. Adhikari and Khanal (2023) show that off-farm hours are negatively associated with savings use but positively associated with debt use and leverage-related outcomes. They also find that diversification is positively associated with savings use and negatively associated with debt use. Taken together, these results suggest that diversification and off-farm engagement should not be treated simply as substitutes for borrowing. Depending on the mechanism involved, they may either strengthen internal liquidity or support a broader financing mix that combines debt, savings, and off-farm income.

3.2.4.2 Demographic, socioeconomic, and managerial characteristics

Age, education, experience, and household characteristics also shape financing behavior, but their effects are not uniform. Wu et al. (2014) find a negative association between age and leverage, suggesting that older farmers tend to adopt more conservative financial positions. Suryani et al. (2023) likewise report that older cassava farmers are less likely to seek loans, while age, business experience, and land size are important in the choice of credit source. Education and credit experience also appear as relevant in this setting, especially for access to more formal sources of finance.

The evidence from small farms in the United States adds another layer to this discussion. Adhikari and Khanal (2023) find that younger operators use less savings than the oldest age group, while education is positively associated with debt financing. The same study also reports that household size affects savings use and leverage-related outcomes, and that computer use is

negatively associated with debt use. These findings suggest that managerial capability and organizational modernization do not produce a single financial outcome. Depending on the mechanism involved, they may reduce reliance on debt or reshape the balance between debt and internal resources.

Prager et al. (2018) add a temporal dimension to this discussion by showing that debt management also changes over the farm life cycle. Their evidence indicates that producers tend to prioritize the repayment of long-term debt, especially mortgages, which suggests that demographic and managerial factors should not be interpreted only as static individual characteristics. They also influence how debt is managed over time under changing financial conditions.

Cultural and institutional norms also influence these decisions. In Afghanistan, education reduces credit constraints, while religious education is associated with avoidance of formal credit. Access to extension services increases participation in formal finance (Moahid & Maharjan, 2020). These findings indicate that financial behavior in agriculture depends not only on economic factors, but also on institutional and cultural aspects.

Overall, the studies show that financing is partly organized at the household and farm operator level. Factors such as diversification, off-farm activities, age, education, experience, household composition, and technology use do not have a single directional effect on leverage, but shape how producers combine credit, savings, and internal resources under different conditions.

3.3 SUMMARY TABLE OF CAPITAL STRUCTURE DETERMINANTS

Table 2 synthesizes the main determinants of capital structure identified in the empirical literature, as well as the variables used to operationalize them. This systematization highlights the diversity of analytical approaches and shows that economic, financial, productive, institutional, and behavioral factors interact in explaining financing decisions in farms. The categories are analytical rather than mutually exclusive, so some variables, such as asset structure, growth, and liquidity, appear in more than one determinant group.Table 2. Synthesis of the main determinants of capital structure in farms and the variables used to operationalize them in the empirical literature.

Table 2. Synthesis of capital structure determinants in farms and their empirical operationalization

Determinant	Variable	Authors
Economic and financial variables and profitability	Equity; Profitability (ROA – Return on Assets); Return on Equity (ROE); Profitability and earnings volatility; Leverage ratio (debt-to-assets ratio; total, short-term and long-term debt); Cash flow; Cost of capital; Asset structure; Liquidity ratio; Sales growth; Net working capital; Leverage rate; Working capital; Tax shield.	Aderajew et al. (2019); Enjolras et al. (2021); Fenyves et al. (2020); Gostkowska-Drzewicka *and* Koralun-Bereźnicka (2024); Kirechev (2023); Peng et al. (2023); Prager et al. (2018); Rábek et al. (2021); Sanchez-Zazueta et al. (2013); Schorr and Lips (2019); Simonovska et al. (2014); Steklá and Grycová (2015); Topcu (2018); West et al. (2021); Wu et al. (2014).
Collateral and asset tangibility	Future cash flow generation capacity; Fixed assets (especially land); Asset tangibility.	Aderajew et al. (2019); Enjolras et al. (2021); Fenyves et al. (2020); Gostkowska-Drzewicka and Koralun-Bereźnicka (2024); Sanchez-Zazueta et al. (2013); Topcu (2018); Vasilyeva (2024); West et al. (2021); Wu et al. (2014).
Risk and volatility	Asset structure; Risk perception (subjective assessment of risk by managers or investors); Earnings variability; ROA volatility; Insurance; Commodity price fluctuations; Crop failure.	Adhikari and Khanal (2023); Enjolras et al. (2021); Gostkowska-Drzewicka and Koralun-Bereźnicka (2024); Moahid and Maharjan (2020); Peng et al. (2023); Prager et al. (2018); Sanchez-Zazueta et al. (2013); Topcu (2018).
Access to credit and financial markets	Financial health (profitability, default risk, collateral); Distance to the city.	Gostkowska-Drzewicka *and* Koralun-Bereźnicka (2024); Moahid and Maharjan (2020); Sanchez-Zazueta et al. (2013); Suryani et al. (2023).
Macroeconomic factors	Subsidies; Tax burden; GDP growth; Economic environment.	Enjolras et al. (2021); Gostkowska-Drzewicka and Koralun-Bereźnicka (2024); Kirechev (2023); Vasilyeva (2024); Wu et al. (2014).
Farm characteristics	Farm size (cultivated land area); Legal organizational form; Land tenure (owned or leased).	Aderajew et al. (2019); Adhikari and Khanal (2023); Enjolras et al. (2021); Fenyves et al. (2020); Kirechev (2023); Moahid and Maharjan (2020); Prager et al. (2018); Suryani et al. (2023); West et al. (2021); Wu et al. (2014).
Diversification and risk management	Crop diversification; Non-farm income.	Adhikari and Khanal (2023); Moahid and Maharjan (2020); Prager et al. (2018); Wu et al. (2014).

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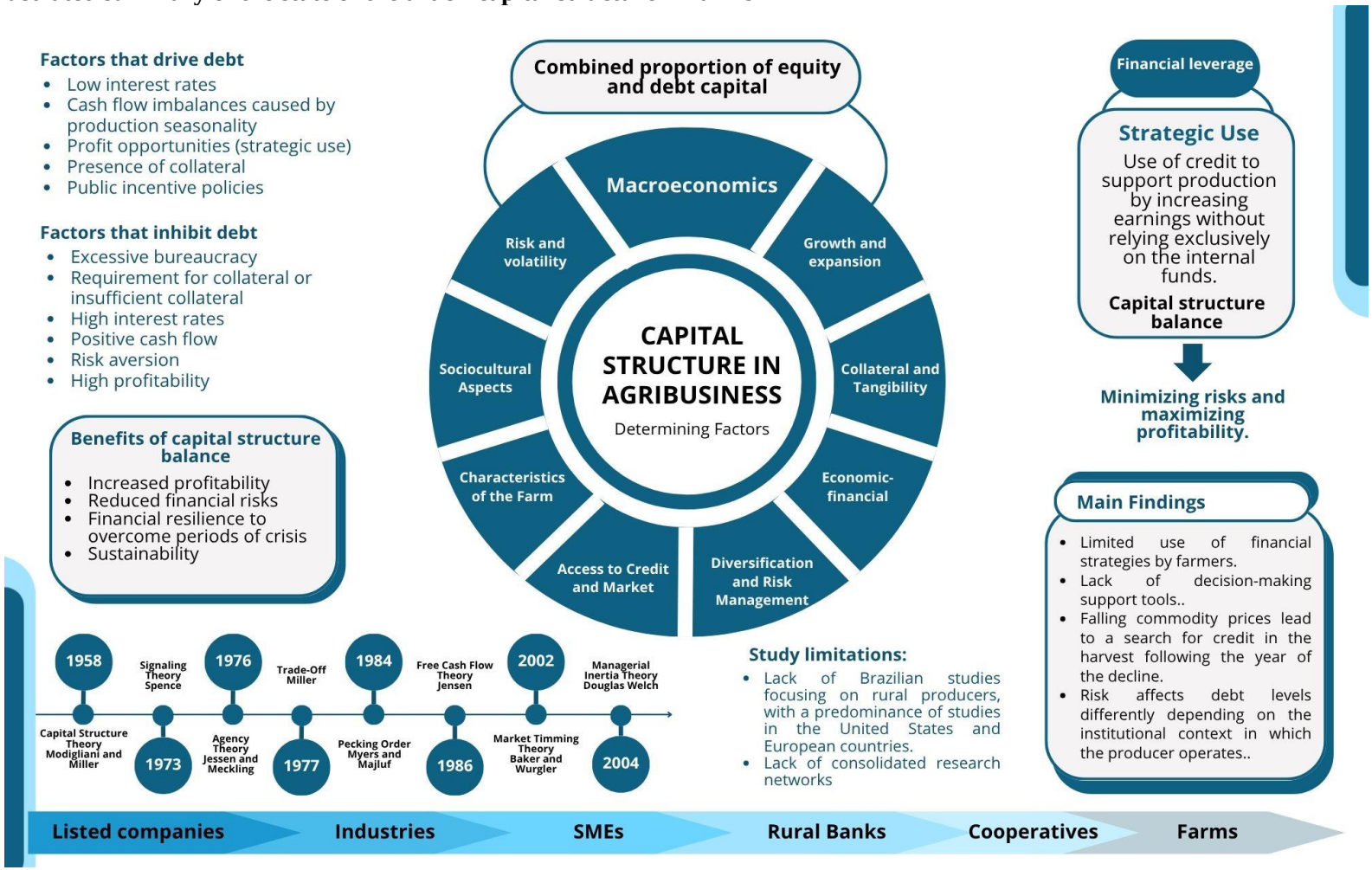
Demographic, socioeconomic, and cultural factors	Farmer's age; Education; Business experience; Credit experience; Participation in associations; Family characteristics; Religious beliefs; Technology use; Financial behavior (preference for equity).	Adhikari and Khanal (2023); Enjolras et al. (2021); Moahid and Maharjan (2020); Prager et al. (2018); Simonovska et al. (2014); Suryani et al. (2023); Wu et al. (2014).
Growth and expansion opportunities	Sales growth; Asset growth; Growth potential (ratio of investments to assets).	Aderajew et al. (2019); Enjolras et al. (2021); Fenyves et al. (2020); Gostkowska-Drzewicka and Koralun-Bereźnicka (2024); Kirechev (2023); Wu et al. (2014).

Source: Prepared by the authors.

3.4 ILLUSTRATED SUMMARY OF THE STATE OF THE ART

Figure 3 synthesizes the main findings of the review and provides an integrated illustration of the current state of the art on capital structure in agricultural farms.

Figure 3. Illustrated summary of the state of the art on capital structure in farms



Source: Prepared by the authors.

3.4 AGENDA FOR FUTURE RESEARCH

Table 3 consolidates a future research agenda derived from the reviewed studies and organizes the main directions in which the literature can advance. Rather than reiterating the most recurrent determinants of leverage, the agenda shifts attention to unresolved issues that continue to limit cumulative explanation, especially those related to behavioral finance, credit architecture, dynamic adjustment, cooperative governance, policy design, and contextual heterogeneity across regions and production systems. In this sense, the table is intended to identify not only promising topics, but also the types of questions and empirical strategies most likely to generate stronger and more internationally comparable evidence on agricultural capital structure.

Table 3. Future research agenda

Strategic research frontier	Why it remains unresolved	Illustrative research questions	Promising empirical designs and analytical directions	Indicative source anchors
1. Behavioral finance, perceived risk, and risk balancing	Financial decisions are still modeled mainly through objective indicators. Perceived risk, prudence, and financial behavior remain underexamined.	How do risk aversion, prudence, and financial literacy shape the choice between debt, savings, and internal funds? Does risk balancing vary by farm size?	Surveys, experiments, and panel data combining perceived risk, liquidity buffers, insurance, and leverage choices.	Adhikari and Khanal (2023); Moahid and Maharjan (2020); Peng et al. (2023)
2. Credit architecture, financial exclusion, and value-chain finance	Credit is often treated as simple access versus no access. The interaction between banks, informal lenders, suppliers, traders, and cooperatives is still poorly explained.	What pushes farmers toward informal or chain-based finance? Who becomes a discouraged borrower? When does value-chain finance reduce costs without increasing dependence?	Multi-actor designs linking farmer, lender, and chain data. Separate formal, semi-formal, and informal credit.	Kirechev (2023); Moahid and Maharjan, (2020); Sanchez-Zazueta et al. (2013); Suryani et al. (2023).
3. Dynamic capital structure and speed of adjustment	Firms do not adjust leverage at the same pace, but the reasons remain unclear. Adjustment costs, policy shifts, and production risks are rarely examined together.	What explains differences in speed of adjustment across countries and farm types? Do crises, interest rates, and climate shocks alter target adjustment?	Longitudinal panels, partial-adjustment models, and separate equations for short- and long-term debt.	Aderajew et al. (2019); Enjolras et al. (2021); West et al. (2021)
4. Cooperative capital architecture and member governance	Cooperative finance is still simplified as debt versus equity. Different forms of member capital have distinct governance	How do allocated equity, unallocated equity, patronage refunds, and revolving funds affect resilience, member	Panels by cooperative type with governance, redemption, member participation, and	Cheng and Katchova (2019); Grashuis (2019); Grashuis and

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	and performance implications.	commitment, and demutualization risk?	capital composition variables.	Jacobs (2024); Qian and Olsen, (2020); Rodrigues et al. (2018)
5. Leverage, profitability, and productivity	The effects of leverage on performance remain mixed. Evidence is negative in some cases and conditional or insignificant in others.	When does leverage improve profitability or productivity? Are there threshold effects? Does debt maturity matter more than total leverage?	Models linking leverage to ROA, ROE, productivity, yield, and land or labor performance, with non-linear tests.	Nassim and Benraïss (2024); Otekunrin et al., (2018); Utami et al., (2020); Xu et al. (2021)
6. Subsidies, directed credit, and public policy	Public support is often included as a control, but its financial role is still weakly specified.	When do subsidies crowd in credit and when do they crowd it out? Do subsidized liabilities lower effective capital costs?	Comparisons between subsidized and non-subsidized debt by rate, maturity, collateral, and investment purpose.	Enjolras et al. (2021); Kirechev (2023); Marongio et al. (2022); Nassim and Benraïss (2024)
7. Territorial, climatic, and production-system heterogeneity	Agricultural firms are often modeled as if they faced similar territorial and production conditions. Regional and system-specific variation remains underexplored.	Do determinants of leverage differ across crop, livestock, mixed, and dairy systems? Do rainfall regimes and remoteness alter financing choices?	Spatial panels, georeferenced data, and separate models by region, chain, and production system.	Kirechev (2023); Rábek et al. (2021); Rodrigues et al. (2018); Topcu (2018); West et al. (2021)
8. Assets, collateral, and new forms of capital	Research still relies heavily on broad tangibility measures. Asset specificity, land rights, and intangible resources remain insufficiently differentiated.	Which assets expand debt capacity most effectively? How do land ownership, collateral quality, and intellectual capital affect financing choices?	Disaggregated asset measures covering land, machinery, livestock, working capital, and intangibles.	Jin and Xu (2022); Kirechev (2023); Mondelli and Klein, (2014); Peng et al. (2023); Sanchez-Zazueta et al. (2013)
9. Underrepresented contexts and methodological renewal	Evidence remains concentrated in a limited set of countries and designs. Underrepresented regions and richer methods are still needed.	What changes when these questions are examined in Latin America, Brazil, Africa, and less studied Asian settings? What do mixed methods add?	Multicountry panels, mixed methods, case comparisons, and datasets built from notes, cooperative records, and policy archives.	Ichsani et al. (2021); Leite et al. (2017); Marongio et al. (2022); Otekunrin et al. (2018)

Source: Prepared by the authors. The agenda suggests that the field should move beyond repeated tests of conventional financial determinants and toward more conditional, dynamic, and context-sensitive explanations of financing decisions. The strongest opportunities for advancement lie in combining longitudinal and comparative designs with finer distinctions between debt types, member capital, subsidies, risk perceptions, and territorial conditions, particularly in underrepresented settings and organizational forms. A more mature research stream will depend on explaining when, for whom, and under which institutional and productive conditions specific financing arrangements enhance resilience, productivity, and organizational performance.

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4 CONCLUSION

This article examined how the literature has explained capital structure in agribusiness, with particular attention to the theories mobilized and to the determinants associated with financing decisions in farms and related organizations. To do so, it developed a systematic literature review and a focused content analysis of studies centered on farms and farmers. This strategy made it possible not only to identify recurrent explanatory patterns, but also to clarify how the field has been organized around distinct theoretical traditions and determinant groups.

The results suggest that capital structure in agriculture cannot be adequately explained through a single theoretical lens. The literature is theoretically plural, but unevenly consolidated. Pecking Order and Trade-Off remain the most recurrent frameworks, yet their explanatory usefulness varies according to liquidity conditions, debt maturity, adjustment dynamics, organizational form, and exposure to risk. Risk-based and optimal debt approaches become especially relevant when financing decisions are examined under uncertainty, while cooperative studies show that ownership rights, retained earnings, allocated and unallocated equity, and member-oriented governance alter the meaning of leverage itself. In this sense, the review indicates that agricultural capital structure is better understood as a context-dependent financial problem than as a simple sectoral application of general corporate finance theory.

The review also shows that the determinants of capital structure are distributed across four broad and interconnected dimensions. Economic and financial variables remain the dominant explanatory block, especially profitability, cost of capital, liquidity, internal financial capacity, and leverage adjustment. Farm characteristics, such as size, land endowment, tenure conditions, and growth opportunities, shape financing choices by affecting collateral capacity, internal accumulation, and borrowing needs. Financing conditions and institutional arrangements influence both the availability and the cost of external funds through credit access, collateral requirements, volatility, subsidies, and taxation. Human, organizational, and management factors add a further layer by showing that household composition, off-farm engagement, diversification, education, experience, and cultural norms also shape how producers combine debt, savings, and internal resources. These findings suggest that financing decisions in agriculture are structured by the interaction between productive conditions, financial constraints, organizational routines, and institutional environments, rather than by isolated variables acting independently.

These findings generate two main contributions. The first is theoretical. The article

provides a more integrated reading of how the literature has adapted, combined, or stretched existing capital structure theories in agricultural settings. The second is analytical. By systematizing the determinants examined in prior studies, the review clarifies where the literature has accumulated evidence and where explanation remains thin, especially in relation to behavioral finance, credit architecture, dynamic adjustment, cooperative governance, and contextual heterogeneity across territories and production systems. For researchers, this means that the next advances in the field are more likely to come from conditional, comparative, and longitudinal explanations than from repeated tests of the same conventional determinants. For practice, the results indicate that financing decisions should be treated as embedded in productive, institutional, and organizational conditions, especially by lenders, farm managers, cooperative leaders, and policymakers. More effective policies and managerial strategies will therefore depend on recognizing differences in credit access, collateral structures, risk exposure, ownership arrangements, and household financial behavior.

This study has limitations that should be acknowledged. The review was restricted to Scopus and Web of Science and to the set of articles selected under the adopted protocol, which may have excluded relevant studies. In addition, the analysis focused mainly on farms and farmers, although the broader mapping also includes other organizational forms. These limitations do not invalidate the conclusions, but indicate that the synthesis is stronger at the farm level. Nevertheless, the study provides a solid basis by identifying theoretical approaches, organizing determinants, and pointing to directions for advancing knowledge on capital structure in agriculture.

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