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Raw Material Inventory Control Using the POQ Method for Cost Efficiency at SPPG Kota Siantar

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ABSTRACT

Effective inventory management supports daily operations at the Nutrition Fulfillment Service Unit (SPPG), which implements the Free Nutritious Meals Program (MBG). At SPPG Kota Siantar, irregular rice and cooking oil orders cause excessive ordering frequency, higher transportation and administrative costs, and warehouse stock accumulation. This study determines optimal order quantities, intervals, and Total Inventory Cost (TIC) using Periodic Order Quantity (POQ), Economic Order Quantity (EOQ), Safety Stock, and Reorder Point (ROP). Data on consumption, receipts, material prices, ordering costs, and lead times were collected during January–February 2026. Optimal quantities were 1,960.86 kg of rice and 1,236.45 liters of cooking oil, with respective ordering intervals of 13 and 18 working days. POQ yielded inventory costs of Rp555,571.51 for rice and Rp370,847.50 for cooking oil, totaling Rp926,419.01, compared with Rp2,816,999.40 under the existing policy. Thus, POQ reduced total inventory costs by Rp1,890,580.39, or 67.1%, relative to SPPG Kota Siantar's current ordering policy.

Keywords: Inventory, POQ, EOQ, TIC, SPPG.

1. Introduction

Inventory management is essential to the efficiency and cost-effectiveness of supply chains across various sectors [1]. Effective inventory management ensures that operational needs are met while minimizing the costs of storing, handling, and maintaining inventory [2]. The success of sustaining a business depends on how well the business manages its product inventory and is able to meet customer needs as well as possible [3]. Inventory management is also defined as a framework used by companies to control their inventory-related interests, which includes recording and monitoring stock levels [4]. Inventory is a collection of materials or goods held to meet the needs of a company and can be used in the production process [5]. If a company makes a calculation error, excessive inventory becomes wasteful because it causes holding costs that are too high, whereas insufficient inventory can hinder operations [6]. In general, inventory can be classified into raw materials, assembly components, supporting materials, work in process, and finished goods [7].

Raw material control is a policy that aims to maintain the condition of goods, prevent disappointing service, and address shortages or oversupply [8]. Raw materials can be divided into direct raw materials, which form the main part of a product, and indirect raw materials [9]. Based on price, raw materials can also be classified into high-value, medium-value, and low-value raw materials [10].

Companies and public service institutions need to carry out planning, supervision, and implementation relating to inventory levels, order timing, order quantity, and order frequency so that inventory is available in the right amount and at the right time. Inventory control is something that requires attention in order to maintain a balance between the size of inventory and the costs it incurs [11]. Inventory control functions to monitor stock levels, determine the stock limits that must be maintained, and decide when stock needs to be replenished and how much to order [12].

The Nutrition Fulfillment Service Unit (SPPG) of Kota Siantar is one of the units established by the National Nutrition Agency to implement the Free Nutritious Meals Program. It operates under the Indonesia Terang Benderang Foundation in Panyabungan District, Mandailing Natal Regency, North Sumatra, and serves 10 schools together with the B3 group (pregnant women, nursing mothers, and toddlers), with a total of 2,500 beneficiaries. Because meals must be prepared on every working day, the availability of staple raw materials such as rice and cooking oil directly determines whether the service targets of the program can be met.

Initial observations show that the raw material ordering system is poorly scheduled for example, an order of 360 kg of rice was repeated only two days later in the same amount, and orders continued to be placed even though raw material demand had declined with the arrival of Ramadan, resulting in an inventory accumulation of up to 325 kg. This condition has the potential to increase transportation and administrative costs, as well as the risk of production disruption if no safety stock is available. In fact, safety stock is crucial because it serves as an anticipatory measure to accommodate fluctuations in supply and demand [13]. To address these problems, this study applies the Periodic Order Quantity (POQ) method to evaluate the optimal order interval. The POQ method sets a fixed order interval but with a varying order quantity that adjusts to the total actual demand during that period [14]. The EOQ model itself is used to determine the economic order size, assuming that demand is constant and precisely known [15] .

The EOQ concept, first introduced by F. W. Harris in 1915, seeks the order size that minimizes total inventory cost by balancing the ordering cost and the holding cost: a large order lot lowers the ordering cost but raises the holding cost, whereas a small lot has the opposite effect. POQ converts the EOQ result into a fixed ordering interval, so that purchasing follows a regular schedule while the quantity of each order follows actual demand[14]. The lead time, namely the span between placing an order and receiving the goods, must also be considered because a longer lead time can raise processing costs, and safety stock and the reorder point are needed to keep operations running when usage is higher than expected, or deliveries are delayed.

This study, compared with previous studies on POQ and EOQ across various manufacturing and commercial industrial sectors, lies in the research object, namely a public service institution in the form of a Nutrition Fulfillment Service Unit (SPPG), and is focused exclusively on comparing the effectiveness of EOQ and POQ to achieve cost efficiency. Therefore, this study aims to determine the optimal order quantity, the optimal order period using the POQ method, and the Total Inventory Cost (TIC) resulting from the application of POQ at SPPG Kota Siantar.

2. Methods

This study was conducted at SPPG Kota Siantar, located at Jl. Amd Lama Gang Tahfis Kota Siantar, Panyabungan District, Mandailing Natal Regency, North Sumatra. The observation data cover a two-month usage period, namely January-February 2026. The use of such short-term data is a limitation of this study, as long-term fluctuations may not have been fully observed. The research object is the inventory control of the raw materials rice and cooking oil. The primary data used include raw material prices, ordering costs, and lead time obtained through interviews, while the secondary data consist of usage data, incoming goods, and a recapitulation of raw material inventory during the study period.

Data were collected using three techniques. First, direct field observation was carried out at the warehouse of SPPG Kota Siantar and during the MBG production activities. Second, interviews were

conducted with the accountant, the staff responsible for placing purchase orders, and the SPPG partners who supply the raw materials, in order to obtain the raw material prices, the ordering cost, and the lead time. Third, documentation was carried out by reviewing the usage records, the incoming goods documents, and the inventory recapitulations held by SPPG Kota Siantar. The collected data were then processed in three stages, namely data reduction (selecting the daily usage, incoming goods, and cost parameters that are relevant to the research questions), data presentation in tables, and drawing conclusions in line with the three research objectives.

The study is limited to the usage, incoming goods, purchasing, lead time, and ordering cost data of rice and cooking oil for January-February 2026. Two assumptions are applied: the raw materials remain in good condition without damage or loss throughout the study period, and the raw material prices do not rise or fall while the study is carried out.

Data analysis was carried out through five calculation stages, namely Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), Total Inventory Cost (TIC), Safety Stock (SS), and Reorder Point (ROP). EOQ is calculated to obtain the economic order quantity using the following equation[16].

$$EOQ = \sqrt{(2A\lambda / h)} \quad (1)$$

Where λ is the demand, A is the ordering cost, and h is the holding cost per unit. The EOQ value is then used to determine the order frequency (N) and the POQ order interval through the following equations [16].

$$N = \lambda / EOQ \quad (2)$$

$$POQ = \text{Usage period} / N \quad (3)$$

where N is the order frequency during the study period and the usage period is the number of working days on which usage was recorded, which is 26 days in this study. The EOQ model rests on several assumptions: the lead time is constant, demand is known and constant, each order is received in a single delivery, there are no quantity discounts, stockouts are avoided, and the only variable costs are the ordering cost and the holding cost [16]. Under these assumptions, the economic order size is reached at the point where the total ordering cost equals the total holding cost.

Total Inventory Cost (TIC) is calculated to evaluate inventory cost efficiency based on the ordering cost and the holding cost using the following equation [2].

$$TIC = (D/Q) \times S + (Q/2) \times h \quad (4)$$

where D is the demand during the study period, Q is the order quantity per order, S is the ordering cost per order (Rp/order), and h is the holding cost per unit adjusted to the study period (Rp/unit).

Safety Stock (SS) is calculated using a 95% service level approach (Z = 1.65) with the equation.

$$SS = Z \times \sigma \times \sqrt{LT} \quad (5)$$

where Z is the standard normal value for the service level, σ is the standard deviation of daily usage, and LT is the lead time in days. Safety stock is the additional inventory held to protect the operation from stockouts that arise when actual usage exceeds expectations or when deliveries are delayed [17]; its size depends on the average usage, the time factor (lead time), and the costs involved.

Meanwhile, the Reorder Point (ROP) is calculated as:

$$ROP = (d \times LT) + SS \quad (6)$$

Where d is the average daily demand, LT is the lead time, i.e., the waiting period from the time an order is placed until the goods arrive [18], and σ is the standard deviation of daily usage [17]. The

holding cost is set at 10% of the raw material price per year [19], which is then adjusted proportionally to the two-month study period (2/12).
Expressed as an equation, the holding cost per unit for the study period is calculated as follows.

$$h = (\text{Raw material price} \times 10\%) \times 2/12 \quad (7)$$

3. Results and Discussion

3.1 Data Collection and Characteristics of the Raw Material Data

The data were collected at the warehouse of SPPG Kota Siantar for the period January-February 2026. The secondary data consist of the usage records, the incoming goods, and the inventory recapitulation, while the primary data consist of the raw material prices, the ordering cost, and the lead time, which were obtained through interviews. The usage records cover 26 working days, namely 16 days in January and 10 days in February. The characteristics of the usage and incoming goods data of both raw materials are summarized in Table 1.

Rice usage totaled 4,190 kg, an average of 161.15 kg per working day. The highest usage was 170 kg on 9 January, and the lowest was 134 kg on 8 January, but on most days it was stable at 162 kg, which gives a small standard deviation of 5.78 kg. In February, rice usage stayed at 162 kg from 2 to 13 February, and no usage was recorded from 14 February onward as demand declined with the arrival of Ramadan. Cooking oil usage, in contrast, fluctuated more strongly. Its total usage was 1,764 liters, an average of 67.84 liters per working day, with a peak of 84 liters on 13 and 14 January, a low of 24 liters on 8 January, and a standard deviation of 12.67 liters. Most days were at 72 liters, and February was more consistent than January.

Table 1. Characteristics of Usage and Incoming Goods Data

Parameter	Rice (Kg)	Cooking Oil (Liter)
Total usage (Jan-Feb 2026)	4,190	1,764
Average daily usage	161.15	67.84
Highest daily usage	170	84
Lowest daily usage	134	24
Most frequent daily usage	162	72
Standard deviation of daily usage	5.78	12.67
Quantity per receipt	360	240
Total incoming goods	4,680	1,920

The incoming goods data show that the quantity received is always the same: SPPG received 360 kg of rice in each of 13 transactions (8 in January and 5 in February) and 240 liters of cooking oil in each of 8 transactions (1,200 liters in January and 720 liters in February). The fixed receipt quantity contrasts with the changing daily usage, and rice was purchased more frequently in January than in February. The monthly movement of the inventory is presented in Table 2 shows that the initial rice stock increased sharply from 3,383 kg in January to 6,850 kg in February, even though the incoming goods and the usage were lower than in the previous month.

Over the two months, the rice received (4,680 kg) exceeded the rice used (4,190 kg) by 490 kg, and the 1,920 liters of cooking oil received were also higher than the 1,764 liters used.

Table 2. Recapitulation of Raw Material Inventory Data in 2026

Raw Material / Month	Initial Stock	Incoming Goods	Usage
Rice - January (kg)	3,383	2,880	2,570
Rice - February (kg)	6,850	1,800	1,620
Rice - Total (kg)	10,233	4,680	4,190
Cooking oil - January (liters)	2,808	1,200	1,068
Cooking oil - February (liters)	1,582	720	696
Cooking oil - Total (liters)	4,390	1,920	1,764

These movements indicate that purchasing was not aligned with actual consumption and that stock accumulated in the warehouse.

3.2 Supporting Data for the Calculations

The supporting data for the inventory calculations include raw material prices, ordering costs, and lead time for rice and cooking oil, as presented in Table 3.

Table 3. Supporting Data for Inventory Calculations

Supporting Data	Rice (Kg)	Cooking Oil (Liter)
Raw material price	Rp17,000	Rp18,000
Ordering cost	Rp130,000	Rp130,000
Lead time	2 days	2 days
Total demand (Jan-Feb 2026)	4,190 kg	1,764 liters

The total ordering cost of Rp130,000 is obtained from the accumulation of transportation costs (Rp100,000), communication costs (Rp10,000), administrative and documentation costs (Rp5,000), and loading and unloading costs (Rp15,000).

3.3 Calculation of Economic Order Quantity (EOQ)

The EOQ calculation for rice uses λ = 4,190 kg, A = Rp130,000, and h = Rp283.33/kg, resulting in EOQ = $\sqrt{(2 \times 130{,}000 \times 4{,}190 / 283.33)}$ = 1,960.86 kg. For cooking oil, with λ = 1,764 liters, A = Rp130,000, and h = Rp300/liter, the EOQ is $\sqrt{(2 \times 130{,}000 \times 1{,}764 / 300)}$ = 1,236.45 liters. These EOQ values then serve as the basis for determining the order frequency and interval in the POQ method.

The holding cost per unit used in these calculations follows from the equation in Section 2, that is, 10% of the raw material price per year adjusted to the two-month study period:

h (rice) = (17,000 × 10%) × 2/12 = Rp283.33 per kg
h (cooking oil) = (18,000 × 10%) × 2/12 = Rp300.00 per liter

The step-by-step EOQ calculation for rice is as follows:

$$EOQ = \sqrt{(2 \times 130{,}000 \times 4{,}190 / 283.33)}$$
$$EOQ = \sqrt{(1{,}089{,}400{,}000 / 283.33)}$$
$$EOQ = \sqrt{3{,}844{,}986.41}$$
$$EOQ = 1{,}960.86 \text{ kg}$$

and for cooking oil:

EOQ = √(2 × 130,000 × 1,764 / 300)
EOQ = √(458,640,000 / 300)
EOQ = √1,528,800
EOQ = 1,236.45 liters

The EOQ of rice is larger than that of cooking oil because its demand (4,190 kg) is higher than that of cooking oil (1,764 liters). Both values are far larger than the fixed quantities that SPPG currently orders (360 kg of rice and 240 liters of cooking oil), about 5.4 times and 5.2 times, respectively, which is a first indication that the current pattern places orders too often and in quantities that are too small.

3.4 Calculation of Periodic Order Quantity (POQ)

The order frequency for rice is obtained from N = λ/EOQ = 4,190/1,960.86 ≈ 2 times, so the POQ order interval is 26/2 = once every 13 working days. Meanwhile, the order frequency for cooking oil is N = 1,764/1,236.45 ≈ 1.42 times, so the POQ order interval is 26/1.42 = 18.3, rounded to once every 18 working days. A summary of the order periods is presented in Table 4.

The step-by-step calculation of the order frequency and the POQ interval is as follows. For rice:

N = λ / EOQ = 4,190 / 1,960.86 ≈ 2 times
POQ = Usage period / N = 26 / 2 = 13 working days

and for cooking oil:

N = λ / EOQ = 1,764 / 1,236.45 = 1.42 times
POQ = Usage period / N = 26 / 1.42 = 18.3 ≈ 18 working days

These results show that rice orders do not have to be placed every time the stock declines within a very short time. Orders can be scheduled every 13 working days, which makes procurement more regular and lets the SPPG anticipate when the next order must be made, whereas in the actual condition, rice was purchased even more often in January than in February. The longer 18-working-day interval for cooking oil reflects its different need, and both intervals help the SPPG reduce the costs related to procurement, particularly transportation, communication, administration, and loading and unloading.

Table 4. Summary of Order Periods

Raw Material	Order Frequency	Order Period
Rice	2 times	13 working days
Cooking Oil	1.42 times	18 working days

3.5 Total Inventory Cost (TIC)

The total inventory cost for rice consists of an ordering cost of Rp277,786.28 and a holding cost of Rp277,785.23, resulting in a rice TIC of Rp555,571.51. For cooking oil, the ordering cost is Rp185,380.00, and the holding cost is Rp185,467.50, resulting in a cooking oil TIC of Rp370,847.50. The total TIC of both raw materials using the POQ method is Rp926,419.01, as presented in Table 5.

The step-by-step TIC calculation for rice, using D = 4,190 kg, Q = 1,960.86 kg, S = Rp130,000 per order, and h = Rp283.33 per kg, is as follows:

Ordering cost (OC) = (4,190 / 1,960.86) × 130,000 = Rp277,786.28
Holding cost (HC) = (1,960.86 / 2) × 283.33 = Rp277,785.23
TIC = 277,786.28 + 277,785.23 = Rp555,571.51

For cooking oil, using D = 1,764 liters, Q = 1,236.45 liters, S = Rp130,000 per order, and h = Rp300 per liter:

Ordering cost (OC) ≈ (1,764 / 1,236.45) × 130,000 = Rp185,380.00
Holding cost (HC) = (1,236.45 / 2) × 300 = Rp185,467.50
TIC = 185,380.00 + 185,467.50 = Rp370,847.50

Table 5. Summary of Total Inventory Cost (TIC) of the Proposed POQ

Raw Material	Ordering Cost	Holding Cost	TIC
Rice	Rp277,786.28	Rp277,785.23	Rp555,571.51
Cooking Oil	Rp185,380.00	Rp185,467.50	Rp370,847.50

Table 5 shows that for both raw materials, the ordering cost and the holding cost are almost equal, which is the characteristic of an economic order size. The TIC of cooking oil is lower than that of rice because its demand is smaller. The total inventory cost of both raw materials under the proposed POQ is:

$$\text{TIC} = 555{,}571.51 + 370{,}847.50 = \text{Rp}926{,}419.01$$

3.6 Safety Stock and Reorder Point

Calculating Safety Stock with a 95% service level (Z = 1.65) yields 13 kg for rice and 30 liters for cooking oil. Reorder Point (ROP) for rice is 336 kg, which means that reordering must be made when the rice inventory in the warehouse reaches that amount. Meanwhile, the ROP for cooking oil is 165 liters. Both parameters are important to support the implementation of the POQ order interval so that the risk of stockouts can be minimized.

The step-by-step calculation of safety stock and reorder point for rice, using Z = 1.65, σ = 5.78 kg, LT = 2 days, and d = 161.15 kg per day, is as follows:

$$\text{SS} = 1.65 \times 5.78 \times \sqrt{2} = 13.49 \text{ kg} \approx 13 \text{ kg}$$
$$\text{ROP} = (161.15 \times 2) + 13.49 = 335.79 \approx 336 \text{ kg}$$

and for cooking oil, using σ = 12.67 liters and d = 67.84 liters per day:

$$\text{SS} = 1.65 \times 12.67 \times \sqrt{2} = 29.56 \text{ liters} \approx 30 \text{ liters}$$
$$\text{ROP} = (67.84 \times 2) + 29.56 = 165.24 \approx 165 \text{ liters}$$

Although cooking oil has a lower average daily usage than rice, its safety stock (30 liters) is larger than that of rice (13 kg) because its daily usage fluctuates much more: the standard deviation is about 19% of the average usage, compared with only about 4% for rice. During the two-day lead time the expected usage is 322.30 kg of rice and 135.68 liters of cooking oil, so a new order should be placed when the warehouse stock reaches 336 kg of rice or 165 liters of cooking oil, which allows the delivery to arrive while the stock is still above the safety stock level.

3.7 Comparison of the Actual Policy and the Proposed POQ

The actual policy of SPPG Kota Siantar is to order rice in a fixed quantity of 360 kg with a frequency of 13 times during the study period, resulting in a TIC of Rp1,740,999.40. Meanwhile, the actual cooking oil policy orders 240 liters with a frequency of 8 times, resulting in a TIC of Rp1,076,000.00. These actual costs are calculated as follows.

$$\text{OC actual (rice)} = \text{N} \times \text{S} = 13 \times 130{,}000 = \text{Rp}1{,}690{,}000.00$$
$$\text{HC actual (rice)} = \left(\frac{\boldsymbol{Q}}{\mathbf{2}}\right) \times \text{h} = \left(\frac{\mathbf{360}}{\mathbf{2}}\right) \times 283.33 = \text{Rp}50{,}999.40$$
$$\text{TIC actual (rice)} = 1{,}690{,}000.00 + 50{,}999.40 = \text{Rp}1{,}740{,}999.40$$

$$\text{OC actual (cooking oil)} = 8 \times 130{,}000 = \text{Rp}1{,}040{,}000.00$$
$$\text{HC actual (cooking oil)} = \left(\frac{\mathbf{240}}{\mathbf{2}}\right) \times 300 = \text{Rp}36{,}000.00$$
$$\text{TIC actual (cooking oil)} = 1{,}040{,}000.00 + 36{,}000.00 = \text{Rp}1{,}076{,}000.00$$

The savings obtained from the proposed POQ are calculated as the difference between the actual TIC and the proposed TIC, divided by the actual TIC:

Savings (rice) = 1,740,999.40 - 555,571.51 = Rp1,185,427.89 (68.1%)
Savings (cooking oil) = 1,076,000.00 - 370,847.50 = Rp705,152.50 (65.5%)

A comparison of the actual policy and the proposed POQ for both raw materials is presented in Table 6.

Table 6. Comparison of TIC Between the Actual Policy and the Proposed POQ

Parameter	Rice (Actual)	Rice (POQ)	Cooking Oil (Actual)	Cooking Oil (POQ)
Order Quantity	Varies	1,960.86 kg	Varies	1,236.45 liters
Order Interval	Unscheduled	13 Working Days	Unscheduled	18 Working Days
Safety Stock (SS)	-	13 kg	-	30 liters
Reorder Point (ROP)	-	336 kg	-	165 liters
(TIC)	Rp1,740,999.40	Rp555,571.51	Rp1,076,000.00	Rp370,847.50
Savings	**-**	**68.1%**	**-**	**65.5%**

The comparison results show that the actual policy of SPPG Kota Siantar, which orders fixed quantities without considering the optimal time interval, incurs ordering costs that are far higher than holding costs due to excessive order frequency. In contrast, applying the POQ method produces a balance between ordering cost and holding cost, so that total inventory cost can be reduced significantly. Overall, the POQ method is able to save total inventory cost by Rp1,890,580.39, equivalent to 67.1%, which is consistent with the findings of previous research conducted by Case et al. [20] . These findings confirm that unscheduled ordering patterns are the main cause of inflated transportation and administrative costs, as well as the risk of inventory accumulation in the warehouse of SPPG Kota Siantar.

The overall savings are summarized in Table 7. The savings for rice are Rp1,185,427.89 (68.1%) and those for cooking oil is Rp705,152.50 (65.5%), so the total savings across both raw materials is Rp1,890,580.39, or 67.1% of the actual cost.

Table 7. Recapitulation of the Actual TIC and the Proposed POQ TIC

Raw Material	Actual TIC	POQ TIC	Savings (Rp)	Savings (%)
Rice	Rp1,740,999.40	Rp555,571.51	Rp1,185,427.89	68.1%
Cooking Oil	Rp1,076,000.00	Rp370,847.50	Rp705,152.50	65.5%
Total	Rp2,816,999.40	Rp926,419.01	Rp1,890,580.39	67.1%

The structure of the costs explains where the savings come from. Under the actual policy the ordering cost makes up about 97% of the TIC of both rice and cooking oil, whereas under the POQ the ordering cost and the holding cost are each about half of the TIC. By reducing the number of orders from 13 to about 2 for rice and from 8 to about 1.4 for cooking oil, the costs of each procurement activity

are incurred far less often, without sacrificing availability because the safety stock and the reorder point protect the operation against stockouts.

3.8 Discussion of the Optimal Order Quantity and Order Period

The problem at SPPG Kota Siantar lies in an ordering pattern that is not well scheduled: rice was ordered twice within two days (12 and 14 January) in the same quantity of 360 kg, and a further 360 kg was ordered on 13 February even though the rice was no longer used from 16 February, which left 325 kg accumulating in the warehouse. The incoming goods data show that the quantity received is the same in every transaction (360 kg of rice and 240 liters of cooking oil) while demand changes with the operational activity, so excess inventory arises whenever usage declines. The EOQ values of 1,960.86 kg for rice and 1,236.45 liters for cooking oil give the SPPG an economic basis for the quantity to procure, and the POQ allows each order to be adjusted to the needs during the ordering interval, even though the usage of cooking oil fluctuates between 24 and 84 liters per day.

Regarding the order period, the POQ results show that the intervals should not be uniform for all raw materials but should follow the characteristics of each one, namely 13 working days for rice and 18 working days for cooking oil. A clear schedule helps the SPPG prepare procurement in advance, while the safety stock and the reorder points serve as additional control between two scheduled orders. Because the calculation is based on two months of data and on stable prices, these parameters should be reviewed whenever the demand pattern changes significantly, as occurred when rice demand declined during Ramadan.

4. Conclusion

Based on this study, it can be concluded that the optimal order quantity is 1,960.86 kg (rice) and 1,236.45 liters (cooking oil), with order intervals of 13 working days and 18 working days using the POQ method. This implementation is able to save 67.1% of the actual total TIC.

The total inventory cost under the POQ method is Rp926,419.01, compared with Rp2,816,999.40 under the actual policy. A safety stock of 13 kg for rice and 30 liters for cooking oil, with reorder points of 336 kg and 165 liters, supports this policy so that the risk of stockouts remains controlled.

This study has a limitation, namely that the data period used is relatively short (two months). Therefore, for further research, it is recommended to use a longer data range. SPPG Kota Siantar is also advised to begin practically adopting this method along with its safety stock levels for more reliable control.

SPPG Kota Siantar is advised to apply the scheduled order periods of every 13 working days for rice and every 18 working days for cooking oil, to consider the order quantity and the stock condition before placing an order, and to use the safety stock and the reorder point as additional controls.

Declaration of AI Use

The author states that ChatGPT was used to a limited extent to assist with language editing and grammar checking during the preparation of the manuscript. The author bears full responsibility for all scientific content, data analysis, interpretation of results, and conclusions. All editing assisted by ChatGPT has been reviewed and verified by the author.

Author Contributions

Conceptualization, Ryan Farel Hedy, and Diana Khairani Sofyan; methodology, Ryan Farel Hedy; formal analysis, Ryan Farel Hedy, and Diana Khairani Sofyan; investigation, Ryan Farel Hedy; data curation, Ryan Farel Hedy; writing—original draft preparation, Ryan Farel Hedy; writing— review and editing, Trisna. All authors have read and agreed to the published version of the manuscript.

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