P-ISSN: 2808-0467
E-ISSN: 2808-5051
Homepage: https://iss.internationaljournallabs.com/index.php/iss

COST EFFICIENCY ANALYSIS OF OYSTER MUSHROOM BAGLOGS' RAW MATERIAL INVENTORY IN CV. DA

Lu'lu'ul Jannah[1]*, Effy Yuswita[2], Fitria Dina Riana[3]
[1,2,3]*Faculty of Agriculture, Universitas Brawijaya, Malang, East Java, Indonesia*
[*] *ll_luluul@student.ub.ac.id*

PAPER INFO

Received: *April 2023*
Revised: *April 2023*
Approved: *April 2023*

ABSTRACT

Background: Oyster mushrooms are famous for having many benefits, in addition to being used as a nutrient-filled food ingredient can also be trusted since a long time ago as a traditional medicine.
Aim: This study aims to describe the inventory control carried out for baglog raw materials, analyze the optimal baglog raw material inventory costs using the JIT and EOQ methods, determine the efficiency of inventory costs and recommend more appropriate methods and purchasing quantities.
Method: This study uses the JIT and EOQ methods for data analysis.
Findings: The results showed that the control of baglog raw material inventory still uses conventional methods, the company determines the quantity of raw material purchases by doing a breakdown. The optimal baglog raw material inventory cost using the EOQ method is Rp 6.055.453, when using the JIT method, it is Rp 5.185.075. Inventory cost efficiency using the JIT method is 29%, when using the EOQ method, the inventory cost efficiency is 17%. The recommended method given is the JIT method because it is more efficient and has been adapted to the company's conditions.

KEYWORDS

cost, efficiency, EOQ, inventory control, JIT

© The author(s). This work is distributed under the terms of the Creative Commons Attribution-ShareAlike 4.0 International License (CC BY-SA 4.0)

INTRODUCTION

Oyster mushrooms are famous for having many benefits. In addition to being used as a nutrient-filled food ingredient, it can also be trusted since a long time ago as a traditional medicine. Many Indonesian people have started cultivating oyster mushrooms because they already know the benefits and economic value of these oyster mushrooms (Egra et al., 2019; Rahmawati & Marbudi, 2021; Sucipto et al., 2015). During the COVID-19 pandemic, it has no effect on oyster mushroom cultivation businesses, even increasing demand (Haryati, 2021; Pambayun, 2021). On weekdays, the demand for oyster mushrooms in the market is only 300 kg per day, but since the Covid-19 pandemic, market demand has become 1 ton per day (Madani, 2020). So that the increasing demand must be balanced with optimal production, one of which is by paying attention to the production of oyster mushroom planting media, namely baglogs.

The availability of oyster mushroom baglogs can be fulfilled if the inventory of input or raw materials for oyster mushroom baglogs is in optimal condition (Jumar et al., 2022). Determining the amount of raw material purchases made by business owners for the baglog production process generally still uses conventional methods, namely with uncertain time and quantity and only following instructions from business owners (Ramdan, 2017). However, if one buys in large quantities and let it sit for too long, these conditions can make the quality of raw materials decrease and even no longer quality, so producers have to replace with new raw materials and result in inefficiency which has an impact on production costs.

Control system and raw material planning carried out by CV. DA uses the conventional method of purchasing raw materials with an estimated order quantity from the company owner and the quantity ordered is exaggerated because it anticipates a surge in demand. This is done because the company cannot make sudden purchases of raw materials. The excess purchase quantity can cause a decrease in quality if there is no surge in demand as assumed by the company owner, and cause customer loyalty to decrease within a certain period of time due to buying baglogs with not maximum quality. These conditions can have an impact on storage costs that are quite high because unused baglog raw materials are stored in storage locations for a certain period of time. Even though the characteristics of companies that have constant demand can be more appropriate when using other inventory management methods whose characteristics are the same as the company, namely the Just in Time (JIT) or Economic Order Quantity (EOQ) method. So it is hoped that one of these methods can be more cost-efficient without hampering the baglog production process.

Broadly speaking, the problems experienced by CV. DA in the form of purchase quantity and storage costs (electricity costs, PBB, damage costs, and labor costs to arrange storage) of raw materials that have been purchased. The system in determining the amount of raw material purchases made is still conventional, namely estimates from company owners, with demand that is fairly constant and high, company owners are accustomed to buying raw materials in sufficient quantities so that it can cause high storage costs. Based on the description of the problem above, the purpose of this study is to find out the control of baglog raw material inventory carried out by CV. DA, the optimal baglog raw material inventory cost for CV. DA using the Just in Time and Economic Order Quantity methods, and inventory cost efficiency and recommendations in the form of methods and purchase quantities that are more appropriate for CV. DA.

METHOD

The research was carried out in CV. DA located in Kebonagung Village, Pakisaji District, Malang Regency, East Java. The technique of determining respondents in this study was carried out purposively, namely the owner of the company. To answer the first problem formulation is done descriptively. The second and third objectives are carried out by means of JIT calculations according to Heizer and Render (Heizer et al., 2008).

1) Calculate minimum order quantity

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

2) Calculate total minimum costs

   $T^* = + \frac{CQ^*}{2} \frac{OD}{Q^*}$

3) Calculate the optimal number of deliveries each time a message

   $na = (\frac{Q^*}{2 \text{ x } a})^2$

4) Calculate order quantity for each order

   $Qn = \text{ x } Q^* \sqrt{na}$

5) Calculate the optimal shipment quantity for each shipment

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

6) Calculating the frequency of purchasing auxiliary raw materials
   $n = \frac{D}{Qn}$
7) Calculate the total cost of inventory in the Just in Time system
   TIC = (Number of Vehicles x Booking Intensity x Booking Cost Each Time Order) + (Raw Material Purchase/2 x Storage Cost Per Unit)
8) The second and third objectives are carried out by means of EOQ calculations
   $EOQ = \frac{\sqrt{2\,(D)(S)}}{C}$

From the results of the data with the calculation of the two methods, it can be seen that if the JIT method has a smaller total inventory cost than the method that has been applied by the company, namely the conventional method, it can be concluded that the JIT method is more efficient, as well as the EOQ method. So that one of the two methods that has the smallest total raw material inventory cost can be a recommendation for companies in streamlining the cost of raw material inventory.

RESULTS AND DISCUSSION

Raw Material Inventory Control Method in CV. DA

Control of raw material inventory carried out by CV. DA starts from determining the raw materials to be purchased first in the breakdown by the company owner who is also the head of production to estimate the quantity of raw material purchases based on the demand received, the availability of the remaining raw materials, and the remaining storage area. In general, company owners will exceed the quantity of raw materials purchased, which is estimated at 20% to a maximum of 50% of raw material needs for one week. This is done because in the field sometimes there are shipping problems that are late or jammed, but until now if there are shipping obstacles it has not hampered the production process because it already has sufficient stock of raw materials.

The stability of the company's raw materials is carried out by having more than one supplier, because the main raw materials used cannot be purchased in the market like stores in general, but must buy to other industries. This is done to anticipate if there are suppliers with low stock capacity, so they can switch to other suppliers. Current CV. DA has suppliers who have been selected both in terms of quality and stable quantity. The number of suppliers of sawdust is 4 people, rice bran 2 people, and corn flour 3 people. During this time CV. DA makes purchases to suppliers in turns and purchases tend not to be made suddenly so it is necessary to build closeness with suppliers, CV. DA closes by visiting or drinking coffee outside so that other waivers can be made if needed, such as sudden purchases, gradual delivery, or payment at the end. Another purpose of selecting suppliers in addition to maintaining quality and quantity is so that the results of the estimated production target of the raw materials used tend to be the same, so that the cost calculation is more accurate and production quality is also constant in accordance with company provisions.

Baglog Raw Material Control Analysis in CV. DA

Conventional

Control of raw material inventory carried out by CV. DA still uses conventional methods. The method of determining the quantity of raw material purchases is carried out by breaking down raw material needs based on the demand received, the availability of remaining raw materials, and the remaining storage area But also adding raw material inventory, an estimate of 20% to a maximum of 50% of raw material needs for one week. This will lead to more storage costs and inventory costs for each existing raw material. The cost of storing raw materials consists of electricity costs, land and building tax costs, damage costs, and labor costs. The total purchase cost, total storage cost, and total inventory cost can be seen in Table 1.

Table 1. Total Cost of Inventory in CV. DA

Raw Materials	Purchase Fee for Each Order (Rp)	Unit Storage Cost (Rp)	Total Inventory Cost (Rp)
Sawdust	105.000	27,72	5.093.129,53
Bran	105.000	27,11	1.430.397,54
Lime	25.000	57,34	162.878,56
Cornstarch	25.000	27,52	325.753,21
Plastic	5.000	43,62	76.287,88
Baglog Ring	15.000	45,87	67.726,8
Seed	5.000	41,35	120.804,87
Cover	5.000	50,67	50.772,71
Total	290.000	321,2	7.327.751,1

Source: Primary data processed, 2021

EOQ (Economic Order Quantity) Method

Raw material inventory control using the EOQ method basically has the same components as conventional raw material control methods. The difference lies in the quantity and frequency of purchasing raw materials. The EOQ method will provide recommendations for a more optimal raw material purchase quantity along with the frequency of purchases. The frequency of purchases, purchase quantity, and EOQ results within 6 months can be seen in Table 2.

Table 2. EOQ method on CV. DA

Raw Materials	Purchase Frequency (Times)	Purchase Quantity (kg)	EOQ (IDR)
Sawdust	5	37.335,5	3.667.470,03
Bran	3	22.038,33	1.558.729,56
Lime	2	1.533,03	93.951,97
Cornstarch	4	6.388,01	387.899,01
Plastic	2	450,63	99.828,24
Baglog Ring	2	938,8	81.531,37
Seed	2	475,35	109.827,86

Cover	2	245,34	56.215,68

Source: Primary data processed, 2021

The calculation results in the form of frequency and quantity of purchases provide the lowest cost of this method so that companies can find out inventory costs when using the EOQ method, this is similar to Rangkuti's (2007) statement that EOQ provides the amount of raw material purchases each time the order is at the lowest cost. Rangkuti's statement is supported by Assauri's opinion (2005) EOQ is the number or size of orders owned, ordering costs and carrying costs are the minimum.

Method JIT (Just in Time)

In addition to the EOQ method, raw material inventory control that can be applied by CV. DA is a JIT method. This method allows an enterprise to have a minimum or even close to zero amount of inventory. With this method, it is expected to help companies to streamline existing inventory costs. In addition to the available data, the calculation of the JIT method requires a targeted average quantity of inventory, this has been prepared by the company owner, which is an estimate of 5% to 15% of the total raw material needs for 6 months, this provision is used if the company applies the JIT method because it can allow the company to have a minimum amount of inventory. The results of calculations using the JIT method within 6 months can be seen in Table 3.

Table 3. JIT Method on CV. DA

Raw Materials	Frequency of purchase of raw materials (f)	Order quantity per order (kg) (d)	Number of Sent per message (c)	Shipment quantity per shipment (kg) (e)	JIT (IDR) (g)
Sawdust	3 times	74.671	4 times	18.668	2.463.724
Bran	2 times	44.077	4 times	11.019	989.362
Lime	2 times	2.168	2 times	1.084	331.078
T. Corn	3 times	9.034	2 times	4.517	482.153
Plastic	1 time	901	4 times	225	529.907
Baglog Ring	1 time	1.878	4 times	469	430.756
Seed	1 time	951	4 times	238	529.920
Cover	1 time	425	3 times	142	318.597

Source: Primary data processed, 2021

The results of the JIT calculation show that the number of purchases is not the same as the number of shipments, this is what distinguishes it from the conventional method and the EOQ method. This difference is an important thing that can be considered by companies because with a more periodic number of shipments can make the company not excessive in raw storage. Another prominent difference of this method compared to other methods is from the average targeted inventory, so the company makes an inventory mechanism of 5%-15% compared to the conventional method whose inventory is between 20%-50%. This can be done because this

method allows companies to have a minimum amount of inventory or even 0. According to the statement of Febrina et al. (2016) starting from the problem, namely excessive or continuous purchases of raw materials can add large inventories to the company, so it is expected that the Just in Time (JIT) method can reduce storage costs because purchases are made regularly.

Comparison of Total Cost of Raw Material Inventory Control between Methods

The comparison of total inventory costs between conventional methods, EOQ methods, and JIT methods aims to determine the comparison of inventory costs incurred between methods. This comparison is also carried out to determine the efficiency of each method of controlling raw material inventory. In addition to the comparison of total inventory costs, this sub-chapter also describes the frequency of shipments and quantity each time raw materials are delivered within 6 months can be seen in Table 4 and Table 5.

Table 4. Comparison of Delivery Frequency between Conventional Method, EOQ Method, and JIT Method

Raw Materials	Delivery Frequency (times)		
	Conventional	***EOQ***	***JIT***
Sawdust	48	5	12
Bran	13	3	8
Lime	6	2	4
Cornstarch	12	4	6
Plastic	15	2	4
Baglog Ring	4	2	4
Seed	24	2	4
Cover	10	2	3

Source: Primary data processed, 2021

Table 5. Quantity Each Time of Delivery between Conventional Method, EOQ Method, and JIT Method

Raw Materials	Quantity Each Time Shipment (kg)		
	Conventional	***EOQ***	***JIT***
Sawdust	4.000	37.335,5	18.668
Bran	6.000	22.038,33	11.019
Lime	450	1.533,03	1.084
Cornstarch	2.000	6.388,01	4.517
Plastic	76.59 (69 packs)	450,63	225
Baglog Ring	600 (100,000 seeds)	938,8	469
Seed	39.48 (141 packs)	475,35	238
Cover	37	245,34	142

Source: Primary data processed, 2021

The difference in frequency and quantity of purchases recommended by the EOQ and JIT methods can result in companies reducing purchase frequency and saving purchase costs. This

will certainly affect the total cost of raw material inventory incurred by CV. DA. The comparison of the total cost of raw material inventory between the EOQ method, JIT method, and conventional method within 6 months can be seen in Table 6.

Table 6. Comparison of Total Raw Material Inventory Cost between EOQ Method, JIT Method, and Conventional Method in CV. DA

Raw Materials	Conventional (Rp)	EOQ (IDR)	JIT (IDR)
Sawdust	5.093.129,53	3.667.470,03	2.463.724,62
Bran	1.430.397,54	1.558.729,56	989.362,54
Lime	162.878,56	93.951,97	331.078,28
Cornstarch	325.753,21	387.899,01	482.153,92
Plastic	76.287,88	99.828,24	529.907,25
Baglog Ring	67.726,8	81.531,37	430.756,51
Seed	120.804,87	109.827,86	529.920,65
Cover	50.772,71	56.215,68	318.597,57
Total	7.327.751,1	6.055.453	5.185.075,34

Source: Primary data processed, 2021

Overall raw materials, the total cost incurred by the company for the inventory cost of all raw materials for making baglogs within six months with conventional methods amounted to Rp 7,327,751.1. Meanwhile, if you use the EOQ method, the company will spend IDR 6,055,453 for all raw materials for making baglogs. Then if you use the JIT method, the company will spend IDR 5,185,075.34 for all raw materials for making baglogs. The efficiency of inventory costs obtained when using the EOQ method is 17% by reducing costs by IDR 1,272,298.1, then when using the JIT method, inventory cost efficiency is obtained by 29% with cost savings of IDR 2,142,675.76. This means that if the company uses the JIT method to control its raw material inventory, the company will incur costs that are more efficient than conventional methods and the EOQ method.

Raw materials that are of special concern with the application of this JIT method are raw materials that have limited shelf life, namely sawdust, bran, lime, corn flour, and seeds. In addition to the raw materials already mentioned, are raw materials that do not have limited shelf life.

Through the JIT method for raw materials in the form of sawdust, 12 shipments are made within a period of 6 months so that every month there are 2 shipments and each shipment amounts to 18,668 kg, this can be applied in the company because these raw materials have a maximum shelf life of 1 month. Kooskurniasari's statement (2015) states that sawdust has a maximum shelf life of 1 month with conditions that must be met, namely dry and not humid conditions.

Raw materials in the form of rice bran are shipped 8 times within a period of 6 months so that every month there are shipments of 1 to 2 times and each shipment amounts to 11,019 kg, this can be applied in the company because these raw materials have a maximum shelf life of 6 weeks. In the opinion of Karim et al. (2012) the best condition of bran storage is in sacks with a maximum shelf life of 6 weeks, before the quality becomes degraded in the storage

period afterwards. Furthermore, raw materials in the form of lime are shipped 4 times within a period of 6 months so that every one and a half months there is a shipment of 1 time and each shipment amounts to 1,084 kg, this can be applied in the company because the raw material has a long shelf life. Edi's statement (2019), lime can be durable if stored in a dry state, the step that can be taken is to make a limit so that lime can last a long time.

Raw materials in the form of corn flour are shipped 6 times within a period of 6 months so that every month there is a shipment of 1 time and each shipment amounts to 4,517 kg, this can be applied in the company because the raw material has a maximum shelf life of 107 days or 3 months. According to Amanto et al. (2011), the best shelf life prediction is 153 days for instant yellow corn flour, and 107 days for instant white corn flour. Furthermore, raw materials in the form of seeds are shipped 4 times within a period of 6 months so that every one and a half months there is a shipment of 1 time and each shipment amounts to 238 kg, this cannot be applied in the company because the raw materials have a shelf life of only 30 days after the production date based on the information on the seed packaging, while delivery is made every 90 days if using the JIT method. So that the alternative used is to use the EOQ or conventional method on baglog raw materials in the form of seeds, the selection of the method aims to ensure that the quality and quantity of baglog production does not decrease due to the application of the JIT method.

Warehouse capacity CV. DA in accommodating sawdust every time shipment, which is as much as 4 times compared to conventional methods, is considered sufficient because the raw materials are sent every 2 weeks, with the meaning that every period of time the raw materials in the warehouse will run out because they use the JIT method which has minimal inventory assumption requirements. Furthermore, raw materials in the form of bran and lime hold 2 times the quantity compared to conventional methods, which are shipped every one to one and a half months. For other raw materials such as corn flour, plastic, baglog rings, seeds, and plastics can also still be accommodated in the warehouse because the quantity accommodated by each shipment is 2 to 3 times the amount compared to the quantity with conventional methods, besides that this method allows inventory in small quantities so that when raw materials are shipped again, the warehouse condition is not full of raw materials that have not been carried out in the production process.

The fulfillment of raw materials with a greater quantity is expected to involve all suppliers contributing to meeting the needs of CV. DA. Through a schedule distribution system in each shipment that is made in turn, of course, the raw materials ordered in large quantities are ordered in advance so that at the time of delivery delivery can be delivered according to CV's needs. DA. This is not a problem because CV. DA has selected all suppliers in terms of quality and quantity according to the production results of its oyster mushroom baglogs.

CONCLUSION

Control of baglog raw material inventory at CV company. DA still uses conventional methods. The company determines the quantity of raw material purchases by breaking down raw material needs based on the demand received, the availability of remaining raw materials, and the remaining storage area. In addition, to anticipate unwanted things such as production failures in the form of mycelium not growing or shipping constraints, the company provides

raw material inventories for estimated reserves of 20% to a maximum of 50% of the total raw material needs in one week.

The optimal baglog raw material inventory cost for CV. DA when using the Economic Order Quantity method is Rp 6,055,453. Furthermore, if the company uses the Just in Time method, it is IDR 5,185,075. Both methods are alternatives to reduce the cost of CV raw material inventory. DA, so far the company has incurred inventory costs of Rp 7,327,751 within six months.

The inventory cost efficiency obtained when using the JIT method is 29%, then when using the EOQ method, inventory cost efficiency is obtained by 17%. Then the recommended method that can be given is the JIT method because it is more efficient and has been adjusted in terms of security, shelf life of raw materials, warehouse capacity, and the ability of suppliers to meet the needs of raw materials in accordance with the frequency of shipments made. The purchase quantity that can be given is 74,671 kg of sawdust, 44,077 kg of bran, 2,168 kg of lime, 9,034 kg of corn flour, 901 kg of plastic, 1,878 kg of baglog rings, and 425 kg of cover with periodic delivery quantity in each purchase.

Especially for raw materials in the form of seeds, they cannot apply the JIT method in the company because these raw materials have a shelf life of only 30 days after the production date based on the information on the seed packaging, while delivery is carried out every 90 days. So that the alternative used is to use the EOQ or conventional method, the selection of the method aims to ensure that the quality and quantity of baglog production does not decrease due to the application of the JIT method.

REFERENCES

Amanto, B. S., Atmaka, W., & Rachmawati, D. (2011). Prediksi umur simpan tepung jagung (Zea mays L.) instan di dalam kemasan plastik. *Jurnal Teknologi Hasil Pertanian, 4*(2).

Assauri, S. (2005). *Production management (Manajemen produksi)*. University of Indonesia.

Edi, W. (2019, December 18). *Kapur pertanian dan pengapuran*. Dinas Pertanian Pemerintah Kabupaten Buleleng.

Egra, S., Kusuma, I. W., Arung, E. T., & Kuspradini, H. (2019). The potential of white-oyster mushroom (Pleurotus ostreatus) as antimicrobial and natural antioxidant. *Biofarmasi Journal of Natural Product Biochemistry, 17*(1). https://doi.org/10.13057/biofar/f170102

Febrina, I., Hidayati, K., & Mahsina, M. (2016). Analisis komparatif manajemen produksi metode just in time dengan metode tradisional dalam rangka meminimalisir biaya produksi pada CV. Cipta Artha Sejahtera. *E-Journal Akuntansi" EQUITY", 2*(1).

Haryati, N. (2021). Business model analysis of mushroom agroindustry and its sustainable development strategy in Covid-19 pandemic. *IOP Conference Series: Earth and Environmental Science, 733*(1), 012125.

Heizer, J., Render, B., & Munson, C. (2008). *Operations management*. Prentice-Hall.

Jumar, Saputra, R. A., Nugraha, M. I., & Wahyudianur, A. (2022). Essential dynamics of rice cultivated under intensification on acid sulfate soils ameliorated with composted oyster mushroom baglog waste. *Pertanika Journal of Tropical Agricultural Science, 45*(3). https://doi.org/10.47836/pjtas.45.3.02

Karim, M. A., Afifah, N., & Desnilasari, D. (2012). *Kajian masa simpan dan kualitas dedak sebagai bagian dalam prosedur penanganan bahan baku pakan*. LIPI Subang.

Kooskurniasari, W. (2015). *Pemanfaatan serbuk gergaji kayu sengon (albizia chinensis) sebagai sorben minyak mentah dengan aktivasi kombinasi fisik* [Undergraduate Thesis]. UIN Syarif Hidayatullah Jakarta.

Madani, M. A. (2020, June 28). *Bisnis jamur tiram tetap eksis di tengah pandemi Covid-19*. Republika.

Pambayun, C. K. (2021). Oyster mushroom business at pandemic Covid-19 era (Study on improving the working productivity of the communities in Kajang Village, Madiun District). *El-Qist: Journal of Islamic Economics and Business (JIEB)*, *11*(1). https://doi.org/10.15642/elqist.2021.11.1.49-59

Rahmawati, N., & Marbudi. (2021). Analysis of oyster mushroom farming in highlands (A case study in Sleman and Temanggung Indonesia). *E3S Web of Conferences*, *232*. https://doi.org/10.1051/e3sconf/202123201012

Ramdan, M. (2017). *Perencanaan persediaan bahan baku dengan menggunakan metode Closed Loop Material Requirement Planning (CLMRP) di Wenys Leather Bantul* [Undergraduate Thesis]. Universitas Islam Indonesia.

Rangkuti, F. (2007). *Manajemen persediaan*. PT. Raja Grafindo Persada.

Sucipto, E., Oktaviani, R., & Rizal, R. (2015). The effects of partnership and entrepreneurship toward business performance of oyster mushroom (Pleurotusostreatus). *Indonesian Journal of Business and Entrepreneurship*, *1*(1). https://doi.org/10.17358/ijbe.1.1.32