

Literature Study: Optimization Strategy Of Rice Supply Chain Management In Regions

Anditania Sari Dwi Putri¹, Annisa Indah Pratiwi²

^{1,2} Department of Industrial Engineering, Faculty of Engineering, Buana Perjuangan University, Karawang
Jl. HS. Ronggowaluyo East Telukjambe, Karawang,
Email: ti23.anditaniaputri@mhs.ubpkarawang.ac.id

ABSTRACT

Efficient and sustainable rice supply chain management is essential to ensure the availability, quality, and price stability of rice in the regions. Factors that influence the efficiency of the rice supply chain include the quality of raw materials, logistics infrastructure, and coordination between farmers, distributors, government, and the private sector. Effective collaboration between related parties can increase productivity and distribution efficiency through the use of technology, strategic partnerships, and improvements in procurement and storage systems. However, the main challenges faced include dependence on weather, high costs, and issues of quality and sustainability of supply. Strategies implemented to overcome these challenges include improving infrastructure, diversifying technology, training for farmers, and strengthening the financing system that supports farmers. Further development is needed to strengthen the partnership between the private sector and the government, as well as introducing innovations in supply management to ensure the sustainability and efficiency of the rice supply chain in the future.

Keywords : Supply chain management; rice; efficiency; collaboration

A. INTRODUCTION

Rice supply chain management plays an important role in ensuring the availability, quality, and affordability of this strategic commodity in the community. Rice is a staple food for the majority of the Indonesian population, so the efficiency and effectiveness of its supply chain are key factors in maintaining national food security. However, the complexity of the rice supply chain often presents various challenges, including production uncertainty, price fluctuations, limited logistics infrastructure, and uneven distribution in various regions. These problems are further exacerbated by dependence on climate conditions, differences in harvest seasons between regions, and limited technology at the farmer level. Meanwhile, urbanization and population growth also add pressure to the rice distribution system, especially in urban areas where demand tends to increase [1].

Supply chain management has come a long way from the traditional era to the modern era. Initially, supply chain management focused on simple logistics aspects, such as transportation and storage of goods. In this era, information and coordination between actors in the supply chain were still very limited, which often led to inefficiency and waste [2]. Entering the industrialization era, supply chain management began to be integrated with the production process. Approaches such as *Economic Order Quantity* (EOQ) and *Material Requirements Planning* (MRP) began to be applied to optimize inventory and support mass production efficiency [2]. At this stage, the main focus was on cost reduction and productivity improvement. At the end of the 20th century, globalization and advances in information technology brought significant changes. The *Just -In- Time* (JIT) concept introduced in Japan became a major breakthrough by reducing waste and increasing efficiency. In addition, *real-time data-based systems* enable faster and more accurate decision making. The relationship

between actors in the supply chain also began to be emphasized through strategic partnerships and collaboration. [2]

In recent decades, technological developments such as artificial intelligence (*Artificial Intelligence*), *Internet of Things* (IoT), and *blockchain* have revolutionized supply chain management [3] . Artificial intelligence is used to predict demand, manage risk, and optimize distribution. IoT enables *real-time tracking of goods* , while *blockchain* increases transparency and data security in the supply chain. In addition to the technological aspect, sustainability issues are also increasingly becoming a major concern. Sustainable approaches to supply chain management aim to reduce environmental impacts, promote ethical practices, and improve the well-being of all actors in the chain, including smallholder farmers. These developments indicate a shift from a focus solely on economic efficiency to more holistic values. [2]

In facing these challenges, innovative and integrated supply chain management strategies and methods are needed. Approaches such as strengthening coordination between actors in the supply chain, implementing information technology for data transparency, and developing logistics infrastructure are very relevant. Literature studies on these strategies and methods are important to identify best practices that have been successfully implemented in various contexts, both nationally and internationally. Through literature reviews, this study aims to understand the dynamics and complexity of rice supply chain management, while providing evidence-based recommendations for more effective management. Thus, it is expected to contribute to efforts to increase the efficiency of rice distribution, reduce waste, and ensure equal distribution of rice availability throughout the region.

B. LITERATURE REVIEW

Management chain supply (SCM) is approach strategic used company For planning, managing and optimizing flow goods, information, and source moving power from Supplier going to consumer end. SCM plays a role important in increase efficiency operational, reduce costs, and ensure satisfaction customers. For reach objective said, the company must implement various effective techniques and technologies in every aspect chain supply, start from planning, procurement, production, to logistics and distribution.

Management chain supply refers to integration between flow coordinated goods and information between suppliers and consumers [4] . They emphasize that The success of SCM depends heavily on greater collaboration close between all parties involved, which allows creation mark plus For Customer Concept This show that SCM is more from just management logistics, but also includes aspect communication and coordination throughout network business.

SCM includes management planning and control on various activities related to procurement, production and distribution goods to consumers. They emphasize importance management effective logistics For ensure efficiency in time, cost and quality products shipped [5]

Main Components in Management Chain Supply

There are some element the main thing to do managed carefully so that the chain supply can functioning optimally [2] :

1. Planning and Management Request

Planning effective request is key in manage chain efficient supply. Ability For predict request in a way accurate allow company For avoid problem lack or excess stock, which

in the end help in guard smoothness operations. Proper planning also improves responsiveness to changing market dynamics.

2. Election Suppliers and Procurement

Success in chain supply is highly dependent on selection the right supplier. strong relationship with suppliers can increase quality product, reduce costs, as well as increase accuracy time shipping. Focus on sustainability in connection Supplier the more become important, taking into account aspect social and environmental, which provides impact positive to performance chain supply in a way overall.

3. Logistics and Distribution

Management efficient logistics covers various element important like transportation , warehousing and management inventory . Management proper logistics ensure goods can sent appropriate time with minimal cost . In addition , technology like system management transportation (TMS) and tools tracking product play a role big in increase efficiency and accuracy of the distribution process .

C. RESEARCH METHODS

This research uses the *Systematic method Literature Review (SLR)*, which is a structured and transparent approach to identify, evaluate, and analyze relevant research [6] . The SLR process follows standardized steps so that the results can be accounted for and replicated by other researchers. Using secondary data from various sources, researchers will explore concepts, theories, and previous research findings to understand rice supply chain management strategies that have been implemented in various regions. In the study of rice supply chain management optimization strategies in regions using the SLR method, the stages used are determining research objectives, creating research questions, the process of searching for literature, selecting articles, extracting data, analyzing data, and compiling reports [6] . The following SLR stages will be explained in more detail in Figure 1.

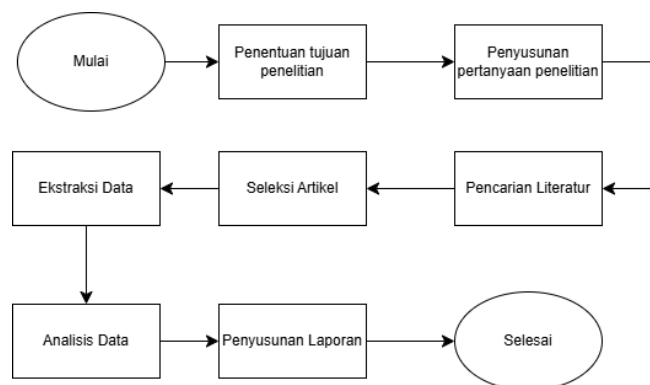


Figure 1. Systematic Stages Literature Review (SLR)

Determining Research Objectives

This study aims to analyze and evaluate various strategies that have been implemented in rice supply chain management in the regions. The focus is to find solutions that can improve the effectiveness, efficiency, and sustainability of the rice supply chain, in order to support food security and rice price stability. This study will be limited to a literature review that discusses rice supply chain management, with case studies in regions in Indonesia. By conducting SLR, this study identifies existing knowledge gaps and collects empirical evidence and policy

recommendations that are useful for policy makers, rice industry practitioners, and academics working in the field of supply chains and food security.

Formulating Research Questions

Determining research questions (*Research Question*) is a very important stage, because it will guide the entire process of searching, selecting, and analyzing literature. This stage involves several steps to ensure that the questions asked can answer the research objectives systematically and focused. The following is *Research Question* (RQ) in this study

Table 1. Research Questions (*Research Question*)

| Code | Research Questions |
|------|---|
| RQ1 | What are the factors that influence the efficiency of the rice supply chain in the region? |
| RQ2 | How collaboration between farmers, distributors, government and the private sector can improve the effectiveness and sustainability of the rice supply chain in the regions |
| RQ3 | What are the main challenges in rice supply chain management in the regions and what strategies are implemented to overcome them? |

Literature Search

Literature search is an important step in the SLR method which aims to identify, find, and collect articles or literature sources that are relevant to the research topic. An effective and systematic literature search will ensure that all relevant literature has been considered for analysis. Literature search is carried out by selecting the right database and literature sources. Academic databases such as *Google Scholar*, *Research Gate*, and *Scencedirect* are common places used to search for literature. Keywords and search phrases used to find relevant literature are “Rice Supply Chain Management”, “Bulog Rice Supply Chain Management”, “Influence of Rice Supply Chain Management”.

Article Selection

After searching the literature, it is important to determine the inclusion and exclusion criteria. These criteria help to conduct the selection and ensure that only relevant and quality literature is included.

Table 2. Inclusion and Exclusion Criteria

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| Literature discussing the topic of rice supply chain | Literature that does not discuss the topic of the rice supply chain |
| Literature can answer at least one Research Question | Literature that cannot answer the Research Questions |
| Literature is published in both Indonesian and English. | Literature published neither in Indonesian nor English |
| Literature published in the last 5 years | Literature published over the last 5 years |

After the initial search is conducted, the articles found will be screened based on the title and abstract. Relevant articles will be selected for further reading. Articles that pass the title and abstract selection will be read in their entirety. At this stage, the researcher will evaluate the eligibility of the articles based on the inclusion criteria and predetermined exclusions .

Data Extraction

At this stage, researchers collect and record important information from relevant literature to answer research questions. For the topic of rice supply chain management optimization strategies in the region, data extraction aims to identify and summarize key elements related to the research topic. Collecting relevant information from existing literature to answer the research questions that have been set.

Data analysis

Data analysis involves combining information from relevant articles to provide a clearer picture of factors affecting supply chain efficiency, collaborations that enhance sustainability, and challenges faced in rice supply chain management. Analysis of findings will also identify patterns that emerge from studies, as well as reveal potential strategies that can be implemented to address existing issues.

Compiling a Report

Based on the results of the literature analysis, this study will draw conclusions regarding effective and efficient rice supply chain management strategies, as well as challenges that need to be overcome in their implementation. This study will provide recommendations for policy makers, industry players, and other researchers regarding strategies or policies that can be adopted to improve rice supply chain management in the regions.

D. RESULTS AND DISCUSSION

The results and discussion will discuss the results of the literature review and three research questions regarding the factors that influence the efficiency of the rice supply chain in the region, how collaboration between farmers, distributors, government, and the private sector can improve the effectiveness and sustainability of the rice supply chain in the region, and what are the main challenges in rice supply chain management in the region and what strategies are implemented to overcome them.

Previous Research

Previous Research refers to previously conducted studies that are relevant to the topic or problem being researched. The purpose of referring to previous research is to understand what is previously known about a topic and to indicate gaps or opportunities for new research. Previous research helps researchers to build a knowledge base, understand existing theories, and explore the methodology and findings that have been obtained. The following are previous studies of 13 major journals that are used as references to analyze factors that influence rice supply chain management, collaboration between *stakeholders* , and strategies to overcome problems in supply chain management.

Table 3. Previous Research Results

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|---|---|--|--|
| 1 | Chain Optimization and Value Analysis Chain at Bulog North Surabaya Branch Office | Journal of Economics, Education and Community Service | Yuyun Fadmala , Hayati's granddaughter, Hanifah (2024) [7] | <p>BULOG North Surabaya Branch Office manages chain supply food with some stages main :</p> <ol style="list-style-type: none"> 1. Procurement of Foodstuffs: BULOG holds material food like rice , sugar and cooking oil through negotiation contract , determination price , and inventory volume from manufacturer local , farmers , and imports . 2. Storage and Handling : BULOG has five warehouses equipped storage facility preservation and control temperature For guard quality product food . 3. Distribution : Distribution done use trucks , pick-up trucks , and Work same as partner logistics For efficiency . 4. Management Stock : BULOG uses technique forecasting data requests and analysis for guard balance stock , avoid lack or excess stock . 5. Coordination with Parties Related : BULOG coordinates with producers , government area , institution finance , and partners For ensure smoothness distribution and supervision quality food . 6. Customers : BULOG customers include: trader large , supermarkets and industries food that requires material standard food main . |
| 2 | Supply Chain Analysis of Availability of Raw Materials for Agricultural Products, Rice Type, Using the Supply Chain Method Operations Reference | Journal of Food Technology and Quality | Laeela Jauhara , Devi Tanggasari (2024) [8] | <p>This study aims to analyze supply chain management at UD. Fajar Samudra, which involves the relationship between suppliers, farmers, and consumers, starting from the provision of raw materials to the products received by consumers. The three main factors that shape raw material supply chain management are cooperative relationships (trust), product availability, and product quality. The results of the study indicate that problems with raw material availability often occur, one of which is caused by the selection of types of raw materials for rice that do not match those produced by several suppliers. To overcome this problem, it is necessary to control the supply chain using historical sales data forecasting, the application of a management information system by suppliers, and a <i>line strategy. balancing</i> to increase production.</p> |
| 3 | Analysis of Rice Procurement Logistics Strategy | Business Logistics Journal | Annisa Rahma Dianti, Aulia | <p>The logistics strategy implemented includes efficient procurement, storage, and distribution of food ingredients,</p> |

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|--|----------------------------------|--------------------------------|--|
| | in Improving Distribution and Stock Quality in the New Bulog Warehouse (GBB) Klaten | | Devita Sari (2024) [9] | involving cooperation with various related parties, such as farmers, traders, and local governments. One of the main strategies is "jemput bola", which is establishing cooperation with partners such as farmer groups, small millers, and trading units to accelerate the rice procurement process in Klaten Regency. In procurement, several strategic steps that can be taken are expanding the rice procurement network, improving rice quality through partnerships with farmers, and utilizing technology for logistics efficiency. To improve the quality of warehouse stock, technology needs to be adapted to monitor stock conditions, while distribution can be improved with monthly performance evaluations, periodic market operations, and product <i>rebranding</i> to improve the image of Bulog rice. In addition, partnerships with franchises and wholesalers can help expand the distribution network and meet market demand. |
| 4 | Optimizing the Rice Supply Chain with Supply Chain Operational References Model and Analytical Hierarchy Process | Calibration Journal | Encep Jianul Hayat (2024) [10] | Based on Analysis The Analytical Hierarchy Process (AHP) method shows that chain supply optimal rice involves collector grain as the only one intermediary between farmers and millers paddy . This model allow farmer deliver results harvest to collector grain , so that distribution more organized . The distribution flow are : Farmers → Rice Collectors → Rice Mills → Distributors → Retailers → Consumers . Results of analysis using the method <i>Supply Chain Operational References (SCOR)</i> concludes : 1. Structure Chain Supply : In Sukawening , Garut, chain supply rice involving farmer , collector grain , milling rice , collector rice , traders , retailers , to consumers . 2. Supply chain performance supply rated Good in a way overall , although There is a number of actors who are still enter “ bad ” category . 3. The problem Chain Supply : Length chain supply cause improvement cost , instability prices , and exploitation in some eye chain , which has an impact on the height cost end . |
| 5 | Structure and Efficiency of Rice | Agro Bali : Agricultural Journal | Ria Indriani, Supriyo Imran, | Chain supply rice in Gorontalo includes farmer , miller , trader large , retailers , BULOG, TTIC, and Alfamart , |

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|--|---|--|---|
| | Supply Chain Performance in Gorontalo Province, Indonesia | | Mukhlis (2024) [11] | with farmers , BULOG, TTIC, and Alfamart as manufacturer main . Efficiency chain supply can improved through practice proper cultivation , optimization production , and repair cycle finance on milling For speed up capital turnover and fulfil request consumer in a way more effective . |
| 6 | Supply Chain Management of Rice Products in Rice Mills New Source of Sidoarjo District, Sidoarjo Regency | Scientific Journal of Agribusiness Management | Inas Mufidati Kusuma, Sri Widayanti and Pawana Nur Indah (2023) [12] | From the analysis and discussion , there are a number of conclusion related chain supply rice at Sumber Baru Rice Mill . Chain supply This involving farmers , middlemen , mills rice , trader retailers , and consumers . Channel patterns its distribution divided become three : <ol style="list-style-type: none"> 1. Channel Pattern I: Farmers → Rice Mills → Consumers 2. Channel Pattern II: Farmers → Middlemen → Rice Mills → Consumers 3. Channel Pattern III: Farmers → Rice Mills → Traders Retailer → Consumer Products produced follow the flow where farmers sell grain to middleman or direct to milling rice , then processed become rice For for sale to trader retailer or direct to consumers . In the flow finance , second pattern channel This rated give benefits . While that , flow information goes both ways , like between farmers and middlemen , farmers and millers rice , middlemen and mills rice , milling rice and traders retailers , up to trader retailers with consumers . In addition , the trading margin varies For every pattern channel . |
| 7 | Optimization Rice Supply Chain Management in Maintaining Food Security (Case Study of Perum Bulog Gorontalo Branch Office) | Agribusiness Media | Amita Djama, Ria Indriani, Agustinus Moonti (2023) [13] | 1. The rice supply chain at Perum BULOG Gorontalo Branch targets the entire Gorontalo community, especially traders and agencies, with the aim of expanding the market by increasing customers. The chain structure includes farmers, suppliers, distributors, consumers, and stakeholders . All chain members carry out their duties, such as farmers as providers of raw materials and distributors as senders of products to consumers. The company has three warehouses and supporting technology such as fumigation sprayers and plastic covers. As a BUMN, funding comes from the government, and the relationship between chain members is based on partnerships with market |

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|---|-----------------------------|--|--|
| | | | | information obtained from observation and collaboration. 2. Optimization of premium and medium rice inventory at Perum BULOG Gorontalo using the EOQ method produces efficient stock with minimal costs. |
| 8 | BULOG Competitive Advantage Development Strategy Map To Become the Market Leader of Rice in Indonesia | FOOD | Ruspayandi Topan , Tajuddin Bantacut , Bustanul Arifin, and Idqan Fahmi (2023) [14] | BULOG focuses on increasing business capacity and volume For leading the rice market national, while guard rice market stability domestic. BULOG's development strategy includes four aspect main: 1. Finance: Efficiency cost, search financing new, and manage asset For increase income. 2. Customer: Fix customer relations, developing products, and improve image company. 3. Internal Process: Optimizing chain supply, strengthen partnerships, and adopt technology new. 4. Learning and Growth: Improving performance based on technology, drive innovation, and strengthening human resources. This strategy will measured through <i>Key Performance Indicators (KPIs)</i> based on <i>Balanced Scorecard</i> strategy map . |
| 9 | Supply Chain Analysis in Rice Commodity Management (Case Study at PB Jembar Ati, Cianjur Regency) | IKRA-ITH Technology Journal | Ahmad Sutoni , Nurwan Tjadis Ibrahim, Dwi Indrawati, Ai Yuni Cahyati, Faddli Muhammad Addilah (2021) [15] | Analysis results show that chain supply in Pb. Jembar Heart Not yet fully apply effective management. Farmers as manufacturer main on duty produce rice, meanwhile collector responsible answer organize results harvest, do sorting, grading, and shipping product to processor (factory) periodically . Collectors also plan timetable harvest For ensure delivery paddy or rice to processor still sustainable . Processor on duty handle post- harvest , including cleaning , packaging , labeling , distribution , and manage order Good from collector and also direct from farmer . Pb. Jembar Heart have a special division For handle activity production . Good planning and strategy are essential use support operational chain supply so that can reach optimization . |
| 10 | Analysis of Rice Supply Chain Network System in Muram Sari Village | EMBA Journal | Frans Roni Lodewyk Manupapami Magdalene Wullur | Rice Supply Chain Management in Muram Sari Village involves farmers, distributors, wholesalers, and consumers with an efficient distribution channel due to close distance, short delivery time, and low cost. Farmers get the highest profit, but still feel |

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|---|--|--|---|
| | Merauke Regency, Papua Province | | Arazzi bin Hasan Jan (2021) [16] | disadvantaged because BULOG only buys good quality grain at a low price, which causes a lot of unsold rice. As a result, farmers mill their own grain to sell directly to the market or wholesalers. This also has an impact on local milling because some farmers choose to sell their grain directly to BULOG. In addition to rice as the main product, processed rice also has the potential to increase the value of the supply chain. The supply chain is considered quite good, but farmers' profits can increase if they sell directly to wholesalers even though it takes more time and transportation costs. |
| 11 | Analysis of Rice Supply Chain Management Implementation At the Bulog Housing Complex, Singakerta Warehouse, Indramayu Regency | Journal of Agricultural Economics and Agribusiness | Yayat Rahmat Hidayat (2020) [17] | <p>Based on the results of the field study, the supply chain pattern (<i>supply chain</i>) rice in Indramayu Regency can be explained in the image below.</p> <ol style="list-style-type: none"> 1. Farmer Producers – Middlemen – Regional Markets – Retail Traders – End Consumers 2. Farmer producers – collectors – RMU – regional markets – Bulog – end consumers 3. Farmer producers – collectors – RMU – Bulog – end consumers 4. Farmer producers – RMU – regional market – Bulog – end consumers 5. Farmer producers – collectors – RMU – regional markets – retailers – end consumers 6. Farmer producers – RMU – regional market - Retailers – end consumers 7. Farmer producers – Collectors – RMU – PIBC – Retailers – end consumers 8. Farmer producers – Collectors – RMU – PIBC – Regional markets – Retailers – end consumers 9. Farmer producers – Farmer Groups – RMU – Bulog – end consumers 10. Farmer producers – Farmer Cooperatives – RMU – Retailers – end consumers <p>Perum Bulog Singakerta Warehouse in Indramayu Regency implements a contract-based procurement system with certain requirements for partners (MKP) to ensure good rice quality. Rice distribution is carried out to the community and market as a step to maintain stock and price stability. To improve supply chain management, a tighter procurement system is needed, assistance for MKP to improve</p> |

| No | Title | Journal/ Proceedings | Author and Year | Results |
|----|---|---|---|--|
| | | | | production performance, and improvements in the management of procurement, storage, stock, and distribution of rice. |
| 12 | Dynamics of the Rice Supply Chain in Bansari District, Temanggung Regency | Agrisep Journal | Aprillia Palupi, Sony Heru Priyanto, Lasmono Tri Sunaryanto (2020) [18] | The rice supply chain in Bansari District has only one flow, namely the product flow, which involves farmers, cutters, collectors, millers, and active and passive traders. Farmers sell grain to all of these parties, but passive traders also sell grain that has been milled into rice. To increase effectiveness and efficiency, it is recommended to develop supply chain patterns other than product flow, government intervention in supply chain regulation and supervision, and business partnerships to support business development and ensure benefits for all supply chain actors. |
| 13 | Rice Supply Chain Performance in Karawang Regency | Journal of Management and Business Applications | Ahmad Irfan Nurmahdy, Machfud, and M. Faiz Syuaib (2020) [19] | Chain supply rice in Karawang Regency involves farmer, trader collectors, and mills rice, but its performance not optimal. Farmers face problem shipping, cost high, and payment slow. Trader collector difficulty in flexibility procurement and costs shipping, while milling paddy face problem similar to cost high. Causes main inefficiency is cost business high farming, lack of flexibility, and systems long payment. Proposed solution including improvement technology agriculture, strengthening group farming, and repairs system payment For increase efficiency chain supply |

Factors affecting the efficiency of the rice supply chain

The efficiency of the rice supply chain is influenced by various factors involving all parties in the supply chain, from farmers to end consumers. These factors can affect the cost, time, quality, and sustainability of rice supply in the market. Here is a complete explanation of the factors that affect the efficiency of the rice supply chain:

1. Quality and Availability of Raw Materials (Grain) [8]
 - The quality of the paddy planted by farmers will affect the quality of the rice produced. Low-quality paddy can cause the final rice product to have poor quality, which in turn will affect the price and market demand.
 - Dependence on harvest seasons can lead to shortages of grain at certain times. Unstable availability can lead to undersupply of rice, while oversupply can lead to falling prices and waste.
2. Technology and Innovation
 - The use of modern technology in rice cultivation such as the use of superior rice varieties, agricultural machinery, and efficient irrigation can increase crop yields and grain quality. Technology also helps farmers reduce losses and increase productivity.

- Technology in the rice milling sector is very important in improving the quality of rice and the efficiency of the processing process. Efficient milling machines can reduce rice losses and increase production speed.
3. Infrastructure and Distribution Facilities [7]
 - A good transportation system will facilitate the distribution of rice from the mill to the market or consumer. Lack of adequate transportation infrastructure, such as poor roads or limited vehicles, can slow down distribution, increase logistics costs, and extend delivery times.
 - The quality and capacity of rice storage warehouses greatly affect the efficiency of the supply chain. Inadequate warehouses or those without temperature control facilities can reduce the quality of rice and cause losses due to spoilage or pest infestation .
 4. Inventory Management [7]
 - Supply chain efficiency is greatly influenced by how accurately rice demand is predicted. Poor forecasting can result in shortages or excess stock, which impacts prices and distribution.
 - Good rice stock management can reduce storage costs and ensure the availability of rice according to demand. If the stock is too high, the storage cost will increase, while too low a stock can cause a shortage of supply.
 5. Coordination and Cooperation between Supply Chain Actors [7]
 - Good relationships between farmers, collectors, mills, distributors, and retailers are essential to ensure a smooth flow of goods. Trust and good communication between parties will reduce delays and errors in order fulfillment.
 - Close collaboration with business partners, such as farmer groups, wholesalers, or financial institutions, can accelerate the procurement of raw materials, improve product quality, and expand distribution reach.
 6. Fees and Payment Systems [8]
 - High production costs, such as labor, fuel, and fertilizer, can reduce supply chain efficiency. Production cost reduction can be done through the application of technology, operational efficiency, and better planning.
 - Payment System: A transparent and efficient payment system between supply chain actors, from farmers to retailers, will reduce conflicts and speed up transactions. Late or untimely payments can cause instability in the supply chain.
 7. Government Regulations and Policies [9]
 - Government policies on price controls, fuel or fertilizer subsidies, and import or export policies can affect the efficiency of the rice supply chain. Policies that support rice price stability can reduce uncertainty in supply and increase profits for farmers and other business actors.
 - The government also has a role in monitoring the quality of rice circulating in the market to ensure that the rice that reaches consumers meets the established quality standards.
 8. Availability of Capital and Human Resources
 - Farmers and millers often face challenges in obtaining financing to purchase equipment or increase production capacity. The availability of sufficient capital will support business development and overall supply chain efficiency.
 - The skills and knowledge of the workforce in rice processing, distribution, and warehouse management are essential in improving efficiency. Education and training for farmers and workers in the rice milling sector can improve quality and productivity.

9. Risk Management [14]

- Climate change, natural disasters, and extreme weather can affect rice yields and grain supplies. Good risk mitigation strategies, such as agricultural insurance and diversification of raw material sources, can help maintain supply chain stability.
- Fluctuations in raw material prices, changes in government policies, and economic instability can affect supply chain performance. Good risk management involves market analysis, supplier diversification, and preparedness for changing economic conditions.

Collaboration between farmers, distributors, government and the private sector can improve the effectiveness and sustainability of the rice supply chain.

Collaboration between farmers, distributors, government, and the private sector is essential in improving the effectiveness and sustainability of the rice supply chain in the regions. Each party in the supply chain has a vital role that supports each other to ensure the smooth supply of quality, efficient, and sustainable rice. Here is a complete explanation of how collaboration between these parties can improve the effectiveness and sustainability of the rice supply chain in the regions:

1. Collaboration between Farmers and Distributors

- Farmers are the main actors in rice production. In order for them to produce quality rice at an efficient cost, they need access to technology, training, and accurate market information. Distributors with extensive networks can help educate farmers about market trends and how to improve production quality. Farmers who have knowledge of the quality of rice needed in the market will be better able to meet distributor demand.
- Distributors often have access to larger markets, both domestic and international. With a good relationship between farmers and distributors, farmers can ensure that their products will be sold at a fair and stable price. This provides an incentive for farmers to increase rice production and quality, and reduces price uncertainty that can affect their livelihoods.
- Through this collaboration, distributors can help farmers by providing the necessary inputs, such as superior seeds, fertilizers, or more efficient processing technology. In turn, farmers who are able to produce high-quality grain can meet greater market demand, thus strengthening the long-term relationship between farmers and distributors.

2. The Role of Government in Collaboration

- The government has an important role in creating policies that support the sustainability of the rice supply chain. This includes providing subsidies for farmers to purchase agricultural equipment, fertilizers, and superior seeds, as well as facilitating financing for the private sector and farmers. The government can also provide agricultural insurance to protect farmers from the risk of extreme weather or natural disasters.
- The government is responsible for providing infrastructure that supports the smooth flow of the rice supply chain, such as the construction of roads, bridges, and storage facilities. In addition, the government can collaborate with the private sector to provide training for farmers on modern agricultural techniques, warehouse management, and how to improve production and distribution efficiency.
- The government can play a role in ensuring that the rice market runs fairly by setting minimum prices or price controls, to protect farmers from detrimental price

fluctuations. In addition, monitoring the quality of rice circulating in the market can also be done to maintain consumer confidence and support market stability.

3. Collaboration between Government and Private Sector

- The private sector can collaborate with the government to build more efficient infrastructure and distribution systems. For example, rice milling companies can invest in more efficient processing technologies, while the government can support through fiscal incentives or capital assistance. Such collaboration can reduce logistics costs, improve the quality of the final product, and ensure a more stable and sustainable rice supply.
- The government and the private sector can collaborate in research and development to create superior rice varieties that are more resilient to climate change, diseases, and pests. This can also include the development of more efficient agricultural technologies, as well as innovations in rice distribution and processing systems. This joint research program will be very beneficial in the long term in improving food security and supply chain efficiency.

4. The Role of the Private Sector in Collaboration

- The private sector, such as rice milling companies and distributors, have extensive networks to distribute rice to domestic and international markets. Large companies in the rice supply chain can facilitate wider market access for local farmers, while ensuring that the products received meet the quality standards desired by consumers.
- Private companies have the ability to invest in technologies that can improve operational efficiency and product quality. This includes investing in more modern rice milling machines, processing rice in a more efficient and environmentally friendly way, and using information technology to optimize distribution and supply chain management.
- The private sector has a major role to play in promoting sustainable farming practices. Companies can introduce sustainability standards for farmers, such as using environmentally friendly materials and reducing reliance on chemicals. These sustainable business practices are not only good for the environment but can also increase the competitiveness of rice products in a global market that is increasingly aware of sustainability issues.

5. Benefits of Effective Collaboration

- With effective collaboration between farmers, distributors, government, and the private sector, the rice supply chain will be more stable. Farmers will get fair and stable prices, while consumers will get sufficient and quality rice supplies at affordable prices.
- This collaboration also encourages improving the quality of rice, both in terms of processing and packaging, which will increase the competitiveness of rice products in domestic and international markets.
- With the support of policies that support sustainability, the adoption of environmentally friendly agricultural technologies, and good risk management, the rice supply chain can be more resilient to market fluctuations and climate change. This will ensure the availability of rice in the long term and support national food security.

Challenges and strategies to overcome problems in rice supply chain management

Rice supply chain management in the regions faces a number of challenges that can affect the efficiency and sustainability of rice supply. These challenges can come from various factors, ranging from technical issues in production, distribution, to government policies. However,

with the right strategy, these challenges can be overcome to create a more efficient and sustainable supply chain. The following are the main challenges in rice supply chain management in the regions along with strategies that can be applied to overcome them:

1. Price Fluctuations and Market Instability [9]
 - Challenge: Sharp fluctuations in rice prices can cause uncertainty for farmers and consumers. Unstable prices can hurt farmers who have difficulty planning their income, while consumers face price uncertainty that affects their purchasing power.
 - Strategies to Overcome It:
 - a. The government can set a minimum price for rice to protect farmers from extreme price fluctuations. This helps to keep farmers' incomes stable and ensures they remain motivated to produce rice.
 - b. Farmers can be assisted to sell their rice in various markets, both locally and for export, so as not to depend on one market that is vulnerable to price fluctuations.
 - c. Distributors and the private sector can enter into long-term contracts with farmers to ensure stable rice prices and supplies.
2. Dependence on Seasons and Climate Change [9]
 - Challenges: Seasonal dependence and unpredictable weather conditions cause instability in rice supply. Climate change causing droughts or floods can reduce yields, increase losses for farmers, and disrupt rice distribution.
 - Strategies to Overcome It:
 - a. Farmers can be given access to agricultural technologies that are more resilient to climate change, such as rice varieties that are resistant to drought or flooding. Governments and the private sector can work together to introduce more efficient and environmentally friendly farming techniques.
 - b. The government can provide agricultural insurance programs that provide protection to farmers against the risk of crop failure due to natural disasters or extreme weather changes.
 - c. Increasing farmers' access to efficient irrigation systems can help reduce dependence on rainfall, which is heavily influenced by climate change.
3. Infrastructure and Market Accessibility Limitations [20]
 - Challenges: Infrastructure limitations, such as poor roads, bridges, and storage facilities, result in high distribution costs and delays in rice supply to the market. In addition, remote areas often struggle to access wider markets.
 - Strategies to Overcome It:
 - a. The government can increase infrastructure development that supports smooth rice distribution, such as better roads, bridges, and rice storage facilities (warehouses with adequate storage capacity). This will reduce transportation costs and speed up rice distribution.
 - b. The private sector can work with farmers to create more efficient distribution systems, such as through the use of information technology to track market supply and demand in real-time, and using more efficient vehicles for transportation.
 - c. Development of better rice storage technologies, such as refrigerated storage or storage under conditions that reduce rice damage due to high humidity, can reduce post-harvest wastage and losses.
4. Inconsistent Rice Quality [17]
 - Challenge: Differences in the quality of rice produced by farmers can be difficult for distributors and consumers. Poor quality rice can harm farmers due to low selling

prices, while consumers can be disappointed with products that do not meet expectations.

- Strategies to Overcome It:
 - a. Training for farmers on better cultivation techniques and the use of modern agricultural technology will help improve the quality of rice produced. Agricultural extension programs involving experts and local governments can help farmers improve the quality of their production.
 - b. Governments or industry associations can set clear quality standards for rice that producers must adhere to. These standards can cover the physical quality of rice, cleanliness, and nutritional content, as well as procedures for regular quality testing of rice.
 - c. The use of technology for more efficient post-harvest processing, such as more modern milling, can improve rice quality and reduce losses in processing.

5. Limited Access to Finance [8]

- Challenges: Many farmers face difficulties in accessing financing to purchase agricultural equipment, quality seeds, or capital to expand their businesses. Without adequate financing, they cannot increase rice production or quality.
- Strategies to Overcome It:
 - a. Governments and financial institutions can provide special financing programs for farmers, such as microcredit or subsidies for purchasing agricultural equipment and supplies. This financing can help farmers increase their productivity without having to face high interest rates.
 - b. Companies involved in rice milling or distribution can work with farmers to provide more accessible financing or provide business capital in the form of goods or technology, with more flexible payment schemes.

6. Limitations of Technology and Innovation [20]

- Challenges: Many farmers still use traditional technology in rice production, which can reduce efficiency and yields. Limited technology adoption also hampers efficiency in rice processing and distribution.
- Strategies to Overcome It:
 - a. Governments and the private sector can work together to introduce more efficient agricultural technologies, such as the use of superior seeds, smart irrigation, and modern agricultural tools that increase yields and reduce costs.
 - b. Training programs for farmers in using new technologies are essential. Information technology-based extension and training that can connect farmers with market information or new farming techniques would be very beneficial.
 - c. Innovations in rice milling, as well as technologies for more sophisticated supply chain management, can increase efficiency throughout the distribution process.

E. CONCLUSION

Based on the results of the literature study, the efficiency of the rice supply chain is influenced by various factors, including the quality of raw materials, technology, infrastructure, inventory management, and coordination between parties in the supply chain. The main challenges faced include price fluctuations, dependence on seasons, limited infrastructure, inconsistent rice quality, limited access to financing, and lack of adoption of modern technology. To overcome this problem, collaboration is needed between farmers, distributors,

the government, and the private sector. Strategies that can be implemented include improving production quality, developing infrastructure, using efficient technology, and providing more accessible financing. With collective efforts, the rice supply chain can become more efficient, sustainable, and support national food security.

BIBLIOGRAPHY

- [1] R. Martanto, *Analysis of Land Use Change Patterns for Rice Self-Sufficiency Stability in Sukoharjo Regency*, vol. 6, no. August. 2019.
- [2] A. Syamil *et al.*, *Textbook of Supply Chain Management*, vol. 1, no. August. 2023. [Online]. Available: <https://books.google.co.id/>
- [3] D. Ivanov, A. Dolgui, and B. Sokolov, "The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics," *Int. J. Prod. Res.*, vol. 57, no. 3, pp. 829–846, 2019, doi: 10.1080/00207543.2018.1488086.
- [4] Rika Ampuh Hadiguna, *Agro-Industry Supply Chain Management*, no. February. 2015.
- [5] T. Bantacut and R. Fadhil, "Application of LOGISTICTS 4.0 in Rice Supply Chain Management at Perum BULOG: An Initial Idea," *J. Pangan*, vol. 1, no. 1, pp. 1–14, 2018.
- [6] FZ Nisa', SFA Wati, A. Rahmadani, AD Setiawan, and MP Sekti, "Literature Study: Strategies and Challenges in Implementing Supply Chain Management," *Pros. Semin. Nas. Technol. and Sist. Inf.*, vol. 3, no. 1, pp. 21–33, 2023, doi: 10.33005/sitation.v3i1.585.
- [7] Y. Fadmala, C. Hayati, and H. Hanifah, "Analysis of Supply Chain and Value Chain Optimization at Bulog North Surabaya Branch Office," *J. Econ. Educator. and Public Servant.*, vol. 1, no. 2, pp. 39–45, 2024.
- [8] DT Laeela Jauhara, "Supply Chain Analysis of Raw Material Availability for Rice Agricultural Products Using the Supply Chain Operations Reference Method," *J. Technol. and Food Quality*, vol. 2, no. 2, pp. 171–180, 2024, [Online]. Available: <https://journal.universitasbumigora.ac.id/index.php/jtmp>
- [9] AR Dianti and AD Sari, "ANALYSIS OF RICE PROCUREMENT LOGISTICS STRATEGY IN IMPROVING DISTRIBUTION AND STOCK QUALITY IN THE NEW BULOG WAREHOUSE (GBB) KLATEN," *J. Business Logistics*, vol. 14, no. 1, pp. 58–63, 2024.
- [10] EJ Hayat, "Rice Supply Chain Optimization with Supply Chain Operational References Model and Analytical Hierarchy Process," *J. Kalibr.*, vol. 22, no. 1, pp. 4–9, 2024, doi: 10.33364/kalibr/v.22-1.1579.
- [11] R. Indriani, S. Imran, and M. Mukhlis, "Structure and Performance Efficiency of Rice Supply Chain in Gorontalo Province, Indonesia," *Agro Bali Agric. J.*, vol. 7, no. 2, pp. 542–558, 2024, doi: 10.37637/ab.v7i2.1648.
- [12] SW and PNI Inas Mufidati Kusuma, "Supply Chain Management of Rice Products at Sumber Baru Rice Mill, Sidoarjo District, Sidoarjo Regency," *J. Ilm. Manaj. Agribisnis*, vol. 11, no. 1, pp. 6–12, 2023.
- [13] A. Djama, R. Indriani, and A. Moonti, "Optimizing Rice Supply Chain Management in Maintaining Food Security (Case Study of Perum Bulog Gorontalo Branch Office)," *Media Agribisnis*, vol. 7, no. 1, pp. 107–115, 2023, doi: 10.35326/agribisnis.v7i1.3199.
- [14] T. Ruspayandi, T. Bantacut, and B. Arifin, "Strategy Map for Developing BULOG's Competitive Advantages to Become the Market Leader in Rice in Indonesia," *FOOD*, pp. 75–

94, 2023.

- [15] A. Sutoni, NT Ibrahim, D. Indrawati, AY Cahyati, and FM Addilah, “Supply Chain Analysis in Rice Commodity Management (Case Study in PB Jembar Ati, Cianjur Regency),” *J. IKRA-ITH Teknol.* , vol. 5, no. 2, pp. 72–80, 2021, [Online]. Available: <https://journals.upi-yai.ac.id/index.php/ikraith-teknologi/article/view/971/760>
- [16] FRL Manupapami, M. Wullur, and A. bin H. Jan, “Analysis of Rice Supply Chain Network System in Muram Sari Village, Merauke Regency, Papua Province,” *Emba* , vol. 9, no. 2, pp. 840–847, 2021.
- [17] YR Hidayat, “ANALYSIS OF RICE SUPPLY CHAIN MANAGEMENT IMPLEMENTATION AT PERUM BULOG SINGAKERTA WAREHOUSE, INDRAMAYU REGENCY,” *J. Econ. Pertan. and Agribisnis* , vol. 4, no. 2, pp. 763–773, 2020.
- [18] A. Palupi, SH Priyanto, and LT Sunaryanto, “Dynamics of Rice Supply Chain in Bansari District, Temanggung Regency,” *J. AGRISEP Kaji. Mass. Soc. Ekon. Pertan. dan Agribisnis* , vol. 19, no. 2, pp. 361–374, 2020, doi: 10.31186/jagrisep.19.2.361-374.
- [19] AI Nurmahdy, M. Machfud, and MFS Syuaib, “Rice Supply Chain Performance in Karawang Regency,” *J. Apl. Business and Manaj.* , vol. 6, no. 2, pp. 325–334, 2020, doi: 10.17358/jabm.6.2.325.
- [20] SN Hakim, R. Syarief, S. Nazli, and K. Pertanian, “Supply Chain Development Strategy Based on Internal Control System in Organic Rice Production,” vol. 13, no. 2, pp. 143–150, 2018.