Journal of Supply Chain and Entrepeneurship
2026, VOL. 2, NO. 1, 12-23
https://doi.org/10.64268/josce.v2i1.111.

Optimizing Raw Material Inventory Efficiency in Small-Scale Agroindustry Using the Economic Order Quantity Model: Evidence from a Milkfish Floss Enterprise in Indonesia

Ainur Rahman, Andi M Ismail
Politeknik Negeri Jember, Indonesia

ainurrahman@gmail.com

ABSTRACT

Background: Efficient raw material inventory management is essential for maintaining production continuity and minimizing operational costs in small-scale agroindustries. Many micro and small enterprises still rely on conventional purchasing practices without systematic inventory planning, which often leads to overstocking, stock shortages, and increased storage costs. In the fish processing sector, particularly in milkfish floss production, the perishable nature of raw materials further increases the importance of accurate inventory control. The application of quantitative inventory models such as the Economic Order Quantity (EOQ) approach can provide a structured framework to determine optimal ordering decisions and improve operational efficiency in small agroindustrial enterprises.

Aims: This study aims to analyze raw material inventory control in a small-scale milkfish floss enterprise and evaluate the effectiveness of the Economic Order Quantity (EOQ) model in determining optimal order quantity, reorder point, safety stock, and total inventory cost.

Methods: A quantitative case study approach was applied using operational data collected from January to December 2024 at a milkfish floss enterprise located in Situbondo, Indonesia. The analysis utilized the EOQ model to calculate optimal order quantity, ordering frequency, safety stock, reorder point, and total inventory cost. Supporting calculations were performed using inventory management analysis procedures to compare the efficiency of the EOQ approach with the existing conventional ordering system.

Result: The results indicate that the enterprise purchased 770 kg of milkfish raw materials with an annual usage of 760 kg and an ordering frequency of 65 times under the conventional system. Using the EOQ model, the optimal order quantity was determined to be 65.25 kg per order with an estimated ordering frequency of 11.65 times per year and an average order cycle of approximately 19.05 days. The recommended safety stock was 12.228 kg, while the reorder point was calculated at 15.648 kg. The implementation of EOQ reduced the total inventory cost to IDR 244,668.75 compared to the conventional system cost of IDR 704,103.75, resulting in a cost saving of IDR 458,435.

Conclusion: The findings demonstrate that the EOQ model provides a practical and efficient approach for improving inventory management in small-scale agroindustries. By determining optimal order quantities and establishing systematic reorder policies, the model helps reduce excessive ordering frequency, minimize inventory-related costs, and prevent raw material shortages that could disrupt production processes. The study highlights the importance of adopting quantitative inventory management tools within small agroindustrial enterprises to enhance operational efficiency and cost control. Furthermore, the results provide empirical evidence that structured inventory planning can significantly improve supply chain stability in small-scale food processing industries. The adoption of EOQ-based inventory management is therefore recommended as a strategic approach to support sustainable production management and operational resilience in small agroindustry systems.

ARTICLE HISTORY
Submitted:10, 01,2026
Accepted:05, 02,2026
Published:17, 03,2026

KEYWORD
Agroindustry;
Economic Order Quantity;
Inventory Control;
Milkfish Processing;
Supply Chain Efficiency.

INTRODUCTION

The development of small-scale agroindustry has become an important driver of rural economic growth and food processing value chains in many developing countries. In agro-food production systems, efficient resource management plays a crucial role in ensuring production continuity and reducing operational costs. According to (Figurek & Thrassou, 2023 and Wicaksono & Illés, 2022), the sustainability of agri-food small and medium enterprises strongly depends on their ability to manage operational processes and supply chain resources effectively. Inventory management therefore becomes a strategic element because raw materials represent a significant component of production costs in agroindustrial systems. In many traditional agro-processing enterprises, purchasing decisions are still based on intuition rather than systematic planning methods. Such practices often create operational inefficiencies, including excessive stock accumulation or unexpected raw material shortages during production cycles. Leitão et al., (2023) and Rambe & Khaola, (2021) emphasize that the adoption of structured operational practices in agribusiness firms contributes significantly to improving efficiency and competitiveness in agroindustrial sectors. Consequently, improving inventory management practices has become an essential topic in agroindustry research because it directly affects production efficiency, cost management, and long-term business sustainability.

Raw material management is particularly critical in fish-based agroindustry due to the perishable nature of aquatic products and their sensitivity to supply fluctuations. Studies in agroindustrial supply chains indicate that ineffective inventory planning can lead to higher storage costs, material waste, and disruptions in production processes. Abbas et al., (2024) and Manggala et al., (2024) demonstrate that supply chain inefficiencies in fish-processing agroindustries often arise from weak coordination between raw material procurement and production scheduling. In small-scale enterprises, these problems are often intensified by limited managerial capacity and the absence of quantitative planning tools. Research by Salah et al., (2023) explains that integrating operational efficiency strategies in food processing industries helps reduce production losses and improves resource utilization. The need for improved inventory planning is also highlighted by Shao & Marwa, (2025), who argue that operational efficiency in post-harvest systems is closely linked to better resource allocation and inventory monitoring. In this context, systematic inventory control models offer an analytical framework for improving purchasing decisions. Implementing such models can help small agroindustrial enterprises maintain optimal stock levels while minimizing operational costs. Therefore, studying inventory optimization strategies within small-scale agroindustries becomes increasingly relevant for supporting sustainable production systems.

Although agroindustrial development continues to expand in many regions, small-scale enterprises frequently encounter operational challenges related to raw material management and production planning. Research by Leão et al., (2023) suggests that inefficiencies in food value chains often originate from weak coordination between procurement activities and production demand. In small food processing enterprises, raw material procurement is commonly performed in small quantities with high ordering frequency, which can increase ordering costs and operational complexity. Gomaa, (2025) indicate that improving supply chain performance in agroindustries requires systematic planning tools capable of integrating procurement, storage, and production activities. Inventory optimization models have therefore been widely proposed as practical decision-making tools for improving operational efficiency. Huerta-Soto et al., (2023) highlight that structured inventory management approaches can significantly reduce operational costs while improving resource utilization in agroindustrial production systems. Despite the growing body of research on supply chain optimization, many micro and small enterprises still lack access to practical analytical methods for managing raw material inventory. This condition creates a research opportunity to apply quantitative inventory models within real agroindustrial production environments.

The Economic Order Quantity (EOQ) model is one of the most widely used analytical tools for determining optimal order quantities in inventory management systems. According to Shadkam & Irannezhad, (2025), optimization models in agroindustry supply chains can significantly improve operational efficiency when applied to real production cases. The EOQ approach allows firms to determine optimal ordering quantities that minimize total inventory costs consisting of ordering costs and holding costs. Several studies in agroindustrial management emphasize that the application of quantitative inventory models helps small enterprises achieve more stable production cycles and better resource planning. Vlachos & Malindretos, (2023) demonstrate that supply chain analysis in fish-processing industries can identify inefficiencies in procurement strategies that affect production continuity. However, most existing studies focus on large-scale supply chain systems or industrial food processing companies. Limited empirical research has examined how EOQ-based inventory management can be implemented in small-scale fish processing enterprises. As a result, understanding the practical benefits of EOQ implementation in small agroindustry contexts becomes an important research focus. This study therefore investigates inventory optimization in a milkfish floss agroindustry as an empirical case of small-scale food processing operations.

Previous studies have widely examined operational efficiency and supply chain management in agroindustrial production systems. Garcez et al., (2026) discuss how sustainability strategies in agri-food small enterprises require improvements in operational planning and resource management. Research by Sun et al., (2026) explains that supply chain performance in agricultural systems is strongly influenced by efficient coordination between production activities and supporting operational processes. In rural agroindustrial communities, Fajardo-Ariza et al., (2026) show that technological and operational improvements can significantly reduce production losses and improve productivity. Studies on circular economy practices in agribusiness conducted by Khan & Mahajan, (2025) highlight the importance of efficient resource utilization in agricultural value chains. Similarly, Suthiluk et al., (2025) propose integrated processing frameworks to improve sustainability and efficiency in agroindustrial production systems. Research by Guerra et al., (2025) demonstrates that lean operational tools and digital transformation can improve production efficiency in agricultural systems. Ji et al., (2025) also emphasize that modern agricultural production systems require systematic quality management and operational planning strategies. These studies collectively suggest that operational efficiency and resource optimization are essential factors in agroindustrial competitiveness.

Several studies have also specifically focused on supply chain optimization and inventory management in agroindustry systems. Paillin et al., (2025) analyze the configuration of tuna agroindustry supply chains and highlight the importance of efficient procurement planning for maintaining production stability. Choque Llerena et al., (2025) demonstrate that the application of the SCOR model can improve inventory efficiency in agroindustrial companies by integrating operational planning with performance measurement systems. Meilizar et al., (2024) develop a conceptual supply chain optimization model for local food agroindustry systems, showing that integrated operational planning improves production performance. Suryaningrat et al., (2024) apply the SCOR method to evaluate supply chain performance in coffee agroindustry and identify key factors affecting operational efficiency. Research on sustainable food value chains conducted by Valdés, (2024) further emphasizes the importance of transaction cost management and operational efficiency in agro-food production systems. Meanwhile, (Schmidt et al., 2024) highlight the role of technological and operational innovations in improving efficiency in post-harvest grain management systems. (Laili et al., 2024) explore optimization strategies in agroindustrial eco-industrial parks to improve resource efficiency and industrial sustainability. Collectively, these studies underline the importance of structured operational models for improving efficiency in agroindustrial supply chains.

Although numerous studies have explored supply chain efficiency and operational optimization in agroindustrial systems, several research gaps remain in the context of small-scale food processing enterprises. Many existing studies primarily focus on large supply chain networks or industrial-scale agro-processing companies, which have different operational characteristics compared to micro and small enterprises. Research on agroindustrial supply chain performance has emphasized strategic planning and sustainability frameworks rather than operational decision-making tools used at the enterprise level. Furthermore, studies investigating fish-based agroindustry systems often concentrate on supply chain structures rather than inventory management practices within production units. Limited empirical evidence exists regarding how quantitative inventory models can be applied in small-scale agroindustry operations with limited managerial resources. Small food processing enterprises often rely on conventional purchasing strategies without systematic analysis of optimal order quantities and inventory costs. As a result, the potential benefits of applying structured inventory management models remain underexplored in small agroindustrial contexts. Addressing this research gap requires empirical studies that evaluate the practical implementation of inventory optimization models in real production environments.

Based on the identified research gaps, this study aims to examine the effectiveness of the Economic Order Quantity model in improving raw material inventory management within a small-scale agroindustry. The research focuses on a milkfish floss processing enterprise as a representative case of fish-based agroindustrial production. By analyzing procurement data and production requirements, the study evaluates optimal ordering quantity, reorder point, safety stock, and total inventory cost. The application of the EOQ model provides an analytical framework for determining the most efficient purchasing strategy for raw materials. The study also compares the performance of the EOQ-based inventory system with the conventional procurement approach currently used by the enterprise. Through this comparison, the research identifies potential cost savings and operational improvements resulting from optimized inventory planning. The findings are expected to contribute to the development of practical inventory management strategies for small agroindustrial enterprises. Ultimately, this study seeks to provide empirical evidence supporting the adoption of quantitative inventory models as a tool for improving operational efficiency in small-scale agroindustry systems.

METHOD

Research Design

This study adopted a quantitative case study approach to analyze raw material inventory efficiency within a small-scale agroindustrial production system. A case study design enables researchers to examine operational management practices in a real organizational context while maintaining analytical rigor in evaluating decision-making processes. Within operations management research, Nappi & Kelly, (2021) explains that case-based quantitative analysis is particularly suitable when the objective is to evaluate management practices implemented in a specific production environment. Agroindustrial enterprises often operate under resource constraints that influence procurement decisions, inventory control practices, and production continuity. Previous research conducted by (Marcone, 2025) indicates that case-based investigation in agroindustrial supply chains provides valuable insights into operational efficiency and resource utilization. In the present study, the selected case involves a milkfish floss processing enterprise representing a typical small-scale fish-processing agroindustry in Indonesia. The enterprise relies on milkfish as its primary raw material and conducts regular procurement activities to sustain production operations. By applying the Economic Order Quantity (EOQ) model within this case context, the study aims to evaluate optimal procurement strategies that can improve inventory efficiency and reduce operational costs in small agroindustrial production systems.

Participant

The unit of analysis in this research was a milkfish floss processing enterprise categorized as a micro-scale agroindustry operating in Situbondo Regency, Indonesia. This enterprise processes fresh milkfish into shredded fish products that are distributed through local food markets and regional retail channels. The selection of the enterprise was based on the availability of structured operational data related to procurement, storage, and production activities. Data were collected from operational records covering the period between January and December 2024. The dataset included raw material purchasing records, inventory usage reports, storage information, and cost data related to procurement and storage operations. In applied management research, purposive sampling is commonly used to select research objects that provide relevant information aligned with research objectives, as described by Bouncken et al., (2025). The enterprise was therefore selected because its operational data allowed for a detailed evaluation of inventory control practices. The availability of complete procurement and production data enabled the analysis of inventory performance using quantitative inventory management models.

Instrument

Data collection in this study utilized structured operational documentation obtained directly from enterprise production records. The primary instruments consisted of inventory data sheets designed to capture raw material procurement patterns and storage conditions. These instruments recorded several operational variables including annual demand for milkfish raw materials, ordering costs associated with procurement transactions, and holding costs related to storage activities. In operations management research, Zou et al., (2025) emphasize that structured data instruments are essential to ensure consistency and reliability in inventory analysis. Data were organized into standardized variables required for the application of the EOQ model. Spreadsheet-based analytical tools were also used to process the collected operational data and convert them into quantitative inventory indicators. This approach allowed the transformation of operational records into analytical parameters necessary for inventory optimization analysis. The structured instrument design ensured that all relevant operational information was systematically captured and prepared for subsequent quantitative evaluation.

Data Analysis Plan

The analytical procedure applied in this research was based on the Economic Order Quantity model to determine the optimal raw material procurement quantity that minimizes total inventory costs. The EOQ model is widely recognized in operations management as an effective analytical tool for balancing ordering costs and holding costs within inventory systems. According to Muhsin et al., (2024), the EOQ model provides a mathematical framework that enables organizations to determine efficient procurement quantities while maintaining adequate inventory levels for production continuity. In agroindustrial systems, structured inventory planning can significantly reduce operational inefficiencies related to excessive ordering frequency and unnecessary storage costs. Research conducted by ("ERP System for Inventory Management in an Agro-Industrial Company," 2025) demonstrates that the application of analytical inventory models can improve cost efficiency and operational performance in agroindustrial enterprises. In this study, the EOQ analysis calculated optimal order quantity, safety stock, reorder point, ordering frequency, and total inventory cost. These indicators were derived from operational data collected during the study period. The results obtained from the EOQ model were subsequently compared with the existing conventional procurement system used by the enterprise in order to evaluate improvements in inventory efficiency and cost management.

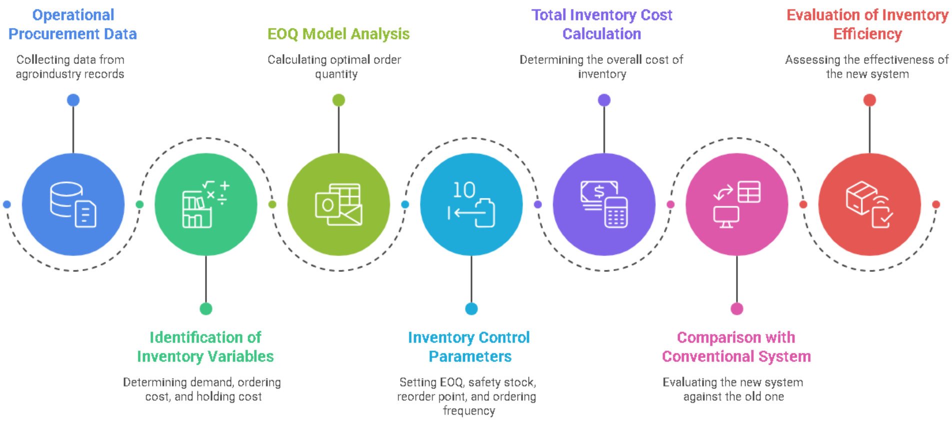

Figure 1. Research Framework for EOQ-Based Inventory Optimization

Figure 1 presents the analytical framework applied in this research. The framework begins with the collection of operational procurement data from the agroindustry enterprise. These data are subsequently used to identify key inventory variables required for EOQ analysis. The Economic Order Quantity model is then applied to determine optimal ordering quantities and inventory control parameters. The calculated parameters include safety stock, reorder point, and ordering frequency that support stable production operations. Total inventory cost is then estimated to evaluate procurement efficiency. Finally, the EOQ-based inventory system is compared with the existing conventional system to assess potential cost reductions and improvements in inventory management efficiency.

Table 1. Inventory Analysis Variables

Variable	Description
Raw Material Demand	Total annual demand for milkfish used in production
Ordering Cost	Cost incurred for each procurement transaction
Holding Cost	Cost associated with storing raw materials
Economic Order Quantity	Optimal quantity of raw materials to be ordered
Safety Stock	Minimum inventory maintained to prevent stock shortages
Reorder Point	Inventory level that triggers a new procurement order
Ordering Frequency	Number of procurement cycles within one year
Total Inventory Cost	Combined cost of ordering and holding inventory

Table 1 summarizes the key variables used in the inventory optimization analysis. These variables represent fundamental parameters required for evaluating procurement efficiency and calculating the optimal order quantity using the EOQ model.

RESULTS AND DISCUSSION

Results

The empirical analysis began with the identification of raw material procurement characteristics within the milkfish floss agroindustry. Operational data obtained from the enterprise indicate that milkfish represents the primary raw material used in the production process. During the 2024 production period, the enterprise recorded total procurement of 770 kg of milkfish, while the annual raw material consumption reached 760 kg. The difference between procurement and consumption reflects the presence of residual inventory maintained for production stability. Procurement activities were conducted frequently throughout the year due to the absence of structured inventory planning. Under the conventional procurement approach, the enterprise performed approximately 65 ordering transactions annually. Such high ordering frequency suggests inefficient procurement planning that potentially increases ordering costs. Therefore, a structured inventory analysis using the Economic Order Quantity model was conducted to determine the optimal procurement strategy for the enterprise.

Table 2. Raw Material Procurement and Usage Data

Variable	Value
Total Raw Material Purchased	770 kg
Annual Raw Material Usage	760 kg
Conventional Ordering Frequency	65 orders/year
Average Purchase per Order	11.84 kg

Table 2 presents the baseline procurement data used as input for the inventory analysis. The data indicate that the enterprise relies on frequent small-scale purchasing decisions, which can lead to inefficient ordering practices and increased operational costs.

The EOQ analysis was then applied to determine the optimal order quantity that minimizes total inventory cost. The calculation incorporated three key parameters including annual demand, ordering cost, and holding cost associated with raw material storage. The results show that the optimal order quantity recommended by the EOQ model is 65.25 kg per order. This optimal quantity significantly differs from the conventional purchasing practice observed in the enterprise. Based on the EOQ model, the optimal ordering frequency was estimated at 11.65 orders per year. This result indicates that the enterprise can substantially reduce its procurement frequency by adopting a structured inventory management system. The EOQ calculation also determined the appropriate reorder point and safety stock required to maintain production continuity. These parameters allow the enterprise to maintain adequate inventory levels while preventing unexpected raw material shortages.

Table 3. EOQ Inventory Optimization Results

Parameter	Result
Economic Order Quantity (EOQ)	65.25 kg
Ordering Frequency	11.65 orders/year

Parameter	Result
Order Cycle Time	19.05 days
Safety Stock	12.228 kg
Reorder Point	15.648 kg

Table 3 presents the inventory control parameters generated by the EOQ model. These parameters provide guidance for the enterprise in determining when and how much raw material should be ordered to maintain efficient production operations.

The application of the EOQ model also resulted in significant improvements in cost efficiency. Under the conventional procurement system, the total annual inventory cost was estimated at IDR 704,103.75. After applying the EOQ model, the total inventory cost decreased substantially to IDR 244,668.75. The difference between these two values represents a potential cost saving of IDR 458,435. The reduction in total inventory cost primarily results from the decrease in ordering frequency and improved procurement planning. Lower ordering frequency reduces administrative and transportation costs associated with procurement transactions. At the same time, optimized order quantities ensure that holding costs remain within manageable limits. The results therefore indicate that structured inventory management can significantly improve operational efficiency in small-scale agroindustrial enterprises.

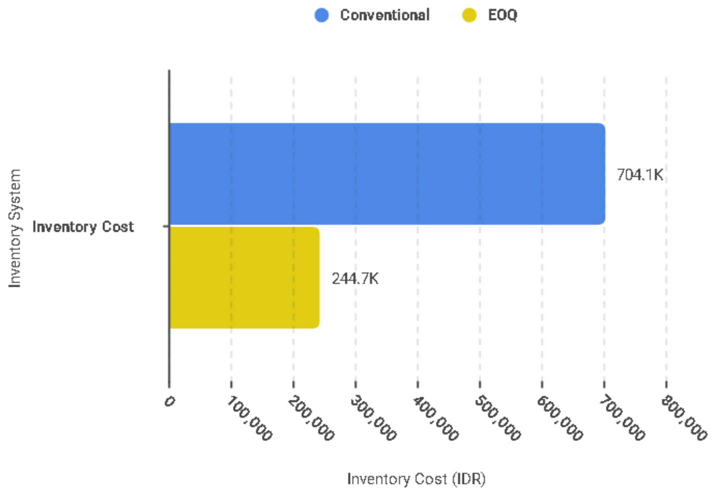

Figure 2. Comparison of Inventory Cost Between Conventional and EOQ System

Figure 2 illustrates the difference in total inventory cost between the conventional procurement system and the EOQ-based inventory system. The EOQ approach significantly reduces the total cost associated with inventory management, demonstrating its effectiveness as a decision-making tool for procurement planning.

Discussion

The findings of this study demonstrate that the application of the EOQ model can significantly improve inventory management efficiency within small-scale agroindustrial enterprises. The reduction in ordering frequency observed in the EOQ model indicates that structured procurement planning can minimize unnecessary operational activities. According to Muhsin et al., (2024), optimal inventory planning allows organizations to balance ordering costs and holding costs more effectively. The results obtained in this study support the argument that systematic inventory management models provide measurable operational benefits for production-oriented enterprises. Research conducted by Choque Llerena et al. (2025) similarly demonstrates that structured inventory models improve cost efficiency in agroindustrial operations. The observed reduction in total inventory cost confirms the effectiveness of EOQ as a practical decision-making tool in inventory management. The findings therefore highlight the importance of adopting analytical procurement strategies in small agroindustrial enterprises. Such strategies enable enterprises to optimize resource utilization while maintaining stable production cycles.

The results also emphasize the importance of inventory control parameters such as safety stock and reorder point in maintaining production continuity. In food processing industries, fluctuations in raw material supply can disrupt production activities if inventory levels are not properly managed. According to Paillin et al. (2025), effective inventory control mechanisms help stabilize agroindustrial supply chains by ensuring consistent availability of raw materials. The safety stock calculated in this study provides a buffer against demand fluctuations and procurement delays. Maintaining a safety stock of 12.228 kg ensures that the enterprise can continue production even when supply disruptions occur. Similarly, the reorder point allows managers to determine the appropriate timing for placing new procurement orders. Research by Meilizar et al. (2024) highlights that structured reorder policies are essential for maintaining operational efficiency in agroindustrial production systems. The adoption of such policies therefore strengthens production planning and supply chain stability.

Another important finding concerns the role of quantitative decision-making tools in improving managerial practices within small enterprises. Many micro and small agroindustrial businesses rely on experience-based decision-making rather than analytical planning tools. According to Valdés (2024), inefficient procurement practices in food value chains often originate from limited managerial capacity and inadequate operational planning. The results of this study demonstrate that the application of a relatively simple analytical model can generate substantial efficiency improvements. The EOQ model does not require complex technological infrastructure and can be implemented using basic operational data. This characteristic makes EOQ particularly suitable for small-scale agroindustrial enterprises with limited technological resources. Research conducted by Khan and Mahajan (2025) also indicates that improving operational management practices can significantly enhance competitiveness in agribusiness sectors. Consequently, the adoption of EOQ-based inventory planning can support long-term operational sustainability.

From a broader perspective, the study contributes to the growing body of research on agroindustrial supply chain efficiency. Previous studies have primarily focused on large-scale agricultural supply chains and industrial production systems. However, small-scale agroindustrial enterprises represent an important component of local food systems and rural economic development. Research by Schmidt et al. (2024) emphasizes that improving operational efficiency in post-harvest and food processing activities can strengthen the overall performance of agricultural value chains. The results obtained in this study demonstrate that inventory optimization can play a critical role in improving efficiency at the enterprise level. By reducing operational costs and improving procurement planning, EOQ-based inventory management supports more sustainable production practices. These findings therefore provide empirical evidence supporting the integration of quantitative management tools into small-scale agroindustrial operations.

The study also highlights the relevance of operational efficiency within the broader context of sustainable agroindustrial development. Efficient resource management not only reduces operational costs but also contributes to minimizing resource waste within production systems. According to Garcez et al. (2026), sustainable agroindustrial strategies require improvements in both operational planning and resource utilization. Inventory optimization helps reduce unnecessary procurement activities that may lead to material spoilage or storage inefficiencies. In fish-based agroindustries where raw materials are highly perishable, efficient inventory planning becomes even more critical. The EOQ model therefore provides a useful analytical framework for improving both economic and operational sustainability. By integrating inventory planning into production management, small agroindustrial enterprises can enhance their resilience in competitive food markets.

Implications

The findings of this study provide several important implications for both managerial practice and agroindustrial supply chain management. From a managerial perspective, the study demonstrates that the adoption of analytical inventory models can significantly improve procurement efficiency within small enterprises. The EOQ model provides a practical tool for determining optimal procurement quantities and reducing unnecessary operational costs. The results also highlight the importance of integrating inventory planning into production management decisions. By applying structured procurement strategies, small agroindustrial enterprises can improve resource utilization and production stability. From a supply chain perspective, efficient inventory management contributes to the stability of raw material supply within agroindustrial production networks. These improvements can strengthen the competitiveness of small-scale food processing enterprises in regional markets. Consequently, the adoption of quantitative inventory management tools should be encouraged within agroindustrial development programs.

Limitations

Despite its contributions, this study has several limitations that should be acknowledged. The research was conducted within a single agroindustrial enterprise, which limits the generalizability of the findings to other production contexts. Differences in production scale, raw material characteristics, and supply chain structures may influence the effectiveness of inventory optimization models. The analysis also focused primarily on procurement efficiency without incorporating broader supply chain variables such as transportation networks and supplier coordination. Additionally, the study relied on historical operational data that may not fully capture future fluctuations in raw material availability. Changes in market demand or environmental conditions could potentially affect the performance of the EOQ model. The research also did not incorporate digital inventory monitoring technologies that are increasingly used in modern supply chain systems. Future research should therefore explore more comprehensive supply chain optimization approaches that integrate inventory management with broader operational planning frameworks.

Suggestions

Future studies should expand the scope of research by examining inventory optimization across multiple agroindustrial enterprises to improve the generalizability of findings. Comparative studies across different food processing sectors may provide deeper insights into how inventory management strategies influence operational performance. Researchers should also consider integrating digital inventory monitoring systems with analytical inventory models to improve decision-making accuracy. The use of real-time inventory data could further enhance the effectiveness of procurement planning. In addition, future research may explore the integration of EOQ with other supply chain management models such as SCOR or lean production frameworks. Such integration could provide a more comprehensive understanding of operational efficiency within agroindustrial production systems. Studies focusing on sustainability indicators may also provide valuable insights into how inventory management contributes to environmentally responsible production practices. These research directions will help strengthen the theoretical and practical understanding of inventory optimization in agroindustry supply chains.

CONCLUSION

This study examined the effectiveness of the Economic Order Quantity model in improving raw material inventory management within a small-scale milkfish floss agroindustry. The findings demonstrate that conventional procurement practices characterized by frequent small-volume purchases lead to inefficient inventory management and higher operational costs. By applying the EOQ model, the enterprise was able to determine an optimal order quantity of 65.25 kg per procurement cycle, which significantly reduced the ordering frequency to approximately 11.65 orders per year. The implementation of EOQ-based inventory planning also generated additional inventory control parameters, including a safety stock level of 12.228 kg and a reorder point of 15.648 kg, which help ensure the continuity of production operations. These parameters enable the enterprise to maintain adequate inventory levels while minimizing the risk of stock shortages caused by demand fluctuations or procurement delays.

The cost analysis further confirms the effectiveness of the EOQ model in enhancing operational efficiency. The total inventory cost under the conventional procurement system reached IDR 704,103.75 annually, whereas the EOQ-based inventory system reduced the total cost to IDR 244,668.75. This reduction represents a cost saving of IDR 458,435, indicating that structured inventory planning can significantly improve procurement efficiency in small-scale agroindustrial enterprises. In addition to cost reduction, the EOQ model provides a systematic decision-making framework that supports more effective inventory control and production planning. The study therefore highlights the importance of integrating quantitative inventory management tools into agroindustrial production systems. From a broader perspective, the findings contribute empirical evidence demonstrating that simple analytical models can play a critical role in strengthening operational performance and supply chain stability in small-scale food processing industries.

AUTHOR CONTRIBUTIONS STATEMENT

Ainur Rahman was responsible for conceptualization, data collection, methodology development, formal analysis, and manuscript preparation. Ainur Rahman conducted the empirical investigation, performed the inventory optimization calculations using the Economic Order Quantity model, and prepared the initial draft of the manuscript including the results and discussion sections.

Andi M. Ismail contributed to the research supervision, conceptual refinement, methodological validation, and critical review of the manuscript. Andi M. Ismail also provided guidance on research design, analytical interpretation, and manuscript improvement to ensure the academic quality and alignment with international journal standards.

Both authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the research.

REFERENCES

Abbas, H., Zhao, L., Gong, X., Jiang, M., & Faiz, T. (2024). Environmental and economic influences of postharvest losses across the fish-food products supply chain in the developing regions. *Environment, Development and Sustainability*, *26*(11), 28335–28366. https://doi.org/10.1007/s10668-023-03814-9

Bouncken, R. B., Czakon, W., & Schmitt, F. (2025). Purposeful sampling and saturation in qualitative research methodologies: Recommendations and review. *Review of Managerial Science*. https://doi.org/10.1007/s11846-025-00881-2

Choque Llerena, A. A., Salinas Rojas, A. P., Aguilar Franco, J. A., Villanuena Delgado, C. M., & Caipo Huacasi, M. S. (2025). DEVELOPMENT OF THE SCOR MODEL IN THE EFFICIENCY OF AGROINDUSTRY INVENTORY MANAGEMENT: CASE STUDY OF THE AGROINDUSTRY LYOPHILIZER COMPANY, AREQUIPA. *Proceedings on Engineering Sciences*, *7*(3), 2105–2112. https://doi.org/10.24874/PES07.03B.011

ERP System for Inventory Management in an Agro-Industrial Company. (2025). *TEM Journal*, *14*(4), 3313–3319. https://doi.org/10.18421/TEM144-39

Fajardo-Ariza, T., García-Medina, I. D., Castillo-Sanabria, L. A., Nieto-Veloza, A., & Zuluaga-Domínguez, C. M. (2026). Socio-productive diagnosis and solar dryer co-design for post-harvest loss reduction in rural communities. *Renewable Energy*, *261*. https://doi.org/10.1016/j.renene.2026.125259

Figurek, A., & Thrassou, A. (2023). An Integrated Framework for Sustainable Development in Agri-Food SMEs. *Sustainability*, *15*(12). https://doi.org/10.3390/su15129387

Garcez, A., Rodrigues, M., Franco, M., Oliveira, A., Costa, J., & Cabeleira, C. (2026). What You Need to Know About Life Cycle Assessment in the “Agri-Food Sector” for Sustainable Business Strategies in SMEs: A Bibliometric Analysis. *Business Strategy and the Environment*, *35*(2), 2295–2307. https://doi.org/10.1002/bse.70288

Gomaa, A. H. (2025). Achieving operational excellence in manufacturing supply chains using lean six sigma: A case study approach. *International Journal of Lean Six Sigma*, *17*(2), 614–648. https://doi.org/10.1108/IJLSS-03-2024-0045

Guerra, J. D., Palomino, G., Yildiz, O., Macassi, I. A., & Alvarez, J. C. (2025). Re-Designing Business Process Models for Enhancing Sustainability in Spinach Production Through Lean Tools with Digital Transformation. *Sustainability (Switzerland)*, *17*(13). https://doi.org/10.3390/su17135673

Huerta-Soto, R., Ramirez-Asis, E., Tarazona-Jiménez, J., Nivin-Vargas, L., Norabuena-Figueroa, R., Guzman-Avalos, M., & Reyes-Reyes, C. (2023). RETRACTED: Predictable inventory management within dairy supply chain operations. *International Journal of Retail & Distribution Management*, *53*(3), 1–17. https://doi.org/10.1108/IJRDM-01-2023-0051

Ji, S., Lu, B., & Li, P. (2025). Some Reflections on Modern Science of Agricultural Product Quality. *Scientia Agricultura Sinica*, *58*(9), 1830–1844. https://doi.org/10.3864/j.issn.0578-1752.2025.09.012

Khan, M. A., & Mahajan, R. (2025). Exploring factors influencing circular economy adoption and firm-level practices in the agribusiness sector: An exploratory study of Indian firms. *Environment, Development and Sustainability*, *27*(4), 9039–9069. https://doi.org/10.1007/s10668-023-04267-w

Laili, N., Djatna, T., Indrasti, N. S., & Yani, M. (2024). Optimization of industrial symbiosis in coffee-based eco-industrial park design. *Global Journal of Environmental Science and Management*, *10*(2), 621–642. https://doi.org/10.22035/gjesm.2024.02.13

Leão, R., Ijatuyi, E. J., & Goulao, L. F. (2023). How Public Procurement Mechanisms Can Be Used as a Tool for Developing Pro-Poor Food Value Chains: From Entry Points to Interventions. *Sustainability*, *15*(12). https://doi.org/10.3390/su15129152

Leitão, F. O., Paiva, E. L., & Thomé, K. M. (2023). Agribusiness capabilities and performance: A systematic literature review and research agenda. *British Food Journal*, *126*(2), 595–622. https://doi.org/10.1108/BFJ-12-2022-1143

Manggala, P. W., Machfud, M., & Sailah, I. (2024). Analysis of Supply Chain Performance Improvement in the Fish Processing Industry. *Industria: Jurnal Teknologi Dan Manajemen Agroindustri*, *13*(1), 54–70. https://doi.org/10.21776/ub.industria.2024.013.01.4

Marcone, M. R. (2025). Sustainable supply chain in a new technological era: The case of the Italian agrifood sector. *European Journal of Innovation Management*, *28*(11), 321–348. https://doi.org/10.1108/EJIM-04-2024-0421

Meilizar, Hadiguna, R. A., Santosa, & Nofialdi. (2024). SUPPLY CHAIN CONCEPTUAL MODEL TO OPTIMIZE A LOCAL FOOD AGROINDUSTRY FROM THE COCONUT MILK PROCESSING. *Journal of Applied Engineering and Technological Science*, *6*(1), 519–536. https://doi.org/10.37385/jaets.v6i1.5820

Muhsin, M., Cahyanti, I. S., Novita, D., Rahayu, Y. S., & Rasban, S. (2024). Adaptation of the Economic Order Quantity (EOQ) Model in the Perspective of Maqasid Shari'a. *Al-'Adalah*, *21*(2), 479–506. https://doi.org/10.24042/adalah.v21i2.26535

Nappi, V., & Kelly, K. (2021). Proposing a performance framework for innovation measurement: An exploratory case-based research. *International Journal of Productivity and Performance Management*, *71*(5), 1829–1853. https://doi.org/10.1108/IJPPM-06-2020-0332

Paillin, D. B., Machfud, Hardjomidjojo, H., & Romli, M. (2025). Analysis of Tuna Loin Agroindustry Supply Chain Configuration: Case Study in Maluku Province, Indonesia. *Egyptian Journal of Aquatic Biology and Fisheries*, *29*(1), 135–150. https://doi.org/10.21608/ejabf.2025.403376

Rambe, P., & Khaola, P. (2021). The impact of innovation on agribusiness competitiveness: The mediating role of technology transfer and productivity. *European Journal of Innovation Management*, *25*(3), 741–773. https://doi.org/10.1108/EJIM-05-2020-0180

Salah, A., Çağlar, D., & Zoubi, K. (2023). The Impact of Production and Operations Management Practices in Improving Organizational Performance: The Mediating Role of Supply Chain Integration. *Sustainability*, *15*(20). https://doi.org/10.3390/su152015140

Schmidt, D., Casagranda, L. F., Butturi, M. A., & Sellitto, M. A. (2024). Digital Technologies, Sustainability, and Efficiency in Grain Post-Harvest Activities: A Bibliometric Analysis. *Sustainability (Switzerland)*, *16*(3). https://doi.org/10.3390/su16031244

Shadkam, E., & Irannezhad, E. (2025). A comprehensive review of simulation optimization methods in agricultural supply chains and transition towards an agent-based intelligent digital framework for agriculture 4.0. *Engineering Applications of Artificial Intelligence*, *143*, 109930. https://doi.org/10.1016/j.engappai.2024.109930

Shao, D., & Marwa, N. (2025). Examining the role of artificial intelligence in post-harvest management for enhanced food security: A critical review. *Sustainable Futures*, *10*, 101286. https://doi.org/10.1016/j.sftr.2025.101286

Sun, Z., Li, F., & Liu, Y. (2026). Dual Drivers and Sustainability Tension: How Does Agricultural Supply Chain Finance Affect Core Enterprise Performance? *Sustainability (Switzerland)*, *18*(1). https://doi.org/10.3390/su18010433

Suryaningrat, I. B., Wibowo, Y., Ansori, L., Kuswardhani, N., & Purnomo, B. H. (2024). Supply Chain Management Performance Analysis Using SCOR Method: A Case of Coffee Agroindustry in Indonesia. *AIP Conf. Proc.*, *3176*(1). https://doi.org/10.1063/5.0222694

Suthiluk, P., Khantachawana, A., Phattarapattamawong, S., Srilaong, V., Setha, S., Pongprasert, N., Konsue, N., & Boonprong, S. (2025). An Integrated Framework for Zero-Waste Processing and Carbon Footprint Estimation in 'Phulae' Pineapple Systems. *Agriculture (Switzerland)*, *15*(15). https://doi.org/10.3390/agriculture15151623

Valdés, R. (2024). Sustainable Food Value Chains: Approaches to Transaction Costs in Agro-Alimentary Systems of Developing Countries—A Chile Case Study. *Sustainability (Switzerland)*, *16*(10). https://doi.org/10.3390/su16103952

Vlachos, I., & Malindretos, G. (2023). Supply chain redesign in the aquaculture supply chain: A longitudinal case study. *Production Planning & Control*, *34*(8), 748–764. https://doi.org/10.1080/09537287.2021.1959663

Wicaksono, T., & Illés, C. B. (2022). From resilience to satisfaction: Defining supply chain solutions for agri-food SMEs through quality approach. *PLOS ONE*, *17*(2), e0263393. https://doi.org/10.1371/journal.pone.0263393

Zou, Y., Shi, M., Chen, Z., Deng, Z., Lei, Z., Zeng, Z., Yang, S., Tong, H., Xiao, L., & Zhou, W. (2025). ESGReveal: An LLM-based approach for extracting structured data from ESG reports. *Journal of Cleaner Production*, *489*, 144572. https://doi.org/10.1016/j.jclepro.2024.144572