

# Comparative Study of Raw Material Inventory Cost Control at Palm Oil Mills as a Cost Minimization Step with the Just in Time (JIT) Method: Case Study

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**Abstract:-** In the implementation of inventory, the company's purchase of raw materials is still based on the number of requests from customers. Production at PT X occurs when there is an order only not based on regular scheduling. The supply of raw materials for production is only limited to 30 tons / hour per day, but if it is insufficient, no production process occurs or is temporarily stopped. This study aims to compare and analyze the control of raw material inventory costs at palm oil mills in minimizing costs between the company's current policy and if using the Just In Time (JIT) method. One of the goals of Just In Time is to make cost savings so that there is no waste. This study shows that the total inventory costs incurred by PT X at this time are still quite large, namely Rp. 2,096,575,200, while if using the Just In Time method, the total cost of raw material inventory issued is only Rp.1,266,822,846. This means that the company is able to save costs of Rp. 829,752,354. By scheduling and making regular deliveries, the company can reduce the amount of costs incurred.

**Keywords:-** Just in Time, Waste, Raw Material Inventory.

## I. INTRODUCTION

Inventory can be defined as materials stored in warehouses as storage materials that can be used for the next production process, whether to be used or to be sold. Inventory is a basic thing that can also be interpreted as the proper function of a processing or manufacturing business. According to Freddy Rangkuti (2013), written in the book Inventory Management, Inventory is one of the most active elements in the company's operations which is continuously obtained, converted, or resold (Dwiningsih & Pratama, 2021).

Company activities have a very close relationship with production activities to meet market needs. Important for holding production activities is the need for raw materials, because the raw material inventory system has an important role in business operations. In order to avoid delays in raw materials, a good determination of the raw material inventory system must be made. Raw materials are the main factor in the company to support the smooth production process, both large and small companies. Every company

always holds supplies so that the continuity of the company's production process is not disrupted. But there is also a raw material inventory system that does not rely on storing large amounts of inventory. Control of raw material inventory also greatly affects the profit that the company will get.

Palm oil production in the world is dominated by Indonesia and Malaysia. Based on data from the Indonesian Central Bureau of Statistics in 2020, the total area of Indonesia's oil palm plantations is estimated to reach 15.59 million ha, this oil palm plantation area is spread across 26 provinces, one of which is in South Sumatra. (BPS RI, 2020). The large area of oil palm plantations causes the competition in the palm oil industry in Indonesia to be very tight, with this increasingly tight competition making companies engaged in palm oil production activities must be able to maintain and develop their industry. To continue to survive and develop, the company must have the right strategy.

PT X is a palm oil production company with raw materials in the form of palm oil located in the province of South Sumatra. This company in getting raw materials from oil palm plantations is still done manually, starting from picking FFB and in the system of transporting raw materials to the factory. Currently PT X in fulfilling the supply of production raw materials is still constrained by the system that applies in the company and has not been standardized properly. So that sometimes if raw materials are not available, then no production runs.

PT X has an oil palm plantation area of 8,584 ha with the provision of about 2000 ha of plasma plantations, namely plantation land originating from community land. The oil palm fruit in the form of Fresh Fruit Bunches (FFB) produced will be processed into Crude Palm Oil (CPO). The company targets the production capacity of FFB into palm oil at 30 tons / hour.

In the procurement and purchase of FFB raw material inventory, currently still using the company policy method. In purchasing raw materials ordered repeatedly with an unknown amount and not based on the production capacity requirements needed by the company. The company carries out the process of purchasing raw material inventory is not

well scheduled, resulting in production can be stopped because the FFB raw material does not meet production capacity. With the unfulfilled production capacity in the end the company has to buy back at a cost that is incurred to be more for the next order of raw materials. This study aims to analyze the cost of raw material inventory if the company applies the Just In Time system, how much savings occur if this method is applied.

**II. LITERATURE REVIEW**

➤ *Raw Materials*

Raw materials are an important requirement for production activities, raw materials determine the results of the production process to run smoothly until it becomes a quality product. In preparing raw materials, proper management is needed so that raw materials can be fulfilled as needed. According to Bustami and Nurlela (2013) raw materials are basic materials that are processed into finished products. Raw materials are materials that form a comprehensive part of the finished product (Mulyadi, 2012), while according to Sujarweni (2015) raw materials themselves have the definition of materials which are the main components that make up the whole of the finished product. According to Jayatmaja (2010) the use of raw materials in companies is usually obtained from local purchases, imports or it could be from their own management.

➤ *The Types of Raw Materials can be Divided into Two, Namely:*

- Direct raw materials are all raw materials that are necessary to complete the finished product of a company and can be traced easily to the finished product. The costs incurred to purchase this direct raw material have a close relationship and are proportional to the amount of finished goods produced.
- Indirect raw materials are raw materials that play a role in the production process but are not directly visible in the finished goods produced.

➤ *Just in Time (JIT)*

Just In Time (JIT) is a production system designed to obtain quality, save costs, and time efficiency to minimize all types of waste contained in the production process so that the company is able to deliver its products (both goods and services) according to the wishes of consumers in a timely manner (Dwiningsih & Pratama, 2021). According to Heizer and Render, 2004: 257, the Just In Time system is a system that produces products when there is demand, and in its production activities eliminates waste because it produces according to consumer needs in the most efficient way possible. The core of the Just In Time concept is a program to reduce the amount of inventory needed at the right time (Janson B & Nurcaya, 2019).

**III. METHODS**

➤ *The Data Analysis used in this Study used the following Steps:*

- *Collecting information about the amount of raw material inventory of the company*
- *Processing data by calculating the amount of ordering raw material inventory based on company policy by means of (Indriyanti, 2018):*

✓ *Calculating the Average Order of Raw Materials / Times the Message (Q)*

$$Q = \frac{\text{persediaan bahan baku rata - rata (D)}}{\text{frekuensi pemesanan (kebijakan perusahaan)}}$$

✓ *Calculating the Total Inventory Cost (TIC)*

$$TIC = C \left(\frac{D}{N}\right) + D \left(\frac{O}{Q}\right)$$

Where:

Q = Average order quantity of raw materials company's raw materials / times the message

TIC = Total inventory cost

C = Storage cost per unit

D = Average amount of raw material inventory average / month

N = Company order frequency

O = Ordering fee for each order

- *Determine the number of economic orders by analyzing using the just in time method which can be determined by the following formula (Indriyanti, 2018):*

✓ *JIT Order Quantity / order quantity each time you order*

$$(Qn) = \sqrt{nQ^*}$$

✓ *JIT Optimal Number of Delivery / Number of deliveries per order*

$$na = \left\lceil \frac{Q^*}{2a} \right\rceil$$

$$Q^* = \sqrt{\frac{2 \times 0 \times D}{c}}$$

✓ *Optimal shipment quantity for each shipment*

$$q = \frac{Qn}{na}$$

✓ *Frequency of raw material purchase*

$$N = \frac{D}{Qn}$$

✓ *Total cost of raw material inventory based on just in time method*

$$T_{JIT} = \frac{CQn}{2n} + \frac{OD}{Qn}$$

Where:

- Qn = JIT order quantity in each order
- N = Optimal number of deliveries during the month
- Q\* = order quantity in EOQ system units
- q = Optimal shipment quantity per shipment
- na = Optimal number of shipments with target level "a" of average inventory in units
- a = Average specific target inventory in units
- O = Ordering cost each time
- D = Total raw material requirements
- C = Storage cost per unit
- TJIT = Total cost of raw material inventory based on just in time method

#### IV. RESULT

##### A. Data Analysis

###### ➤ *Company Policy*

The cost of PT X's FFB raw material inventory in 1 year, the ordering cost of Rp. 6,000,000 includes the cost of FFB and the cost of unloading fruit from the truck to the storage area and for storage costs per unit is Rp. 1,200 consisting of FFB inspection, supervision and security. The calculation of FFB costs can be described as follows.

Calculating the Average Purchase of Raw Materials (Q) and Total Cost of Inventory Procurement (TIC) in January - December 2021.

- *Calculating the Average Order of Raw Materials / Times the Message (Q)*

$$Q = \frac{\text{persediaan bahan baku rata - rata (D)}}{\text{frekuensi pemesanan (kebijakan perusahaan)}}$$

$$= \frac{124.286.500 \text{ kg}}{250 \text{ kali}}$$

$$= 414.288,3 \text{ kg}$$

- *Calculating the Total Inventory Cost (TIC)*

$$TIC = C \left( \frac{D}{N} \right) + D \left( \frac{O}{Q} \right)$$

$$= Rp.1200 \left( \frac{124.286.500 \text{ kg}}{250 \text{ kali}} \right) + 124.286.500 \text{ kg}$$

$$\left( \frac{Rp. 6.000.000}{414.288,3 \text{ kg}} \right)$$

$$= Rp.596.575.200 + Rp. 1.500.000.000$$

$$= Rp.2.096.575.200$$

The cost incurred by PT X for FFB raw material inventory in January - December 2021 is IDR 2,996,575,200.

###### ➤ *Just In Time (JIT) Method*

The cost of PT X's FFB raw material inventory in 1 year is as follows:

- *Calculate the Amount of Raw Material Ordering Quantity and Total Cost of Inventory Procurement*

$$Q^* = \sqrt{\frac{2 \times O \times D}{C}}$$

$$= \sqrt{\frac{2 \times Rp.6.000.000 \times 124.286.500 \text{ kg}}{Rp.1200}}$$

$$= \sqrt{1.242.865.000.000}$$

$$= 1.114.839 \text{ kg}$$

Frequency of ordering raw materials (N)

$$N = \frac{D}{Qn}$$

$$= \frac{124.286.500 \text{ kg}}{1.114.839}$$

$$= 111,4838553$$

$$= 111 \text{ kali}$$

- *Calculate the JIT Optimal Number of Delivery / The optimal number of deliveries each time the message is:*

$$na = \left\lceil \frac{Q^*}{2a} \right\rceil$$

$$= \left\lceil \frac{1.114.839}{2(1.054.288)} \right\rceil^2$$

$$= \left\lceil \frac{1.114.839}{2.108.576} \right\rceil^2$$

$$= 0,279540952$$

- *The Optimal Number of Deliveries Per Message using the Just in Time Method is 0.279540952, which is Equal to 2 Deliveries.*

- *Calculate the JIT Order Quantity / Order Quantity for each Order, Namely:*

$$(Qn) = \sqrt{nQ^*}$$

$$= \sqrt{0,279540952} \times 1114839$$

$$= 0,5 \times 1114839$$

$$= 589.433,34 \text{ Kg}$$

- Calculate the Optimal Shipping Quantity for each Shipment i.e.:

$$q = \frac{Qn}{na}$$

$$= \frac{589.433,34 \text{ Kg}}{2}$$

$$= 294.717 \text{ Kg}$$

- Frequency of raw material purchase

$$N = \frac{D}{Qn}$$

$$= \frac{124.286.500}{589.433}$$

$$= 210,8576$$

$$\approx 211 \text{ kali}$$

- Total cost of raw material inventory based on just in time method

$$T_{JIT} = \frac{CQn}{2n} + \frac{OD}{Qn}$$

$$= \frac{1200 \times 589.433}{2 \times 211} + \frac{6.000.000 \times 124.286.500}{589.433}$$

$$= \frac{707.320.011}{422} + \frac{745.719.000.000.000}{589.433}$$

$$= \text{Rp.}16.772.460 + \text{Rp.} 1.250.822.846$$

$$= \text{Rp.}1.266.822.846$$

After carrying out the above calculations, namely calculations using company policy and the Just In Time Method in controlling the cost of inventory of fresh fruit bunch raw materials at PT. X in January - December 2021, it can be seen that the comparison between the three cost control systems is presented as in table 1.

From table 1, it shows that the use of the Just In Time method in controlling the cost of FFB raw material inventory is able to save costs greater than the costs incurred by the company. The use of the Just In Time method is very suitable for PT X considering that it can only be stored for no more than 24 hours and if it exceeds that time it will reduce the quality of the FFB itself.

Table 1 Comparison of FFB Raw Material Inventory Control

Description	Company Policy	Just in Time Method (JIT)
Raw Material Requirements (kg)	124.286.500	124.286.500
Optimal Order Quantity / Order (kg)	497.146,00	511.766,98
Order Frequency/Year (times)	250	211
Delivery Frequency/Order (times)	1	2
Delivery Frequency/Year (times)	250	111
Ordering Cost/Year (Rp)	1.500.000.000	1.265.145.600
Storage Cost/Year (Rp)	596.575.200	16.772.460
Total Inventory Cost/Year (Rp)	2.096.575.200	1.266.822.846

## V. CONCLUSION

➤ Based on the Results of Research Conducted at PT X, it can be Concluded that:

- The total cost incurred to control raw material inventory costs with company policy is Rp. 2,096,575,200, while with the just in time method the company only incurs costs of Rp.1,266,822,846.
- The company is able to save significant costs of Rp. 829,752,354, if supplies are scheduled and as needed only.

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