Digital-based performance model for the Arabica Coffee supply chain: A case study of the Koerintji Barokah Bersama Cooperative in Kerinci, Indonesia

Teguh Tri Handiyanto[1]; Suandi[2*]; Fuad Muchlis[3]

[1)] The Food, Agriculture, and Fisheries Office of Batang Hari Regency, Jambi Province, Indonesia
[2,3)] Department of Agribusiness, Faculty of Agriculture, Universitas Jambi, Indonesia

**To whom correspondence should be addressed. Email: suandi_pertanian@unja.ac.id*

DOI:	Received:	Revised:	Accepted:	Published:
10.22437/ppd.v12i4.34483	12.06.2024	19.09.2024	29.09.2024	31.10.2024

Abstract

This study examines the performance model of the Arabica coffee supply chain managed by the Koerintji Barokah Bersama Cooperative, emphasizing the integration of supply chain management (SCM), social capital (SC), and information technology (IT) to enhance efficiency, transparency, and competitiveness. Using a mixed-methods approach involving descriptive analysis and Structural Equation Modeling (SEM), the study explores the current state of SCM, SC, and IT, evaluates supply chain performance, and develops a comprehensive performance model. The findings indicate that SCM, SC, and IT significantly influence supply chain performance, with IT and SC playing crucial mediating roles. The cooperative demonstrated strengths in reliability, flexibility, and utility, though cost management requires further improvement. The proposed model validates that a collaborative and digital approach can improve operational efficiency, stakeholder coordination, and market adaptability. The study highlights the need for stronger SCM coordination, enhanced SC through trust and collaboration, and greater IT adoption for real-time monitoring and data-driven decision-making. Despite its robust methodology, limitations include a localized focus and exclusion of broader external factors like global market trends and climate change. Future research should explore advanced technologies such as IoT, AI, and Big Data Analytics and assess long-term performance across diverse regions and market contexts to ensure sustainability and global competitiveness.

Keywords: Arabica Coffee, Information technology, Social capital, Supply chain

JEL Classification: O33, L14, Q13

INTRODUCTION

Coffee is one of Indonesia's most significant agricultural commodities, contributing substantially to the nation's economy. In 2021, Indonesia's coffee production reached 382,930 thousand tons, generating national revenues of USD 842.5 million, solidifying Indonesia's position as the world's fourth-largest coffee producer

(Direktorat Jenderal Pertanian, 2021). The majority of this production originates from smallholder plantations, with the remainder supplied by state-owned and private estates. Indonesian coffee is exported to various countries, including the United States, Egypt, Spain, Malaysia, and Japan.

Key coffee-producing provinces in Indonesia include South Sumatra, Lampung, Aceh, North Sumatra, and Jambi. In Jambi Province, Kerinci Regency is the largest contributor to Arabica coffee production, accounting for 83% of the province's total coffee output in 2021 (Badan Pusat Statistik, 2022). Kerinci Arabica Coffee is renowned for its unique flavor and aroma and is marketed across Indonesia, including in cities such as Payakumbuh and Medan. It is also exported to countries such as Switzerland, Belgium, and Brazil.

According to tests conducted by the Indonesian Coffee and Cocoa Research Institute (Puslitkoka), Kerinci Arabica Coffee is classified as a specialty grade, achieving a score of >84. Its fragrance, flavor, acidity, and body are highly rated, with values ranging from 7.75 to 7.88. Moreover, its sweetness is considered exceptional, scoring a perfect 10, with notes of chocolate, caramel, and lemon. These attributes indicate that Kerinci Arabica Coffee has significant potential to penetrate international markets and appeal to global coffee enthusiasts (Wahyudi & Izhar, 2018).

Despite this potential, several challenges persist in the coffee supply chain. The complexity of the supply chain, which involves multiple stakeholders, often results in inefficiencies such as delivery delays, unclear pricing information, and insufficient quality control. Additionally, Arabica coffee farmers usually occupy a weak bargaining position as "price takers" due to limited access to market information. This situation negatively impacts farmers' incomes and the quality of the coffee produced. Furthermore, the adoption of digital technology within the supply chain remains minimal, even though digitalization holds the promise of enhancing efficiency and transparency.

Cooperatives play a pivotal role in addressing the challenges faced by the coffee supply chain. As collective institutions, cooperatives can shorten the lengthy supply chain that often disadvantages farmers while adding value to the product by processing raw coffee cherries into hulled and skinned (HS) coffee or parchment coffee, which can then be further processed into ready-to-consume coffee powder. Additionally, cooperatives can facilitate supply chain integration by providing shared marketing services, technical training, and support for the adoption of information technology. By maximizing their role, cooperatives can establish a more efficient, transparent, and sustainable supply chain system.

According to Mentzer et al. (2001), key principles of supply chain management include integrated behavior, information sharing, risk and reward sharing, collaboration, and process integration with a focus on customer service. Furthermore, social capital—encompassing trust, collaboration, and the creation of social networks among supply chain actors—forms a robust foundation for mutually beneficial collaboration. On the other hand, information technology offers strategic solutions for enhancing transparency, efficiency, and competitiveness, as highlighted by Waringga et al. (2022).

Previous studies have predominantly focused on analyzing the potential and unique characteristics of Kerinci Arabica Coffee but have not comprehensively examined the role of cooperatives in integrating supply chain management, social capital, and information technology to improve overall supply chain performance. In the era of Industry 4.0, the utilization of digital technologies, such as the Internet of Things

(IoT), presents significant opportunities to address these challenges (Garay-Rondero et al., 2020).

This study builds on this foundation to: 1) Analyze the current state of supply chain management, social capital, and information technology within the cooperative-based Kerinci Arabica Coffee supply chain system; 2) Assess the performance of the cooperative-based Kerinci Arabica Coffee supply chain; 3) Develop a cooperative-based supply chain performance model that integrates supply chain management, information technology, and social capital to enhance the efficiency, transparency, and competitiveness of Kerinci Arabica Coffee in international markets.

METHODS

Research location and duration

The research was conducted at the Koerintji Barokah Bersama Cooperative, located in Kerinci Regency, Jambi Province. This cooperative is a pioneer in the marketing of Kerinci Arabica Coffee and successfully exported 15.5 tons of green bean coffee to Belgium in 2020 (Saragih, 2020). The study was carried out over six months, from February to July 2024, focusing on the cooperative's operational areas in Gunung Tujuh, Kayu Aro, and Kayu Aro Barat subdistricts.

Population and sample

The population is comprised of 390 Arabica Coffee farmers who are members of the Koerintji Barokah Bersama Cooperative. Using the Slovin formula with a 10% margin of error, a sample of 80 respondents was selected. To include all actors in the supply chain, the snowball sampling method was employed to identify processing units (*Unit Pengolahan Hasil* or UPH), wholesalers, and other stakeholders up to the final consumer. This approach allowed researchers to trace the Arabica coffee marketing chain from farmers to end consumers, using initial respondents as references to identify subsequent informants.

Data collection

Data were collected through structured interviews using questionnaires, in-depth interviews with farmers, UPH representatives, wholesalers, and Focus Group Discussions (FGDs) involving key supply chain actors. Each main research variable was broken down into specific indicators, which were used to create statements in the questionnaire. Respondents' perceptions were captured using a five-point Likert scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA)

Data analysis

Descriptive analysis was used to address the first two research objectives: analyzing the conditions of supply chain management, social capital, and information technology, as well as evaluating the performance of the cooperative-based Kerinci Arabica Coffee supply chain. The average Likert scale score for each indicator was converted into a percentage of the maximum possible score (5 on the scale). These percentages were categorized into the following levels:

- Very Poor: 20% – 35%
- Poor: 36% – 51%
- Fair: 52% – 68%
- Good: 69% – 84%

- Very Good: 85% – 100%

This method provided a quantitative depiction of the research variables and allowed for qualitative interpretation based on these predefined categories, enabling systematic evaluation of respondent perceptions.

For the third research objective, a performance model for the Arabica coffee supply chain was developed using Structural Equation Modelling (SEM). This model integrates supply chain management, social capital, and information technology to propose strategies for improving the efficiency, transparency, and competitiveness of Kerinci Arabica Coffee in international markets.

The provided model (as shown in Figure 1) represents the Structural Equation Modelling (SEM) framework for analyzing the performance of the Kerinci Arabica Coffee supply chain managed by the Koerintji Barokah Bersama Cooperative.

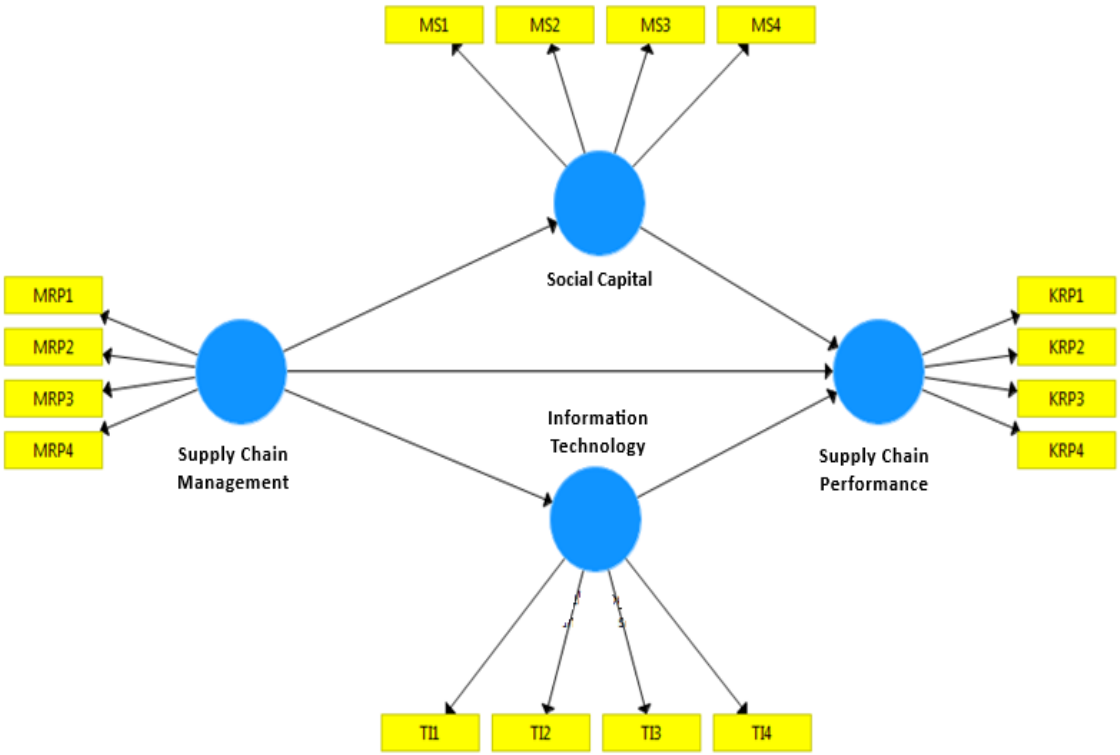

Figure 1. Performance model of the Arabica Coffee supply chain at the Koerintji Barokah Bersama Cooperative

Below is a detailed explanation of the variables and their corresponding indicators in the model:

Supply Chain Performance (KRP)

1. Reliability (KRP1): Evaluates the consistency in fulfilling consumer needs, on-time delivery, production and distribution reliability, effective tracking systems, and demand change management.
2. Flexibility (KRP2): Measures the adaptability of the supply chain to demand changes, effective strategies, flexible product cycle times, and quick supplier switching capabilities.

3. Cost (KRP3): Assesses the efficiency in managing production costs, transparency in distribution costs, cost optimization, cost management policies, and cost reduction methods.
4. Utility (KRP4): Captures product value addition, service responsiveness, customer satisfaction, and product innovation.

Supply Chain Management (MRP)

1. Network Structure (MRP1): Focuses on structured relationships, roles within the network, network flexibility, and technology integration.
2. Business Processes (MRP2): These include distribution patterns, business process innovation, inter-stage relationships, and demand forecasting accuracy.
3. Network Management (MRP3): Examines shared vision and mission with business partners, transaction systems, decision-making processes, and market responsiveness.
4. Resources (MRP4): Encompasses physical assets, technology, capital, and investments.

Social Capital (MS)

1. Trust (MS1): Includes transparency, compliance with agreements, secure interactions, and collaborative decision-making.
2. Cooperative Efforts (MS2): Evaluates stakeholder collaboration, innovation sharing, technological contributions, and joint product development.
3. Mutual Affection (MS3): Measures positive emotional relationships, mutual support among partners, and acceptance of strengths and weaknesses.
4. Social Network Creation (MS4): Captures business network expansion, open communication, and regular discussion forums.

Information Technology (TI)

1. Computer Use (TI1): Covers business process automation, inventory monitoring, data security, and ease of access.
2. Internet Use (TI2): Includes product tracking, demand planning, real-time communication, and transaction integration.
3. Electronic Data Interchange (EDI) (TI3): Focuses on data exchange efficiency, business process acceleration, and data accuracy.
4. Decision Support System (DSS) Use (TI4): Encompasses data analysis, strategic planning, and decision-making integration.

RESULTS AND DISCUSSION

Supply chain management of Arabica Coffee in the Koerintji Barokah Bersama Cooperative

A supply chain is a network consisting of various entities that collaborate to deliver products to the end-user or consumer. An effective supply chain model is essential for managing all production processes, from upstream farming activities to downstream sales. Based on theoretical frameworks and interview findings, the supply chain model for Arabica coffee in the Koerintji Barokah Bersama Cooperative can be developed using Van Der Vorst's model within the Food Supply Chain Network

(FSCN) framework. This model emphasizes integrating business processes, ensuring high-quality information flow, and fostering coordination among actors within the supply chain. Its key dimensions include the flow of products, information, and finances, with an emphasis on managing uncertainties and variability in the supply chain. Achieving the expected level of efficiency requires implementing sound management practices.

Supply chain management involves planning, organizing, implementing, and monitoring activities collaboratively with all members of the Arabica coffee supply chain in the Koerintji Barokah Bersama Cooperative, located in Kerinci Regency. Each member has distinct roles and functions, necessitating effective management to meet the shared goals of the supply chain participants. Key aspects to address in supply chain management include partner selection, contractual agreements, transaction systems, government support, and inter-member collaboration. Operationally, supply chain management encompasses a series of activities, including planning, procurement, production, packaging, distribution, and controlling products or services from the initial point to the end consumer. This process involves integrating all business functions within the supply chain, ensuring the coordination and regulation of goods, information, and funds among the various stakeholders.

The data in Table 1 shows that supply chain management at the Koerintji Barokah Bersama Cooperative is classified as "Good," with an average percentage of 69.53 percent. Supply chain management for Arabica coffee in this cooperative involves several critical dimensions, including Network Structure, Business Processes, Network Management, and Resources.

Table 1. Supply chain management performance at Koerintji Barokah Bersama Cooperative, 2024

Indicator	Percentage (%)	Remarks
Network structure	69.15	Good
Business processes	69.70	Good
Network management	70.44	Good
Resources	68.83	Fairly Good
Average	69.53	Good

A well-organized network ensures a clear flow from farmers, acting as raw material suppliers, through collectors and wholesalers, to end consumers, with integrated steps in the business processes from raw material procurement to final distribution. Contract negotiation and collaboration among stakeholders enhance transparency and trust among all parties. Investment in appropriate technology, particularly for farmers, is necessary to improve supply chain efficiency. Strengthening stakeholder collaboration and adopting advanced technology is essential to further enhancing the effectiveness and sustainability of the supply chain.

Information technology

Information technology encompasses the use of computers, software, hardware, communication networks, and other infrastructure to process, store, retrieve, transmit, and secure data (Aprianto, 2021). In the context of supply chains, information technology plays a crucial role in facilitating the flow of information and goods from suppliers to end consumers. The application of information technology within the supply chain of the Koerintji Barokah Bersama Cooperative is detailed in Table 2.

Table 2. Information technology in the Arabica Coffee supply chain at Koerintji Barokah Bersama Cooperative

Indicator	Percentage (%)	Remarks
Computer usage	70.21	Good
Internet usage	73.20	Good
Electronic Data Interchange (EDI) Usage	69.75	Good
Decision Support System (DSS) Usage	69.47	Good
Average	70.66	Good

Table 2 indicates that information technology at the Koerintji Barokah Bersama Cooperative is categorized as "Good," with an average percentage of 70.66 percent. This demonstrates that the cooperative has effectively implemented information technology within its supply chain operations. The proficient use of information technology contributes to enhancing the efficiency, visibility, and overall performance of the supply chain. These improvements, in turn, yield significant benefits in terms of customer satisfaction, cost reduction, and market competitiveness.

Social capital

Social capital in a supply chain refers to the relationships among individuals, groups, organizations, and communities involved in the supply chain of a product or service. It encompasses elements such as trust, cooperative efforts, mutual affection, and the creation of social networks that influence the performance of the supply chain (Santoso, 2020). The social capital within the supply chain of the Koerintji Barokah Bersama Cooperative is detailed in Table 3.

Table 3. Social capital in the Arabica Coffee supply chain at Koerintji Barokah Bersama Cooperative.

Indicator	Percentage (%)	Remarks
Trust	69.33	Good
Cooperative efforts	68.23	Fairly good
Mutual Affection	68.92	Fairly good
Social network creation	70.67	Good
Average	69.29	Good

Table 3 reveals that social capital in the Koerintji Barokah Bersama Cooperative is classified as "Good," with an average percentage of 69.29%. Trust and social network creation scored 69.33% and 70.67%, respectively, indicating the cooperative's success in building trust and fostering strong relationships with stakeholders in the Arabica coffee supply chain. This trust serves as a solid foundation for collaboration and shared growth in the industry.

However, there is room for improvement in enhancing cooperative efforts and mutual affection. According to Santoso (2020), strengthening these aspects can be achieved by increasing the awareness and commitment of cooperative members to the organization’s goals and vision, as well as establishing clear and specific agreements. By addressing these areas, the cooperative can further enhance the performance and effectiveness of its supply chain.

Supply chain performance of Arabica Coffee at Koerintji Barokah Bersama Cooperative

Supply chain performance measures the efficiency and effectiveness of a supply chain in delivering products or services from producers to end consumers. Based on

theoretical frameworks and research design, supply chain performance is evaluated across four key dimensions: reliability, flexibility, cost, and utility (Munizu, 2017).

Reliability refers to the ability of the supply chain to deliver products or services on time and at the expected quality. Flexibility measures the capability to adapt operations to changes in demand or market conditions. The cost dimension evaluates expenditure efficiency, encompassing inventory, production, and distribution costs. Utility assesses the extent to which the supply chain adds value to customers through services and products that meet their needs.

Good supply chain performance is crucial for maintaining customer satisfaction, improving operational efficiency, reducing costs, and enhancing a company's competitiveness in a dynamic market. An effective supply chain enables companies to respond quickly to market changes and customer demands while optimizing resource utilization to achieve business objectives. The supply chain performance of the Koerintji Barokah Bersama Cooperative is summarized in Table 4.

Table 4. Supply chain performance of Arabica Coffee at Koerintji Barokah Bersama Cooperative

Indicator	Percentage (%)	Remarks
Reliability	70.57	Good
Flexibility	71.40	Good
Cost	68.87	Fairly good
Utility	72.51	Good
Average	70.84	Good

Table 4 shows that the supply chain performance at the Koerintji Barokah Bersama Cooperative is categorized as "Good," with an average percentage of 70.84%. This indicates that the cooperative has established a well-functioning supply chain that optimizes the time and cost to meet consumer and partner needs.

The reliability, flexibility, and utility aspects, categorized as "Good," reflect the cooperative's strong foundation in delivering products on time, adapting to market demand changes, and providing added value to customers. These results underscore the cooperative's commitment to consistent delivery, adaptability to a dynamic business environment, and a focus on meeting customer needs and satisfaction.

However, the cost dimension, categorized as "Fairly Good," suggests potential for improvement. Strategic steps are required to identify and eliminate unnecessary expenses and enhance resource management more effectively. These improvements would further bolster the overall efficiency and competitiveness of the supply chain.

Model of supply chain performance for Arabica Coffee in Koerintji Barokah Bersama Cooperative

The supply chain performance model for Arabica coffee in the Koerintji Barokah Bersama Cooperative integrates multiple key components to ensure efficiency, resilience, and sustainability. Based on research and theoretical frameworks, the model evaluates the influence of Supply Chain Management (SCM), Social Capital (SC), and Information Technology (IT) on Supply Chain Performance (SCP). This model emphasizes direct and indirect relationships among variables to achieve optimal supply chain performance.

Evaluation of the outer model

The outer model represents the relationships between indicators and latent variables. The evaluation of the outer model (Figure 2) demonstrates that all indicators

have loading factor values exceeding 0.90, significantly surpassing the minimum threshold of 0.60 (Haryono, 2017). These high loading factor values confirm a strong correlation between the indicators and the latent constructs, thus supporting the convergent validity of the model.

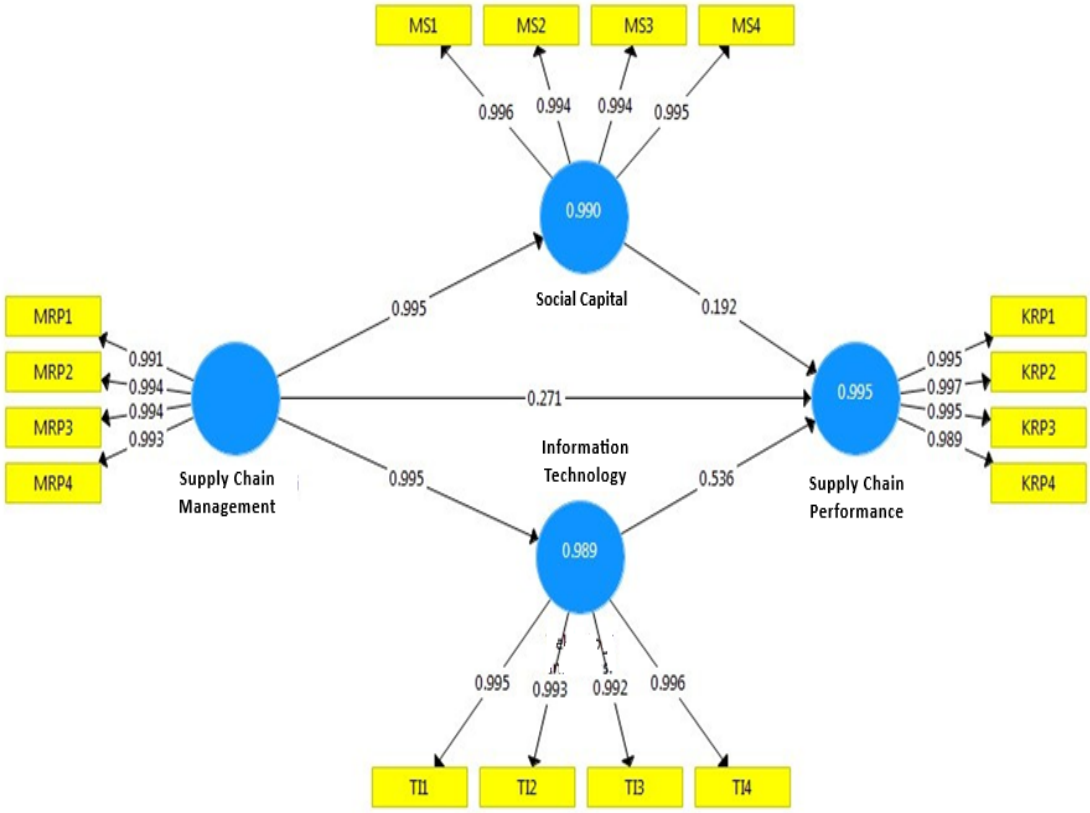

Figure 2. Structural relationship model of Arabica Coffee supply chain performance

In addition to convergent validity, construct reliability was assessed using Composite Reliability (CR) and Average Variance Extracted (AVE). The analysis results indicate that all variables achieved CR values above 0.97 and AVE values exceeding 0.98, signifying excellent levels of reliability and validity (Table 5).

Table 5. Reliability test of the Arabica Coffee supply chain performance model, 2024

Construct	CR	AVE
Supply Chain Management	0.9965	0.9861
Social Capital	0.9974	0.9895
Information Technology	0.9970	0.9880
Supply Chain Performance	0.9970	0.9880

The results presented in Table 5 demonstrate that the constructs in the model are highly reliable, with CR and AVE values far exceeding the recommended thresholds. This strong reliability and validity underline the robustness of the measurement model in capturing the intended latent constructs accurately. These findings validate the suitability of the model for further analysis and provide a reliable basis for understanding the performance of the Arabica coffee supply chain.

Inner model evaluation

The evaluation of the inner model assesses the structural relationships among latent variables by analyzing the R^2 values for endogenous latent variables. The R^2 values obtained are 0.988 for Supply Chain Management, 0.990 for Social Capital, 0.989 for Information Technology, and 0.995 for Supply Chain Performance. These values exceed the threshold of 0.75 and are categorized as strong, indicating that exogenous latent variables collectively have a significant and positive impact on endogenous latent variables.

Goodness of Fit (GoF) was evaluated using predictive relevance (Q^2). The analysis produced a Q^2 value greater than 0.988, demonstrating that the model explains 99.98% of the variability in Arabica coffee supply chain performance. The remaining 0.02% is attributed to factors outside the model. This result confirms the model's strong predictive capability in explaining the variability of supply chain performance phenomena. The findings validate the structural model's robustness and its high explanatory and predictive power.

Hypothesis testing

Hypothesis testing was conducted using the bootstrapping method to estimate p-values. The results show that Supply Chain Management, Social Capital, and Information Technology have a positive and significant effect on Supply Chain Performance. Additionally, indirect effects were identified, indicating that Supply Chain Management indirectly affects Supply Chain Performance through Social Capital and Information Technology. The detailed results are presented in Table 6.

Table 6. Path coefficient of Arabica Coffee supply chain performance model

Path Coefficient	Original sample	T Statistic	P Values
Supply Chain Management → Supply Chain Performance	0.271	2.795	0.003
Social Capital → Supply Chain Performance	0.192	1.855	0.032
Information Technology → Supply Chain Performance	0.536	5.731	0.000
Supply Chain Management → Social Capital → Supply Chain Performance	0.191	1.854	0.032
Supply Chain Management → Information Technology → Supply Chain Performance	0.533	5.728	0.000

Based on Table 6, all relationships meet the significance criteria (p-value < 0.05). These results confirm that the research hypotheses are accepted. This indicates that the proposed relationships in the model are statistically supported, highlighting the significant direct and indirect effects of the tested variables on supply chain performance.

The impact of supply chain management (SCM) on supply chain performance (SCP)

Supply chain management has a positive and significant impact on supply chain performance. The direction of the influence is positive and significant, indicating that well-developed supply chain management enhances the overall performance of the supply chain. Supply chain management is a critical element in business operations, encompassing production and distribution processes with a focus on coordinating entities to improve efficiency and customer satisfaction.

The primary components of supply chain management include optimizing operations and establishing a global market network. This involves internal coordination and robust collaboration with suppliers, producers, distributors, retailers, and customers. The engagement of supply chain management with stakeholders strengthens relationships, encourages collaboration, and facilitates innovative, sustainable solutions to complex issues within the supply chain network.

The findings align with Rizkya et al. (2019), who identified that supply chain management significantly impacts supply chain performance by monitoring performance, identifying issues, improving processes, and ultimately enhancing efficiency and effectiveness in meeting customer needs while increasing business profitability.

George & Pillai (2019) highlighted that supply chain management influences supply chain performance through factors such as supply chain structure, inventory control policies, information sharing, customer demand, forecasting methods, lead time, and review periods. Wilujeng et al. (2022) reported agility, flexibility, and alignment between the interests of supply chain partners as critical factors. A strong commitment to supply chain management significantly affects overall supply chain performance, enabling the operational efficiency of supply chains in adapting to evolving market needs and fostering strong relationships with partners.

An integrated approach to supply chain management aims to coordinate the flow of production from raw materials to finished products, focusing on customer satisfaction. The primary objectives are to reduce operational costs, ensure product quality, and deliver added value through product availability and service speed (Putri et al., 2019). These findings emphasize that effective supply chain management is instrumental in driving both operational excellence and strategic competitiveness.

The impact of social capital (SC) on supply chain performance (SCP)

Social capital has a statistically significant impact on supply chain performance. Social capital is defined as resources embedded in social relationships, such as trust, norms, and networks, that facilitate cooperation and coordination within a mutually beneficial supply chain (Suandi, 2012). Social capital plays a critical role in improving supply chain practices and performance. Dias & Silva (2022) emphasized that social capital enhances collaboration among supply chain members by fostering trust and mutual understanding, which positively impacts communication, information sharing, and collective problem-solving.

Trust and cooperation are vital dimensions of social capital. Leaders with trust from members and partners must demonstrate consistency between words and actions, serving as role models for mutual benefit. Collective action, which involves cooperation among members in planning, implementation, and oversight, is crucial for organizational progress. Strengthening social capital through collaboration among stakeholders and fostering relationships among suppliers, distributors, and consumers enables long-term success in ensuring environmental, social, and economic sustainability (Sembiring et al., 2020).

Social capital also contributes to supply chain resilience, allowing for quick responses to disruptions and uncertainties. Strong relationships built on social capital help organizations adapt to changing conditions and recover more effectively from disruptions. Furthermore, social capital stimulates innovation within supply chains by

encouraging knowledge exchange and creativity among partners. Collaborative relationships based on social capital drive the development of new ideas, processes, and products that support sustainability initiatives (Johnson et al., 2013).

Integrating social capital into supply chain practices enhances overall sustainability performance. Organizations that adopt strategies emphasizing social capital, including supplier engagement, transparency, resource efficiency, collaborative partnerships, continuous improvement, compliance, and standards, can achieve more sustainable outcomes. This approach creates value for all stakeholders involved in the supply chain, promoting long-term success and resilience.

The impact of social capital (SC) on supply chain performance (SCP)

Social capital has a significant impact on supply chain performance. It is defined as resources embedded in social relationships, including trust, norms, and networks, which facilitate cooperation and coordination in mutually beneficial supply chains (Suandi, 2012). Social capital plays a critical role in improving supply chain practices and performance by fostering collaboration, trust, and shared understanding among supply chain members.

Research by Dias and Silva (2022) highlights that social capital strengthens collaboration among supply chain participants by building trust and mutual understanding. This enhances communication, information sharing, and collective problem-solving within the supply chain. Key dimensions of social capital include trust and cooperation. Leaders who command trust from members and partners demonstrate consistency between words and actions, thereby setting an example for shared goals. For organizational progress, collective action is vital, requiring cooperation among members in planning, program implementation, and oversight.

Social capital refers to the interconnected relationships among individuals, communities, and organizations within the supply chain. These relationships enable cooperation, trust, and the exchange of beneficial information. Strengthening social capital through stakeholder collaboration and improving relationships among suppliers, distributors, and consumers fosters long-term success, ensuring environmental, social, and economic sustainability (Sembiring et al., 2020).

Social capital also enhances supply chain resilience by enabling quick responses to disruptions and uncertainties. Strong relationships grounded in social capital allow organizations to adapt to changing conditions and recover more effectively from disruptions. Furthermore, social capital drives innovation within the supply chain by encouraging knowledge sharing and creativity among partners. Collaborative relationships based on social capital facilitate the development of new ideas, processes, and products that support sustainability initiatives (Johnson et al., 2013).

Integrating social capital into supply chain practices improves overall sustainability performance. Organizations adopting strategies centered on social capital—such as supplier engagement, transparency, resource efficiency, collaborative partnerships, employee involvement, continuous improvement, and adherence to standards—achieve more sustainable outcomes. This approach creates value for all stakeholders in the supply chain, contributing to long-term success and resilience.

The impact of information technology (IT) on supply chain performance (SCP)

Information technology has a positive and significant influence on supply chain performance. Improved adoption and utilization of information technology contribute to

enhanced supply chain performance. This finding aligns with Riyadi et al. (2021), who found that the adoption and implementation of information technology positively impact supply chain performance, particularly by increasing responsiveness to customer demands, reducing operational costs, and enhancing overall company value. Similarly, Ganbold et al. (2020) confirmed that IT adoption significantly improves supplier integration by facilitating collaboration and efficient information exchange on inventory availability and production planning.

Information technology plays a crucial role in integrating and automating supply chain processes while enabling real-time monitoring. Through IT connectivity, the relationship between physical and informational flows from customers to suppliers can be managed efficiently, enhancing organizational flexibility and responsiveness to uncertainties (Nunez-Merino et al., 2022). By incorporating IT into supply chain systems, companies can improve resource management and coordination among supply chain partners. Effective information exchange enabled by IT helps supply chain members collect, analyze, and distribute data, leading to better decision-making processes.

IT integration reduces temporal and physical barriers by bridging functional and organizational gaps, providing managers with timely, accurate, and relevant information. This enables collaborative decision-making, as highlighted by Alghofeli (2023). Tools such as Decision Support Systems (DSS) and Expert Systems (ES) facilitate rapid and precise decision-making, particularly in areas like product development and innovation, which contribute to increased competitiveness (Riyadi et al., 2022).

The integration and automation of processes through IT positively impact supply chain performance by improving operational efficiency and coordination. Both theoretical and empirical research, as well as field studies, have consistently demonstrated the significant role of IT in enhancing supply chain performance. However, challenges remain in implementing IT across all companies, often constrained by human resources, particularly in skills and knowledge related to technologies such as the Internet of Things (IoT).

Despite these challenges, companies that successfully adopt and integrate IT into their supply chain systems are better equipped to achieve operational excellence, enhance flexibility, and improve overall competitiveness in the marketplace. This underscores the importance of investing in IT and developing the required competencies for its effective implementation.

The impact of supply chain management (SCM) on supply chain performance (SCP) through information technology (IT)

Supply chain management has a positive and significant impact on supply chain performance through the mediation of information technology. The indirect effect of supply chain management on supply chain performance through IT is greater than its direct effect. This emphasizes the need for continuous and intensive efforts by supply chain management to enhance supply chain performance through the application of information technology.

Information technology, as defined by Naibaho (2017), processes data to produce high-quality, relevant, accurate, and timely information for decision-making. It plays a pivotal role in achieving competitive advantage by enhancing performance and

supporting organizational decisions. In an era of intense business competition, optimal and integrated IT systems—including hardware, software, and digital communication networks—are essential to support organizational operations and decision-making processes.

The integration of IT into supply chain management significantly improves supply chain performance. IT serves as a critical mediator by enhancing procurement, production, inventory management, and retail performance (Alghofeli et al., 2023). IT facilitates the integration, digitalization, and automation of processes, along with the adoption of new analytical capabilities (Fatorachian & Kazemi, 2021).

Marinagi et al. (2014) emphasized that IT enables the integration of internal business functions through systems such as Enterprise Resource Planning (ERP) for logistics, planning, warehousing, and inventory, and Customer Relationship Management (CRM) for managing customer relationships. Moreover, IT supports external business function integration via Interorganizational Information Systems (IOS), which include technologies like Electronic Data Interchange (EDI), extranets, and e-commerce. These systems enable efficient information exchange among suppliers, customers, and business partners, enhancing visibility and operational coordination.

For Arabica coffee supply chains, IT plays a critical role in creating effective information flows, enhancing competitive advantage, and improving supply chain performance. Waringga et al. (2022) demonstrated that IT positively impacts supply chain integration, information sharing, and overall performance. IT enhances responsiveness, system integration, and consumer understanding. Safitri and Huda (2022) also reported significant positive effects of IT on supply chain integration and information exchange, which in turn positively affect supply chain performance.

Through online platforms and social media, IT improves coordination, accelerates delivery to end consumers, and reduces operational costs. Septarianes et al. (2020) highlighted that leveraging IT and building partnerships between coffee farmers and agro-industries contribute to improved performance and supply chain sustainability.

Ikhwana (2018) identified key elements in coffee supply chain management, including suppliers, collectors, exporters, and consumers. Strong relationships between these elements facilitate distribution and serve as feedback channels for adapting quality standards to consumer demands. Maintaining sustainability requires a collective commitment to establish and uphold product standards and quality.

The rapidly evolving global market, influenced by economic, financial, social, and technological changes, necessitates continuous evolution and adaptation of supply chains. The Fourth Industrial Revolution, driven by digital technologies such as the Internet of Things (IoT) and cyber-physical systems (CPS), has accelerated supply chain innovation and digitalization (Garay-Rondero et al., 2020). IT integration enhances decision-making, streamlines operations, and fosters collaboration, making it indispensable for achieving higher supply chain performance.

The impact of supply chain management (SCM) on supply chain performance (SCP) through social capital (SC)

Supply chain management positively and significantly impacts supply chain performance through the mediating role of social capital. By leveraging social capital, supply chain management can enhance supply chain performance, particularly in terms

of resilience. Gölgeci & Kuivalainen (2020) emphasize that social capital strengthens the ability of supply chains to adapt to disruptions, unforeseen changes, and market uncertainties, serving as a relational resource critical for addressing challenges and fostering sustainable value creation.

Social capital—encompassing trust, reciprocity norms, and social networks—plays a pivotal role in improving business performance (Santoso et al., 2019). These attributes facilitate participants' ability to work together more effectively toward shared business objectives. Strengthening social capital fosters trust among entrepreneurs, positive relationships between entrepreneurs and consumers, enhanced cooperation, and expanded business networks, all of which contribute to improved business interests.

Parrangan et al. (2014) highlight the vital role of social capital in enhancing supply chain performance. Social capital founded on trust, honesty, and rule compliance improves supply chain and corporate performance, especially when supported by effective partnership strategies. Strong social capital, combined with robust partnership strategies, helps supply chains manage consumer demand uncertainties. Partnerships within supply chains are characterized by commitment, trust, and collaboration among companies, which significantly boost performance.

Ryu et al. (2009) further explain that trust not only fosters collaboration but also plays a crucial role in building commitment among supply chain members. Strong trust between companies within the supply chain strengthens commitments, which can enhance overall supply chain performance and sustainability.

Yekti & Solovida (2021) report that social capital positively impacts sustainable supply chain management. Effective communication between stakeholders and companies reduces incidents such as workplace and environmental accidents, thereby enhancing sustainable supply chain management. Strong social capital also promotes open information sharing among supply chain partners, encouraging long-term collaboration and alignment across agribusiness subsystems to improve supply chain performance. This alignment necessitates social capital and strategic partnerships.

Dias & Silva (2022) explored the link between supply chain management and supply chain performance through social capital, emphasizing that collaboration among supply chain members is key to achieving improvements. Practices such as cooperation, coordination, resource sharing, and information exchange rely heavily on social capital, which plays a central role in refining supply chain practices and performance.

By integrating social capital into supply chain management, organizations can build resilience, foster collaboration, and create a sustainable competitive advantage. Trust, mutual understanding, and effective partnerships form the foundation for improved coordination, resource utilization, and overall performance within the supply chain.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study reveals that the performance model of the Arabica coffee supply chain at the Koerintji Barokah Bersama Cooperative is built upon the integration of three key elements: supply chain management, social capital, and information technology, which collectively influence supply chain performance. Supply chain management directly contributes to enhancing coordination, operational efficiency, and stakeholder

collaboration, establishing a strong foundation to support the smooth flow of goods, information, and finances. Social capital plays a crucial role by strengthening trust, reciprocity norms, and social networks, which enhance resilience and adaptability to market uncertainties. Information technology complements these elements by providing tools for process integration, real-time monitoring, and data-driven decision-making, enabling greater efficiency and visibility within the supply chain.

The model also demonstrates that the mediating effects of social capital and information technology on supply chain performance are more significant than the direct effects of supply chain management. This underscores the importance of building strong social capital and optimizing the use of information technology to reinforce relationships among supply chain actors and improve competitiveness in global markets. Performance dimensions such as reliability, flexibility, and utility have become cooperative strengths, while cost management requires further attention to achieve greater efficiency.

This study successfully validates that a collaborative and digital approach to supply chain management can enhance the sustainability and competitiveness of the Arabica coffee supply chain. By integrating social capital as a driver of collaboration and information technology as a process integration tool, the cooperative can respond to global market dynamics more quickly and efficiently. An in-depth evaluation of this performance model also highlights that sustainability is not only determined by internal factors but also by the cooperative's ability to adapt to external factors, such as changes in market demand and environmental challenges.

Overall, the developed supply chain performance model not only provides solutions to the cooperative's internal challenges but also offers a strategic framework to enhance the efficiency, transparency, and sustainability of the coffee supply chain in an increasingly competitive international market. By continuously strengthening social capital, adopting the latest information technology, and improving coordination in supply chain management, the cooperative has significant potential to become a leading player in the global specialty coffee industry.

Recommendations

Strengthening supply chain management is crucial to improving coordination among farmers, processors, distributors, and consumers through enhanced communication and collaboration. Technologies like Enterprise Resource Planning (ERP) can be adopted to integrate logistics, inventory, and procurement processes. At the same time, cost-efficiency strategies should be implemented by identifying and minimizing unnecessary operational expenses to maintain profitability. Social capital should also be reinforced by building trust and fostering collaboration through regular forums, expanding networks with local and international partners, opening new market opportunities, and strengthening the cooperative’s global position.

The adoption of information technology must be prioritized. Digitalizing processes with systems like Electronic Data Interchange (EDI) and Decision Support Systems (DSS) can accelerate information flow, improve product tracking, and support data-driven decision-making. Digital literacy training for cooperative members is essential to maximize the benefits of these technologies. Cost management should also be enhanced through more efficient production and distribution strategies, exploring alternative income sources such as utilizing coffee by-products, and setting competitive

pricing based on thorough market analysis.

Sustainability needs to be at the core of supply chain management. Encouraging sustainable farming practices and obtaining international certifications, such as Rainforest Alliance or Fair Trade, will boost credibility and access to global markets. Continuous education on sustainability across social, economic, and environmental dimensions should be provided to all stakeholders. Expanding into new international markets and leveraging digital marketing tools like e-commerce and social media will help strengthen the global visibility of Kerinci Arabica Coffee.

This study has several limitations. The analysis is based on the specific context of the Koerintji Barokah Bersama Cooperative and the Arabica coffee supply chain in Kerinci, which may limit generalizability to other supply chains with different market or infrastructure conditions. Furthermore, external factors such as government regulations, global market dynamics, and climate change impacts were not deeply explored. Data collection was limited to a specific time frame, which might not capture long-term performance variations. Additionally, limited technological resources within the cooperative could pose challenges for implementing recommended technology-based solutions.

Future research should broaden the geographical and demographic scope by comparing coffee supply chain performance across different regions and cooperatives to validate and generalize the developed model. It should also delve deeper into the impacts of external factors like regulations, global market trends, and climate change on supply chain performance. Longitudinal studies are recommended to capture performance dynamics over extended periods.

Future studies could also integrate advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data Analytics to improve predictions, automation, and efficiency in supply chain processes. Exploring the interplay between social capital and technology adoption and how these elements can collectively enhance sustainability would provide valuable insights. Experimental research testing the effectiveness of IT and stakeholder collaboration under various disruption scenarios is essential to assess supply chain resilience and flexibility. These future directions will help build a more comprehensive understanding of supply chain sustainability and competitiveness in a complex global market.

REFERENCES

Alghofeli, M. S. (2023). The Correlation between Supply Chain Performance and Information Technology. *Tehnički Glasnik*, *17*(1), 81–87. https://doi.org/https://doi.org/10.31803/tg-20220826130310

Badan Pusat Statistik. (2022). *Statistik Kopi Indonesia 2021*. Jakarta: Badan Pusat Statistik.

Dias, G. P., & Silva, M. E. (2022). Revealing performance factors for supply chain sustainability : a systematic literature review from a social capital perspective. *Brazilian Journal of Operations & Production Management*, *19*(1), 1–18. https://doi.org/https://doi.org/10.14488/BJOPM.2021.037

Direktorat Jenderal Pertanian. (2021). *Statistik Perkebunan Non Unggulan Nasional 2020-2022*. Sekretariat Direktorat Jendral Perkebunan. www.ditjenbun.pertanian.go.id

Fatorachian, H., & Kazemi, H. (2021). Impact of Industry 4.0 on supply chain

performance. *Production Planning and Control*, *32*(1), 63–81. https://doi.org/10.1080/09537287.2020.1712487

Ganbold, O., Matsui, Y., & Rotaru, K. (2020). Effect of information technology-enabled supply chain integration on firm' s operational performance. *Journal of Enterprise Information Management*, *34*(3), 948–989. https://doi.org/10.1108/JEIM-10-2019-0332

Garay-Rondero, C. L., Martinez-Flores, J. L., Smith, N. R., Caballero Morales, S. O., & Aldrette-Malacara, A. (2020). Digital supply chain model in Industry 4.0. *Journal of Manufacturing Technology Management*, *31*(5), 887–933. https://doi.org/10.1108/JMTM-08-2018-0280

George, J., & Pillai, V. M. (2019). A study of factors affecting supply chain performance. *Journal of Physics: Conference Series*, *1355*. https://doi.org/10.1088/1742-6596/1355/1/012018

Gölgeci, I., & Kuivalainen, O. (2020). Does social capital matter for supply chain resilience? The role of absorptive capacity and marketing-supply chain management alignment. *Industrial Marketing Management*, *84*(September 2018), 63–74. https://doi.org/10.1016/j.indmarman.2019.05.006

Haryono, S. (2017). *Metode SEM untuk Penelitian Manajemen dengan AMOS LISREL PLS*. Luxima Metro Media.

Ikhwana, A. (2018). Supply chain management of coffee commodities. *MATEC Web of Conferences*, *197*(14003), 1–4. https://doi.org/10.1051/matecconf/201819714003

Johnson, N., Elliott, D., & Drake, P. (2013). Exploring the role of social capital in facilitating supply chain resilience. *Supply Chain Management: An International Journal*, *18*(3), 324–336. https://doi.org/10.1108/SCM-06-2012-0203

Kementerian Hukum dan Hak Asasi Manusia. (2017). *Sertifikat Indikasi-Geografis Koperasi Koerintji Barokah Bersama*. Direktorat Jenderal Kekayaan Intelektual, Kementerian Hukum dan Hak Asasi Manusia. Jakarta

Marinagi, C., Trivellas, P., & Sakas, D. P. (2014). The Impact of Information Technology on the Development of Supply Chain Competitive Advantage. *Procedia - Social and Behavioral Sciences*, *147*, 586–591. https://doi.org/10.1016/j.sbspro.2014.07.161

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. Journal of Business logistics. *Journal of Business Logistics*, *22*(2), 1–25.

Munizu, M. (2017). Pengaruh Kepercayaan, Komitmen dan Teknologi Informasi Terhadap Kinerja Rantai Pasok (Studi Kasus IKM Pengolah Buah Markisa di Kota Makassar). *Jurnal Manajemen & Bisnis*, *14*(1), 32–42. https://doi.org/10.17358/JMA.14.1.32

Naibaho, R. S. (2017). Peranan Dan Perencanaan Teknologi Informasi Dalam Perusahaan. *Warta Edisi*, *52*.

Nunez-Merino, M., Maqueira-Marin, J. M., Moyano-Fuentes, J., & Castano-Moraga, C. A. (2022). Industry 4 . 0 and supply chain . A Systematic Science Mapping analysis. *Technological Forecasting & Social Change*, *181*. https://doi.org/10.1016/j.techfore.2022.121788

Parrangan, K., Syam, E., & Mappigau, P. (2014). Pengaruh Modal Sosial dan Strategi Kemitraan Terhadap Kinerja Rantai Pasok Hortikultura Sayuran di Timika-Papua. *Sains Dan Teknologi*, *14*(1), 78–87.

Putri, Y. D., Huda, L. N., & Sinulingga, S. (2019). The concept of supply chain management performance measurement with the supply chain operation reference model (Journal review). *IOP Conf. Series: Materials Science and Engineering*, *505*(1), 6–12. https://doi.org/10.1088/1757-899X/505/1/012011

Riyadi, S., Munizu, M., & Arif, D. (2021). Supply chain performance as a mediating variable effect of information technology on company competitiveness. *Uncertain Supply Chain Management*, *9*, 811–822. https://doi.org/10.5267/j.uscm.2021.8.008

Rizkya, I., Hidayati, J., Syahputri, K., Sari, R. M., Siregar, I., Siregar, K., & Utaminingrum, J. (2019). Measurement of Supply Chain Performance in Manufacturing. *Journal of Physics: Conf. Series*, *1230*, 0–8. https://doi.org/10.1088/1742-6596/1230/1/012056

Ryu, I., So, S., & Koo, C. (2009). The Role of Partnership in Supply Chain Performance and Data Systems, 109 (4), 496-514. https://doi.org/10.1188/02635570910948632

Safitri, W., & Huda, M. (2022). Teknologi Informasi dalam Integrasi Supply Chain dan Pertukaran Informasi Terhadap Performa Supply Chain. *Widya Cipta: Jurnal Sekretari Dan Manajemen*, *6*(1).

Santoso, D., Indarto, & Sadewisasi, W. (2019). Pola Peningkatan Kinerja Bisnis UKM Melalui Modal Sosial dan Modal Manusia Dengan Kebijakan Pemerintah Sebagai Moderating. *Dinamika Sosial Budaya*, *21*(2), 152–171.

Saragih, R. (2020). *Pandemi Covid-19, Petani Kerinci Justru Berhasil Ekspor Kopi ke Belgia*. Beritasatu.Com. https://www.beritasatu.com/news/660191/pandemi-covid19-petani-kerinci-justru-berhasil-ekspor-kopi-ke-belgia

Sembiring, N., Tambunan, M. M., & Ginting, E. (2020). Collaboration of sustainability and digital supply chain management of achieving a successful company. *IOP Conf. Series: Materials Science and Engineering*, *830*. https://doi.org/10.1088/1757-899X/830/3/032093

Septarianes, S., Marimin, & Raharja, S. (2020). Strategi Peningkatan Kinerja Dan Keberlanjutan Rantai Pasok Agroindustri Kopi Robusta Di Kabupaten Tanggamus. *Jurnal Teknologi Industri Pertanian*, *30*(2), 207–220. https://doi.org/10.24961/j.tek.ind.pert.2020.30.2.207

Siswoyo Haryono, 2017. Metode SEM untuk Penelitian Manajemen dengan AMOS LISREL PLS. Luxima Metro Media. ISBN: 978-602-268-176-2

Suandi. (2012). Modal Sosial dan Pembangunan Ketahanan Pangan Berkelanjutan. *Ageisep*, *11*(2), 1–14.

Van Der Vorst, J. G. A. J. (2006). Performance measurement in agri-food supply-chain networks. *Quantifying the Agri-Food Supply Chain*, 15–26. https://doi.org/10.1007/1-4020-4693-6_2

Wahyudi, & Izhar, E. (2018). Strategi Pemasaran Kopi Arabika Kerinci Di Provinsi Jambi. *Jurnal Pengkajian Dan Pengembangan Teknologi Pertanian*, *21*, 284.

Waringga, K. F., Riana, F. D., & Aprilia, A. (2022). Pengaruh Penerapan Teknologi Informasi Terhadap Peningkatan Keunggulan Kompetitif Pada Usaha Kedai Kopi Di Kota Bandung. *SEPA: Jurnal Sosial Ekonomi Pertanian Dan Agribisnis*, *19*(1), 31. https://doi.org/10.20961/sepa.v19i1.51628

Wilujeng, S., Sarwoko, E., & Nikmah, F. (2022). Triple-A strategy: For supply chain performance of Indonesian SMEs. *Uncertain Supply Chain Management*, *10*(1), 95–100. https://doi.org/10.5267/j.uscm.2021.10.007

Yekti, K. N., & Solovida, G. T. (2021). Pengaruh Strategi Kewirausahaan dan Modal Sosial Terhadap Kinerja Keuangan serta Non-Keuangan Melalui Manajemen Rantai Pasok Berkelanjutan. *Jurnal Wahana Akuntansi*, *16*(1), 52–73. https://doi.org/10.21009/wahana.16.014