Applied Mathematics & Information Sciences
An International Journal

http://dx.doi.org/10.18576/amis/200309

Soybean Raw Material Inventory Control in the Home Industry: A Case in Kabupaten Simalungun, Indonesia

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Received: 2 Mar. 2026, Revised: 12 Apr. 2026, Accepted: 27 Apr. 2026.
Published online: 1 May 2026.

Abstract: In this study, we investigated the soybean inventory system at Tahu Tukiran Artomoro Home Industry in Kabupaten Simalungun, Indonesia. Effective raw material inventory control is essential for ensuring operational efficiency and sustainability in home-based industries. Data were collected through interviews and supported by monthly purchase and consumption records for 2023. A descriptive approach combining qualitative analysis with quantitative methods was employed, specifically the Economic Order Quantity (EOQ) model for optimizing ordering policy and the Moving Average method for demand forecasting. The results show that total annual soybean purchases reached 33,800 kg, while consumption was 33,420 kg, indicating a relatively balanced condition with seasonal fluctuations, especially during Ramadan. Before EOQ implementation, ordering occurred 24 times per year, resulting in higher ordering and holding costs. After applying EOQ, the optimal frequency decreased to 17 orders annually, reducing ordering costs by 29.17% and holding costs by 94.17%, demonstrating significant cost efficiency. Furthermore, demand forecasting using the Moving Average method achieved a Mean Absolute Percentage Error (MAPE) of 9.653%, indicating high accuracy and reliability in capturing demand patterns, including seasonal surges. The findings reveal that the previous system relied on intuitive decision-making, leading to inefficiencies. The integration of EOQ and Moving Average improved both cost efficiency and planning accuracy. This study highlights the importance of simple data-based inventory management in micro-scale industries and provides practical insights for improving decision-making and sustainability in traditional small enterprises.

Keywords: Home iIndustry; Inventory Management; Raw Material Control; Soybean Inventory; Tofu Production.

1. Introduction

The growth of home industries has played a crucial role in supporting local economies, particularly in rural and semi-urban areas of Indonesia [1]. Among these, tofu production has long been a staple home-based business, fulfilling both economic and nutritional needs [2]. One example is the Home Industry Tahu Tukiran Artomoro, located in Dolok Ulu, Kecamatan Tapian Dolok, Kabupaten Simalungun. Like many small-scale tofu producers, it relies heavily on a stable supply of soybeans to ensure smooth production and product quality [3]. Therefore, effective inventory control of soybeans is essential to sustain its operations.

Inventory control in home industries poses unique challenges due to limited scale, capital constraints, and labor availability [5]. In tofu production, which requires fresh, high-quality soybeans daily, a reliable inventory system is essential to prevent disruptions [6]. Inefficient inventory management may result in overstocking, causing spoilage, or understocking, halting production [7]. For small-scale businesses like Tahu Tukiran Artomoro, maintaining this balance is critical, as even minor inefficiencies can significantly affect profitability [8].

Soybeans are an agricultural commodity with specific storage requirements to maintain freshness and quality. In the context of the tofu home industry, raw soybeans are typically stored in modest facilities without climate control, which increases their susceptibility to moisture, pests, and spoilage. Additionally, fluctuations in market prices and supply availability often influenced by harvest cycles and import regulations complicate planning and procurement [9]. These conditions necessitate a more strategic approach to inventory management, even in a home industry setting [10].

Many home industry owners still rely on conventional inventory practices such as estimation and manual recording, often without standardized reorder points or analytical tools [11], [12]. Based on initial observations and one-month fieldwork conducted at the Tahu Tukiran

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Artomoro factory, it was found that inventory decisions were primarily made based on short-term demand estimates and the owner’s experience. This practice, while practical, exposes the business to risks of raw material shortages and production inefficiencies.

The research for this paper was conducted over a period of one month and involved direct interviews and observations of three key individuals in the tofu production process: the business owner and two employees. This qualitative and descriptive approach allows for a close analysis of current inventory management practices and the identification of feasible strategies for improvement. Although the population size is limited, it reflects the scale of the operation and provides valuable insights into the real-world inventory challenges faced by similar home industries.

The main objective of this study is to analyze the existing soybean raw material inventory control practices at Home Industry Tahu Tukiran Artomoro and identify areas for improvement using established inventory control models such as Economic Order Quantity (EOQ), Safety Stock analysis, and the Just-In-Time (JIT) method. Although these models are commonly applied in large-scale operations, they can be adjusted to suit the scale and resource constraints of home industries [13], [14], [15].

In addition, this study helps address a research gap in inventory control within informal sector businesses, which are often underrepresented in academic literature. Even simple inventory improvements can reduce waste, optimize storage space, and enhance production continuity in home industries. The practical implications of these improvements extend beyond individual businesses, potentially improving local food supply reliability and supporting regional economic resilience.

In summary, this paper presents a case study of soybean inventory management in a tofu home industry located in Simalungun Regency. It evaluates the challenges, documents current practices, and explores realistic strategies for enhancing inventory efficiency. The findings are expected to provide applicable recommendations not only for Tahu Tukiran Artomoro but also for other similar small-scale producers in Indonesia facing similar operational conditions.

2. Literature Review

2.1. Inventory Management in the Context of Home Industries

Home industries, particularly in rural and semi-urban regions of Indonesia, are critical drivers of local economies [16]. They are often characterized by small-scale production, limited capital, and basic tools or technology [17]. Inventory management in this context plays a vital role in maintaining consistent production while avoiding waste and inefficiencies. According to [12], poor inventory control in home industries often leads to operational delays and material spoilage, especially for perishable commodities like soybeans. Effective inventory control strategies are essential for sustaining business operations and improving profitability.

In home-based tofu production, soybeans are the primary raw material. Maintaining their availability through careful planning and stock monitoring directly affects the production process. However, unlike large enterprises, home industries usually lack formal systems for inventory tracking and rely heavily on manual records and personal judgment [18]. This makes them particularly vulnerable to problems such as overstocking, understocking, and spoilage due to improper storage.

2.2. Characteristics and Challenges of Soybean Inventory

Soybeans, while relatively shelf-stable compared to some fresh agricultural products, are still susceptible to damage from pests, moisture, and improper storage. For small producers, maintaining soybean quality is challenging without adequate storage infrastructure. Soybean degradation begins to occur after just a few weeks if stored in high-humidity environments, leading to losses in both quality and quantity.

Moreover, market fluctuations in soybean supply and pricing create additional challenges. Seasonal variations, import dependency, and distribution chain inefficiencies all influence procurement decisions. These uncertainties demand that home industries adopt better forecasting and raw material planning strategies, even if done at a small scale [19].

2.3. Inventory Control Techniques for Small Enterprises

Various inventory models and techniques can be adapted for use in home industries. The Economic Order Quantity (EOQ) model is a classic method for determining the optimal purchase quantity that minimizes total inventory costs [20], [21], [22]. While EOQ is typically used in larger-scale settings, several studies have shown its adaptability for micro and small businesses [23]. For instance, even simplified EOQ applications can help reduce excessive ordering frequency and holding costs in small tofu enterprises [18].

Another technique relevant to raw material management in small industries is the Reorder Point (ROP) system, which indicates when new orders should be placed based on usage rates and lead times [24]. This method helps avoid running out of stock, a common problem in businesses with irregular supply schedules (Situmorang & Dewi, 2021). Additionally, buffer stock or safety stock strategies provide added security against unexpected demand or supplier delays [25].

2.4. Just-in-Time (JIT) and Its Applicability

The Just-in-Time (JIT) inventory approach, which emphasizes minimizing storage costs by receiving goods only as needed for production [26], has also been considered in small industry settings [26],[27]. However, its successful implementation requires reliable suppliers and consistent production schedules. In many home industries, supplier inconsistency makes full JIT implementation difficult [28], but partial application such as minimizing on-hand stock or establishing short-term delivery contracts can improve efficiency [29].

2.5. Previous Research on Inventory Control in Food-Based SMEs

Previous studies have demonstrated that well-planned inventory control policies are able to reduce total logistics costs while simultaneously improving the service level, particularly in systems with fluctuating demand [30]. In deterministic models, the Economic Order Quantity (EOQ) approach has been proven to minimize total inventory costs by determining the optimal order size and controlling the ordering frequency [31], [32]. However, in the context of small and medium-sized enterprises (SMEs), several studies report that limitations in digitalization, capital, and managerial capabilities result in reactive inventory practices that are not based on quantitative calculations, thereby increasing holding costs and the risk of raw material shortages [33],[34]. The implementation of EOQ in the agro-industrial and food sectors has been shown to reduce total inventory costs and stabilize ordering systems, but it has mostly been applied in firms with well-established recording systems [35]. Meanwhile, studies on SMEs tend to emphasize managerial aspects and technology adoption without integrating the actual inventory conditions with quantitative optimization models [36].

Based on these conditions, the novelty of this study lies in the integration of the analysis of the actual inventory system in a traditional household-scale tofu industry with a quantitative EOQ approach to determine the optimal order quantity, ordering frequency, safety stock, and reorder point, thereby producing an economical and applicable inventory policy in accordance with the characteristics of food-based SMEs.

3. Methodology

3.1. Research Design

This research employs a qualitative descriptive approach aimed at understanding the inventory control practices for soybean raw materials in a home-based tofu production business. The qualitative method is appropriate for this study because it allows the researcher to explore real-life practices [37], decision-making processes, and challenges experienced by the actors involved in inventory management within a small-scale industry setting. Through direct engagement with the subject of the study, the research seeks to produce in-depth and contextual insights that may not emerge from quantitative methods.

3.2. Data Source

The primary data for this study was collected from the Home Industry Tahu Tukiran Artomoro, located in Jl. Lorong Tujuh, Dolok Ulu, Kecamatan Tapian Dolok, Kabupaten Simalungun. The data sources include:

a) One owner of the tofu factory, who is responsible for procurement and production decisions

b) Two employees, who are involved in daily operations including soybean handling, storage, and production.

To minimize potential bias due to the limited number of interviewees, this study applied source and method triangulation. Information obtained from interviews was cross-checked with direct observations at the production site and supporting documents such as raw material procurement and usage records. In addition, the interviews were conducted in multiple sessions at different times to ensure the consistency of responses. A member-checking procedure was also employed by reconfirming the summarized interview results with the participants to ensure that the information accurately reflected the actual conditions. Data reliability was further strengthened through prolonged engagement in the field and systematic field-note documentation. These strategies enhanced the credibility, consistency, and trustworthiness of the qualitative findings and ensured that they represented the routine operational practices of the studied home industry.

3.3. Research Instrument

The primary instruments used in this research include:

a) Interview guides: Semi-structured interview questions were developed to explore participants' knowledge, practices, and challenges in inventory management.

b) Observation sheets: These were used to document the physical conditions of soybean storage, record-keeping practices, and procurement activities.

c) Field notes: Used to capture researcher observations, insights, and contextual information during visits to the production site.

These instruments were designed to gather qualitative data on the decision-making and day-to-day practices related to inventory control.

3.4. Data Collection Method

The data collection process was conducted over a period of one month through the following methods:

a) In-depth interviews with the owner and employees to gather information on how soybeans are procured, stored, and monitored.

b) Direct observation at the production site to assess the layout, condition of storage facilities, frequency of purchases, and volume of soybean usage.

c) Documentation review, including checking available procurement records, receipts, or manual logs used by the business.

All interviews were conducted on-site to ensure accuracy, and with permission from the respondents. Data were collected in multiple sessions to ensure that the findings were consistent and reflective of regular operations.

3.5. Data Analysis Method

The qualitative data obtained from interviews and observations were analyzed using the Miles and Huberman model, which involves three main steps:

a) Data reduction – selecting, simplifying, and focusing data from field notes, interviews, and observations that are relevant to inventory control.

b) Data display – organizing the data in narrative form and using visual tools (such as tables or matrices) to describe soybean procurement cycles, frequency, and storage practices.

c) Conclusion drawing and verification – interpreting the patterns and drawing conclusions about the strengths and weaknesses of the inventory control system in the tofu home industry.

This analysis approach allows the researcher to generate practical insights and recommendations based on actual conditions observed in the field.

4. Analysis and Results

This section presents the results of the data collected from Home Industry Tahu Tukiran Artomoro, focusing on the purchasing volume, usage of soybean raw materials, order frequency, and inventory-related costs throughout the year 2023.

Table 1: Summary of Soybean Raw Material Inventory (Purchases, Usage, and Costs) in 2023

Month	**Purchase (kg)**	**Usage (kg)**	**Remarks**
January	2,500	2,480	Normal operation
February	2,500	2,470	Normal operation
March	2,400	2,450	Slight shortage
April	2,500 *(assumed)*	2,500 *(est.)*	No data, estimated based on average
May	3,500	3,600	Ramadan – increased demand
June	3,700	3,670	Ramadan – peak production
July	3,700	3,690	Highest usage
August	2,600	2,550	Post-Ramadan adjustment
September	2,600	2,530	Stable operation
October	2,400	2,320	Decreased demand
November	2,400	2,160	Lowest usage
December	2,200	2,000 *(est.)*	End of year – production decline
Total	**33,800**	**33,420**	

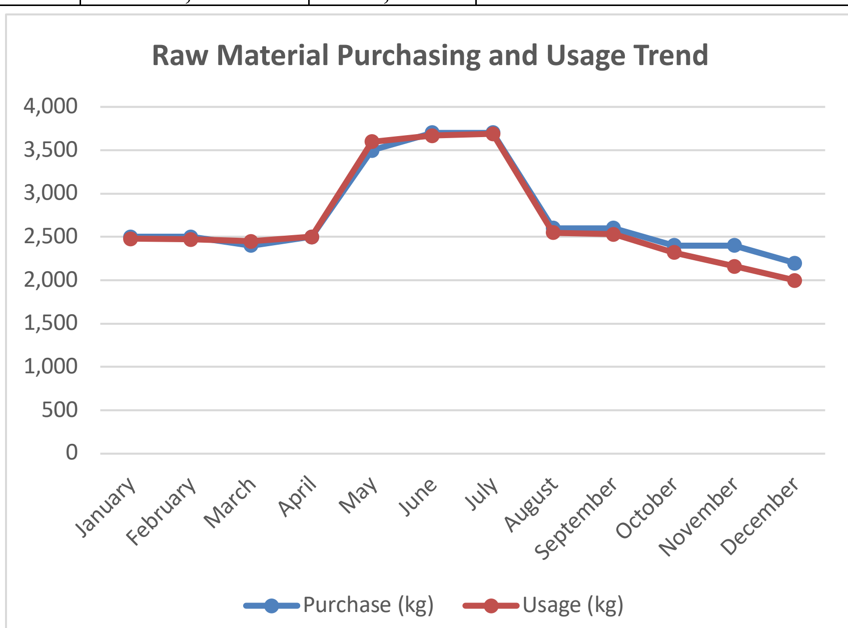

Fig. 1: Trend of Raw Material Purchases and Usage

4.1. Soybean Purchase Volume

Based on Table 1, the data for April and December are presented as estimates obtained through the calculation of the average purchases and usage from the adjacent monthsthe. Total soybean raw material purchased by the home industry throughout the year 2023 was 33,800 kg, with an average monthly purchase of 2,816 kg. The purchase pattern varied each month, influenced by seasonal demand and religious holidays. The trend of raw material purchases and usage is shown in Figure 1 below.

Figure 1 shows the monthly trend of raw material purchases and usage, which exhibit a relatively similar movement pattern throughout the year. In the first quarter (January, February, March), purchase and usage values tend to remain stable within the range of 2,400–2,500 kg, indicating a balance between procurement activities and raw material consumption.

Entering April, there is an increase, which then peaks during May, June, and July at approximately 3,500–3,700 kg. The simultaneous rise in both variables suggests higher production activity or increased demand in the middle of the year. After July, a significant decrease is observed in both purchases and usage. From August to December, the trend gradually declines, with raw material usage showing a slightly steeper drop compared to purchases. This condition indicates a more cautious procurement strategy or the possible formation of safety stock towards the end of the period.

To address the challenges of adjusting production and minimizing the risk of stock uncertainty, the application of an accurate forecasting method becomes a highly necessary strategic instrument [38]. Based on data processing using QM for Windows software, the Moving Average (MA) method shows a very high level of accuracy with a Mean Absolute Percent Error (MAPE) value of 9.653%. This value is below the 10% threshold, which classifies the model as highly accurate in forecasting [39]. The analysis results project the soybean raw material requirement for the next period to be 2,000 kg, with a MAD value of 269.091 and an MSE value of 237,600.

The forecasting results using the Moving Average method are represented in Figure 2 below.

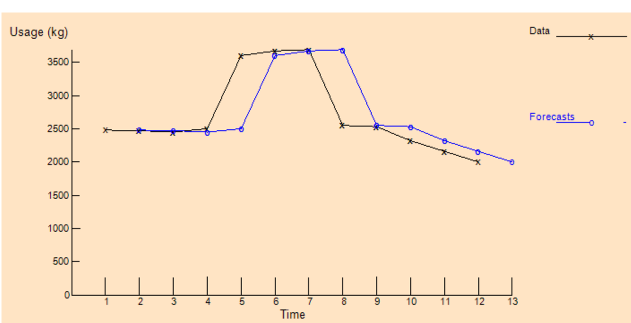

Fig. 2: Forecasting Soybean Raw Material Usage Using Moving Average

Visually, the forecasting graph is able to follow the fluctuations of the actual data responsively, including when a significant surge in usage occurs from period 5 to period 8; therefore, these results can serve as a strategic basis for optimizing inventory control.

4.2. Soybean Usage Patterns

Table 2: Inventory Ordering and Cost Summary (2023)

Category	**Value**
Total Orders (annual)	24 orders (2 per month)
Total Purchase Quantity	33,800 kg
Average Monthly Purchase	2,816 kg
Total Usage Quantity	33,420 kg
Total Ordering Cost	IDR240,000
Average Cost per Order	IDR10,000
Total Storage (Holding) Cost	IDR5,880,000
Main Storage Cost Component	Electricity
Average storage cost per kg	IDR174
Average price of 1 kg of soybean	IDR14.000

According to Table 2, the total soybean usage over the year 2023 was 33,420 kg. This is only slightly below the total purchased amount, suggesting that inventory control was generally well aligned with actual consumption. Monthly usage varied significantly:

1. Highest usage occurred in July, with 3,690 kg, corresponding with increased production during Ramadan.
2. Lowest usage occurred in November, at just 2,160 kg, which aligns with the general decrease in consumer demand during the post-festival period.

The data indicates a fairly consistent usage pattern overall, though it is closely linked to seasonal consumption behavior. The home industry's ability to adjust production to meet fluctuating demand is essential to minimizing overstock and understock scenarios.

4.3. Order Frequency

The ordering frequency of soybean raw materials was recorded at twice per month, resulting in 24 orders per year. The average cost per order is IDR10.000; therefore, the total ordering cost of soybeans in 2023 amounts to IDR240.000.This relatively frequent ordering practice suggests that the business prioritizes maintaining a stable stock level without holding excessive inventory. While this can help preserve product freshness and reduce spoilage, it may also contribute to higher cumulative ordering costs.

The Economic Order Quantity (EOQ) model is then applied to evaluate the efficiency of the current ordering policy. The EOQ calculation is performed using the following formula:

$$Q^* = \sqrt{\frac{2DS}{H}} \quad (1)$$

Notation

Q : Quantity per order

Q^* : Optimal order quantity per order (EOQ)

D : Annual demand in units for the inventory item

S : Setup or ordering cost per order

H : Holding cost or carrying cost per unit per year

Based on the calculations, the following results are obtained:

$$Q^* = \sqrt{\frac{(2)(33.420)(10000)}{174}} = 1959,944$$

Thus, we have determined the quantity of soybeans to be ordered per order, which is 1,959.944 units, rounded to 1,960 units. Assuming the number of effective working days in a year is 306, we can then calculate the number of orders (N) and the expected time between orders (T). The optimal number of orders per year is subsequently calculated using the following formula:

$$N = \frac{D}{Q^*} \quad (2)$$

$$N = \frac{33.420}{1960}$$

$$N = 17{,}051$$

Thus, the frequency of purchases in one period is 17.051 or 17 times. Using the assumption that the number of working days per year is 306 days, the expected time between orders is

$$T = \frac{Jumlah\ Hari\ kerja\ per\ tahun}{N} \quad (3)$$

$$T = \frac{306}{17}$$

$$T = 18$$

These results indicate that the optimal order frequency is lower than the company's current policy, which places 24 orders per year. The reduction in order frequency leads to a decrease in total ordering costs from IDR240.000 per year to IDR170.000 per year, resulting in a cost saving of IDR 70.000 per year. Therefore, the application of the EOQ method not only determines the optimal order quantity but also produces a more economical inventory control policy by reducing the ordering frequency without increasing the risk of overstock or stockouts.

4.4. Inventory-Related Costs

The cost structure for inventory management includes both ordering and holding (storage) costs:

1. Total ordering cost for soybeans in 2023 was IDR 240,000. Given 24 orders per year, the average cost per order is IDR 10,000.
2. Total holding (storage) cost was IDR5,880,000, attributed primarily to electricity costs used to maintain storage conditions.

These figures highlight the operational expenses involved in managing inventory. Notably, storage costs are significantly higher than ordering costs, suggesting that improvements in storage efficiency or order sizing (e.g., through EOQ analysis) could help reduce overall expenses.

To obtain a more comprehensive overview of the efficiency of the inventory policy, the total annual inventory cost is then calculated, which is the sum of ordering costs and holding costs. Mathematically, the total inventory cost, excluding the purchase cost, is expressed as:

$$TC = \frac{D}{Q}S + \frac{Q}{2}H \quad (4)$$

$$TC = \frac{33.800}{1960}(10.000) + \frac{1960}{2}(174)$$

$$TC = IDR\ 342.969$$

This value indicates that the holding cost has decreased significantly. Previously, the company incurred storage costs of Rp5,880,000; however, after implementing the Economic Order Quantity (EOQ) method, the cost was reduced to IDR 342,969. Thus, the company achieved a cost saving of IDR 5,537,031, or approximately 94.17% of the initial holding cost.

Next, to ensure the continuity of the production process and to prevent raw material shortages during the order lead time, the Reorder Point (ROP) is calculated using the following formula:

$$ROP = d\ x\ L \quad (5)$$

$$d = \frac{D}{Number\ of\ working\ days\ per\ year} \quad (6)$$

$$d = \frac{33.800}{306} = 11{,}457 \text{ units.}$$

$$ROP = 110\ units\ per\ day\ x\ 2\ days = 220\ units$$

These results indicate that a reorder should be placed when the soybean inventory in the warehouse reaches 220 kg to ensure the production process continues without experiencing a stockout.

In addition, the total inventory cost can also be analyzed by including the purchase cost of raw materials. If the price of soybeans is IDR 14,000 per kilogram, the total annual inventory cost is expressed as:

$$TC = \frac{D}{Q}S + \frac{Q}{2}H + PD \quad (7)$$

$$TC = \frac{33.800}{1960}(10.000) + \frac{1960}{2}(174) + (14.000)(33.800)$$

$$TC = IDR\ 473.542.969$$

This value indicates that the purchase cost component constitutes the largest portion of the total annual inventory cost, while ordering and holding costs represent a smaller proportion. These findings suggest that optimizing the ordering policy through the EOQ approach not only improves the efficiency of order frequency but also minimizes the total inventory cost while ensuring smooth production processes and adequate raw material availability.

4.5. Implications for Inventory Control

The findings indicate that Home Industry Tahu Tukiran Artomoro demonstrates a reactive inventory strategy, adjusting procurement and production based on anticipated seasonal demand. While the current approach enables flexibility, the business could benefit from implementing a more structured inventory model, such as EOQ (Economic Order Quantity) or Safety Stock analysis, to balance ordering and holding costs more effectively.

Furthermore, while soybean consumption and procurement are generally well-aligned, slight over-purchasing (33,800 kg purchased vs. 33,420 kg used) may still result in unnecessary storage and cost implications. Optimizing order quantities and reviewing ordering frequency could improve cost efficiency without compromising supply continuity.

5. Discussion

The results indicate that the inventory practices of the observed tofu home industry are predominantly reactive and experience-based, a condition commonly found in micro and small enterprises with limited managerial systems and low levels of data utilization. Although procurement and consumption volumes were relatively balanced, the extremely high holding cost prior to EOQ implementation confirms that intuitive decision-making does not necessarily lead to cost efficiency. This finding supports previous studies which emphasize that the effectiveness of inventory management in SMEs is strongly influenced by the use of structured planning and quantitative decision tools rather than operational experience alone [5]. From a theoretical perspective, the significant reduction in holding cost after applying EOQ empirically validates the fundamental function of lot-sizing models in balancing ordering and storage costs to achieve the minimum total inventory cost [20], [22], [31].

The economic impact of the proposed intervention is substantial. The 94.17% reduction in holding cost indicates that a large portion of working capital that was previously tied up in excessive inventory can be reallocated to more productive activities, such as increasing production capacity, improving product quality, or stabilizing cash flow. For micro-scale food industries that operate with limited financial flexibility, this shift represents not only operational efficiency but also financial resilience. This result confirms that the adoption of a simple quantitative inventory model can generate tangible economic value even without sophisticated digital infrastructure, thereby challenging the common perception that formal inventory optimization is only relevant for medium and large-scale enterprises.

In addition, the forecasting performance with a MAPE value below 10% demonstrates that the Moving Average method is sufficiently reliable for short-term planning in a seasonal demand environment. This finding is consistent with the inventory–forecasting integration framework which states that accurate demand prediction is a critical prerequisite for determining efficient ordering policies and reducing supply chain uncertainty [30], [38]. The ability of the model to capture the demand surge during the Ramadan period further confirms that simple time-series approaches can support adaptive procurement decisions in traditional food production systems.

From a practical standpoint, this study provides a low-cost and scalable inventory control framework for micro-scale food enterprises. The integration of EOQ, reorder point, and demand forecasting enables businesses to reduce operational costs, maintain production continuity, and minimize the risk of overstock and stockout without requiring complex technological investments. This is particularly relevant in the context of Indonesian MSMEs, where limited access to digital tools and formal training remains a major structural constraint [16], [18]. From a theoretical standpoint, the study extends the application of classical deterministic inventory models into the informal and resource-constrained sector, which has been largely underrepresented in the inventory management literature that predominantly focuses on large-scale and highly digitized supply chains.

However, this study has several limitations. The analysis is based on a single case study, which limits the generalizability of the findings [37]. The EOQ model also assumes deterministic demand and constant lead time, while in practice both parameters are subject to uncertainty. Furthermore, the cost analysis only includes observable operational costs and does not account for opportunity costs or potential quality deterioration of stored soybeans. Future research is therefore recommended to apply probabilistic inventory models, involve multiple tofu home industries, and evaluate the cost–benefit of simple digital recording systems for inventory management.

The novelty of this study lies in the empirical and contextual integration of actual inventory behavior, EOQ optimization, reorder point determination, and demand forecasting in a traditional tofu home industry operating with minimal data infrastructure. While previous studies on MSMEs mainly discuss competitiveness, production optimization, or managerial readiness[1], [40], this research provides direct quantitative evidence that classical inventory models are operationally feasible and economically beneficial for micro-scale food production. In this way, the study bridges the gap between inventory theory and informal sector practice and contributes to the development of sustainable, data-driven inventory management for traditional small-scale industries.

6. Conclusion

This study demonstrates that the integration of the Economic Order Quantity (EOQ) model and the Moving Average forecasting method significantly improves the efficiency of soybean inventory control at Tahu Tukiran Artomoro Home Industry, Simalungun Regency, Indonesia. The total annual procurement reached 33,800 kg with an actual consumption of 33,420 kg, indicating a relatively balanced supply–demand condition despite seasonal fluctuations. The implementation of EOQ reduced the ordering frequency from 24 to 17 times per year and lowered the ordering cost from IDR 240,000 to IDR 170,000, representing a 29,17% saving. More importantly, the holding cost decreased drastically from IDR 5,880,000 to IDR 342,969, equivalent to a 94.17% reduction. In addition, the Moving Average method produced a MAPE value of 9.653%, confirming a high level of forecasting accuracy and its reliability for adaptive inventory planning.

These findings confirm that the previous intuition-based inventory policy led to an inefficient cost structure, while a simple quantitative approach can generate substantial cost savings and more optimal ordering decisions. The main contribution of this study lies in providing empirical evidence that inventory optimization and demand forecasting models are applicable and scalable for traditional micro-scale food enterprises with limited resources and minimal digital support. Practically, the proposed approach offers a low-cost and data-driven solution to maintain supply continuity and reduce the risks of overstocking and stockouts in similar SMEs.

However, this study is limited to a single case with deterministic assumptions for cost and lead time. Future studies may incorporate stochastic demand, multi-item inventory systems, and digital recording integration to develop a more adaptive and generalizable inventory policy.

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