

Application of the Economic Order Quantity (EOQ) Method in Soybean Raw Material Inventory Control at the Haji Maman Tofu Factory in Matraman District, East Jakarta

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ABSTRACT: This research is based on the lack of implementation of a method in controlling the inventory of soybean raw materials at Haji Maman's Tofu Factory in the Matraman District of East Jakarta. Haji Maman's Tofu Factory still relies on daily records and sometimes uses estimates or assumption in its operational activities. In the procurement of raw materials, there is often an excess due to the lack of precise calculations regarding the ordering needs of raw materials, resulting in accumulation in the warehouse. In this study, the researcher utilized the Economic Order Quantity (EOQ) method, which determines the optimal quantity of raw material orders for each purchase, the optimal purchase frequency, and establishes the Re-Order Point. The approach and type of research used is a quantitative research method with a descriptive research approach. The objective of this study is to examine the implementation of the EOQ method in controlling the inventory of soybean raw materials at Haji Maman's Tofu Factory in the Matraman District of East Jakarta. Data Collection was conducted through observation and interviews with Mr. Haji Maman, the owner. The data analysis technique employed was the EOQ method, taking into account purchase frequency, Re-Order Point, and Total Inventory Cost (TIC). The results of this study indicate that the optimal average frequency of raw material orders is 17 times per year. The total inventory cost using Haji Maman's Tofu Factory policy amounts to Rp. 9,709,261, while using the EOQ method it amounts to Rp. 7,492,129, resulting in savings of Rp. 2,217,132 for Haji Maman's Tofu Factory. The Re-Order Point is determined to be 216 kilograms.

Keywords: Raw Material Inventory Control, Economic Order Quantity (EOQ) Method.



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INTRODUCTION

Haji Maman Tofu Factory is a manufacturing company that processes raw materials in the form of soybeans into finished products, namely tofu. Founded in 1960 by Mr. Wikarta then in 1980 it was continued by his son, namely Mr. Haji Maman until now (Nurohman et al., 2016; Sabrin, 2016; Septiana & DP, 2012). Tofu production at the Haji Maman Tofu Factory consumes an average of 200 kilograms of soybeans every day (Taufiqurrahman, 2022; Tiezzi, 2014; Zhou & Leung, 2015).

Table 1. Soybean Raw Material Inventory Data from January to December 2022

Month	Initial Preparation (kg)	Purchase (kg)	Consumption (kg)	Ending Stock (kg)
January	300	6.500	6.300	500
February	500	6.300	6.200	600
March	600	6.300	6.300	600
April	600	6.300	6.200	700
May	700	6.300	6.100	900
June	900	6.100	6.300	700
July	700	6.200	6.100	800
August	800	6.100	6.200	700
September	700	6.400	6.300	800
October	800	6.100	6.200	700
November	700	6.300	6.400	600
December	600	6.200	6.200	600

Source: Haji Maman Tofu Factory data has been processed

From the table above, it shows that the largest surplus of soybean raw materials occurred in May 2022 of 900 kg and the final supply increased to 600 kg (Mardiyati et al., 2015). Shows that the purchase of raw materials for soybeans is less efficient because optimal calculations are not carried out or only estimating the needs of the raw materials purchased. To overcome these problems Haji Maman Tofu Factory can use the method *Economic Order Quantity* (EOQ) where this method is used to make purchases with optimal quantities and to reduce inventory costs (Milewski, 2020). It is hoped that with this method the Haji Maman Tofu Factory can minimize the excess supply of soybean raw materials so that it can meet customer demands with minimum or economical costs (Tuncel et al., 2022). According to Gitosudarmo (2002), "Method *Economic Order Quantity* (EOQ) is one of the most widely used calculation methods because it is the easiest and most efficient (Li et al., 2021; Moon et al., 2018; Shabani et al., 2021; Toft et al., 2015) . With the application of the EOQ method, companies will be able to reduce storage costs, save space, and problems arising from accumulated inventories (Abdolazimi et al., 2021).

METHOD

Approach and Type of Research

The approach and type of research used is a quantitative research method with a descriptive research approach. With the aim of describing the data that has been obtained so that the research results are easy to understand.

According to Sugiyono (2013: 13) argues, Quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to examine certain populations or samples, sampling techniques are generally carried out randomly, collecting data using research

instruments, analyzing data quantitative or statistical in nature with the aim of testing the established hypothesis (Sugiyono, 2019).

It can be concluded that this research uses quantitative research with a descriptive approach to describe the object or research results. This is so that researchers understand the problems faced and can take steps to overcome them.

Operational Variables

In this study, one independent variable or independent variable was determined. According to Sugiyono (2011: 61) who argues that, "The independent variable is the variable that influences or causes the change or the emergence of the dependent variable." The independent variable of this study is the application of the method *Economic Order Quantity* (EOQ) in raw material inventory control.

Data Collection Techniques

1. Data Primer

According to Sugiyono (2018: 456), "Primary data is a data source that directly provides data to data collectors. Data is collected by the researchers themselves directly from the first source or where the object of research is carried out. Researchers used notes from interviews and field observations obtained from informants regarding the research topic as primary data.

2. Data Seconds

According to Sugiyono (2018: 456), "Secondary data are data sources that do not directly provide data to data collectors, for example through other people or through documents." This data is used to support the primary information that has been obtained, namely from library materials, literature, previous research, books and so on.

Sampling Techniques

According to Sugiyono in Yuli Evitha and Fauzy Ma'ruf HS (2019) states that, "The sampling technique is a way to determine a sample whose number is in accordance with the size of the sample that will be used as the actual data source, taking into account the characteristics and distribution of the population so that a sample is obtained that is representative."

Sampling techniques are divided into two groups namely *probability sampling* and *non-probability sampling*. In this study using *non probability sampling*. According to Sugiyono (2017:82), *Non-Probability Sampling* is a sampling technique that does not provide equal opportunities or opportunities for each element or member of the population to be selected as a sample.

a. Population and Sample

According to Sugiyono (2015: 148-149) says, "Population is a generalization area consisting of: objects/subjects that have certain quantities and characteristics set by researchers to study and then draw conclusions." In this study, the researchers concluded that the population was all production data for soybean raw materials at the Haji Maman Tofu Factory in Matraman District, East Jakarta for one year of production, namely 2022. Production data consisted of ordering data, storage data, and data on soybean raw material requirements for one year. production year.

b. Sampling technique

Preparatory sampling techniques using techniques *Non-Probability Sampling*. Technique *Non-Probability Sampling* is a sampling technique that does not provide equal opportunity/opportunity for each element or member of the population to be selected as a sample.

About the type of technique *Non-Probability Sampling* used by researchers is saturated sampling technique (*Saturation Sampling*). According to Sugiyono (2015:154-156), “*Sampling Saturation* is a sampling technique when all members of the population are used as samples. This is often done when the population is relatively small. The term for a saturated sample is a census, where all members of the population are sampled.

The sample used in this research is soybean raw material as the main ingredient in tofu production at the Haji Maman Tofu Factory in Matraman District, East Jakarta. Researchers used data on the need for soybean raw materials for one year of production, namely 2022 of 75,100 kilograms.

RESULT AND DISCUSSION

A. General Description of the Research Object

Haji Maman Tofu Factory is a manufacturing company that processes raw materials in the form of soybeans into finished products, namely tofu. Founded in 1960 by Mr. Wikarta then in 1980 it was continued by his son, namely Mr. Haji Maman until now. Tofu production at the Haji Maman Tofu Factory consumes an average of 200 kilograms of soybeans every day. Haji Maman Tofu Factory is located at Jalan Srikaya Ujung RT 007 RW 06 No. 05, Utan Kayu Utara, Matraman, East Jakarta.

B. Research result

Using calculations by method *Economic Order Quantity* (EOQ) to answer raw material control problems that occur at the Haji Maman Tofu Factory, this type of research with a descriptive approach will test the application of the Method *Economic Order Quantity* (EOQ) in handling the supply of soybean raw materials at the Haji Maman Tofu Factory in Kecamatan Matraman, East Jakarta.

In this study the EOQ method was applied to control the supply of soybean raw materials using analytical techniques. The following are the calculation steps to analyze the data as follows:

1. Data Presentation

The data needed in analyzing include the following:

a. Order Cost Data

Ordering costs are costs incurred by the Haji Maman Tofu Factory in ordering soybean raw materials. The ordering costs incurred by the Haji Maman Tofu Factory are:

1. Telephone Fees

Costs incurred to place an order with communication services so that it requires credit to contact the party *supplier* in ordering soybean raw materials. Orders are made 3 times in one month. Phone fee for one subscriber is IDR 12,000

2. Loading and unloading costs

Costs incurred by the Haji Maman Tofu Factory in loading and unloading services for soybean raw materials for each order. The loading and unloading fee charged is IDR 100 per kilogram of soybeans. Orders in one year are 75,100 kilograms with 36 orders. Transportation of soybean raw materials using the type of pick-up car transportation.

Table 2. Loading and unloading costs

One year booking	One time order
IDR 100,- x 75,100 kg	Rp. 7.510.000,- : 36
= Rp. 7.510.000,-	= IDR 208,611,-

Data source : The Haji Maman Tofu Factory has been processed

The following is a recap of ordering cost data in one month:

Table 3 Ordering Fees

No.	Cost component	The amount of costs
1	Telephone Fees	IDR 36,000
2	Loading and unloading costs	IDR 625,833
	Total	IDR 661,833

Data source : The Haji Maman Tofu Factory has been processed

From table 3 above, it is known that the cost of ordering soybean raw materials issued by the Haji Maman Tofu Factory per month, for a year is IDR 7,941,996

b. Storage Fee Data

Storage costs are costs incurred by the Haji Maman Tofu Factory to store soybean raw materials for a certain period of time, resulting in storage costs.

The Haji Maman Tofu Factory also has to pay the cost of storing soybean raw materials as follows:

1. Electricity cost

The costs incurred by the Haji Maman Tofu Factory are due to the use of electricity in storing soybean raw materials. The costs incurred each month are IDR 2,000,000

2. Labor costs

The costs that must be incurred by the Haji Maman Tofu Factory consist of 4 production workers with a wage of 1,000 per kilogram of production. The average daily production spends 200 kilograms of soybeans. Haji Maman Tofu Factory's policy is to pay wages per week. Each worker gets a wage of IDR 1,400,000

3. Maintenance cost

Costs incurred by the Haji Maman Tofu Factory with the repair or maintenance of factory facilities if there is damage or maintenance such as maintenance of production equipment. Every day Mr. Haji Maman sets aside IDR 100,000

The following is a recap of storage cost data for one month:

Table 4. Storage Fees

No.	Cost component	The amount of costs
1	Electricity cost	IDR 2,000,000
2	Labor costs	IDR 5,600,000
3	Maintenance cost	IDR 3,000,000
	Total	IDR 10,600,000

Data source : The Haji Maman Tofu Factory has been processed
From table 4 above it is known that the cost of storing raw materials incurred for one month is IDR 10,600,000 or IDR 127,200,000 for one year.

c. Raw Material Procurement Needs Data

In procuring or supplying soybean raw materials to smooth the production process, the Haji Maman Tofu Factory must meet the needs of its soybean raw materials.
The following is a table of data on the need for soybean raw materials needed by the Haji Maman Tofu Factory from January to December 2022:

Table 5. data on the procurement of soybean raw materials from January to December 2022

Moon	Soybean Raw Material Needs in Orders Per Month (kg)			Order Totals
	First order	Second order	Third order	
January	2.100	2.000	2.400	6.500
February	2.000	2.300	2.000	6.300
March	2.200	2.000	2.100	6.300
April	2.000	2.300	2.000	6.300
May	2.200	2.100	2.000	6.300
June	2.100	2.000	2.000	6.100
July	2.100	2.000	2.100	6.200
August	2.000	2.100	2.000	6.100
September	2.300	2.000	2.100	6.400
October	2.100	2.000	2.000	6.100
November	2.200	2.100	2.000	6.300
December	2.100	2.000	2.100	6.200
	Total			75.100

Data source : The Haji Maman Tofu Factory has been processed
Based on the table above, the policy of the Haji Maman Tofu Factory in ordering soybean raw materials 3 times in one month, in total in one year the Haji Maman Tofu Factory orders 36 soybean raw materials.

2. The Cost of Ordering Goods in One Message (S)

With the formula / equation according to Sulaiman and Nanda (2015) as follows:

$$S = \frac{\text{Total Order Cost}}{\text{Order Frequency}}$$

$$S = \frac{\text{IDR } 7,941,996}{36}$$

$$S = \text{IDR } 220,611$$

Based on the calculation above, the costs incurred by the Haji Maman Tofu Factory in one order of soybean raw materials are IDR 220,611.

3. Storage Cost Per Unit (H)

With the formula / equation according to Sulaiman and Nanda (2015) as follows:

$$H = \frac{\text{Total Storage Fee}}{\text{Total Needs of Goods}}$$

$$H = \frac{\text{IDR } 127,200,000}{75.100}$$

$$H = \text{IDR } 1,694 \text{ per kilogram}$$

Based on the calculation above, the costs incurred by the Haji Maman Tofu Factory for the cost of storing soybean raw materials per kilogram are Rp. 1,694.-

4. Average Purchase of Goods in One Order

With the formula / equation according to Sulaiman and Nanda (2015) as follows:

$$Q = \frac{\text{Total Needs of Goods}}{\text{Order Frequency}}$$

$$Q = \frac{\text{IDR } 75,100}{36}$$

$$Q = 2.086 \text{ kilogram}$$

Based on the calculation above, it states that the average purchase of soybean raw materials at the Haji Maman Tofu Factory is 2,086 kilograms.

5. Determine *Total Inventory Cost* (TIC) before using the EOQ Method

With the formula / equation according to Heizer & Render (2015), as follows:

$$TIC = \frac{D}{Q} S + \frac{Q}{2} H$$

$$TIC = \frac{75.100}{2.086} \text{ IDR } 220,611 + \frac{2.086}{2} \text{ IDR } 1,694$$

$$TIC = \text{Rp } 9.709.261$$

So in one year, *Total Inventory Cost* (TIC) issued by the Haji Maman Tofu Factory before applying the method *Economic Order Quantity* (EOQ) is IDR 9,709,261

6. Optimal Raw Material Inventory Needs by using the Method *Economic Order Quantity* (EOQ)

To be able to determine the need for soybean raw material supplies, calculations can be made using the Haider and Render formula (2015), as follows:

$$EOQ = \sqrt{\frac{2 \times D \times S}{H}}$$
$$EOQ = \sqrt{\frac{2 \times 75,100 \times IDR 220,611}{IDR 1,694}}$$

$$EOQ = 4.423 \text{ kilogram}$$

Based on the calculation above, the most optimal and economical purchase of raw materials made by the Haji Maman Tofu Factory is 4,423 kilograms in one order.

7. Determine the Optimal Order Frequency

To calculate the frequency of purchases, you can use the formula according to Deanta (2012: 40):

$$I = \frac{D}{EOQ}$$
$$I = \frac{75.100}{4.423}$$
$$I = 17 \text{ time}$$

The frequency of purchasing soybean raw materials by the Haji Maman Tofu Factory by applying the EOQ Method is 17 times a year.

8. Determine *Total Inventory Cost* (TIC) after applying the EOQ Method

Calculation *Total Inventory Cost* calculated using the formula according to Haizer and Render (2015):

$$TIC = \frac{D}{Q^*} S + \frac{Q^*}{2} H$$
$$TIC = \frac{75.100}{4.423} IDR 220,611 + \frac{4.423}{2} IDR 1,694$$
$$TIC = Rp 7.492.129$$

within one year, *Total Inventory Cost* (TIC) issued by the Haji Maman Tofu Factory after applying the Method *Economic Order Quantity* (EOQ) is IDR 7,492,129,-

9. Determine *Re-Order Point* (ROP)

Haji Maman Tofu Factory has a waiting time (*Lead Time*) in the process of ordering soybean raw materials that have been ordered, namely for 1 day. The number of working days of the Haji Maman Tofu Factory in a year is 348 days.

Before counting *Re-Order Point* (ROP) then what needs to be known in advance is the level of production of raw materials per day with the following formula:

$$d = \frac{D}{t}$$
$$d = \frac{75.100}{348}$$

$$d = 216 \text{ kilograms per day}$$

To be able to count *Re-Order Point* (Reorder Point) using the following formula:

$$ROP = (d \times Lt)$$

$$ROP = (216 \times 1)$$

$$ROP = 216 \text{ kilogram}$$

Based on the calculation above, the reorder point (*Re-Order Point*) what the Haji Maman Tofu Factory has to do to replenish its soybean raw material supply is when the remaining soybean raw material supply reaches 216 kilograms.

10. Determine *Life Time* (Duration of Use)

For calculations *Life Time* (duration of use) using the following formula:

$$Life\ Time = \frac{Working\ days\ a\ year}{Order\ frequency}$$

$$Life\ Time = \frac{348\ days}{17\ times}$$

$$Life\ Time = 20\ day$$

Based on the calculation above, *Life Time* (duration of use) that is for 20 days. Within 20 days the Haji Maman Tofu Factory can place another order (*Re-Order Point*) of 4,423 kilograms according to the EOQ calculation.

11. Table of Comparison Results Before and After Applying the Method *Economic Order Quantity* (EOQ)

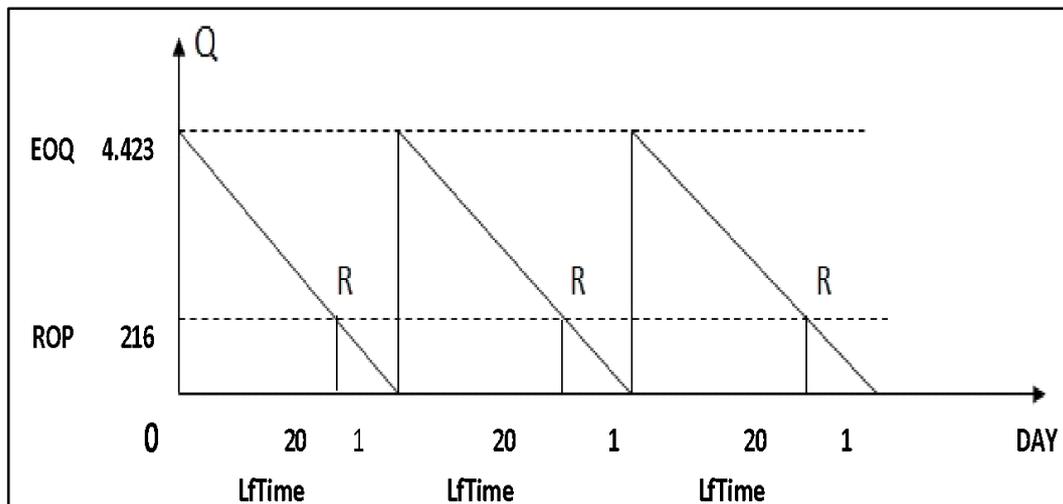
From the results of the calculations that have been done that by applying the method *Economic Order Quantity* (EOQ) found a comparison of the total costs applied using the Haji Maman Tofu Factory policy.

Table 6. Comparison of Haji Maman Tofu Factory Policies with the Implementation of the EOQ Method

No.	Description	Haji Maman Tofu Factory Policy	Application of the EOQ Method
1	The number of items in one order	2.086 kilogram	4.423 kilogram
2	Purchase Frequency (I)	36 times	17 times
3	Total <i>Inventory Cost</i> (TIC)	IDR 9,709,261	IDR 7,492,129
4	<i>Re-Order Point</i>	-	216 kilogram

12. Inventory Graph using the Method *Economic Order Quantity* (EOQ)

EOQ & ROP Inventory Chart



Based on the information in the policy comparison table of the Haji Maman Tofu Factory with the application of the EOQ Method, some information can be obtained, namely *Total Inventory Cost* (TIC) policy of the Haji Maman Tofu Factory with a larger amount of Rp. 9,709,261.- while in the application of the EOQ Method, which is Rp. 7,492,129,- it is said that the application of the EOQ Method shows that the Haji Maman Tofu Factory can carry out efficiency in total inventory costs soybean raw materials of IDR 2,217,132, -

The EOQ method produces an optimal order quantity of 4,423 kilograms which makes the purchase frequency 17 times a year compared to the Haji Maman Tofu Factory policy of 2,086 kilograms with 36 orders a year.

In this case the number of reorders (*Re-Order Point*) by applying the EOQ method totaling 216 kilograms so that when the raw material inventory remains 216 kilograms, the company will purchase soybean raw materials so that the activity of the tofu production process is not hampered and runs smoothly.

CONCLUSION

Based on the results of the study it can be concluded that the application of the method *Economic Order Quantity* (EOQ) in controlling the supply of soybean raw materials at the Haji Maman Tofu Factory has a very significant influence, namely the policy of the Haji Maman Tofu Factory in purchasing soybean raw materials previously carried out 36 times with 2,086 kilograms, whereas

with the application of the EOQ Method the economic amount was 4,423 kilograms with 17 times in one year. And in the policies of the Haji Maman Tofu Factory the number *Re-Order Point* uncertain amount but by applying the amount EOQ method *Re-Order Point* carried out when the inventory reaches the point of 216 kilograms with *Life Time* for 20 days.

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