

Coordination and Digitalization Gaps in Rural Agribusiness: Case Studies from Indonesia's MSME Sector

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ABSTRACT: Micro, Small, and Medium Enterprises (MSMEs) form the backbone of Indonesia's agricultural economy, yet they face persistent inefficiencies in supply chain management (SCM), particularly in rural and coastal areas. This study examines the coordination and digitalization challenges that hinder SCM performance among agricultural MSMEs, using three case studies: Sidrap rice distribution, Malk Chips (processed taro), and Bunga Seroja (seaweed production). The SCOR (Supply Chain Operations Reference) model is employed to assess performance across five key processes: Plan, Source, Make, Deliver, and Return. A qualitative, case study approach was used, relying on secondary data from journal articles, government reports, and institutional studies. Comparative analysis was conducted to evaluate digital readiness, stakeholder coordination, and SCM performance metrics across the cases. Findings show that while Malk Chips benefits from partial digital adoption and efficient logistics practices, Sidrap and Bunga Seroja continue to rely on traditional models with limited integration of digital tools. Common issues include fragmented coordination, poor infrastructure, low digital literacy, and inadequate stakeholder engagement. These factors contribute to suboptimal performance in the Deliver, Make, and Return segments of the SCOR model. The study concludes that successful SCM digitalization in agricultural MSMEs requires localized, context sensitive interventions. These include mobile based communication platforms, peer learning models, and tailored policy frameworks that integrate the lived realities of rural enterprises. Such strategies can foster efficiency, transparency, and competitiveness in Indonesia's agribusiness supply chains.

Keywords: Msmes, Agriculture, Digitalization, Supply Chain Management, SCOR Model, Indonesia.



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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are not only vital contributors to Indonesia's economy but also central actors in agricultural supply chains that increasingly demand effective coordination and digital integration. While they account for nearly 60% of GDP and 97% of

employment (Chatra et al., 2023; Hermina & Firdaus, 2023), their role goes beyond economic contribution by determining how efficiently agricultural products move from farmers to markets. The COVID-19 pandemic further exposed structural gaps in coordination and the limited adoption of digital solutions, underscoring the urgency of strengthening both aspects to sustain resilience and competitiveness in rural agribusiness (Kusnanto et al., 2023).

In the context of agriculture, MSMEs serve as strategic actors that facilitate the flow of goods from farmers to markets, thus contributing directly to food security and rural income generation (Dewi et al., 2023). These enterprises bridge the gap between small scale producers and broader market structures, playing a critical role in regional economic equilibrium. By creating job opportunities and stimulating local economies, agricultural MSMEs address rural poverty while fostering localized economic resilience.

The evolution of digital transformation policies in Indonesia has increasingly focused on empowering MSMEs to participate in a digitally integrated economy. Government initiatives recognize the necessity for developing a robust digital ecosystem tailored to the needs of MSMEs, particularly those operating in agricultural sectors. Policies have thus been introduced to promote digital literacy, technological adoption, and the easing of fiscal constraints that often hinder technological integration (Haqqi, 2023).

Global SCM frameworks, such as the Supply Chain Operations Reference (SCOR) model, have proven effective in measuring and enhancing supply chain performance. The SCOR model facilitates standardized performance indicators, helping enterprises identify inefficiencies and formulate targeted interventions (Erlany et al., 2022; Kurniawati et al., 2021). When applied to small scale agriculture, SCOR allows for increased transparency, responsiveness, and traceability within supply chains. These attributes are vital for sectors marked by high volatility and multiple actors, such as Indonesian agribusiness.

Digital adoption further enhances the capabilities of MSMEs by streamlining operational tasks such as inventory management, logistics, and customer relationship management. The integration of e commerce and digital tracking technologies enables rural producers to access broader markets, reduce transactional inefficiencies, and improve demand forecasting (Alfarizi et al., 2023; Sumiok, 2023). Moreover, digital communication tools enhance coordination among supply chain actors, fostering agile responses to market trends and consumer behavior (Kaukab, 2022).

Despite these potentials, the implementation of SCM frameworks such as SCOR within Indonesian MSMEs continues to encounter persistent barriers, including infrastructural deficiencies, limited financial capacity, and shortages of digitally skilled personnel. Cultural and institutional resistance to technological change further slows adoption (Karim et al., 2023; Riwanto et al., 2023). emphasizing the need for context-sensitive policy refinements that address these systemic challenges. The socioeconomic consequences of weak SCM performance in agriculture are particularly severe: higher operating costs, greater levels of waste, and reduced revenue opportunities for farmers and MSMEs. At a national scale, these inefficiencies weaken the

contribution of the agricultural sector to economic growth and exacerbate rural poverty (Haryaningsih et al., 2022; Reni et al., 2023).

Unlike previous studies that mainly address digitalization or SCM in isolation, this research highlights the combined gaps of coordination and digital adoption in rural agribusiness, offering a comparative perspective across three distinct MSME cases. The novelty lies in applying the SCOR framework to systematically evaluate both coordination mechanisms and digital readiness in rural contexts, thereby linking theoretical performance metrics with on-the-ground challenges. Specifically, this study aims to (1) assess how coordination and digitalization influence SCM performance among agricultural MSMEs; (2) identify key barriers that limit effective adoption of SCM frameworks; and (3) propose actionable, context-sensitive strategies to enhance efficiency and resilience in Indonesia's rural supply chains.

METHOD

This study employs a qualitative case study approach to examine the intersection of supply chain management (SCM) performance and digitalization in Indonesian agricultural MSMEs. The analysis is framed using the Supply Chain Operations Reference (SCOR) model, which provides a comprehensive structure for assessing performance across five core processes: Plan, Source, Make, Deliver, and Return. This chapter outlines the methodological steps and data sources employed, justifying the application of the SCOR framework and acknowledging the limitations of secondary data.

The SCOR model is particularly well suited to agricultural SCM research due to its ability to standardize performance benchmarks and facilitate targeted process improvements (Putra et al., 2023). Its process driven architecture supports clear communication among stakeholders, aligning operational activities and performance expectations (Girsang & Razali, 2023). In agricultural MSMEs, where stakeholder coordination is often fragmented and informal, the SCOR framework enables a structured assessment of inefficiencies and process gaps.

Several previous studies have demonstrated the successful application of SCOR metrics within MSME contexts. For instance, research in diverse agro industrial settings has shown that applying SCOR principles can improve inventory management, mitigate perishability risks, and enhance responsiveness to demand fluctuations (Coco et al., 2023). Moreover, the framework's adaptability allows researchers to tailor its components to local conditions, thereby ensuring its relevance across varied agricultural systems (Mazya et al., 2022).

This research draws on secondary data from multiple sources, including peer-reviewed journals, institutional reports, and government publications. The selection of cases Sidrap rice distribution, Malk Chips (processed taro), and Bunga Seroja (seaweed production) was based on their representation of different agricultural subsectors (staple food, processed food, and coastal commodity), allowing for cross-case comparison across diverse supply chain contexts. Key data

were obtained from documented case studies in Jurnal Agrimor (2021) for the Sidrap rice supply chain, as well as SCOR-based performance evaluations of Malk Chips and Bunga Seroja. In addition, macro-level insights were drawn from the 2023 Agricultural Statistics Report by Indonesia's Pusat Data dan Sistem Informasi Pertanian (Pusdatin).

The analysis process followed a structured cross-case synthesis. First, relevant indicators were extracted from each case study and coded according to the five SCOR dimensions (Plan, Source, Make, Deliver, and Return). Second, thematic synthesis was applied to identify recurrent patterns related to coordination, digital readiness, and performance outcomes. Third, triangulation across multiple sources was conducted to improve reliability and reduce potential reporting bias.

While secondary data provide broad contextual insights, this approach also imposes limitations. Specifically, the absence of primary data restricts the ability to capture real-time operational practices, and differences in the scope or methodology of original studies may introduce inconsistencies in the comparative analysis. These limitations may have led to underrepresentation of farmer-level perspectives and constrained the precision of SCOR performance measurement. Accordingly, future research should complement this approach with primary data collection, including interviews and field observations, to validate and enrich the findings.

RESULT AND DISCUSSION

This chapter presents the comparative findings from three MSME case studies in Indonesia's agricultural sector: Sidrap rice supply chain, Malk Chips, and Bunga Seroja. Each case is analyzed through the lens of the SCOR model, highlighting performance metrics and digital readiness.

Sidrap Rice Supply Chain

The Sidrap rice supply chain is characterized by traditional wholesaler-centric distribution models, where approximately 70% of transactions are mediated by intermediaries. This structure reduces farmers' bargaining power and keeps producer margins low, with price markups averaging 15–20% compared to direct sales (Achmad & Ilhami, 2022; Amri et al., 2023). Coordination inefficiencies among supply chain actors contribute to delivery delays averaging 3–5 days and significant post-harvest losses estimated at 8–10% annually (Iskandar, 2023; Wardhani et al., 2023).

Government interventions through Bulog help stabilize markets, but they often reinforce dependency and discourage innovation. Informal collaboration mechanisms, such as farmer groups pooling resources for collective marketing, have improved trust yet lack transparency and scalability required for modern SCM (Wardana et al., 2022).

Malk Chips

Malk Chips, an MSME producing processed taro chips, demonstrates relatively high SCM performance. The enterprise reported a SCOR efficiency score of 45.707, with distribution channels achieving up to 92% on-time delivery. Integration of digital tools such as cloud-based inventory tracking and demand forecasting has reduced stockouts by 12% and shortened lead

times by 18% (Sonar et al., 2023). Just-in-time inventory and the use of local warehouses further enhanced efficiency, making Malk Chips the strongest performer among the three cases.

Bunga Seroja (Seaweed MSME)

Bunga Seroja operates within the seaweed value chain and faces structural challenges such as limited cold storage facilities, financing gaps, and unstable internet connectivity (Santoso et al., 2023). The enterprise recorded a SCOR average of 3.4, with low performance in Deliver (2.7), Make (3.2), and Return (2.8). While proposals for blockchain traceability and mobile tracking exist, Bunga Seroja has only piloted mobile-based communication for coordinating with suppliers in 2022. The pilot was hindered by weak connectivity and high costs, preventing full-scale adoption. These constraints highlight both the potential and the current underutilization of digital tools in coastal MSMEs (Purwaningsih et al., 2022).

Cross Case Analysis

Across all three cases, shared SCM inefficiencies include fragmented coordination, poor data integration, and inconsistent stakeholder communication. These issues elevate transaction costs and reduce responsiveness to market changes (Badri & Amrina, 2023).

Digital readiness is hampered by infrastructural shortcomings such as inadequate internet access and poor transport networks. Despite policy support, execution remains weak, highlighting the importance of localized digital literacy programs and rural infrastructure investments (Chatra et al., 2023).

Digital maturity frameworks, like the Digital Maturity Model, can aid MSMEs in evaluating and planning their digital transitions. Furthermore, peer learning networks offer promising potential for disseminating best practices and fostering innovation among MSMEs (Alyani et al., 2023).

The findings from this study underscore the persistent structural and technological limitations faced by agricultural MSMEs in Indonesia in optimizing their supply chain performance. While policy frameworks have been instituted to support digitalization and improve supply chain integration, their impact remains uneven, often hampered by limited applicability to rural contexts and insufficient awareness among stakeholders (Ayu et al., 2023).

Government programs aimed at enhancing digital infrastructure and extending financial support to MSMEs are essential yet insufficient in isolation. In practice, these initiatives are frequently constrained by bureaucratic inefficiencies and low uptake due to a lack of localized engagement strategies (Anatan & , 2023). The success of digital transformation efforts hinges on the extent to which policies are adaptable to the operational realities of rural enterprises and their unique sociotechnical environments. As such, policy effectiveness would benefit from continuous monitoring and iterative design improvements.

Mobile based communication tools have emerged as a particularly promising solution for improving supply chain coordination in rural contexts. Their potential lies in enabling real time information exchange across various supply chain actors, enhancing responsiveness to market dynamics and logistical challenges (Rudianti & Ningrum, 2022). These tools also reduce communication lags and foster trust based collaboration among MSME actors. However, digital illiteracy and inconsistent access to mobile technology remain major obstacles that limit their effectiveness (Yeremia et al., 2023).

From a strategic perspective, successful interventions in fragmented supply chains have demonstrated the value of case-based, context-sensitive approaches. Strategies involving cross-sector collaborations and locally driven networking initiatives have shown potential in improving information flow, market access, and collective bargaining capacity (Rochimah et al., 2023). In the Sidrap case, these strategies could take the form of peer-to-peer learning platforms embedded in farmer cooperatives, which build on existing trust networks while gradually introducing digital tools. For Malk Chips, expanding external partnerships and integrating predictive analytics could strengthen already efficient logistics practices, while for Bunga Seroja, locally driven networking requires stronger government support through connectivity subsidies and targeted digital literacy training. These recommendations ensure that the strategies highlighted by Rochimah et al. (2023) are directly aligned with the gaps observed in each case.

Nonetheless, realizing the benefits of digital transformation at scale requires a recalibration of policy orientation toward the realities of rural MSMEs. This involves designing interventions that explicitly address issues of technological capacity, infrastructure inadequacy, and financing constraints (Wardana et al., 2022). Support mechanisms should not only focus on technology provision but also on skill development and institutional strengthening. For instance, peer-based digital training programs (Estherina, 2021), would be more effective if adapted to local sociocultural dynamics. In Sidrap, involving local leaders in training initiatives could accelerate acceptance, while in Bunga Seroja, engaging women's groups already active in seaweed processing may increase sustainability of adoption. Thus, cultural and institutional aspects become central determinants of MSME readiness, complementing the technical and financial considerations raised by Wardana et al. (2022).

Moreover, stakeholder engagement in policy formulation can enhance the effectiveness and sustainability of digital initiatives. Involving MSME operators, local governments, and civil society in co-developing policies ensures that digital transformation strategies are responsive, inclusive, and scalable (Tyoso et al., 2021). Such participatory governance frameworks can also build accountability and ownership among stakeholders, which are critical for long-term impact.

In sum, while digital tools and SCM frameworks offer significant promise, their successful implementation in Indonesia's agricultural MSMEs requires targeted, context-aware interventions. The combination of mobile technologies, stakeholder engagement, and policy refinement can catalyze systemic improvements in supply chain efficiency and digital readiness.

CONCLUSION

This study examined coordination and digitalization gaps in the supply chain management of Indonesian agricultural MSMEs using three cases: Sidrap rice, Malk Chips, and Bunga Seroja through the SCOR framework. Findings reveal systemic inefficiencies: Sidrap remains bound to traditional wholesaler-dominated networks, Malk Chips demonstrates the benefits of selective digital adoption with improved SCOR scores, while Bunga Seroja reflects coastal MSME vulnerabilities with limited success in piloting mobile-based tools. Across cases, poor coordination, weak infrastructure, and low digital literacy emerge as common constraints. The study's contribution lies in combining coordination and digitalization analysis within a SCOR-based comparative framework, bridging theoretical metrics with context-specific operational challenges.

Nevertheless, the study is limited by its reliance on secondary data, which restricts the granularity of farmer-level practices and may introduce reporting inconsistencies. Future research should incorporate primary data collection, such as field surveys and interviews, to validate SCOR metrics and capture local perspectives more accurately. Further exploration of cultural and institutional factors influencing digital adoption in rural settings would also deepen understanding. Targeted digital interventions peer-based learning, participatory governance, and connectivity support remain critical to enhance efficiency and resilience in Indonesia's agribusiness supply chains.

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