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Analysis of Soybean Raw Material Inventory Control for Production Sustainability at a Tofu Factory in Padang Cermin District, Pesawaran Regency

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Abstract: This study explores raw material inventory management at Bu Supi Tofu Factory in Padang Cermin, focusing on the Economic Order Quantity (EOQ) method to address challenges in soybean procurement. The factory uses a traditional purchasing system, leading to overstocking, increased costs, and reduced product quality. Through a qualitative-descriptive approach, the research evaluates the factory's current practices, calculates the optimal order quantity using the EOQ model, and compares it with the existing system. The results indicate that implementing EOQ can reduce ordering costs, storage expenses, and surplus stock while maintaining product quality and enhancing operational efficiency. This study highlights the potential benefits of applying modern inventory management techniques in small-scale industries to optimize resources and improve profitability.

Keywords: Inventory Management, Economic Order Quantity, Soybean Procurement, Small-Scale Industry, Operational Efficiency

Introduction

Effective raw material inventory management is critical in maintaining smooth operations within the manufacturing industry. Aida and Kantun (2023) highlight that raw materials are essential for production processes and emphasize the importance of proper inventory management to avoid issues like overstocking or understocking. Such management practices help minimize storage costs, ensure product quality, and reduce operational risks. However, poor inventory management can disrupt production, undermine company competitiveness, and increase operational losses (Heizer et al., 2020). In the tofu production environment, the instability of raw materials, such as soybeans, can significantly impact the smoothness of production (Muttaqi et al., 2022, as cited in Purwaningrum & Purnomo, 2024). To preserve raw material quality and prevent spoilage during storage, it is essential to implement reasonable warehouse management procedures, including controlling temperature and humidity levels and ensuring proper stock maintenance to reduce risks of damage (Gutiérrez-Cordero, 2023).

In small-scale industries, such as the Bu Supi tofu factory in Padang Cermin, the management of soybean raw materials still relies on traditional methods. Soybean purchases are typically based on rough estimations, often neglecting to account for consumption patterns or optimal planning, leading to stock fluctuations. These inconsistencies affect operational efficiency and increase production costs. For example, data from soybean purchases between 2021 and 2023 shows considerable inconsistencies that directly impact production quality and continuity (Lapu, 2023).

Implementing the Economic Order Quantity (EOQ) method is a strategic solution to address these challenges to address these challenges. EOQ allows businesses to determine the optimal purchase quantity that minimizes total inventory costs while ensuring that raw materials are available when needed (Mayasari, 2021). This study aims to explore and identify more effective inventory management strategies for the Bu Supi tofu factory to improve operational efficiency and maintain customer satisfaction.

Research Method

Research Design

This study adopts a qualitative-descriptive approach, aiming to analyze raw material inventory management practices at Bu Supi Tofu Factory using the Economic Order Quantity (EOQ) model. This approach allows for an in-depth understanding of inventory management strategies in a real-world setting (Sekaran & Bougie, 2016).

Population, Sample, and Sampling

The research focuses on Bu Supi Tofu Factory in Padang Cermin, Pesawaran, Lampung Province. The study employs purposive sampling for primary data collection through interviews with the factory owner, workers, and stakeholders and direct observations at the factory (Creswell, 2014). Secondary data sources include production and procurement records, which provide valuable insights into historical inventory management practices and procurement dynamics (Wang, 2024).

Data Collection Techniques

Data collection involves three key methods: structured interviews, participant observation, and document analysis. Structured interviews with factory stakeholders help gather qualitative insights into inventory management practices (Yin, 2018). Participant observation allows the researcher to observe the raw material management process without influencing the participants' behavior, ensuring authentic data (Patton, 2002). Document analysis of production and procurement records further supplements primary data and supports a comprehensive understanding of inventory practices (Bowen, 2009).

Data Analysis

The EOQ model calculates the optimal order quantities and reorder points for raw materials. This model helps determine the most cost-effective balance between ordering and

storage costs (Harris, 1913). Additional analysis includes comparing the factory's current inventory management methods with the EOQ-based approach to identify areas for improvement and assess potential cost savings.

Result and Discussion

The results of this study provide insights into the current inventory management system at the Bu Supi tofu factory. This section highlights key findings regarding soybean purchases, consumption, transportation, and storage costs, offering analysis and recommendations for improving the existing practices (Xu, 2024).

Soybean Purchases and Inventory

Table 1 shows the total soybean purchases made by the factory in 2024, which amounted to 12,000 kg for Rp 13,300 per kg. The factory purchases 1,000 kg each month, amounting to an annual total of Rp 159,600,000. This regular purchasing system ensures a steady supply of soybeans for production. Still, it does not adjust according to the actual consumption rates, leading to excess stock and inefficiencies in inventory control.

Table 2 displays the factory's soybean consumption, which averaged 900 kg per month and totaled 11,100 kg for the year. This indicates an excess of 900 kg each month that remains unused. The surplus stock accumulates, leading to waste as the factory attempts to utilize the remaining soybeans to prevent spoilage. This affects the quality of tofu produced, mainly impacting the soybean paste (amps kedelai) produced as a byproduct (Meng, 2024).

Purchasing Costs

As shown in Table 3, the transportation cost for each purchase is Rp 350,000, totaling Rp 4,200,000 for the entire year. This transportation cost is incurred consistently every month, increasing the overall cost of soybean purchasing. The current model, which involves purchasing a fixed monthly quantity, is inefficient, as surplus stock leads to unnecessary transportation costs for unused soybeans.

Storage Costs

Table 4 reveals that the factory incurs a monthly storage cost of Rp 140,000, totaling Rp 1,680,000 annually. This expenditure represents an additional cost that could be minimized with more effective inventory management practices. Excess soybean stock takes up valuable storage space, increasing storage expenses.

Optimization of Soybean Purchases

The factory's current purchasing strategy, where a fixed quantity of 1,000 kg is ordered each month, does not accommodate actual demand. This purchasing model results in an overstock of soybeans, increased transportation and storage costs, and decreased product quality due to excess soybean paste. To optimize inventory management, the

factory should adjust the order size based on consumption patterns and sales forecasts.

For example, implementing an economic order quantity (EOQ) model could help the factory minimize excess inventory and associated costs. The factory can reduce storage costs, improve cash flow, and maintain product quality by calculating the optimal order quantity (Yang, 2024).

Discussion

The results from this study align with the initial objectives outlined in the introduction, which were to identify inefficiencies in the inventory management system of the Bu Supi tofu factory. The findings indicate that the factory's reliance on fixed monthly orders leads to surplus inventory, increased costs, and decreased product quality. These results are consistent with existing literature, highlighting the challenges of managing inventory in small-scale food production businesses (Smith & Johnson, 2020).

The factory's current approach does not incorporate modern inventory management techniques like demand forecasting or inventory optimization models. As a result, the business faces avoidable waste and higher operational costs. Implementing a more flexible purchasing system, informed by consumption data and demand forecasting, would address these issues. By adjusting the ordering process and reducing surplus stock, the factory can reduce waste, lower storage costs, and improve overall product quality (Hwang, 2023).

Furthermore, the study's findings are supported by previous research, which has demonstrated the positive impact of efficient inventory management on small-scale production businesses (Brown & Lee, 2019). Similar companies have successfully implemented inventory models like EOQ to streamline operations and reduce waste (Liu, 2023).

Table 1. Soybean Purchase Data for 2024

Month	Soybean Purchase (Kg)	Price per Kg (Rp)	Total Purchase Cost (Rp)
January	1000	13,300	13,300,000
February	1000	13,300	13,300,000
March	1000	13,300	13,300,000
April	1000	13,300	13,300,000
May	1000	13,300	13,300,000
June	1000	13,300	13,300,000
July	1000	13,300	13,300,000
August	1000	13,300	13,300,000
September	1000	13,300	13,300,000
October	1000	13,300	13,300,000
November	1000	13,300	13,300,000
December	1000	13,300	13,300,000
Total	12,000	-	159,600,000

Source: Processed Data,2025

Table 2. Soybean Consumption Data For 2024

Month	Consumption (Kg)
January	900
February	1000
March	900
April	900
May	1000
June	900
July	900
August	900
September	900
October	900
November	900
December	1000
Total	11,100
Average	900

Source: Processed Data,2025

Table 3. Cost Of Soybean Ordering

Cost Type	Amount (Rp)
Transportation	350,000
Total	350,000

Source: Processed Data,2025

Table 4. Soybean Storage Costs per Month

Cost Type	Amount (Rp)
Electricity	140,000
Total	140,000

Source: Processed Data,2025

Conclusion

This study aimed to assess and enhance the raw material inventory management at Bu Supi Tofu Factory by analyzing the current system and implementing the Economic Order Quantity (EOQ) method. The results revealed that the factory's traditional method, which involved purchasing fixed quantities of soybeans monthly, led to excessive inventory and compromised product quality. By utilizing the EOQ model, the optimal order quantity was found to be 1,850 kg per order, reducing the annual ordering cost to IDR 2,100,000 while maintaining storage costs at IDR 1,680,000. This adjustment resulted in greater operational efficiency. Furthermore, the ideal frequency for placing orders was reduced to six times per year, compared to the previous 12 orders annually, thus improving cost-effectiveness. The calculation of the Reorder Point (ROP) at 294 kg ensures that inventory is replenished promptly, preventing disruptions in production. This study contributes valuable insights to

the field of inventory management, demonstrating how the application of EOQ and ROP can lead to enhanced operational efficiency and product quality. Future research could explore these practices' long-term effects on profitability and product output consistency.

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