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Identifying Factors Affecting a Financial Optimization Model for Value and Supply Chain Management in Agricultural-Sector Development Companies Using a Multi-Grounded Approach

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ABSTRACT

The present study aimed to identify the factors affecting a financial optimization model for value and supply chain management in agricultural-sector development companies using a Multi-Grounded approach. The principal research problem concerns the inefficiency of existing financial structures, weak alignment between financial resources and development objectives, the complexity and uncertainty of the agricultural supply chain, and the need to create sustainable value for stakeholders. This study employed a qualitative approach. In the first step, the meta-synthesis method based on Sandelowski and Barroso's seven-step model was used to identify, classify, and synthesize the findings of previous studies. The initial search identified 617 studies, and after screening and quality assessment using the Critical Appraisal Skills Programme (CASP), 38 studies were selected for the final analysis. The resulting data were subsequently coded using grounded theory and integrated within a Multi-Grounded framework, while system dynamics was employed to explain causal relationships among the components. The findings indicated that the proposed model is centered on the core category of "integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies." The causal conditions include inefficient financial structures, weak long-term planning, dependence on governmental resources, financial-operational misalignment, supply chain complexity, and the necessity of digital transformation. Contextual conditions emphasize financial management maturity, managerial capabilities, a data-driven culture, development of information infrastructures, data integration, supply chain collaboration, and institutional support. In contrast, economic fluctuations, liquidity constraints, poor data quality, supply disruptions, the high cost of digital transformation, and organizational resistance were identified as intervening conditions. The principal strategies of the model include intelligent financial resource management, development of an intelligent supply chain, risk management and financial resilience, and the application of advanced analytics and artificial intelligence. Implementing these strategies can improve financial performance, enhance supply chain efficiency, increase economic resilience, promote sustainable development of the agricultural sector, and create value for stakeholders.

Keywords: Financial Optimization, Value Management, Agricultural Supply Chain, Development Companies, Risk Management, Sustainable Value Creation



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Introduction

Agricultural-sector development companies operate at the intersection of finance, production, logistics, market coordination, public policy, and sustainable development, which makes their supply chains substantially more complex than those of many conventional industries. Agricultural supply chains are characterized by seasonality, perishability, volatile demand, exposure to climatic and market shocks, fragmented production structures, heterogeneous stakeholders, and recurrent imbalances between financing needs and operational cash flows. These characteristics increase the importance of designing integrated management systems capable of simultaneously improving financial efficiency, supply chain coordination, resilience, and stakeholder value. In such environments, financial optimization cannot be treated merely as a matter of minimizing financing costs or maximizing short-term profitability; rather, it should be understood as an integrated managerial process through which financial resources, operational decisions, investment priorities, risk exposures, and development objectives are aligned across the supply chain. This perspective is particularly relevant for development-oriented companies whose missions extend beyond conventional profitability and include regional development, food security, producer support, employment, environmental sustainability, and long-term value creation. Research on agricultural product supply chains has repeatedly emphasized that structural fragmentation, market uncertainty, logistical inefficiency, and limited coordination among producers, intermediaries, and downstream actors create persistent managerial challenges that require systemic rather than isolated solutions (1). At the same time, studies of sustainable value creation have shown that supply chain performance increasingly depends on an organization's capacity to integrate economic, environmental, and social objectives into a coherent value-generating architecture (2).

The financial dimension of this challenge is especially significant because agricultural supply chains require continuous financing for procurement, inventories, transportation, storage, processing, credit transactions, infrastructure, and technological modernization. Weak financial planning, inadequate working-capital management, dependence on limited funding sources, high financing costs, and inefficient allocation of capital can disrupt the entire chain even when production capacity is technically adequate. Financial supply chain management therefore seeks to coordinate financial flows with material and information flows so that liquidity, credit, payment, inventory, and investment decisions reinforce rather than constrain operational performance. Recent work on financial supply chain optimization has demonstrated the potential of innovative mechanisms such as credit cashback arrangements to improve financial coordination and reduce inefficiencies in interorganizational transactions (3). Similarly, the emergence of intelligent financial trust assessment demonstrates a transition from traditional credit evaluation toward data-driven systems capable of integrating textual, behavioral, and structural information into supply chain financing decisions (4). These developments suggest that the financial architecture of a supply chain should be designed not only around accounting indicators but also around trust, information quality, creditworthiness, relational continuity, and the strategic allocation of financial resources.

Value management provides an important conceptual complement to financial optimization because it shifts attention from isolated financial outcomes toward the broader question of how organizations create and preserve value across interconnected stakeholders. In agricultural development companies, value creation may include shareholder returns, farmer income stability, customer satisfaction, reduced transaction costs, supply reliability, social legitimacy, environmental performance, and regional economic development. Sustainable value creation therefore requires a multidimensional approach in which profitability is pursued alongside resilience, efficiency,

innovation, and social responsibility. Evidence from value-added modeling in industrial supply chains indicates that sustainable development can be embedded into supply chain architecture when financial and operational decisions are evaluated through a broader value-creation lens (2). Green supply chain studies similarly show that supply chain practices can improve environmental and organizational performance when they are supported by innovation mechanisms and strategically coordinated across the organization (5). Furthermore, research on green supply chains demonstrates that knowledge management and organizational integration play mediating roles in translating supply chain practices into innovation performance, indicating that value creation depends not only on formal structures but also on organizational learning and cross-functional coordination (6).

The need for integrated optimization is intensified by the growing importance of sustainability. Sustainable supply chain management requires balancing economic performance with resource conservation, environmental protection, and social responsibility, while also maintaining operational continuity under conditions of uncertainty. System dynamics research has shown that the relationships between sustainable supply chain management and sustainable development are inherently recursive and time-dependent, meaning that isolated interventions may produce delayed or unintended consequences elsewhere in the system (7). In this regard, development companies in the agricultural sector require decision frameworks that capture feedback loops among investment, costs, productivity, resilience, market performance, and sustainability outcomes. Sustainable performance is also related to firm-specific risk, because organizational decisions regarding transactions, resource allocation, and stakeholder relationships can affect both resilience and exposure to financial instability (8). Consequently, a comprehensive financial optimization model should incorporate sustainability not as an external compliance criterion but as an endogenous component of financial and strategic decision-making.

Risk management constitutes another central requirement of such a model. Agricultural supply chains are exposed to multiple and interacting risks, including liquidity risk, credit risk, price volatility, inflation, exchange-rate fluctuations, supply disruption, infrastructure failure, quality problems, climate-related shocks, and demand instability. Traditional risk management approaches that evaluate these risks separately are increasingly inadequate because disruptions often propagate through financial and operational networks. Research on supply chain management risks emphasizes the necessity of identifying risk sources throughout the chain and developing coordinated mitigation mechanisms rather than reactive responses after disruption has occurred (9). Likewise, contemporary resilience research has moved beyond a narrow focus on recovery to consider multiple resilience capacities, including anticipation, absorption, adaptation, response, and recovery (10). For agricultural-sector development companies, these capacities have direct financial implications because insufficient liquidity, inflexible financing structures, or poorly diversified funding can reduce the organization's ability to absorb shocks and restore operations. Accordingly, financial resilience should be regarded as inseparable from supply chain resilience.

Digital transformation offers important opportunities for addressing these interconnected challenges. Digital technologies can improve information visibility, reduce decision latency, enhance forecasting accuracy, automate transactions, support predictive analytics, and facilitate real-time financial control. Research has shown that corporate digital transformation is shaped by institutional and economic incentives, suggesting that digitalization is not merely a technological issue but also a financial and strategic one (11). In smart supply chains, cyber-physical systems can support real-time decision-making by integrating physical operations with continuous data collection and computational analysis (12). This integration is especially valuable in agriculture, where production cycles, weather conditions, inventories, logistics, and market prices may change rapidly. The use of intelligent decision-

support tools can therefore enable companies to adjust procurement, financing, inventory, and distribution decisions more dynamically than conventional periodic planning systems allow.

The relationship between digitalization and resilience has also become a major area of investigation. Empirical studies indicate that digital transformation can strengthen supply chain resilience by improving visibility, coordination, information sharing, and network responsiveness (13). From a network perspective, digital technologies can enhance resilience by strengthening connections among supply chain actors, improving the speed and quality of information flows, and enabling more adaptive responses to disruption (14). These findings are particularly relevant to agricultural supply chains, where fragmented actors and uneven technological capabilities frequently hinder integrated planning. However, digital transformation also creates new challenges, including high implementation costs, inadequate data standards, cybersecurity risks, organizational resistance, and shortages of digital skills. Research on digital agriculture has highlighted the importance of building professional and institutional capabilities to overcome digital divides and prepare organizations for increasingly data-intensive agricultural systems (15). Therefore, a financial optimization model that incorporates digital transformation must also account for organizational readiness, workforce capabilities, technological infrastructure, and the economics of digital investment.

Artificial intelligence and advanced analytics further expand the possibilities of intelligent financial and supply chain management. Deep learning, predictive modeling, scenario analysis, and multi-objective optimization can enable decision-makers to evaluate complex trade-offs among cost, risk, liquidity, service levels, and resilience. An intelligent decision-making framework for financial risk management in smart supply chains illustrates how advanced analytical methods can be used to support simultaneous consideration of competing financial and operational objectives (16). These methods are particularly suitable for agricultural development companies because decision variables are often nonlinear and interdependent. For example, reducing inventory may lower holding costs but increase the probability of shortages; expanding supplier diversification may improve resilience but increase coordination costs; and increasing liquidity reserves may strengthen risk absorption while reducing the funds available for development investment. Advanced analytics can help managers evaluate such trade-offs more systematically and identify robust solutions rather than locally optimal decisions.

Transparency and traceability are also increasingly important in value-oriented supply chain management. In agricultural and food systems, stakeholders increasingly demand information about product origin, quality, safety, environmental impacts, and transactional integrity. Research on traceability implementation in food supply chains shows that organizational, technological, and interorganizational factors jointly determine the success of traceability capabilities (17). Blockchain technologies can strengthen this dimension by improving transparency and potentially increasing consumer trust and market outreach when supply chain information is credible and accessible (18). For development-oriented companies, traceability can support not only customer confidence but also financial governance by creating more reliable data on procurement, inventory movements, supplier performance, and contractual compliance. This information can improve credit decisions, risk assessment, auditing, and performance measurement, thereby linking information transparency directly to financial optimization.

Despite the advantages of intelligent systems, technological effectiveness depends heavily on organizational integration and institutional conditions. Data-driven models require reliable data, compatible information systems, managerial acceptance, and a culture that supports analytical decision-making. If organizations possess advanced technologies but continue to rely on fragmented decision structures or traditional managerial routines, expected

performance improvements may not materialize. Knowledge inertia and weakened competitiveness can further undermine organizational adaptation, particularly when firms fail to update assumptions, learning routines, and strategic practices in response to environmental change (19). Accordingly, financial optimization requires organizational learning alongside technological modernization. Managers must be capable of interpreting analytical outputs, integrating them with strategic objectives, and coordinating decisions across financial, operational, and supply chain functions.

Institutional and market conditions also shape the feasibility of integrated financial optimization. Agricultural markets are often affected by price interventions, government policies, financing regulations, subsidies, tax structures, and procurement arrangements. Research on guaranteed pricing in agricultural markets demonstrates that policy instruments may not always produce the intended market outcomes, highlighting the need to understand how regulatory interventions interact with actual market behavior (20). This is particularly relevant for development companies that operate within public-policy environments and may depend partly on governmental funding or institutional support. Financial models designed for such organizations must therefore consider policy uncertainty, regulatory constraints, marketization levels, and access to capital. Institutional context can affect not only financing availability but also incentives for innovation, digital transformation, and long-term investment.

Supply chain optimization itself is increasingly approached through hybrid analytical frameworks capable of identifying influential factors and modeling complex relationships. Fuzzy intelligent frameworks that integrate interpretive structural modeling and MICMAC analysis can help identify key variables, distinguish driving from dependent factors, and clarify structural relationships within complex supply chain systems (21). Similar approaches to green supply chain implementation emphasize the importance of identifying critical success factors rather than treating all variables as equally influential (22). These methods are useful because financial and supply chain systems contain numerous interconnected variables, but they may be insufficient when used alone to explain how empirical managerial experiences interact with theoretical evidence. A comprehensive model should therefore integrate systematic literature-based knowledge with contextual evidence obtained directly from experts and organizational actors.

The increasing convergence of Industry 4.0, circular economy principles, intelligent analytics, sustainability, and value-chain redesign reinforces the need for integrated theoretical frameworks. Research on Industry 4.0 and circular value chains indicates that digital technologies can reshape how value is generated, captured, and circulated across supply chain networks, especially when they are linked to sustainability objectives (23). In agriculture, this convergence can support precision resource allocation, waste reduction, improved information sharing, and more efficient coordination between production and downstream activities. However, realizing these benefits requires simultaneous consideration of financial feasibility, organizational capacity, technological infrastructure, and stakeholder incentives. The transformation of a traditional agricultural supply chain into an intelligent and sustainable network is therefore not simply an operational project; it is a financial, organizational, and institutional transformation.

Innovation-oriented supply chain design also requires attention to the interaction between risk-taking, information infrastructure, and collaborative structures. Agricultural-sector development companies frequently coordinate with producers, suppliers, logistics providers, financial institutions, government agencies, and market intermediaries. The effectiveness of this network depends on trust, information sharing, coordinated planning, and alignment of incentives. Intelligent financial systems can strengthen these relationships by increasing transparency, improving

payment reliability, facilitating credit assessment, and enabling better allocation of resources across supply chain members. At the same time, financial governance must prevent excessive risk exposure and ensure that innovation investments generate measurable operational and economic returns. The growing use of intelligent optimization tools, cyber-physical systems, digital trust indices, and advanced risk analytics reflects a broader movement toward integrated decision architectures in which finance is embedded directly into supply chain management rather than treated as a separate support function (4, 12, 16).

Another important issue concerns the balance between efficiency and resilience. Conventional optimization frequently emphasizes cost minimization, inventory reduction, and capital efficiency, while resilience requires redundancy, diversification, safety stocks, financial reserves, and flexible capacity. These objectives may conflict in the short term, which makes multi-objective decision-making essential. Resilience metrics provide a structured basis for assessing whether organizations possess sufficient capacities to anticipate, respond to, and recover from shocks (10). Digital transformation can reduce some of the apparent trade-offs by improving prediction, visibility, and coordination, allowing organizations to maintain resilience with less excessive redundancy (13, 14). Nevertheless, the optimal balance remains context-dependent, especially in agricultural supply chains characterized by uncertainty and resource constraints.

The literature also suggests that optimization should extend beyond internal organizational boundaries. Supply chain performance emerges from relationships among multiple actors, and financial optimization at the focal-company level may simply transfer costs or risks to suppliers, farmers, or customers if the system is not designed from a network perspective. Sustainable supply chain models therefore emphasize coordination, shared value, long-term relationships, and stakeholder integration (7). Green and sustainable supply chain research likewise indicates that organizational integration and innovation can improve system-level outcomes when practices are coordinated rather than fragmented (5, 6). Thus, a value-oriented financial model should assess not only internal profitability but also how financial policies influence supplier stability, customer value, production continuity, environmental outcomes, and social development.

Although the existing literature provides valuable insights into financial supply chains, digital transformation, sustainability, resilience, intelligent analytics, traceability, green supply chain management, and value creation, these streams are often examined separately. Studies tend to focus on individual dimensions such as financial mechanisms, technological tools, risk management, environmental performance, or digital capability without integrating them into a unified framework specifically tailored to agricultural-sector development companies. Moreover, many analytical models are developed from a predominantly theoretical or quantitative perspective and may not fully capture the contextual knowledge of managers and experts who deal with the operational realities of agricultural financing, market uncertainty, public-policy constraints, and supply chain fragmentation. This fragmentation in the literature creates a need for an integrative approach capable of combining accumulated theoretical evidence with empirical expert knowledge.

The Multi-Grounded approach is particularly suitable for addressing this need because it enables the integration of theoretical grounding derived from existing research with empirical grounding derived from qualitative field data. By combining meta-synthesis with grounded theory, it is possible to identify established constructs in the literature while remaining open to context-specific concepts emerging from expert experience. This dual grounding can reduce the risk of producing a model that is either theoretically comprehensive but contextually weak, or empirically rich but insufficiently connected to accumulated scientific knowledge. Furthermore, the inclusion of causal,

contextual, intervening, strategic, and outcome-related categories can support a more systematic explanation of how financial optimization is shaped by organizational, technological, economic, and supply chain conditions. This type of model is especially useful for agricultural-sector development companies because their performance depends on complex interactions among financing, value creation, digital capability, risk, sustainability, and operational coordination.

Accordingly, the present study aims to identify the factors affecting a financial optimization model for value and supply chain management in agricultural-sector development companies using a Multi-Grounded approach.

Methods and Materials

The present study is exploratory in terms of its objective, descriptive-analytical in nature, and classified as field research. This study employed a Multi-Grounded approach to identify the factors affecting a financial optimization model for value and supply chain management in agricultural-sector development companies. The results of the data analysis were initially examined using qualitative meta-synthesis to extract the main and subcategories from the literature. Subsequently, the interviews were coded based on the grounded theory method. Finally, an integrated model was developed using the Multi-Grounded method. In general, this method integrates grounded theory and meta-synthesis. In grounded theory, an empirical approach is followed based on in-depth interviews. In meta-synthesis, a theoretical approach is adopted through examination of the theories and findings of other researchers. Finally, based on internal grounded theory, theoretical and empirical data are integrated. Based on these three steps, Multi-Grounded Theory constitutes a comprehensive qualitative method. In the meta-synthesis section, studies published from 1991 to 2026 and from 2000 to 2026 were used, while in the grounded theory section, the study sample consisted of 25 empirical and theoretical experts in the field under investigation. Purposive sampling was employed, and based on the achievement of theoretical saturation, the number of experts was determined to be 25. Regarding the demographic characteristics of the experts, 18 were men and 7 were women. In terms of age, 3 experts were younger than 35 years, 10 were between 35 and 45 years old, and 12 were aged 45 years or older. Regarding educational attainment, 11 experts held master's degrees and 14 held doctoral degrees. Finally, 13 experts had between 10 and 20 years of work experience, while 12 had more than 20 years of work experience.

Table 1. Demographic Characteristics of the Experts

Demographic Characteristic	Category	Frequency	Percentage
Gender	Male	18	72%
	Female	7	28%
Age	Younger than 35 years	3	12%
	35–45 years	10	40%
	45 years and older	12	48%
Education	Master's degree	11	44%
	Doctoral degree	14	56%
Work Experience	10–20 years	13	52%
	More than 20 years	12	48%

Findings and Results

Initially, the qualitative meta-synthesis method was employed. The steps of this method are examined and analyzed below.

Step One: Formulating the Research Questions

The first step in the meta-synthesis method is the formulation of the research questions. These questions are generally formulated based on four parameters: what, who, when, and how. In categorizing and analyzing the dimensions of designing and developing a financial optimization model for value and supply chain management in agricultural-sector development companies, these parameters were addressed.

Table 2. Research Questions

Parameter	Research Question
What	Identification of the components involved in designing and developing a financial optimization model for value and supply chain management in agricultural-sector development companies
Who	Various sources, including books, articles, and reports, concerning the design and development of a financial optimization model for value and supply chain management in agricultural-sector development companies
When	All works published from 2000 to 2026
How	Thematic review, identification and note-taking, extraction of key points, and conceptual analysis

Step Two: Systematic Review of the Literature

There are numerous reputable scientific databases worldwide and in the online environment containing Persian- and English-language resources relevant to the present research. Accordingly, keywords related to meta-synthesis and grounded theory were searched in both Persian and English. Researchers generally provide an abstract at the beginning of their studies, followed by a set of keywords. Reputable scientific databases use these keywords to retrieve results relevant to other researchers' information needs. Studies related to the subject of the present research were therefore identified and searched using these keywords. The greater the precision in selecting keywords at this stage, the more accurately the retrieved studies correspond to the intended research topic. Table 3 presents the keywords considered appropriate for the subject of the present study.

Table 3. Keywords Used in the Second Step of the Meta-Synthesis Method

Persian Keyword	English Keyword
بهینه‌سازی مالی	Financial Optimization
مدیریت ارزش	Value Management
زنجیره تأمین بخش کشاورزی	Agricultural Supply Chain

In this section, various keywords used for the research and collection of the required information were identified, and various sources for data collection were also introduced. The present study exclusively used data and information available in the specified sources and databases. Google Scholar and ScienceDirect were also used for international studies. Accordingly, by reviewing and identifying studies through the National Library search system and other libraries, research institutes, and websites such as the Academic Center for Education, Culture and Research (ACECR), Noor Specialized Journals Database, scientific papers from national conferences, the national publications database, IranDoc, IEEE, and ScienceDirect, and by searching keywords related to the design and development of a financial optimization model for value and supply chain management in agricultural-sector development companies in the title field, a total of 617 studies were identified.

Step Three: Searching for and Selecting Appropriate Literature

In this section, the objective was to use the inclusion criteria to collect and identify only the materials and findings that were most appropriate for the purposes of the study. In simpler terms, a sampling procedure was conducted. In other words, if the statistical population consists of all studies conducted on a particular subject, the sample under investigation comprises the studies selected according to the inclusion criteria.

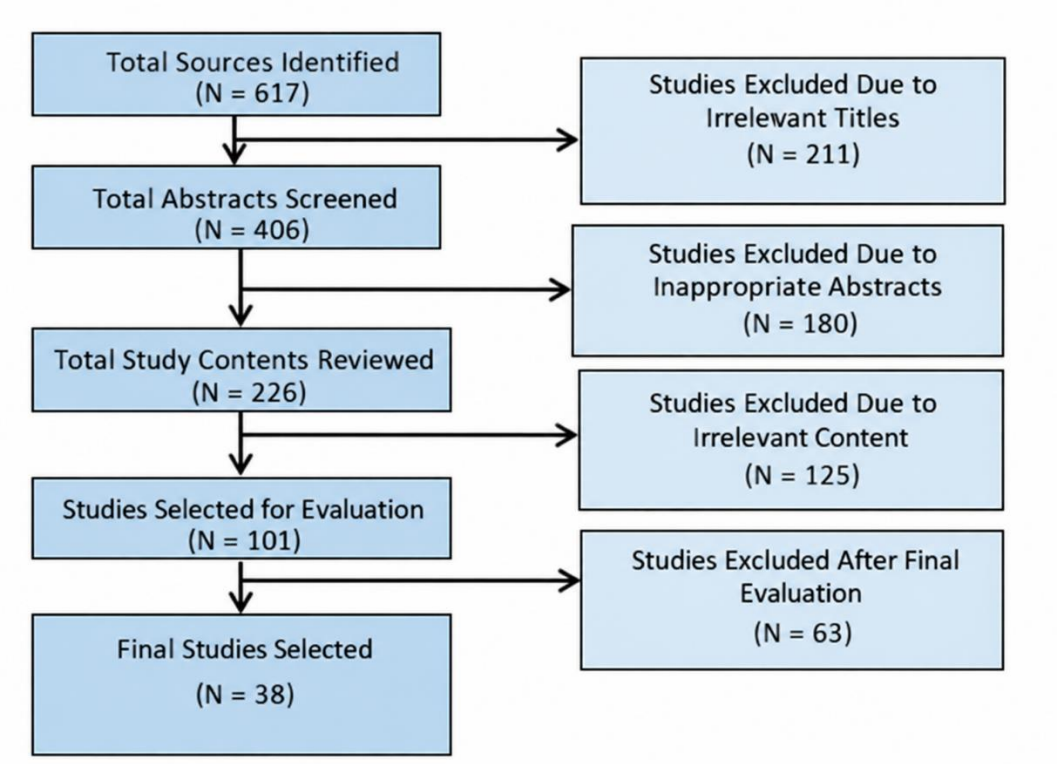


Figure 1. Review and Selection Process

At this stage, the 617 studies identified in the previous step were carefully reviewed through several stages to exclude studies that were inconsistent with the research questions and ultimately identify the most relevant studies for answering those questions. The review process included an examination of the titles, abstracts, research content, and research methodologies of the studies.

After studies inconsistent with the research objectives and questions were excluded, the researcher assessed the methodological quality of the remaining studies. The purpose of this stage was to exclude studies whose reported findings were not considered sufficiently trustworthy. The instrument commonly used to evaluate the quality of primary qualitative studies is the Critical Appraisal Skills Programme (CASP), which uses ten questions to assess the rigor, credibility, and significance of qualitative studies. These questions focus on the following issues: 1. research objectives, 2. methodological rationale, 3. research design, 4. sampling method, 5. data collection, 6. reflexivity, referring to the relationship between the researcher and participants, 7. ethical considerations, 8. rigor of data analysis, 9. clear presentation of findings, and 10. research value.

In the present study, this assessment was also performed for the extracted codes. The coding status of the first and second researchers was examined, and the results of analyses conducted using SPSS indicated that the significance value obtained for the kappa coefficient was less than 0.05. Therefore, the hypothesis of independence among the extracted codes was rejected, and the interdependence of the extracted codes was confirmed. Accordingly, it can be argued that the instrument used to extract the codes demonstrated adequate reliability.

Step Four: Extracting Information from the Selected Articles

Step Five: Analysis of the Qualitative Findings

During the analysis, the researcher searches for themes that emerge across the studies included in the meta-synthesis. This process is known as **thematic analysis**. Once the themes are identified and specified, the reviewer constructs categories and groups similar and related categories under a theme that best describes them. Themes

provide the foundation for developing explanations, models, theories, or hypotheses. In the present study, all factors extracted from the studies were initially treated as codes. Subsequently, based on the meaning of each factor, codes with similar conceptual meanings were grouped together. Similar concepts were then classified into explanatory categories so that the explanatory dimensions of the research indicators could ultimately be identified in terms of the main and subcomponents of the study.

Table 4. Main Categories and Corresponding Codes

Indicator	Component	Dimension
Alignment of financial policies with supply chain strategy	Financial Policies	Supply Chain Financial Governance
Budget flexibility	Financial Policies	Supply Chain Financial Governance
Financial discipline	Financial Policies	Supply Chain Financial Governance
Integration of financial decisions	Financial Policies	Supply Chain Financial Governance
Diversification of financial resources	Financing Structure	Supply Chain Financial Governance
Cost of capital	Financing Structure	Supply Chain Financial Governance
Access to financial resources	Financing Structure	Supply Chain Financial Governance
Sustainability of financial resources	Financing Structure	Supply Chain Financial Governance
Internal control system	Financial Control	Supply Chain Financial Governance
Monitoring of financial deviations	Financial Control	Supply Chain Financial Governance
Financial transparency	Financial Control	Supply Chain Financial Governance
Financial accountability	Financial Control	Supply Chain Financial Governance
Liquidity ratio	Liquidity Management	Working Capital Management
Operating cash flow	Liquidity Management	Working Capital Management
Free cash flow	Liquidity Management	Working Capital Management
Cash adequacy	Liquidity Management	Working Capital Management
Accounts receivable collection period	Receivables Management	Working Capital Management
Quality of receivables	Receivables Management	Working Capital Management
Receivables collection rate	Receivables Management	Working Capital Management
Default risk	Receivables Management	Working Capital Management
Inventory turnover	Inventory Management	Working Capital Management
Inventory value	Inventory Management	Working Capital Management
Inventory holding cost	Inventory Management	Working Capital Management
Stockout rate	Inventory Management	Working Capital Management
Economic Value Added (EVA)	Economic Value Creation	Financial Value Creation
Market value added	Economic Value Creation	Financial Value Creation
Economic profit	Economic Value Creation	Financial Value Creation
Return on capital	Economic Value Creation	Financial Value Creation
Investor satisfaction	Stakeholder Value	Financial Value Creation
Share value	Stakeholder Value	Financial Value Creation
Customer value	Stakeholder Value	Financial Value Creation
Social value	Stakeholder Value	Financial Value Creation
Profit margin	Sustainable Profitability	Financial Value Creation
Return on assets	Sustainable Profitability	Financial Value Creation
Return on capital	Sustainable Profitability	Financial Value Creation
Profitability growth	Sustainable Profitability	Financial Value Creation
Operational productivity	Operational Efficiency	Supply Chain Efficiency
Order cycle time	Operational Efficiency	Supply Chain Efficiency
On-time delivery rate	Operational Efficiency	Supply Chain Efficiency
Operational capacity	Operational Efficiency	Supply Chain Efficiency
Information sharing	Supply Chain Coordination	Supply Chain Efficiency
Supply-demand coordination	Supply Chain Coordination	Supply Chain Efficiency
Alignment of plans	Supply Chain Coordination	Supply Chain Efficiency
Collaboration among supply chain members	Supply Chain Coordination	Supply Chain Efficiency
Response speed	Supply Chain Agility	Supply Chain Efficiency

Supply flexibility	Supply Chain Agility	Supply Chain Efficiency
Supply chain recovery time	Supply Chain Agility	Supply Chain Efficiency
Adaptability	Supply Chain Agility	Supply Chain Efficiency
Liquidity risk	Financial Risk	Financial and Supply Chain Risk Management
Credit risk	Financial Risk	Financial and Supply Chain Risk Management
Interest rate risk	Financial Risk	Financial and Supply Chain Risk Management
Investment risk	Financial Risk	Financial and Supply Chain Risk Management
Supply disruption	Operational Risk	Financial and Supply Chain Risk Management
Equipment failure	Operational Risk	Financial and Supply Chain Risk Management
Operational delays	Operational Risk	Financial and Supply Chain Risk Management
Quality risk	Operational Risk	Financial and Supply Chain Risk Management
Supplier diversification	Supply Chain Resilience	Financial and Supply Chain Risk Management
Alternative capacity	Supply Chain Resilience	Financial and Supply Chain Risk Management
Supply network flexibility	Supply Chain Resilience	Financial and Supply Chain Risk Management
Recovery speed	Supply Chain Resilience	Financial and Supply Chain Risk Management
Warehouse development	Infrastructure Investment	Investment and Development
Transportation development	Infrastructure Investment	Investment and Development
Equipment development	Infrastructure Investment	Investment and Development
Development of processing infrastructure	Infrastructure Investment	Investment and Development
Digitalization	Technological Investment	Investment and Development
Automation	Technological Investment	Investment and Development
Data analytics	Technological Investment	Investment and Development
Artificial intelligence	Technological Investment	Investment and Development
Production capacity	Capacity Development	Investment and Development
Storage capacity	Capacity Development	Investment and Development
Distribution capacity	Capacity Development	Investment and Development
Processing capacity	Capacity Development	Investment and Development
Production cost	Cost Control	Cost Management and Financial Productivity
Transportation cost	Cost Control	Cost Management and Financial Productivity
Warehousing cost	Cost Control	Cost Management and Financial Productivity
Financial cost	Cost Control	Cost Management and Financial Productivity
Capital productivity	Resource Productivity	Cost Management and Financial Productivity
Human resource productivity	Resource Productivity	Cost Management and Financial Productivity
Equipment productivity	Resource Productivity	Cost Management and Financial Productivity
Energy productivity	Resource Productivity	Cost Management and Financial Productivity
Waste elimination	Cost Optimization	Cost Management and Financial Productivity
Reduction of transaction costs	Cost Optimization	Cost Management and Financial Productivity
Reduction of procurement costs	Cost Optimization	Cost Management and Financial Productivity
Reduction of inventory costs	Cost Optimization	Cost Management and Financial Productivity
Data integration	Information Systems	Financial and Information Intelligence
Information quality	Information Systems	Financial and Information Intelligence
Real-time information access	Information Systems	Financial and Information Intelligence
Information security	Information Systems	Financial and Information Intelligence
Demand forecasting	Intelligent Analytics	Financial and Information Intelligence
Financial analysis	Intelligent Analytics	Financial and Information Intelligence
Risk analysis	Intelligent Analytics	Financial and Information Intelligence
Management dashboard	Intelligent Analytics	Financial and Information Intelligence
Financial decision-support system	Intelligent Decision-Making	Financial and Information Intelligence
Forecasting models	Intelligent Decision-Making	Financial and Information Intelligence
Scenario analysis	Intelligent Decision-Making	Financial and Information Intelligence
Decision optimization	Intelligent Decision-Making	Financial and Information Intelligence
Revenue stability	Economic Sustainability	Financial Sustainability and Sustainable Development
Long-term profitability	Economic Sustainability	Financial Sustainability and Sustainable Development

Continuity of investment	Economic Sustainability	Financial Sustainability and Sustainable Development
Economic growth	Economic Sustainability	Financial Sustainability and Sustainable Development
Natural resource productivity	Environmental Sustainability	Financial Sustainability and Sustainable Development
Waste reduction	Environmental Sustainability	Financial Sustainability and Sustainable Development
Emission reduction	Environmental Sustainability	Financial Sustainability and Sustainable Development
Energy management	Environmental Sustainability	Financial Sustainability and Sustainable Development
Support for farmers	Social Responsibility	Financial Sustainability and Sustainable Development
Sustainable employment	Social Responsibility	Financial Sustainability and Sustainable Development
Equity in the supply chain	Social Responsibility	Financial Sustainability and Sustainable Development
Regional development	Social Responsibility	Financial Sustainability and Sustainable Development
Return on Investment (ROI)	Financial Performance	Supply Chain Financial Performance and Effectiveness
Return on Assets (ROA)	Financial Performance	Supply Chain Financial Performance and Effectiveness
Return on Equity (ROE)	Financial Performance	Supply Chain Financial Performance and Effectiveness
Profitability ratio	Financial Performance	Supply Chain Financial Performance and Effectiveness
Service level	Supply Chain Performance	Supply Chain Financial Performance and Effectiveness
Delivery accuracy	Supply Chain Performance	Supply Chain Financial Performance and Effectiveness
Customer satisfaction	Supply Chain Performance	Supply Chain Financial Performance and Effectiveness
Total supply chain cost	Supply Chain Performance	Supply Chain Financial Performance and Effectiveness
Growth in firm value	Developmental Performance	Supply Chain Financial Performance and Effectiveness
Market development	Developmental Performance	Supply Chain Financial Performance and Effectiveness
Export development	Developmental Performance	Supply Chain Financial Performance and Effectiveness
Sustainable competitive advantage	Developmental Performance	Supply Chain Financial Performance and Effectiveness

Step Six: Quality Control of the Analysis

The kappa method is a statistical decision-making tool used to examine the degree of agreement and consistency between two individuals, phenomena, or decision-making sources that have each been measured independently. The kappa coefficient is a numerical value ranging from $-1$to $+1$. Values closer to $+1$indicate stronger direct agreement, values closer to -1indicate inverse agreement, and values close to zero indicate a lack of agreement.

To assess the reliability of the meta-synthesis, one of the selected documents was provided to an expert. Following the assessment, the kappa coefficient was calculated as 0.711. A kappa coefficient greater than $0.60$is considered acceptable (Landis et al., 1977). Therefore, this value indicates the reliability of the research findings.

In addition, the following procedures were adopted in the present study to maintain the quality of the research:

Throughout the study, efforts were made to provide clear and explicit explanations regarding the research choices and procedures.

Both electronic and manual search strategies were employed to identify relevant studies.

Step Seven: Reporting the Research Findings

At this stage of the meta-synthesis method, the findings obtained from the preceding stages are presented. Subsequently, the research indicators are identified. From the indicators extracted from the relevant literature, synonymous and highly repetitive indicators were eliminated, and the remaining indicators were categorized into final categories. Ultimately, 5 categories and 64 codes were obtained. At this stage of coding, the main and subcategories of the study were identified. The scores obtained from the decision matrix concerning the issue under investigation are presented in the following table.

Table 5. Determination of the Degree of Importance and Emphasis in Previous Studies

Component	Frequency	$\sum P_{ij} \times knP_{ij}$	E_j	$d_j = 1 - E_j$	W_j
Financial Policies	23	0.6053	0.0835	0.9165	0.0328
Financing Structure	23	0.6053	0.0835	0.9165	0.0328
Financial Control	38	1.0000	0.0000	1.0000	0.0358
Liquidity Management	22	0.5789	0.0870	0.9130	0.0327
Receivables Management	22	0.5789	0.0870	0.9130	0.0327
Inventory Management	23	0.6053	0.0835	0.9165	0.0328
Economic Value Creation	23	0.6053	0.0835	0.9165	0.0328
Stakeholder Value	38	1.0000	0.0000	1.0000	0.0358
Sustainable Profitability	22	0.5789	0.0870	0.9130	0.0327
Operational Efficiency	22	0.5789	0.0870	0.9130	0.0327
Supply Chain Coordination	23	0.6053	0.0835	0.9165	0.0328
Supply Chain Agility	23	0.6053	0.0835	0.9165	0.0328
Financial Risk	38	1.0000	0.0000	1.0000	0.0358
Operational Risk	22	0.5789	0.0870	0.9130	0.0327
Supply Chain Resilience	22	0.5789	0.0870	0.9130	0.0327
Infrastructure Investment	23	0.6053	0.0835	0.9165	0.0328
Technological Investment	23	0.6053	0.0835	0.9165	0.0328
Capacity Development	38	1.0000	0.0000	1.0000	0.0358
Cost Control	22	0.5789	0.0870	0.9130	0.0327
Resource Productivity	22	0.5789	0.0870	0.9130	0.0327
Cost Optimization	23	0.6053	0.0835	0.9165	0.0328
Information Systems	23	0.6053	0.0835	0.9165	0.0328
Intelligent Analytics	38	1.0000	0.0000	1.0000	0.0358
Intelligent Decision-Making	22	0.5789	0.0870	0.9130	0.0327
Economic Sustainability	22	0.5789	0.0870	0.9130	0.0327
Environmental Sustainability	23	0.6053	0.0835	0.9165	0.0328
Social Responsibility	23	0.6053	0.0835	0.9165	0.0328
Financial Performance	38	1.0000	0.0000	1.0000	0.0358
Supply Chain Performance	22	0.5789	0.0870	0.9130	0.0327
Developmental Performance	22	0.5789	0.0870	0.9130	0.0327

After reviewing the literature through meta-synthesis, empirical data were collected and analyzed using grounded theory in this section.

The research data were analyzed through a coding process based on the systematic grounded theory design developed by Strauss and Corbin (1998). Coding is an analytical process through which data are conceptualized and linked together to construct theory. Within this process, data analysis is not conducted separately from data collection and sampling.

In the grounded theory research design, data analysis is conducted through open, axial, and selective coding. The interview questions were as follows:

How do you evaluate the most important financial challenges and issues faced by agricultural-sector development companies in relation to resource financing, cost management, and economic value creation?

What factors have led agricultural-sector development companies to require a comprehensive financial optimization model for value and supply chain management?

What is the current status of the financing structure in agricultural-sector development companies, and what weaknesses and challenges exist in this area?

From your perspective, what components should be considered in a financial optimization model to enhance value creation and improve agricultural supply chain performance?

How do you evaluate the role of liquidity management, working capital, cost control, and financial resource management in the success of agricultural-sector development companies?

What organizational, managerial, and structural factors affect the quality of financial and investment decisions in agricultural-sector development companies?

How can a balance be established among financial objectives, development objectives, sustainability requirements, and the needs of the agricultural supply chain?

What capabilities and infrastructures are required to implement an intelligent and value-based financial system in agricultural-sector development companies?

How can emerging technologies such as data analytics, artificial intelligence, information systems, and decision-support systems contribute to the optimization of financial decisions and supply chain management?

What environmental, economic, political, and institutional factors can affect the successful implementation of the financial optimization model in agricultural-sector development companies?

What are the most important financial, operational, and supply chain risks in agricultural-sector development companies, and what solutions do you recommend for managing them?

What factors contribute to enhancing the resilience of agricultural supply chains against market fluctuations, resource constraints, and operational disruptions?

What strategies do you recommend for increasing resource productivity, reducing costs, improving financial performance, and increasing the economic value of agricultural-sector development companies?

In your view, what consequences could implementation of a financial optimization model have for financial performance, supply chain performance, sustainable development, and the competitive advantage of companies?

If you were to design a comprehensive model for financial optimization and value management within the supply chain of agricultural-sector development companies, what dimensions, components, and indicators would you consider essential?

During the open coding stage, the data obtained from the interviews were first carefully read, reviewed, and analyzed. Concepts were then extracted from the data, and appropriate labels were assigned to data segments that were conceptually similar. For open coding, all data were entered into ATLAS.ti software. In this process, the use of specialized software such as ATLAS.ti is highly useful for data management and analysis. Such software enables interview data to be effectively analyzed and managed, while the resulting conceptual codes can be used for reporting and further analyses. Throughout this process, the researcher adhered to theoretical sensitivity and the principles of scientific inquiry and attempted to maintain neutrality and data credibility in order to prevent discrimination or bias in the analyses and to ensure greater accuracy and validity of the results.

The open coding of the factors constituting the grounded theory model is presented below.

Table 6. Open Codes

Initial Category (Grounded Theory)	Related Indicator	Extraction Technique
Designing an integrated financial system	Alignment of financial policies with supply chain strategy	Meta-synthesis + Grounded Theory
Developing a data-driven financial decision-making framework	Integration of financial decisions	Meta-synthesis + Grounded Theory
Developing an optimal financial resource allocation model	Budget flexibility	Grounded Theory
Establishing a balance between financial and development objectives	Financial discipline	Meta-synthesis + Grounded Theory
Establishing an economic value assessment system	Economic Value Added (EVA)	Meta-synthesis
Optimizing financial resource allocation	Diversification of financial resources	Meta-synthesis + Grounded Theory
Managing capital and financial resources	Cost of capital	Meta-synthesis
Financial sustainability	Access to financial resources	Meta-synthesis + Grounded Theory
Establishing a sustainable financing system	Sustainability of financial resources	Meta-synthesis + Grounded Theory
Organizational financial control system	Internal control system	Meta-synthesis + Grounded Theory
Monitoring financial performance	Monitoring of financial deviations	Meta-synthesis
Transparent financial governance	Financial transparency	Meta-synthesis + Grounded Theory
Organizational accountability	Financial accountability	Grounded Theory
Cash flow management	Liquidity ratio	Meta-synthesis
Working capital management	Operating cash flow	Meta-synthesis + Grounded Theory
Control of cash resources	Free cash flow	Meta-synthesis
Ensuring payment capacity	Cash adequacy	Meta-synthesis
Customer credit management	Accounts receivable collection period	Meta-synthesis
Controlling the quality of current assets	Quality of receivables	Meta-synthesis + Grounded Theory
Reduction of overdue receivables	Receivables collection rate	Meta-synthesis + Grounded Theory
Credit risk management	Default risk	Meta-synthesis
Optimization of inventory management	Inventory turnover	Meta-synthesis
Valuation of current assets	Inventory value	Meta-synthesis
Control of holding costs	Inventory holding cost	Meta-synthesis + Grounded Theory
Balancing inventory supply and demand	Stockout rate	Meta-synthesis + Grounded Theory
Economic value creation	Market value added	Meta-synthesis
Increasing economic profit	Economic profit	Meta-synthesis + Grounded Theory
Improving return on investment	Return on capital	Meta-synthesis
Creating value for investors	Investor satisfaction	Grounded Theory
Developing market value	Share value	Meta-synthesis
Multilateral value creation	Customer value	Meta-synthesis + Grounded Theory
Social responsibility and public value	Social value	Meta-synthesis + Grounded Theory
Developing sustainable profitability	Profit margin	Meta-synthesis
Sustainable financial performance	Return on assets	Meta-synthesis
Capital productivity	Return on capital	Meta-synthesis
Organizational financial growth	Profitability growth	Meta-synthesis + Grounded Theory
Improving operational processes	Operational productivity	Meta-synthesis + Grounded Theory
Increasing operational speed	Order cycle time	Meta-synthesis
Enhancing service delivery capability	On-time delivery rate	Meta-synthesis

Developing operational capacity	Operational capacity	Meta-synthesis + Grounded Theory
Supply chain information coordination	Information sharing	Meta-synthesis + Grounded Theory
Demand and supply management	Supply-demand coordination	Meta-synthesis + Grounded Theory
Alignment of supply chain activities	Alignment of plans	Grounded Theory
Network collaboration	Collaboration among supply chain members	Meta-synthesis + Grounded Theory
Supply chain agility	Response speed	Meta-synthesis + Grounded Theory
Supply flexibility	Supply flexibility	Meta-synthesis + Grounded Theory
Recovery after disruption	Supply chain recovery time	Meta-synthesis + Grounded Theory
Organizational adaptability	Adaptability	Grounded Theory
Financial risk management	Liquidity risk	Meta-synthesis
Credit risk control	Credit risk	Meta-synthesis
Financial market risk management	Interest rate risk	Meta-synthesis
Investment risk assessment	Investment risk	Meta-synthesis
Managing supply disruptions	Supply disruption	Meta-synthesis + Grounded Theory
Operational risk control	Equipment failure	Meta-synthesis + Grounded Theory
Reducing process delays	Operational delays	Meta-synthesis + Grounded Theory
Ensuring supply chain quality	Quality risk	Meta-synthesis + Grounded Theory
Diversifying the supply network	Supplier diversification	Meta-synthesis + Grounded Theory
Establishing alternative capacity	Alternative capacity	Grounded Theory
Supply network flexibility	Supply network flexibility	Meta-synthesis + Grounded Theory
Increasing recovery speed	Recovery speed	Meta-synthesis + Grounded Theory
Developing supply chain infrastructure	Warehouse development	Meta-synthesis
Developing logistics infrastructure	Transportation development	Meta-synthesis
Equipment modernization	Equipment development	Meta-synthesis + Grounded Theory
Developing agricultural processing	Development of processing infrastructure	Meta-synthesis + Grounded Theory
Organizational digital transformation	Digitalization	Meta-synthesis + Grounded Theory
Intelligent process automation	Automation	Meta-synthesis + Grounded Theory
Intelligent data analysis	Data analytics	Meta-synthesis + Grounded Theory
Artificial-intelligence-based decision-making	Artificial intelligence	Meta-synthesis + Grounded Theory
Increasing production capacity	Production capacity	Meta-synthesis + Grounded Theory
Developing storage capacity	Storage capacity	Meta-synthesis + Grounded Theory
Developing the distribution network	Distribution capacity	Meta-synthesis + Grounded Theory
Developing product processing	Processing capacity	Meta-synthesis + Grounded Theory
Controlling operating costs	Production cost	Meta-synthesis
Logistics optimization	Transportation cost	Meta-synthesis
Supply chain cost management	Warehousing cost	Meta-synthesis
Reducing the cost of capital	Financial cost	Meta-synthesis
Increasing capital productivity	Capital productivity	Meta-synthesis + Grounded Theory

Human resource productivity	Human resource productivity	Meta-synthesis + Grounded Theory
Equipment productivity	Equipment productivity	Meta-synthesis
Energy productivity	Energy productivity	Meta-synthesis + Grounded Theory
Eliminating non-value-added activities	Waste elimination	Meta-synthesis + Grounded Theory
Reducing transaction costs	Reduction of transaction costs	Meta-synthesis + Grounded Theory
Reducing procurement costs	Reduction of procurement costs	Meta-synthesis + Grounded Theory
Controlling inventory costs	Reduction of inventory costs	Meta-synthesis
Integrating information systems	Data integration	Meta-synthesis + Grounded Theory
Improving organizational data quality	Information quality	Meta-synthesis + Grounded Theory
Rapid access to managerial information	Real-time information access	Meta-synthesis + Grounded Theory
Protecting information assets	Information security	Meta-synthesis
Developing management information systems	Financial information system	Meta-synthesis + Grounded Theory
Developing intelligent financial analytics	Financial analysis	Meta-synthesis + Grounded Theory
Identifying and assessing risks	Risk analysis	Meta-synthesis + Grounded Theory
Developing managerial monitoring tools	Management dashboard	Meta-synthesis + Grounded Theory
Developing decision-support systems	Financial decision-support system	Meta-synthesis + Grounded Theory
Forecasting financial and market trends	Forecasting models	Meta-synthesis + Grounded Theory
Evaluating managerial alternatives	Scenario analysis	Meta-synthesis + Grounded Theory
Optimizing managerial choices	Decision optimization	Meta-synthesis + Grounded Theory
Forecasting market behavior	Demand forecasting	Meta-synthesis + Grounded Theory
Data-driven decision-making	Intelligent analytics	Meta-synthesis + Grounded Theory
Organizational financial knowledge management	Learning from financial data	Grounded Theory
Developing managers' analytical capabilities	Information-analysis capability	Grounded Theory
Stability of economic performance	Revenue stability	Meta-synthesis + Grounded Theory
Generating long-term profit	Long-term profitability	Meta-synthesis + Grounded Theory
Continuity of development investment	Continuity of investment	Meta-synthesis + Grounded Theory
Regional economic development	Economic growth	Meta-synthesis + Grounded Theory
Sustainable resource utilization	Natural resource productivity	Meta-synthesis + Grounded Theory
Supply chain waste management	Waste reduction	Meta-synthesis + Grounded Theory
Developing cleaner production	Emission reduction	Meta-synthesis + Grounded Theory
Energy consumption management	Energy management	Meta-synthesis + Grounded Theory
Supporting local stakeholders	Support for farmers	Grounded Theory
Developing social responsibility	Sustainable employment	Meta-synthesis + Grounded Theory
Equity in supply chain interactions	Equity in the supply chain	Grounded Theory
Balanced regional development	Regional development	Meta-synthesis + Grounded Theory

Sustainable supply chain governance	Organizational social responsibility	Meta-synthesis + Grounded Theory
Sustainable agricultural development	Environmental sustainability	Meta-synthesis + Grounded Theory
Evaluating return on investment	Return on Investment (ROI)	Meta-synthesis
Measuring asset productivity	Return on Assets (ROA)	Meta-synthesis
Evaluating shareholders' performance	Return on Equity (ROE)	Meta-synthesis
Measuring profit-generating capacity	Profitability ratio	Meta-synthesis
Enhancing supply chain service quality	Service level	Meta-synthesis + Grounded Theory
Increasing delivery-operation accuracy	Delivery accuracy	Meta-synthesis + Grounded Theory
Increasing supply chain customer satisfaction	Customer satisfaction	Meta-synthesis + Grounded Theory
Reducing total supply chain cost	Total supply chain cost	Meta-synthesis + Grounded Theory
Increasing organizational value	Growth in firm value	Meta-synthesis + Grounded Theory
Developing target markets	Market development	Meta-synthesis + Grounded Theory
Entering international markets	Export development	Meta-synthesis + Grounded Theory
Creating sustainable differentiation	Sustainable competitive advantage	Meta-synthesis + Grounded Theory
Increasing organizational brand value	Brand value	Grounded Theory
Strengthening the company's competitive position	Competitive position	Grounded Theory
Increasing trust among supply chain partners	Interorganizational trust	Grounded Theory

The principal objective of this stage was to establish relationships among the concepts generated during open coding. Accordingly, this coding stage was organized around the central phenomenon of "designing a model for the design and development of financial optimization for value and supply chain management in agricultural-sector development companies." This concept was selected as the central category and positioned at the center of the model because its effects could be clearly observed in the data and in the interviewees' statements. Therefore, this concept served as the reference point for organizing the other data in relation to it. During axial coding, the categories extracted from open coding and secondary coding were classified into six categories: the core category, causal conditions, intervening conditions, contextual conditions, strategies, and consequences. In accordance with the research objective, the core category was identified as the design and development of a financial optimization model for value and supply chain management in agricultural-sector development companies. The formation of the causal, intervening, contextual, strategic, and outcome-related categories is presented in the following table and diagram.

Finally, the principal stage of grounded theory analysis is selective coding, in which the researcher develops a theory based on the results of open and axial coding. In this section, the roots and reasons underlying the formation of these conditions are explained in the form of theoretical memos containing the analyst's reflections and interpretations concerning the research conditions.

Table 7. Theoretical Memo and Root-Cause Analysis of the Research Conditions

Initial Category	Axial Category	Selective Category
Designing an integrated financial system	Intelligent financial governance of the supply chain	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Developing a data-driven financial decision-making framework	Intelligent financial governance of the supply chain	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies

Developing an optimal financial resource allocation model	Intelligent financial governance of the supply chain	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Establishing a balance between financial and development objectives	Intelligent financial governance of the supply chain	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Establishing an economic value assessment system	Intelligent financial governance of the supply chain	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Integrating financial and supply chain decisions	Value-Oriented Financial Optimization Model	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Optimizing financial resource allocation	Value-Oriented Financial Optimization Model	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Value management throughout the supply chain	Value-Oriented Financial Optimization Model	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Coordinating investment and operational performance	Value-Oriented Financial Optimization Model	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Establishing a balance among cost, value, and risk	Value-Oriented Financial Optimization Model	Integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies
Weak long-term financial planning	Inefficiency of Existing Financial Structures	Causal Conditions
Lack of alignment between financial resources and development objectives	Inefficiency of Existing Financial Structures	Causal Conditions
Heavy dependence on governmental financial resources	Inefficiency of Existing Financial Structures	Causal Conditions
Weak cost-control system	Inefficiency of Existing Financial Structures	Causal Conditions
Lack of a comprehensive capital management model	Inefficiency of Existing Financial Structures	Causal Conditions
Fluctuations in product supply and demand	Complexities of the Agricultural Supply Chain	Causal Conditions
Uncertainty in agricultural markets	Complexities of the Agricultural Supply Chain	Causal Conditions
Fragmentation of supply chain actors	Complexities of the Agricultural Supply Chain	Causal Conditions
Weak coordination among production, distribution, and the market	Complexities of the Agricultural Supply Chain	Causal Conditions
Increased operational supply chain risks	Complexities of the Agricultural Supply Chain	Causal Conditions
Focus on economic value creation	Necessity of Sustainable Economic Value Creation	Causal Conditions
Increasing investment productivity	Necessity of Sustainable Economic Value Creation	Causal Conditions
Enhancing sustainable profitability	Necessity of Sustainable Economic Value Creation	Causal Conditions
Improving return on assets	Necessity of Sustainable Economic Value Creation	Causal Conditions
Developing financial competitive advantage	Necessity of Sustainable Economic Value Creation	Causal Conditions
Need for intelligent financial analytics	Digital Transformation in Financial Management	Causal Conditions
Use of agricultural big data	Digital Transformation in Financial Management	Causal Conditions
Development of decision-support systems	Digital Transformation in Financial Management	Causal Conditions
Application of financial artificial intelligence	Digital Transformation in Financial Management	Causal Conditions
Digitalization of financial processes	Digital Transformation in Financial Management	Causal Conditions

Organizational financial management maturity	Organizational and Managerial Capabilities	Contextual Conditions
Managers' financial analytical capabilities	Organizational and Managerial Capabilities	Contextual Conditions
Data-driven decision-making culture	Organizational and Managerial Capabilities	Contextual Conditions
Organizational financial learning	Organizational and Managerial Capabilities	Contextual Conditions
Development of specialized human capital	Organizational and Managerial Capabilities	Contextual Conditions
Development of financial information systems	Information and Technology Infrastructure	Contextual Conditions
Integration of supply chain data	Information and Technology Infrastructure	Contextual Conditions
Implementation of ERP systems	Information and Technology Infrastructure	Contextual Conditions
Establishment of management dashboards	Information and Technology Infrastructure	Contextual Conditions
Rapid access to decision-making information	Information and Technology Infrastructure	Contextual Conditions
Interaction between producers and development companies	Supply Chain Collaboration Structure	Contextual Conditions
Information sharing among supply chain members	Supply Chain Collaboration Structure	Contextual Conditions
Long-term collaborative contracts	Supply Chain Collaboration Structure	Contextual Conditions
Coordination of operational processes	Supply Chain Collaboration Structure	Contextual Conditions
Development of the supplier network	Supply Chain Collaboration Structure	Contextual Conditions
Government policy support	Institutional and Policy Environment	Contextual Conditions
Financial laws and regulations	Institutional and Policy Environment	Contextual Conditions
Agricultural development policies	Institutional and Policy Environment	Contextual Conditions
Access to capital resources	Institutional and Policy Environment	Contextual Conditions
Economic stability of the operating environment	Institutional and Policy Environment	Contextual Conditions
Exchange-rate fluctuations	Economic and Financial Risks	Intervening Conditions
Inflation and increased input costs	Economic and Financial Risks	Intervening Conditions
Liquidity constraints	Economic and Financial Risks	Intervening Conditions
Credit risk	Economic and Financial Risks	Intervening Conditions
Instability of financial markets	Economic and Financial Risks	Intervening Conditions
Disruption in raw-material supply	Supply Chain Constraints	Intervening Conditions
Weak transportation infrastructure	Supply Chain Constraints	Intervening Conditions
Unpredictability of demand	Supply Chain Constraints	Intervening Conditions
Dependence on a limited number of suppliers	Supply Chain Constraints	Intervening Conditions
Vulnerability of the supply network	Supply Chain Constraints	Intervening Conditions
Poor quality of financial data	Technological and Data Factors	Intervening Conditions
Lack of data standards	Technological and Data Factors	Intervening Conditions
Weak information security	Technological and Data Factors	Intervening Conditions
Employee resistance to technology	Technological and Data Factors	Intervening Conditions

High cost of digital transformation	Technological and Data Factors	Intervening Conditions
Organizational resistance	Managerial and Human Factors	Intervening Conditions
Weak managerial analytical skills	Managerial and Human Factors	Intervening Conditions
Organizational conflicts of interest	Managerial and Human Factors	Intervening Conditions
Weak innovation culture	Managerial and Human Factors	Intervening Conditions
Traditional decision-making	Managerial and Human Factors	Intervening Conditions
Performance-based budgeting	Intelligent Financial Resource Management	Strategies
Cash flow optimization	Intelligent Financial Resource Management	Strategies
Working capital management	Intelligent Financial Resource Management	Strategies
Operational cost control	Intelligent Financial Resource Management	Strategies
Optimal capital allocation	Intelligent Financial Resource Management	Strategies
Creating coordination among supply chain links	Development of an Intelligent Supply Chain	Strategies
Increasing supply chain agility	Development of an Intelligent Supply Chain	Strategies
Developing strategic collaboration	Development of an Intelligent Supply Chain	Strategies
Intelligent inventory management	Development of an Intelligent Supply Chain	Strategies
Improving logistics processes	Development of an Intelligent Supply Chain	Strategies
Identification of financial risks	Financial Risk Management and Resilience	Strategies
Designing an early-warning system	Financial Risk Management and Resilience	Strategies
Diversification of financial resources	Financial Risk Management and Resilience	Strategies
Establishment of financial reserves	Financial Risk Management and Resilience	Strategies
Increasing supply chain flexibility	Financial Risk Management and Resilience	Strategies
Predictive financial modeling	Application of Advanced Analytics	Strategies
Use of artificial intelligence	Application of Advanced Analytics	Strategies
Financial scenario analysis	Application of Advanced Analytics	Strategies
Data-driven decision-making	Application of Advanced Analytics	Strategies
Continuous monitoring of performance indicators	Application of Advanced Analytics	Strategies
Increased profitability	Improved Financial Performance	Consequences
Reduced financial costs	Improved Financial Performance	Consequences
Increased return on investment	Improved Financial Performance	Consequences
Improved cash flow	Improved Financial Performance	Consequences
Enhanced economic value of the company	Improved Financial Performance	Consequences
Reduced procurement lead time	Improved Supply Chain Performance	Consequences

Increased supply chain reliability	Improved Supply Chain Performance	Consequences
Improved operational coordination	Improved Supply Chain Performance	Consequences
Reduced waste and losses	Improved Supply Chain Performance	Consequences
Increased stakeholder satisfaction	Improved Supply Chain Performance	Consequences
Increased economic resilience	Sustainable Development of the Agricultural Sector	Consequences
Support for sustainable production	Sustainable Development of the Agricultural Sector	Consequences
Development of regional employment	Sustainable Development of the Agricultural Sector	Consequences
Reduction of environmental impacts	Sustainable Development of the Agricultural Sector	Consequences
Increased food security	Sustainable Development of the Agricultural Sector	Consequences
Increased shareholder satisfaction	Value Creation for Stakeholders	Consequences
Improved trust among supply chain partners	Value Creation for Stakeholders	Consequences
Strengthened social responsibility	Value Creation for Stakeholders	Consequences
Creation of shared value	Value Creation for Stakeholders	Consequences
Enhanced competitive position	Value Creation for Stakeholders	Consequences

Among the identified factors, the axial coding paradigm was developed, based on which the linear relationships among the research categories—including causal conditions, the core category, contextual conditions, intervening conditions, strategies, and consequences—were specified. Figure 2 presents the axial coding paradigm or, in other words, the qualitative research process model.

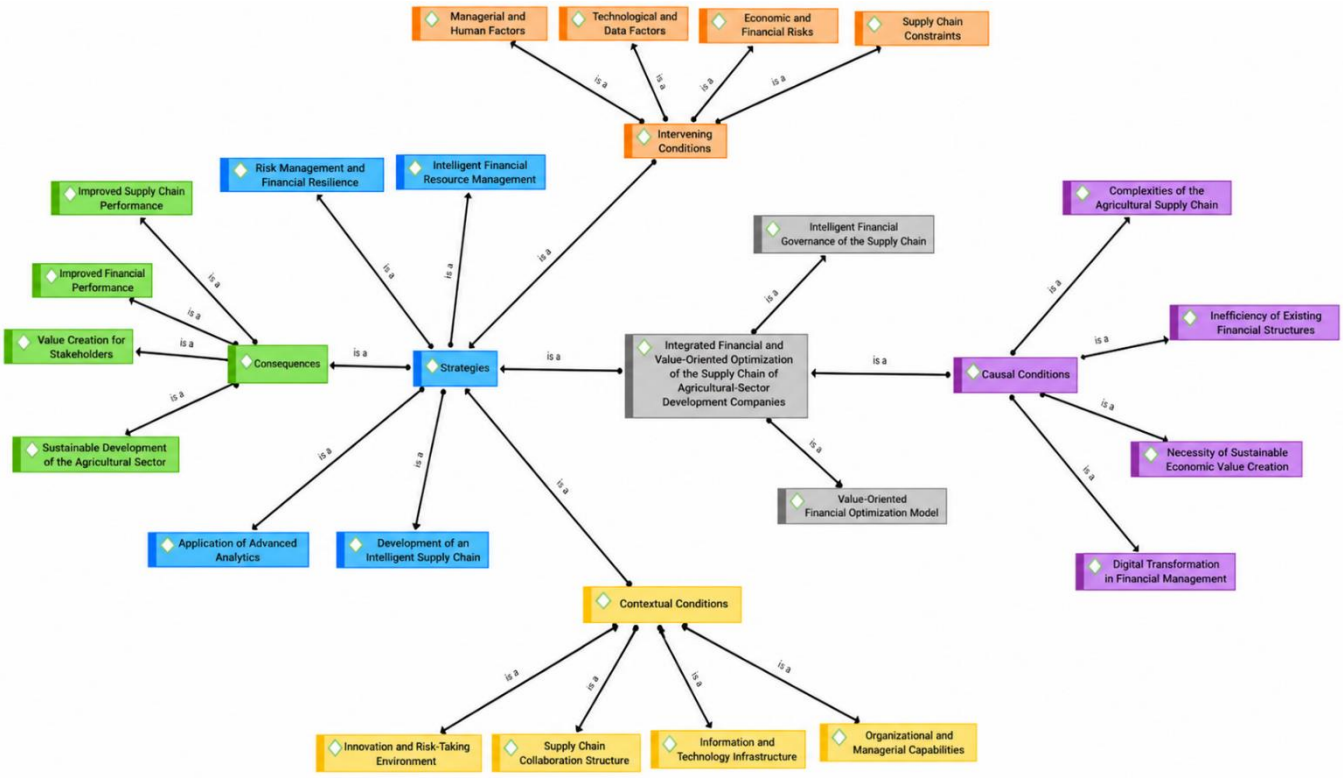


Figure 2. Graphical Output of ATLAS.ti Software

Based on Figure 2, it can be stated that the Strauss and Corbin model, as one of the established models for designing a financial optimization model for value and supply chain management in agricultural-sector development companies, is of considerable importance.

Discussion and Conclusion

The findings of the present study resulted in a comprehensive model centered on the core category of integrated financial and value-oriented optimization of the supply chain of agricultural-sector development companies. The model demonstrated that financial optimization in these companies cannot be reduced to isolated financial indicators or conventional cost-control mechanisms; rather, it emerges from the interaction of financial governance, supply chain coordination, technological capabilities, risk management, sustainability, and stakeholder value creation. In the axial coding structure, the findings were organized into causal conditions, contextual conditions, intervening conditions, strategies, and consequences. This configuration indicates that the financial performance of agricultural-sector development companies is embedded within a broader organizational and supply chain system in which financial, operational, technological, and institutional variables continuously influence one another. Such a result is consistent with the broader literature on sustainable and value-oriented supply chain management, which emphasizes that supply chain outcomes are generated through the alignment of economic, operational, environmental, and social dimensions rather than through isolated functional optimization (2, 7).

With respect to the causal conditions, the findings identified inefficiency of existing financial structures, complexities of the agricultural supply chain, the necessity of sustainable economic value creation, and digital transformation in financial management as the principal drivers necessitating the development of the model. Weak long-term financial planning, dependence on governmental funding sources, inadequate cost-control systems, lack of integrated capital management, fluctuations in supply and demand, uncertainty in agricultural markets, fragmented supply chain actors, and poor coordination among production, distribution, and market functions were among the most prominent underlying factors. These findings are strongly aligned with previous research showing that agricultural supply chains are particularly vulnerable to structural fragmentation, market volatility, logistical discontinuity, and financial constraints (1). The identified dependence on limited financing sources and weak integration between financial resources and development objectives also supports research on financial supply chain optimization, which suggests that innovative financing arrangements can improve coordination and reduce inefficiencies across interorganizational transactions (3). Therefore, the present findings reinforce the view that agricultural-sector development companies require an integrated financial model because conventional financial structures are insufficient for managing the uncertainty and interdependence inherent in agricultural supply chains.

The causal role of sustainable economic value creation is another important finding. The results indicated that firms are increasingly required to move beyond short-term profitability and toward improving investment productivity, return on assets, sustainable profitability, and competitive advantage. This finding is consistent with value-chain research showing that sustainable development objectives can be integrated into supply chain value creation when economic, environmental, and social considerations are jointly incorporated into managerial decision-making (2). Similar support can be found in studies of green supply chain management, where the improvement of organizational and environmental performance depends on innovation and cross-functional integration rather than only on immediate cost reduction (5, 6). In this sense, the present model extends the concept of value creation by linking financial outcomes directly with supply chain resilience, sustainability, and stakeholder benefits.

The study also showed that digital transformation in financial management is a key causal condition. The need for intelligent financial analysis, agricultural big data, decision-support systems, artificial intelligence, and digitalized financial processes was repeatedly emphasized in the extracted findings. This result is highly compatible with recent research demonstrating that digital transformation can improve supply chain resilience, responsiveness, and information visibility (13, 14). The application of cyber-physical systems in smart supply chains also supports the present finding by showing how real-time data integration can improve operational and managerial decisions (12). Furthermore, corporate digital transformation has been shown to be influenced by institutional and market incentives, suggesting that digitalization is simultaneously a technological, strategic, and financial process (11). Therefore, the present findings confirm that digital transformation should not be viewed as a peripheral technological enhancement but as an essential foundation of financial optimization.

Regarding contextual conditions, the results identified organizational and managerial capabilities, information and technology infrastructure, supply chain collaboration structure, and the institutional and policy environment as the principal enabling contexts. Financial management maturity, managerial analytical capability, data-driven decision-making culture, organizational learning, and specialized human capital emerged as critical organizational conditions. These findings are consistent with research demonstrating that technological systems alone do not guarantee improved supply chain performance unless they are supported by managerial competence, knowledge integration, and organizational alignment (6). The importance of organizational learning is also supported by research showing that knowledge inertia can weaken competitiveness and reduce organizational adaptability when firms fail to update established routines and decision patterns (19). Accordingly, the effectiveness of a financial optimization model appears to depend significantly on whether managers are able to interpret financial and supply chain information and translate analytical outputs into coordinated organizational action.

The contextual importance of information and technological infrastructure was also clearly evident. The findings highlighted the integration of supply chain data, implementation of ERP systems, management dashboards, rapid access to decision information, and development of financial information systems. These factors are consistent with studies emphasizing the central role of digital infrastructure in enabling visibility, traceability, integration, and resilience across supply chain networks (13, 14). Traceability-related research similarly indicates that successful implementation depends on a combination of technological capability, organizational readiness, and interorganizational coordination (17). Moreover, blockchain-enabled transparency can enhance trust and outreach by improving the credibility and accessibility of supply chain information (18). Thus, the present findings suggest that integrated financial optimization requires a high-quality informational architecture in which financial, operational, and supply chain data can be connected in real time.

The study further identified supply chain collaboration structure as an important contextual condition, including producer–company interaction, information sharing, long-term collaborative contracts, operational coordination, and supplier-network development. This result is consistent with the broader understanding that supply chains are relational systems rather than simple sequences of transactions. Sustainable and resilient supply chains depend on trust, coordination, information exchange, and shared planning among actors. Research on Industry 4.0 and circular value-chain design similarly indicates that effective value creation increasingly depends on integrated networks supported by digital connectivity and collaborative mechanisms (23). Therefore, the present findings confirm that financial optimization must extend beyond organizational boundaries and incorporate the quality of relationships among supply chain members.

Among the intervening conditions, the study identified economic and financial risks, supply chain constraints, technological and data factors, and managerial and human factors. Exchange-rate fluctuations, inflation, liquidity shortages, credit risk, unstable financial markets, raw-material disruptions, transportation weaknesses, unpredictable demand, dependence on limited suppliers, poor data quality, insufficient data standards, weak information security, employee resistance to technology, high digital transformation costs, managerial skill deficiencies, conflicts of interest, and traditional decision-making were identified as major barriers. These results are consistent with the literature on supply chain risks, which emphasizes that financial, operational, market, and structural risks interact and can amplify one another when they are not managed systematically (9). Research on resilience metrics also supports the importance of recognizing multiple dimensions of vulnerability and assessing organizational capacities to anticipate, absorb, adapt to, and recover from disruptions (10). The present study therefore contributes to the literature by demonstrating that the implementation of financial optimization depends not only on the design of the model but also on managing the external and internal conditions that can weaken its effectiveness.

The role of economic and institutional uncertainty is especially relevant in agricultural systems. The identified influence of government policy, financial regulations, market instability, and access to capital is consistent with evidence showing that agricultural market interventions do not always produce straightforward or predictable outcomes (20). This suggests that financial optimization models for agricultural-sector development companies need to remain flexible and adaptive rather than assuming a stable market or regulatory environment. Similarly, sustainability performance and firm-specific risk have been shown to be associated with organizational and transactional characteristics, reinforcing the need to integrate risk assessment into financial decision-making (8).

In terms of strategies, the findings identified four principal strategic domains: intelligent financial resource management, development of an intelligent supply chain, risk management and financial resilience, and the use of advanced analytics. Intelligent financial resource management included performance-based budgeting, cash flow optimization, working capital management, operational cost control, and optimal capital allocation. These strategies are consistent with the core logic of financial supply chain management, which seeks to align financial flows with material and information flows and reduce inefficiencies across organizational boundaries (3). The emphasis on intelligent financial trust and credit decision-making also aligns with recent efforts to integrate advanced analytical methods into financial governance (4). Thus, the present findings suggest that financial optimization should be operationalized through continuous and data-informed management of liquidity, capital, cost, and investment decisions.

The second strategic domain, development of an intelligent supply chain, included stronger coordination among chain links, improved agility, strategic collaboration, intelligent inventory management, and optimized logistics. These findings are consistent with the view that digitalization can strengthen supply chain resilience by improving network connectivity, coordination, and responsiveness (13, 14). The use of real-time cyber-physical systems further supports the potential of intelligent supply chains to improve operational decision-making and reduce delays (12). Similarly, intelligent and fuzzy analytical frameworks have been proposed for identifying key supply chain factors and understanding their structural relationships (21). The alignment between these studies and the present findings indicates that supply chain intelligence is an important complement to financial intelligence.

The third strategic domain, risk management and financial resilience, included financial risk identification, early-warning systems, diversification of financial resources, creation of financial reserves, and increased supply chain

flexibility. This finding is strongly supported by resilience research, which emphasizes that resilience depends on both preventive and adaptive capacities rather than only post-disruption recovery (10). The design of intelligent financial risk-management systems using deep learning and multi-objective optimization also supports the importance of integrating predictive risk analysis into supply chain decision-making (16). Consequently, the present study confirms that financial resilience should be treated as a strategic capability and embedded directly into the architecture of the optimization model.

The fourth strategic domain involved advanced analytics, including predictive financial modeling, artificial intelligence, financial scenario analysis, data-driven decision-making, and continuous monitoring of performance indicators. This finding is aligned with the increasing use of intelligent decision-making methods in supply chain and financial management. AI-based tools can support the simultaneous evaluation of complex trade-offs among cost, risk, liquidity, resilience, and service performance (16). Data-driven approaches are also strengthened by the availability of integrated digital platforms, cyber-physical systems, and advanced financial trust models (4, 12). These results indicate that the analytical layer of the proposed model is not merely supportive but central to its functioning.

Finally, the findings identified four broad consequences: improved financial performance, improved supply chain performance, sustainable development of the agricultural sector, and value creation for stakeholders. Improved profitability, reduced financial costs, increased return on investment, stronger cash flows, enhanced company value, reduced procurement lead times, greater reliability, better coordination, reduced waste, and higher stakeholder satisfaction were among the principal expected outcomes. These consequences are compatible with research suggesting that integrated supply chain and value-oriented management can simultaneously improve financial, operational, and sustainability performance (2, 7). The findings regarding sustainability and stakeholder value also correspond with studies linking green supply chain practices to improved environmental and organizational outcomes (5, 6). Furthermore, the emphasis on innovation, digitalization, and intelligent value chains is consistent with the broader transition toward Industry 4.0 and circular value creation (23). Overall, the findings indicate that integrated financial optimization can produce multidimensional benefits when implemented as a coordinated system rather than as a narrow financial intervention.

The present study has several limitations that should be considered when interpreting its findings. First, the qualitative nature of the research means that the results are strongly dependent on the experiences, judgments, and perspectives of the selected experts, and although theoretical saturation was achieved, other stakeholder groups may have emphasized different priorities. Second, the model was developed specifically for agricultural-sector development companies and may not be fully transferable to other industries without contextual adaptation. Third, the meta-synthesis depended on the accessibility and quality of published studies and may therefore have been affected by publication bias or incomplete reporting. Fourth, although the study integrated theoretical and empirical evidence through the Multi-Grounded approach, the proposed relationships were not statistically tested using a large quantitative sample. Finally, rapid technological, economic, and policy changes in the agricultural sector may alter the relative importance of some identified components over time.

Future studies are recommended to quantitatively validate the proposed model using structural equation modeling, partial least squares structural equation modeling, or other multivariate techniques with larger samples of managers and experts from agricultural-sector development companies. Comparative research could also examine whether the relative importance of the identified dimensions differs across regions, agricultural subsectors,

ownership structures, or levels of digital maturity. Longitudinal studies would be particularly valuable for assessing how implementation of financial optimization strategies affects financial performance, resilience, and stakeholder value over time. Future research could also develop measurable indicators for each category and test causal relationships among digital transformation, financial resilience, supply chain coordination, and sustainable value creation. In addition, simulation approaches such as system dynamics, agent-based modeling, or scenario-based optimization could be used to examine the behavior of the proposed model under different economic shocks, policy environments, and supply chain disruptions.

Managers of agricultural-sector development companies are advised to treat financial optimization as an integrated managerial architecture rather than as an isolated accounting or budgeting activity. Organizations should establish unified financial and supply chain information systems, develop real-time dashboards, strengthen working-capital and cash-flow management, diversify financing sources, and create early-warning mechanisms for financial and operational risks. Investment in digital infrastructure should be accompanied by development of managerial analytical skills and a data-driven organizational culture to ensure that advanced technologies are translated into better decisions. Companies should also strengthen long-term collaboration with producers, suppliers, logistics partners, and financial institutions and align financial incentives with supply chain performance and sustainability objectives. Finally, performance evaluation systems should include not only conventional financial indicators but also resilience, stakeholder value, environmental performance, service quality, and long-term development outcomes.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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