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Optimization of Raw Material Inventory Management and Productivity Analysis in Small-Scale Fish Milling Business: A Case Study of Afif Tenggiri Bengkulu

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Afif Tenggiri, Raw Materials, Inventory Management, Fish Milling Business Productivity.

ABSTRACT

Purpose: *Afif Tenggiri Bengkulu, a fish milling business, faces challenges in raw material inventory management due to irregular frequency and delivery delays, especially during the rainy season. This research analyzes raw material inventory management and productivity at Afif Tenggiri in Bengkulu City.* ***Methodology:*** *Conducted in Kampung Bahari, RT 14 Pulau Baai, from April to May 2025, using direct observation and interviews with the owner.* ***Results:*** *Results show effective inventory management through planning, organizing, mobilizing, and controlling stages. EOQ calculations yield optimal order quantity of 441.31 kg, Safety Stock of 5,331 kg, and reorder point of 10,662 units. Productivity: raw materials 0.4 (moderate), labor 40.92 kg/person/month (moderate), operational cost 6.59787 kg per Rp 1,000,000 (moderate).* ***Findings:*** *The findings indicate that inventory management is well-executed, yet productivity remains at moderate levels across all measured dimensions.* ***Novelty & Originality:*** *The novelty of this study lies in its application of EOQ-based inventory analysis to a small-scale fish milling business in Bengkulu, a context rarely examined in prior research.* ***Conclusions:*** *The study recommends improving supply chain coordination and operational efficiency to enhance overall productivity.* ***Type of Paper:*** *This paper is an case study research paper.*

INTRODUCTION

Is a type of marine fish widely found in various oceanic regions. Mackerel is a primary marine fishery commodity due to its high commercial value and considerable nutritional content, which helps meet the demand for animal protein. Mackerel is popular among the community as it can be processed into various products like empek-empek, crackers (kerupuk), and salted fish (Aceng, 2008). To ensure the availability of raw materials for production, sound inventory management is necessary.

Inventory management is a crucial function in a company's operational activities. Besides requiring significant capital investment, inventory management also impacts customer service and influences production, marketing, and financial activities. Inventory is part of working capital. If the

production department can determine the required order quantity and timing for raw materials, this information is highly beneficial to the finance department for planning the necessary funds and procurement timing. Therefore, inventory management plays a vital role in building long-term competitive advantage. Aspects such as quality, product design, price, overtime, excess capacity, speed in responding to customer needs, lead time, and even the company's profit level are all heavily influenced by the management and quantity of inventory held (Riyanto 2001). Observations at Afif Tenggiri revealed that raw material inventory and stock frequency were irregular, and there were issues with unstable stock availability and delivery delays, particularly during the rainy season.

Inventory management is essential to ensure a sufficient supply of goods to meet customer demand and production needs, while simultaneously preventing excess stock that leads to high costs and waste. Afif Tenggiri in Bengkulu City plays a significant role in supporting the productivity of the fish processing business and the sustainability of the raw material supply chain. Further research is needed to analyze the raw material inventory management system applied by Afif Tenggiri and evaluate its impact on business productivity, which can ultimately improve operational efficiency and ensure optimal raw material availability to meet market demand.

METHOD

Research Methods

The research location was in Kampung Bahari, RT 14, Pulau Baai, Bengkulu City. This location was chosen intentionally (purposive sampling) due to its significant potential in the Mackerel fish grinding business within Bengkulu City.

Respondent Determination Method

According to Sugiyono (2018), the population is the totality of all objects or individuals to be studied, possessing specific, clear, and complete characteristics. In this study, the sole respondent is the owner of the Mackerel fish grinding business, Ibuk Neni Okta Reda.

Data Analysis Techniques

The study employs specific quantitative techniques to analyze inventory management and business productivity.

Economic Order Quantity (EOQ)

The Economic Order Quantity (EOQ) method is used to determine the optimal inventory quantity to order, minimizing total inventory costs (ordering and holding costs).
The formula used for the EOQ calculation is:

$$\text{EOQ} \frac{= \sqrt{2DS}}{H}$$

Where:
EOQ = Economic Order Quantity (optimal order quantity).
D = Annual demand/product need (units/year).
S = Ordering cost (Rupiah/order).
H = Holding/storage cost (Rupiah/unit/year).

Safety Stock (SS)

Safety Stock (SS), or buffer inventory, is calculated to prevent stock-outs and safeguard against potential shortages.
The formula for Safety Stock is:

SS = (Maximum Use – Average Use) x Lead Time
SS = Safety Stock

D = Average Daily Use
L = Lead Time (Waiting time)

Reorder Point (ROP)

The Reorder Point (ROP) determines the precise time to place a new order before the existing stock is depleted.
The formula for Reorder Point is:

$$ROP = (D \times L) + SS$$

Where:

ROP = Reorder Point
D = Average Demand rate per unit (Average Daily Use)
L = Lead Time
SS = Safety Stock

Business Productivity

Productivity is defined as the ratio of output to input within a production process over a specific period (Mangkuprawira, 2007). While agricultural productivity (Ramalia, 2011) involves inputs like labor, land, and technology, business productivity generally measures efficiency.
The general formula for Business Productivity is:

$$\text{Productivity} = \frac{\text{Output (Production Result)}}{\text{Input (resources Used)}}$$

For this study on the fish grinding business:
Output is the quantity of ground fish (kg) produced per month.
Input includes the quantity of raw fish used (kg), labor, and operational costs.

1. Raw Material Productivity:

$$\text{Raw Material Productivity} = \frac{\text{Amount of Ground Fish (Kg) / Month}}{\text{Amount ofRaw Fish (Kg) / month}}$$

2. Labor Productivity :

$$\text{Labor Productivity} = \frac{\text{Amount of Ground Fish (Kg) / Month}}{\text{Amount of Labor (per hour / month)}}$$

3. Operational Cost Productivity:

$$\text{Operational Cost Productivity} = \frac{\text{Amount of Ground Fish (Kg) / Month}}{\text{Total Production Cost (Kg / Month)}}$$

RESULTS AND DISCUSSION

RESULTS

Raw Material Ordering with the Economic Order Quantity (EOQ) Method

D (Annual product requirement)	14,124 Kg
S (Ordering Cost)	855,025,000 IDR
H (Holding/Storage Cost)	123,937,000 IDR

Therefore, the EOQ is calculated as:

$$= \frac{\sqrt{2DS}}{H}$$

$$= 2 \times D \times S$$

$$= 2 \times 14.124 \times 855.025.000$$

$$= \frac{24.137.946.2000}{123.937.000}$$

$$\sqrt{194.772,85}$$

$$= 441,31$$

To minimize inventory costs, the Economic Order Quantity (EOQ) analysis can be utilized, as per Riyanto (2001).

Table 1. Economic Ordering

No	Description	Amount (IDR)
1.	Quantity Required (Kg)	14.124
2.	Ordering Cost (IDR)	855.025.000
3.	Holding Cost (IDR)	123.937.000
	Economic Order Quantity (EOQ) Unit/Kg	**441,31**

Source: Data Processed, 2025

The EOQ calculation of 441.31 kg is based on the general EOQ formula used to determine the optimal quantity of materials that should be ordered to effectively minimize total costs, which consist of ordering costs and holding costs.

Raw Material Safety Stock (SS) for Fish

SS = Safety StocK
D = Average Use
L = Lead Time

Given:

D (Average Use) = 1,777 Kg
L (Lead Time) = 3 Days
= D x L
= 1,777 x 3
= 5,331 Kg

The minimum material inventory that the company must maintain is to protect against potential delays in the arrival of raw materials, thereby preventing stagnation. The amount of safety stock is as stated by Slamet (2019).

Table 2. Safety Stock

No	Description	Amount
1	Average Use (Kg/Unit)	1.777
2	Lead Time (Days)	3
Safety Stock		**5.331**

Source: Data Processed, 2025

The average usage of 1,777 Kg indicates the amount of raw material typically used in a certain period, calculated as total raw material usage divided by the duration of that period. The lead time of 3 days is the duration from the moment the raw material is ordered until it is actually available for production. The resulting safety stock is 5,331 Kg.

Raw Material Reorder Point (ROP) for Fish

ROP = *Recorder Point*
D = Average Use
L = *Lead Time*
SS = *Safety Stock*

$$ROP = (D \times L) + SS$$
$$= 1.777 \times 3 + 5.331$$
$$= 10.662$$

Munawaroh, N. M. (2016). The Determination of the Reorder Point (ROP) in Raw Material Inventory Control for Wheat Flour (Case Study at Amirah Bakery Tulungagung). *Proceedings of the National Seminar on Management, Economics, and Accounting*.

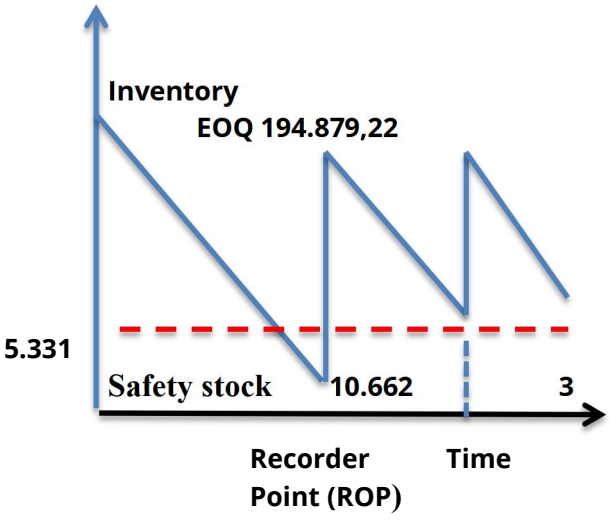
Table 3. Reorder

No	Description	Amount
1.	Average Use (Kg)	1.777
2.	Lead Time (Days)	3
3	*Safety Stock* (Kg)	5.331
Recorder Point		**10.662**

Source: Data Processed, 2025

The calculation of the reorder point (ROP) of 10,662 units is carried out by summing the product of the average daily usage and the lead time with the safety stock. The average daily usage of 1,777 units indicates how many items are typically used or sold each day. The lead time of 3 days is the duration required from the moment the order is placed until the goods arrive at the warehouse.

Figure 1. The calculation of the reorder point (ROP)



Graph Axes

Vertical Axis (Y) : Represents the inventory quantity/level.
Horizontal Axis (X) : Represents time.

Economic Order Quantity (EOQ)

EOQ is the most economical order quantity to minimize the total inventory cost (ordering cost + holding cost). In the graph, the EOQ is indicated by the peak of the curve—which is when the new inventory arrives and the quantity of goods is fully replenished.

Safety Stock (SS)

Safety Stock is a buffer inventory kept to anticipate uncertain demand or delayed deliveries. In the graph, SS is shown by the horizontal red line at the bottom. Its function is to prevent a stockout (running out of stock) when demand increases or there is a supply delay.

Reorder Point (ROP)

Reorder Point is the point at which the company must place a reorder, so that the new goods arrive precisely when the stock reaches the safety limit. In the graph, ROP is indicated by the vertical green line.
Its value is calculated using the general formula

ROP = Average Use x Lead Time + Safety Stock
ROP = 1.777 X 3 + 5331 =10.662

Inventory Flow

Inventory gradually decreases over time as it is used for production or sales. When the stock reaches the ROP (Reorder Point), a new order is placed. After the goods arrive, the stock rises back to the EOQ (Economic Order Quantity) level, and this cycle repeats.

Productivity of Afif Tenggiri Fish Grinding Business

The raw material productivity at this fish grinding business remains stable at a value of 0.4 every month, which means that for every kilogram of raw fish processed, 0.4 kilograms of ground fish are produced. This consistency demonstrates the maintained efficiency of the raw material conversion process into the final product over time, and also serves as an indication of production quality stability.

At Afif Tenggiri, there are three main types of productivity, namely Raw Material Productivity, Labor Productivity, and Operational Cost Productivity. These can be seen in the following table.

Table 4 Raw Material Productivity

No	Component	Value/Amount (Kg)/Month	Category
1.	Amount of Ground Fish (Production Output)	409,2	
2.	Amount of Raw Fish	1023	
	Raw Material Productivity	**0,4**	**Medium**

Source: Data Processed, 2025

Information :
< 40% = Bad / Low
40 – 60% = Moderete / Sufficient
> 60% = Good / High

From every kilogram (Kg) of raw fish, only 0.4 Kg (40%) becomes ready-to-process ground fish. The remaining portion (60%) is lost due to the removal of heads, bones, skin, guts (entrails), and water content during grinding**.**

Sumantri, R. & Purnomo, D. (2019). Raw Material and Labor Productivity in the Small-Scale Fish Processing Industry in Pati Regency. *Journal of Marine and Fisheries Socio-Economics*.

Table 5. Labor Productivity

No	Component	Value/Amount Per Month	Category
1.	Amount of Ground Fish (Production Output))	409,2	
2**.**	Number of Workers (Labor)	10	
Labor Productivity		**40.92**	**Medium**

Source: Data Processed, 2025

Information :
< 30 Kg / Person / Month = low (poor)
35 -45 Kg / person / Month = Moderate (Sufficient)
> 45 Kg / Person / Month = Height (Good)

According to Sumantri R, (2019), the production of ground fish that is less than 30 kg per person per month is categorized as low or poor. Production between 35–45 kg per person per month is classified as medium or adequate, and if it exceeds 45 kg per person per month, it is categorized as high or good. This classification is used as a standard for assessing individual efficiency and productivity in the monthly ground fish processing operation.

Table 6. Operational Cost Productivity

No	Component	Value/Amount Per Month	Category
1.	Amount of Ground Fish (Production Output)	409,4	
2.	Total Production Cost	62.020.000	
Operational Cost Productivity		**6,59787**	**Medium**

Source: Data Processed, 2025

Information :
Converted to per IDR 1.000.000 :
6,59787 x 1.000.000 = 6.597.870 Kg per IDR 1.000.000
Low (Poor) < 5 Kg
Medium (Enough) 5,8 Kg
Height (Good) > 8 Kg

According to Hidayat (2021), the quality of ground fish is classified based on its weight, with the categories being low (poor) if the weight is less than 5 kg, medium (adequate) at around 5.8 kg, and high (good) if the weight is more than 8 kg. This classification serves as a standard for assessing the quality of ground fish, which affects the economic value and the production and processing of the fish product.

CONCLUSION

The raw material inventory management at Afif Tenggiri fish grinding business is already running well through structured stages of planning, organizing, actuating, and controlling. The Economic Order Quantity (EOQ) method determined the optimal order quantity to be approximately 194,879.22 kg, with a Safety Stock (SS) of 5,331 kg and a Reorder Point (ROP) of 10,662. Furthermore, the overall productivity of the Afif Tenggiri grinding business shows specific values across key areas: Raw Material Productivity is 0.4, Labor Productivity is 40.92, and Operational Cost Productivity is 6.59787.

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