



Supply Chain Management Analysis to Support the Operations of Gethuk Semar Micro, Small, and Medium Enterprises

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ABSTRACT: Gethuk Semar Micro, Small, and Medium Enterprises (MSMEs) is a traditional cassava-based food agro-industry business that is developing in Karangpandan District, Karanganyar Regency, with market characteristics influenced by local demand and the tourism sector. Dependence on local cassava raw materials that are perishable and seasonal demand fluctuations make supply chain management a key factor in maintaining the operational sustainability of MSMEs. This study aims to analyze the structure and performance of supply chain management at Gethuk Semar MSMEs and design a more integrated and efficient supply chain management system. The research method used is a qualitative approach with field observation techniques and documentation studies to describe the flow of raw material supply, production processes, and product distribution. The results show that the Gethuk Semar supply chain involves local cassava farmers, collectors, MSME production units, and direct distribution channels to local consumers and tourists. However, supply chain management is still simple and not supported by an integrated information system. Therefore, this study designs a supply chain management system based on supplier, inventory, production, distribution, and reporting modules. This system is expected to improve operational efficiency, raw material supply stability, and the competitiveness of Gethuk Semar MSMEs amidst market dynamics and regional tourism.

KEYWORDS: Supply Chain Management, MSMEs, Gethuk Semar, Agroindustry, Cassava

1. INTRODUCTION

Supply chain management (SCM) has become a crucial pillar for the sustainability and competitive advantage of companies of all sizes, including Micro, Small, and Medium Enterprises (MSMEs) (Marina 2025). In the era of globalization and digitalization, MSMEs in the ASEAN region face unique challenges and opportunities in managing their supply chains, from market access and technology adoption to operational sustainability (Firdausya & Ompusunggu, 2023; Sulaeman et al., 2024).

The urgency of this research is reinforced by several aspects. First, MSMEs in ASEAN are vital to economic growth and job creation in the region, so improving SCM performance will positively impact the economy as a whole (Lubis & Salsabila, 2024; Wahyunti, 2020).

Second, regional economic integration initiatives, such as those emphasizing the importance of efficient and integrated supply chains across member countries (Ishikawa, 2021; Prakash, 2023). Third, a better understanding of SCM research trends can assist policymakers and industry associations in designing more targeted support programs for MSMEs (Aini & Riofita, 2025).

The role of effective SCM in increasing efficiency, reducing costs, and enhancing customer satisfaction is increasingly crucial for MSMEs to compete in regional and global markets (Lumbanraja et al., 2025). Micro, Small, and Medium Enterprises (MSMEs) are a key pillar of the regional economy in Indonesia, contributing significantly to employment and strengthening local economies, particularly in the agriculture-based food sector (Ministry of Cooperatives and SMEs of the Republic of Indonesia, 2022). In Karanganyar Regency, agro-industrial MSMEs are growing rapidly in line with the availability of local agricultural raw materials and support from the tourism sector (BPS Karanganyar Regency, 2025).

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One of the traditional food MSMEs developing in Karangpandan District is Gethuk Semar, which processes cassava as its primary raw material into high-value traditional gethuk products. Cassava agro-industries, such as gethuk, are characterized by a strong dependence on the local raw material supply chain due to cassava's perishability and seasonality ([Trienekens, 2011](#)). Therefore, the operational success of this MSME is highly determined by the effectiveness of its supply chain management.

The agro-industrial supply chain encompasses the flow of raw materials, information, and products from farmers as suppliers to end consumers, requiring coordination between actors to maintain supply continuity and product quality ([Vorst, 2006](#)). In small-scale MSMEs, supply chain management is generally informal, without clear supply contracts and demand-based production planning ([Setiawan & Rahmawati, 2018](#)). This situation leads to high uncertainty in raw material supply and fluctuations in production costs. Supply chain issues in the cassava agro-industry MSMEs often include unstable raw material prices, limited storage, and poor integration between farmers and processing businesses ([Handayati & Simatupang, 2015](#)). Furthermore, processed cassava products such as gethuk have a relatively short shelf life, requiring good synchronization between raw material supply, production schedules, and distribution ([Aramyan et al., 2007](#)).

The Gethuk Semar MSME also faces the challenge of seasonal increases in demand, particularly on weekends and during tourist holidays, which often lacks a balanced raw material supply chain ([Pujawan & Mahendrawathi, 2017](#)). Without effective supply chain planning, MSMEs risk experiencing raw material shortages during periods of high demand or waste during periods of low demand ([FAO, 2019](#)).

Given these conditions, research on the supply chain of the Gethuk Semar MSME in Karangpandan is crucial to identify the supply chain structure, the actors involved, and the critical points that impact MSME operational performance. The results of this study are expected to provide applicable recommendations for supply chain improvements to increase operational efficiency, production stability, and the competitiveness of traditional food MSMEs in Karanganyar Regency ([Trienekens, 2011](#); [Ministry of Cooperatives and SMEs of the Republic of Indonesia, 2022](#)).

2. LITERATURE REVIEW

2.1 Supply Chain Management

Supply Chain Management (SCM) is an integrated approach to managing the flow of materials, information, and finances from the procurement stage of raw materials to the final product being received by consumers ([Mentzer et al., 2001](#)). Supply Chain Management (SCM) has long been recognized as a crucial and evolving discipline, with a solid theoretical foundation rooted in Resource-Based View (RBV) and Transaction Cost Economics (TCE). RBV, for example, explains how unique capabilities within SCM, such as logistical efficiency or information integration, can be a source of sustainable competitive advantage for a company ([Gopal et al., 2025](#); [Wahyuningsih et al., 2024](#); [Wu et al., 2006](#)). Meanwhile, TCE helps explain a company's decisions to manage its supply chain activities internally or externally, with the goal of minimizing transaction costs ([Ketokivi & Mahoney, 2020](#)).

Recently, network and business ecosystem theories have also become increasingly relevant in understanding modern SCM, emphasizing the importance of collaboration and interdependence between actors in the supply chain ([Cimino et al., 2024](#)). These theories provide a framework for analyzing how MSMEs in ASEAN manage and optimize their supply chains within the context of a dynamic business environment.

This concept emphasizes the importance of coordination and integration of cross-functional and cross-organizational activities to improve the efficiency and effectiveness of the entire supply chain system ([Lambert & Cooper, 2000](#)). Thus, supply chain management is viewed not only as an operational activity but also as a business strategy oriented towards creating value for customers and other stakeholders ([Chopra & Meindl, 2016](#)).

According to the Council of Supply Chain Management Professionals (CSCMP), supply chain management encompasses the planning and management of all activities involved in procurement, conversion, and logistics management, including coordination and collaboration with supply chain partners such as suppliers, distributors, and customers ([CSCMP, 2018](#); [Christopher \(2016\)](#) stated that supply chain management focuses on managing interdependent relationships between organizations to create sustainable competitive advantage. Therefore, the success of supply chain management is largely determined by an organization's ability to align objectives, processes, and information flows across supply chain actors ([Van der Vorst, 2004](#)).

The ASEAN region presents a unique SCM context, distinct from other regions such as Europe or North America, primarily due to economic diversity, varying infrastructure, and varying levels of digitalization across member countries ([Goh, 2002](#)). SCM in ASEAN is often characterized by logistical fragmentation, challenges in harmonizing cross-border regulations, and the dominance of MSMEs in business structures ([Dansomboon et al., 2016](#); [Khanam & Hasan, 2025](#)). Unlike more mature supply chains in developed countries, SCM in ASEAN is often still in its infancy, with a focus on increasing visibility, achieving fundamental cost efficiencies, and adapting to highly specific local market needs ([Punnakikashem et al., 2010](#)).

Global disruptions such as the pandemic and geopolitical tensions also demonstrate the need for greater resilience in ASEAN supply chains, given their reliance on export and import markets ([Annamalah et al., 2025](#); [Keefe et al., 2024](#)). In an operational context, supply chain management involves decision-making related to demand planning, raw material procurement, inventory management, production processes, and coordinated product distribution ([Heizer, Render, & Munson, 2017](#)). In the agro-industrial and MSME sectors, supply chain management plays a crucial role in maintaining supply continuity, reducing operational costs, and mitigating risks resulting from supply uncertainty and demand fluctuations ([Trienekens, 2011](#)). The implementation of effective supply chain management in MSMEs can also improve efficiency, flexibility, and business competitiveness despite resource constraints ([Kumar et al., 2017](#); [Pujawan & Mahendrawathi, 2017](#)).

2.2 Definition of Supply Chain

A supply chain is a network of interconnected organizations, individuals, activities, resources, and information involved in the procurement of raw materials, their transformation into products, and their distribution to end consumers ([Mentzer et al., 2001](#)). Issues such as global supply chain disruptions due to the COVID-19 pandemic and geopolitical tensions have highlighted the fragility and need for resilience in Supply Chain Management (SCM), especially for MSMEs, which tend to have limited resources ([Putranto, 2023](#)). MSMEs in ASEAN, which are the backbone of the regional economy, often lag behind larger companies in implementing sophisticated Supply Chain Management (SCM) ([Mohite et al., 2025](#); [Setijadi et al., 2021](#)).

This is due to various factors, including limited capital, lack of expertise, and inadequate infrastructure ([Darmeinis, 2024](#)). However, on the other hand, the adoption of digital technology and e-commerce platforms also opens up opportunities for MSMEs to better integrate their supply chains ([Faisal & Fasa, 2025](#)). The supply chain encompasses all stages directly or indirectly involved in meeting customer needs, from suppliers, manufacturers, distributors, to retailers, working in an integrated manner to create added value ([Chopra & Meindl, 2016](#)). Despite the increasing attention to SCM in the MSME context, a comprehensive mapping of the literature specific to MSMEs in ASEAN remains limited. Most literature reviews tend to be general or focus on other regions, making it difficult for researchers and practitioners to gain a complete picture of SCM dynamics in the region ([Anam et al., 2025](#)). This gap raises the need for a systematic analysis that can identify key contributors, topic trends, and collaboration patterns in SCM research for MSMEs in ASEAN ([Tamam et al., 2024](#)). From a systems perspective, the supply chain focuses not only on the physical flow of goods but also involves the flow of information and finances that connect each actor in the network ([Christopher, 2016](#)). Relationships and coordination between supply chain actors are crucial because the performance of one party will affect the performance of the entire supply chain system ([Lambert & Cooper, 2000](#); [Van der Vorst, 2004](#)).

Recent studies have explored relevant SCM strategies for MSMEs, ranging from adopting digital technology to developing strategic partnerships to increase efficiency and resilience ([Zainurrafiqi, & Gazali, 2024](#)). In the agroindustrial sector, supply chains have special characteristics such as dependence on perishable raw materials, seasonal influences, and the need for high coordination between farmers, processors, and markets ([Trienekens, 2011](#)). In the context of MSMEs, supply chains are generally simpler and shorter, but are vulnerable to supply disruptions and demand fluctuations, so understanding the structure and flow of the supply chain is an important factor in maintaining business sustainability and competitiveness ([Aramyan et al., 2007](#); [Kumar et al., 2017](#)).

3. Benefits of Supply Chain Management

Supply chain management provides key benefits in the form of increased operational efficiency through the coordinated management of the flow of raw materials, information, and products, thereby reducing production and distribution costs ([Chopra & Meindl, 2016](#)). Effective supply chain management implementation can also improve supply reliability and on-time delivery, which directly impacts customer satisfaction ([Christopher, 2016](#)). The role of technology in SCM transformation for MSMEs in ASEAN has also been highlighted in recent literature. The adoption of technologies such as e-procurement, blockchain, and data analytics is seen as a catalyst for improving MSME efficiency, transparency, and competitiveness ([Dey et al., 2024](#)). However, studies also indicate that technology adoption by MSMEs in ASEAN still faces obstacles, including high investment costs, lack of internal expertise, and resistance to change ([Zailani et al., 2009](#)). The importance of cross-border collaboration and regional integration, as mandated by the ASEAN Economic Community (AEC), is increasingly encouraging MSMEs to adopt more integrated and internationally standardized SCM practices ([Annamalah et al., 2025](#); [Dansomboon et al., 2016](#); [Khanam & Hasan, 2025](#)). In addition, supply chain management helps organizations reduce supply uncertainty and risk through better planning, coordination, and collaboration between supply chain actors ([Lambert & Cooper, 2000](#)). From a performance perspective, supply chain management enables improved product quality and process consistency due to the integration and control of activities from upstream to downstream ([Mentzer et al., 2001](#)).

The agro-industrial sector, supply chain management plays a crucial role in maintaining the continuity of raw materials, reducing waste of perishable products, and increasing the added value of agricultural products ([Trienekens, 2011](#); [Aramyan et al., 2007](#)). For MSMEs, implementing supply chain management can increase business competitiveness through cost efficiency, production flexibility, and the ability to respond to changing market demand despite limited resources ([Kumar et al., 2017](#); [Pujawan,](#)

(Mahendrawathi, 2017). This includes product design and demand forecasting (Khanam, Hasan, 2025). General benefits companies aim to achieve by implementing supply chain management include achieving customer satisfaction, increasing revenue and profits, reducing expenses, optimizing asset utilization, and achieving company growth (Satmoko, 2023). Global disruptions such as the pandemic and geopolitical tensions also demonstrate the need for greater resilience in supply chains in ASEAN, given their reliance on export and import markets (Keefe et al., 2024).

3. RESEARCH SUBJECTS AND METHODS

Qualitative methods are used to examine the natural conditions of the research object, with the researcher as the primary research instrument. Information is collected in a natural manner and formulated in a general, easily understood manner (Sugiyono, 2023). Information sources are those who possess information or are directly involved with the issue being observed. This qualitative method emphasizes phenomena within the context and understanding of the research information sources. The dynamics of human behavior, social interactions, and the phenomena that occur are expected to be easily understood in the research (Creswell, 2014). This research method consists of three separate phases (Heizer & Render, 2025). In the initial phase, a preliminary survey was conducted to gain insight into the characteristics of the supply chain in the designated case study area, with a specific focus on cassava. Next, interviews were conducted to identify the effectiveness and efficiency of the Supply Chain process. Data analysis was then conducted to further explore the interview results and draw conclusions.

4. RESULTS AND DISCUSSION

Based on observations at Gethuk Semar, located on Jl. Solo-Tawangmangu, Gedangan, Salam, Karangpandan District, Karanganyar Regency, it was found that there are several variants, including: a) Original fried gethuk, as the main product with a traditional flavor. b) Fried gethuk, aimed at attracting tourists. c) Steamed/wet gethuk, marketed in limited quantities to local consumers. d) Gethuk souvenir packages, simply packaged for tourists visiting the Karangpandan Tawangmangu area. e) Gethuk Semar MSMEs offer a variety of processed cassava products designed to meet the needs and tastes of tourists and the general public in the Karangpandan area and its surroundings. The main product offered is the original fried gethuk, which maintains the traditional flavor of local cassava, with a crispy outside and soft inside texture.

This product is a major attraction because it represents a regional culinary specialty familiar to local tastes and is sought after by tourists seeking an authentic culinary experience;

- a) Objectives of the Supply Chain Management Design. The Gethuk Semar MSME's supply chain management design aims to ensure the sustainable availability of cassava raw materials, increase production process efficiency, maintain product quality, and ensure timely product distribution to local consumers and tourists. This design also aims to reduce dependence on a single supply source and minimize the risk of supply disruptions due to seasonal factors.

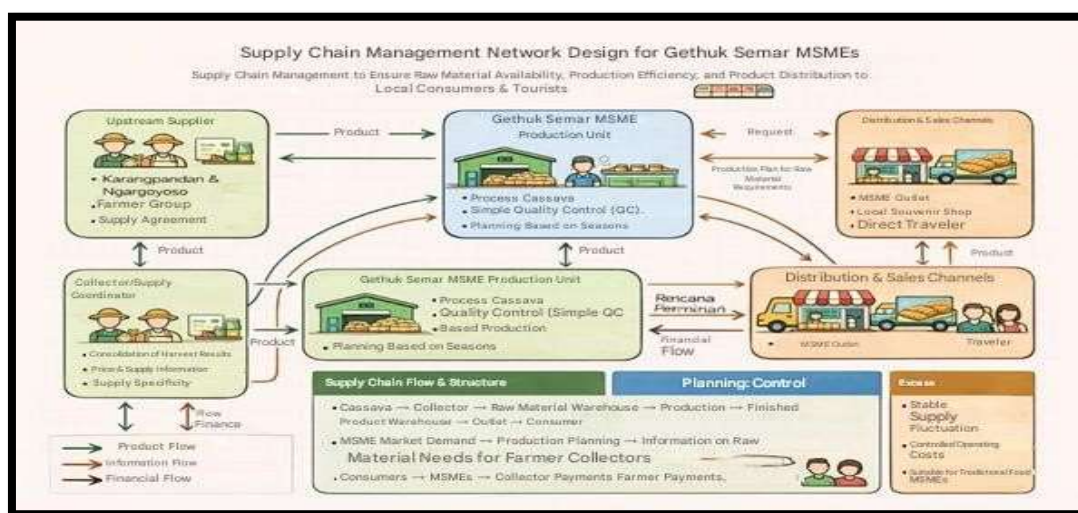


Figure 1. Supply Chain Management Design

- b) Designed Supply Chain Structure. The Gethuk Semar supply chain is designed around several main nodes: 1) Upstream Suppliers (Cassava Farmers); Cassava farmers in the Karangpandan and Ngargoyoso areas are encouraged to form or join farmer groups. Simple supply agreements are implemented (quantity, quality, and indicative prices). 2) Collectors/Supply Coordinators; Serve as consolidators of farmers' harvests. Maintain the continuity of raw material supply and quality. Serve as the starting point for

- the flow of supply and pricing information. 3) MSME Raw Material Warehouse: Stores cassava for very short periods (1–2 days). Equipped with a quality sorting system and daily stock recording. This reduces the risk of raw material spoilage before production. Gethuk Semar MSME Production Unit. 4) Main processes: cassava processing, dough making, frying, and packaging. Equipped with simple quality control (QC) for raw materials and finished products. Production planning is based on daily demand and seasonal tourism. 5) Distribution & Sales Channels: MSME-owned outlets. Selling to partner souvenir shops. Direct sales to tourists. 6) End Consumers: Local consumers (regular). Tourists (seasonal and high volume).
- c) Flow in Supply Chain Management: 1) Product Flow. Cassava → Collector → Raw material warehouse → Production → Finished product warehouse → Outlet → Consumer. 2) Information Flow Market demand → MSMEs → Production planning → Raw material requirement information → Collectors → Farmers. 3) Financial Flow Consumers → MSMEs → Collector payments → Farmer payments.
- d) Planning and Control; 1) Supply planning: based on the harvest calendar and tourist seasons. 2) Production planning: daily and weekly. 3) Inventory control: minimum raw material stock. 4) Risk management: alternative suppliers and product diversification.
- e) Supply Chain Performance Indicators; 1) Raw material availability (% of days without shortage). 2) Cassava supply lead time. 3) Raw material damage rate. 4) Accuracy of demand fulfillment. 5) Consumer satisfaction.
- f) Design Advantages; 1) More stable against supply fluctuations. 2) More controllable operational costs. 3) Suitable for traditional food MSMEs. 4) Supports long-term business sustainability.

3. Supply Chain Management System Display Design.

This figure shows the Supply Chain Management (SCM) network design for the Gethuk Semar MSME, organized through an SCM Dashboard as a control center. This system is designed to integrate information on raw material flow, production processes, and product distribution to consumers:

- a) SCM Dashboard as the System Center. The dashboard serves as the main module that receives, processes, and presents data from all connected modules. The dashboard also provides real-time information summaries to support operational decisions, such as raw material availability, production capacity, market demand, and supplier performance.
- b) Supplier Module. This module manages data and activities of cassava raw material suppliers, both farmers and local collectors. The information managed includes: 1) Supplier identity. 2) Supply location. 3) Supply capacity and frequency. 4) Raw material price. 5) Cassava quality. 6) Delivery history.

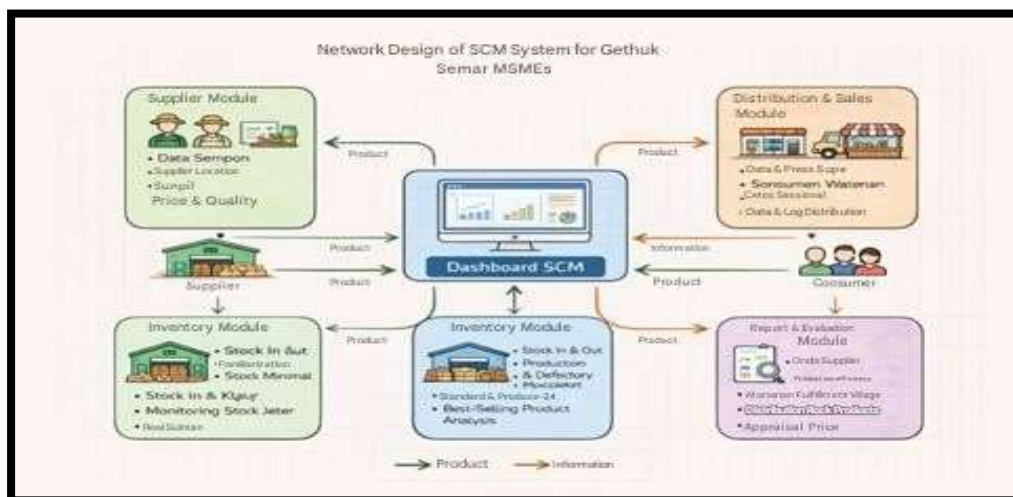


Figure 2. Supply Chain Management System Design

- c) Inventory Module. The inventory module records the flow of cassava raw material stock from suppliers to the MSME warehouse. The system monitors: 1) Incoming and outgoing stock. 2) Raw material shelf life. 3) Minimum stock system. 4) Waste monitoring. 5) Inventory history. 6) Its main function is to ensure a safe and efficient supply of raw materials before entering the production stage.
- d) Production & Quality Control Module. This module manages the Gethuk Semar production process, including raw material processing, quality standardization, and production quantities. Daily production data is recorded for: 1) Production planning. 2) Quality control. 3) Defective product recording. 3) Production capacity estimation. 4) Bestselling product analysis. This module ensures product quality and quantity meet market needs.

- e) Distribution & Sales Module. After production, the product is distributed to various outlets and direct consumers. This module records: 1) Sales partner/outlet data. 2) Distribution volume. 3) Consumer segmentation (local vs. tourist). 4) Daily and seasonal demand patterns. 5) Best-selling products. This module supports sales growth and market expansion.
- f) Reporting & Evaluation Module. The reporting module provides periodic evaluative data related to: 1) Supplier performance. 2) Production efficiency. 3) Supply chain costs. 4) Fulfillment of consumer demand. 5) Sales trends. 6) Distribution analysis. This module is essential for long-term strategic decisions.
- g) Product, Information, and Financial Flow. The SCM design shows three main flows: 1) Product Flow. Supplier → Warehouse → Production → Outlet → Consumer. 2) Information Flow. Consumer → Sales → Production → Inventory → Supplier. 3) Financial Flow. Consumer → MSME → Supplier.

Importance of the Design for MSMEs.

This SCM System Design supports Gethuk Semar MSME in: Improving operational efficiency. 2) Reducing the risk of raw material shortages. 3) Increasing supply chain transparency. 4) Increasing data-driven competitiveness. 5) Supporting scaling and market development

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- b) Supplier Module. This module manages data and activities of cassava raw material suppliers, both farmers and local collectors. The information managed includes: Supplier identity. Supply location. Supply capacity and frequency. Raw material price. Cassava quality. Delivery history. This module plays a role in maintaining supply continuity and serves as a basis for evaluating supplier relationships.
- c) Inventory Module The inventory module records the flow of cassava raw material stock from suppliers to the MSME warehouse. The system monitors: 1) Incoming and outgoing stock. 2) Raw material shelf life. 3) Minimum stock system. 4) Waste monitoring. 5) Inventory history. 6) Its main function is to ensure a safe and efficient supply of raw materials before entering the production stage.
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5. CONCLUSION

Based on the research and analysis conducted, it can be concluded that the Gethuk Semar Micro, Small, and Medium Enterprise in Karangpandan District has a relatively simple and local supply chain structure, involving cassava farmers, collectors, the Micro, Small, and Medium Enterprise's production unit, and end consumers, consisting of local residents and tourists. This short supply chain offers the advantage of easier quality control and distribution efficiency, but also presents limitations in inventory management, coordination between supply chain actors, and dependence on raw material supply and seasonal demand fluctuations. Current supply chain management is still carried out conventionally and is not supported by an integrated management system.

Therefore, this study designs a structured supply chain management system through strengthening supplier relationships, raw material inventory control, production planning, and integrated distribution and information management. This system design is expected to improve operational efficiency, maintain a continuous supply of cassava raw materials, and enhance the competitiveness of the Gethuk Semar Micro, Small, and Medium Enterprise in facing market dynamics and the tourism sector. By implementing better supply chain management, Gethuk Semar Micro, Small and Medium Enterprises has the potential to develop sustainably and provide a more optimal economic contribution to the Karangpandan area and its surroundings.

Author Contributions:

Muhammad Abdul Malik Ibrahim, Siti Nurlale, Dzulfikar Ridhwanul Haq, Harmoko, Agus Wahyudi, Herni Meinarti.. Siti Nurlale: Conceptualization, Writing - original draft, Introduction, Discussion. The authors have read and approved the final manuscript.

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