Vol. 14, No. 4 (2025): 1212 - 1221 http://dx.doi.org/10.23960/jtep-l.v14i4.1212-1221

JURNAL TEKNIK PERTANIAN LAMPUNG

ISSN 2302-559X (print) / 2549-0818 (online)
Journal homepage : https://jurnal.fp.unila.ac.id/index.php/JTP

Analysis of Raw Material Inventory Control in Robusta Ground Coffee Production

Adinda Dwi Ulfah Maharani[1], Sri Tjondro Winarno[1,✉], Sri Widayanti[1]

[1] Faculty of Agriculture, UPN "Veteran" Jawa Timur, Surabaya, INDONESIA.

Article History:

Received : 07 August 2024
Revised : 22 October 2024
Accepted : 06 November 2024

Keywords:

Forecasting.
Lot Sizing,
Material Requirements Planning.

Corresponding Author:
✉ sritjondro_w@upnjatim.ac.id
(Sri Tjondro Winarno)

ABSTRACT

This study aims to analyze raw material inventory control using the Material Requirements Planning method as raw material inventory control and to forecast inventory in 2024. The data analysis method is qualitative quantitative descriptive analysis. This analysis was carried out at CV Kopi Citarasa Persada. Efficiency data processing uses Minitab 21 and Excel. The problem in this study is related to frequent running out of raw materials due to late ordering by the company. The results of the study show that the availability of raw materials for coffee beans, packaging and stickers has a Lead Time of 4 days with the application of the Lot Sizing method, Part Period Balancing technique and the Wagner Within Algorithm which are the most efficient in obtaining minimum ordering costs in this study. Robusta ground coffee demand data for a year in 2023 produces forecast data for January and February 2024 by comparing the Moving Average and Single Exponential Smoothing techniques. The comparison results show that the Moving Average technique is suitable for forecasting raw material inventory because it has a smaller MAD value, the smaller the forecast value obtained, the more accurate it is in determining the size of the data as it was originally.

1. INTRODUCTION

Pasuruan Regency is one of the Robusta coffee producing centers in East Java Province. This regency has a characteristic in the coffee produced in the form of taste and aroma that is not owned by other cities or districts. Known by the branding "Kopi Kapiten" makes the outside community more confident in the coffee products produced from Pasuruan. Kapiten coffee is a blend of coffee products produced by eight sub-districts in Pasuruan, namely Purwodadi, Tutur, Puspo, Lumbang, Pasrepan, Purwosari, Prigen, and Tosari. The total area of coffee plantations in Pasuruan is 4,964.01 ha, of which 3,478.81 ha are Robusta coffee plantations and 1,489.2 ha are Arabica coffee plantations (Dinas Pertanian Kabupaten Pasuruan, 2020). The size of the coffee plantation area in Pasuruan Regency is proportional to the coffee products of approximately 2,055.55 thousand tons per harvest (Ramawati *et al*., 2019).

According to Deftania *et al.* (2022), inventory control is a mandatory activity carried out by business actors to determine and ensure the availability of materials needed during the production process both in quality, quantity and the right time. Inventory control activities consist of purchasing raw materials, efficient storage and maintenance of raw materials in the warehouse. Purchasing raw materials in low quantities compared to the available production capacity, results in increased costs due to the frequent ordering process. Meanwhile, companies that buy large quantities of raw materials will also be detrimental, because it makes warehouse storage costs large and the risk of damage to raw materials due to agricultural commodity products (Haydar *et al*., 2022).

Inaccuracy of a company in calculating and determining inventory will affect the profits earned. It is necessary to plan raw material inventory by forecasting past data to determine the number of future needs (Aida *et al*., 2022).

Forecasting is used as a benchmark for estimating the amount of inventory that must be available for the smooth production process. If the company has done forecasting of past product demand, it can be taken into consideration in the production process for the next period. According to Pratama *et al*. (2020), raw material inventory that is not optimally controlled will affect the distribution and sales process. Suboptimal distribution and sale of raw materials will cause over stock (excess raw materials) or out stock (running out of raw materials) in the warehouse. To overcome the problem, the implementation of control is carried out as an effort to improve the company's production efficiency.

The application of the Material Requirements Planning method can be used as an estimate of the need for raw materials in the production process. The MRP technique that has been designed can be made to carry out a planning and control system with a dependent nature or dependent on demand (Pratama, 2019). This method can be used by CV Kopi Citarasa Persada to improve the control system for robusta ground coffee raw materials including coffee beans, packaging and stickers. This study aims to analyze raw material inventory control using the Lot Sizing method and perform inventory forecasting in 2024 to produce company production optimization.

2. MATERIALS AND METHODS

2.1. Materials and Tools

This research was carried out at the CV Kopi Citarasa Persada in Pasuruan. This coffee producer was chosen as a research site because the business has problems regarding inventory control of Robusta ground coffee raw materials. The problem arises because of a less than optimal management system for controlling raw materials, which often results in running out of raw material supplies such as coffee beans, packaging and stickers in the warehouse for the ground coffee production process. The control management system that has been used by CV Kopi Citarasa Persada is only through estimates. The merging of job desks also has an impact on the system, because workers who have many activities will have difficulties to focus. The high consumer demand for green coffee bean causes problems with the raw material for ground coffee, which is often sold as raw bean. This inability makes CV Kopi Citarasa Persada experience a shortage of raw material inventory for ground coffee. The raw material that should be available in the warehouse per month for ground coffee production is 500 Kg, however, it is not in accordance with the rules where HS (hard skin) beans are often sold as green bean to meet consumer demand. Green bean sales are considered less profitable for the company because they have low added value. Hard skin beans are purchased from the warehouse at a price of IDR 60,000/kg for the production of Green bean and ground coffee. The green bean products are sold at IDR 70,000/kg and ground coffee products are sold at IDR 200,000/kg.

2.2. Research Methods and Data Analysis

Materials used in this study included Robusta ground coffee raw material inventory data, Robusta ground coffee consumer demand data, and Robusta ground coffee inventory cost data obtained from CV Kopi Citarasa Persada by looking at the company ledger. The tools used in processing the analysis are Minitab 21 and excel. This research method is descriptive qualitative quantitative. The qualitative descriptive method is obtained by forecasting demand data in 2024 using 2023 demand data. Quantitative descriptive methods are obtained by processing data such as optimal raw material inventory data and minimum order cost data using the Lot Sizing method and will produce raw material purchase data. The data collection techniques used in this research include forecasting, MRP (Materials Requirements Planning) system input, and MRP processing.

A. Forecasting

Forecasting is a calculation technique carried out to estimate future events using past data references with qualitative and quantitative approaches (Sofyan, 2017). The forecasting method in the study uses Single Exponential Smoothing and Moving Average because it is in accordance with seasonally patterned demand data (Martono, 2018).

- **Single Exponential Smoothing Method.** According to Eunike *et al*. (2020), Single Exponential Smoothing serves to smooth out existing seasonal values with different parameters from the original series. Forecasting in this method uses two smoothing parameters, namely with values between 0 and 1 and $0<\alpha<1$. Here is the equation:

$$S_t = \alpha X_t + (1 - \alpha) S_t \quad (1)$$

where S_t is forecasted future value, α is smoothing constant, X_t is actual X value, and S_t is old smoothing value.

- **Moving Average Method.** According to Rhufyano *et al.* (2022), Moving Average functions as a forecast in the coming period. The following are the special characteristics of this method, first, when you want to determine the forecast, you must have historical data for at least the past 3 months. Second, the longer the time period, the more visible the effect will be because the data obtained will be smoother. Here is the equation:

$$M_t = F_t + 1 \quad (2)$$

$$M_t = Y_t + Y_{t-1} + Y_{t-2} + \ldots + Y_{t-n} + 1 \quad (3)$$

where M_t is moving average in period t, $F_t + 1$ is forecast period t+1, Y_t is real value in period t, n is number of boundaries.

B. Materials Requirements Planning (MRP) System Input

- **Master Production Schedule (MPS).** According to Eunike *et al*. (2020), the Production Master Schedule is a plan in the company in determining the amount of product produced and when the product is needed, so that consumer demand can be met and not to reject incoming requests. The production Master Schedule can be calculated by dividing the amount of raw material requirements used by those needed.
- **Bill of Materials (BOM).** According to Limakrisna (2019), Bill of Materials is a description of the product structure that shows the product is formed from various components. The product structure can show the number of items needed to form a product along with the assembly sequence. The description consists of data for each component level, the number of requirements for each component and the source of the components.

Production Master Schedule (PMS) and Bill of Materials (BOM) have a relationship with each other to determine the optimal inventory control results. The Production Master Schedule is used as an analytical tool when the company can buy a raw material in accordance with the company's production schedule to be efficient and minimize the surge or run out of raw materials in the storage warehouse. Bill of Materials is a description of the structure of raw materials in a product produced by the company. Without the description of the BOM, the company will find it difficult to analyze the inventory limit of each raw material needed.

C. Material Requirement Planning (MRP) Processing

- **Netting.** According to Kholil *et al*. (2019), the net requirement method is used to determine the amount of net requirement for Hard Skin (HS) seed raw materials. Obtained net needs from the calculation of the difference between gross requirements and existing inventory either in hand (On Hand) or being ordered (Schedule Receipt).
- **Lot Sizing.** According to Purwoko (2022), the Material Requirement Planning (MRP) method is used to determine Lot Sizing by using a raw material planning format table with three techniques Lot For Lot, Part Period Balancing and Wagner Within Algorithm.
- **Lot For Lot.** According to Guillaume *et al*. (2019), the Lot For Lot (LFL) technique in the MRP method table format is used as a fulfillment of raw material requirements in the production process. The value obtained in this technique is obtained by looking at when the raw material needs are used. The data used is the gross demand for raw materials and inventory in hand. After the data is generated, if the raw materials in the warehouse are still there, there is no need to place a reorder or reorder point.

$$\text{Lot For Lot} = \text{Order Quantity} = \text{Net Requirements} \quad (4)$$

- **Part Period Balancing.** According to Maury *et al*. (2018), the PPB technique is one way in the MRP method that can balance the total ordering cost and the total storage cost by using the Economic Part Period (EPP). This technique is used to determine the number of lots of raw materials even though it is not the same but can reduce the total inventory of existing raw materials. The following is the Economic Part Period (EPP) formula, namely:

$$\text{EPP} = \frac{\text{Ordering Costs}}{\text{Storage Costs}} \quad (5)$$

2.3. Wagner Within Algorithm

According to Tersine (1994), the Wagner Within Algorithm (WWA) technique is an optimization calculation technique based on a dynamic program derived from the entire schedule of requirements by minimizing order costs and storage costs. This method can be done for all ordering methods in fulfilling the schedule of needs for each horizon period. The use of the algorithm is useful as a combination of all past periods for the fulfillment of the next period and will provide an optimal minimum cost. The following is the calculation of the Wagner Within Algorithm, namely:

Ordering Costs: $${}_{k}(P_{jk}) = A_j + P_j\,(N_j + N_{j+1} + \ldots. + N_k) \quad (6)$$

Inventory Costs: $${}_{k}(I_{jk}) = \sum_{r=\,j\,+\,1}^{k} k\,(Ir) \quad (7)$$

3. RESULTS AND DISCUSSION

3.1. Demand Data

CV Kopi Citarasa Persada is an Agroindustry company that focuses on producing ground coffee. The company produces its products based on historical data from consumer demand. Robusta ground coffee demand data can be seen in the graph attachment. The graph is known if the highest demand for robusta ground coffee is in the 5th month of 575 kg while the lowest demand is in the 9th month of 300 kg. The following is a graph of the pattern of ground coffee demand data can be seen from Figure 1. Robusta ground coffee demand data in 2023 which has a seasonal pattern. The existence of fluctuating data that occurs in the monthly period causes the graph to be included in the seasonal data pattern. The pattern can be observed through the similarity of demand for robusta ground coffee repeatedly. The same data pattern is in weeks 2 to 4, weeks 6 to 9 and weeks 11 to 12. The similarity is measured by the amount of consumer demand which is almost the same in each month. So, it can be said that the pattern in Figure 4.4 is a seasonal data pattern.

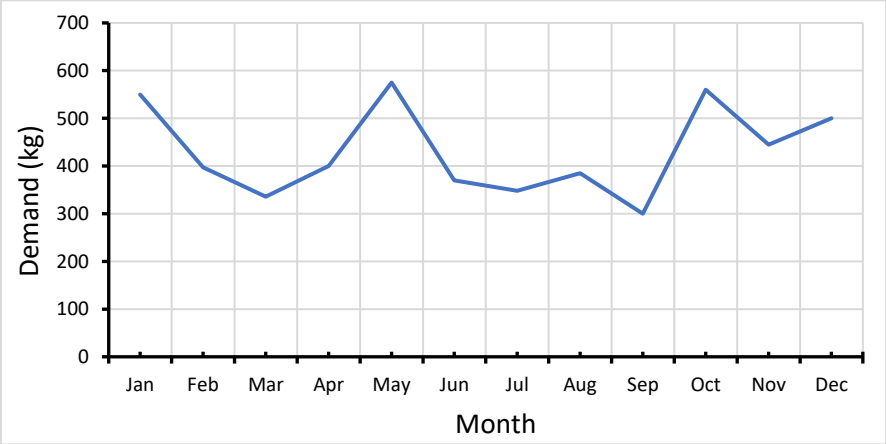

Figure 1. Demand for Robusta ground coffee in 2023

3.2. Bill of Materials (BOM)

The existing product structure is then used as a description of the product structure on the Bill of Materials (BOM). The description consists of data for each component level, the amount needed for each component and the source of the component. The components required for the manufacture of Robusta ground coffee products per 1 kilogram require raw materials including hard skin beans, packaging and stickers. Table 1 shows BOM of Robusta per kilogram ground coffee products. Based on Table 1, it is known that to produce Robusta ground coffee products, first, the ground coffee content component is 1 kilogram, which is obtained by producing it yourself. Second, Hard Skin Coffee beans as much

as 1.2 kg obtained by processing themselves. Third, Packaging which is useful as the outer packaging of coffee by buying from suppliers. Fourth, the sticker used as a brand of ground coffee comes from buying from suppliers by customizing the company's signature "logo".

Table 1. Robusta ground coffee bill of materials for CV Kopi Citarasa Persada

Component Level	Items	Amount Needed	Product Source
0	Robusta Ground Coffee	1 Kg	Production
1	Hard Skin Seems	1,2 Kg	Production
1	Packaging	1 Pcs	Buy
1	Stikers	1 Pcs	Buy

3.3. Raw Material Forecasting in 2024

Forecasting is a calculation technique carried out to estimate future events using past data references with qualitative and quantitative approaches. According to Pratama *et al*. (2020), a demand that has a seasonal data pattern can use the Moving Average and Single Exponential Smoothing methods as forecasting. Forecasting processing is carried out with Minitab 21 software using historical demand data for 2023.

Ground coffee at CV Kopi Citarasa Persada using historical demand data for 1 year, namely 2023 in a monthly period. Demand data will then be used as a benchmark in determining the forecasting method used. In forecasting analysis, the method with the smallest error value is used so that the results are effective and used to determine the Production Master Schedule (JIP). The following is Table 2 regarding the results of the two methods.

Table 2. Forecasting results of MA and SES methods on Minitab 21 for CV Kopi Citarasa Persada

Forecasting Method	MAD	MAPE	MSD	Forecast
Moving Average	25.3	104	15.264.6	472.5
Single Exponential Smoothing	28.6	122.1	18.235	495.404

Based on the calculation results as shown in Table 2, it is obtained that the appropriate forecasting method used is Moving Average because it has an MAD value of 25.3, MAPE of 104 and MSD of 15,264.6 smaller than the MAD of 28.6, MAPE of 122.1 and MSD of 18,235 in Single Exponential Smoothing forecasting. So, the forecasting data in January and February of 2024 has a demand value of 472.5. Meanwhile, the results of research from Irwansyah (2020), state that the forecasting used in determining the logistics inventory of the company jamu sehat perkasa using the Moving Average method is more appropriate than the Single Exponential Smoothing method because it has the smallest MAD, MAPE and MSD values.

3.4. Master Production Schedule

The Master Production Schedule (MPS) at the CV. Kopi Citarasa Persada is obtained from the results of previous forecasting in 2023 which consisted of 12 months. These results are used to meet the forecasting of consumer demand of Robusta ground coffee for the first 2 months of 2024. The MPS is used as a benchmark for production schedules and purchasing raw materials efficiently. Table 3 shows PMS at the CV. Kopi Citarasa Persada for January and February 2024. The monthly PMS obtained in Table 3 is then broken down into weekly schedule to simplify the calculation. It is assumed that 1 month consists of 4 weeks and the number of units from the first week to the fourth week produces the same product. Table 4 details the Master Production Schedule per week during January and February 2024.

Table 3. Master Production Schedule (MPS) at the CV. Kopi Citarasa Persada for January and February 2024

Month	Quantity Request (unit)
January – 2024	472
February – 2024	472

Table 4. Weekly MPS of Robusta ground coffee product at the CV. Kopi Citarasa Persada for January and February 2024

Month	Week				
	1	2	3	4	Totals (unit)
January	118	118	118	118	472
February	118	118	118	118	472

Table 4 is a weekly Master Production Schedule with forecasting results in January and February 2024 of a total 944 unit products. The number of products is calculated into weekly production where each week produces 118 units of Robusta ground coffee products. This schedule is obtained from the results of forecasting data on the number of consumers of Robusta ground coffee in 2023.

3.5. Inventory Cost

Inventory Costs at CV Kopi Citarasa Persada are categorized into two, namely ordering costs and storage costs. Ordering costs required in the process of purchasing raw materials include telephone costs, administrative costs and inspection costs. Storage costs are costs incurred from storing raw materials such as warehouse maintenance costs.

3.5.1. Ordering Cost

Ordering costs are costs incurred by the company when purchasing raw materials. The amount of ordering raw materials is influenced by many incoming orders. In this company, purchases occur at the company's own warehouse because the raw materials come from private gardens. However, costs remain due to the need for a communication and transportation process from the warehouse to the production plant. The following Table 5 is a breakdown of ordering costs as follows. Based on Table 5, telephone costs occur due to the communication process between production staff and other parties carried out at CV Kopi Citarasa Persada. Generally, the duration of the conversation is approximately 3 min per order. This cost is charged at a rate per minute of IDR 300, - according to the estimated internet cost.

Transportation costs occur due to the transfer of raw materials from the warehouse to the production plant. The sacks of coffee beans are carried using tosa transportation with a one-way fee of IDR 5,000. The transportation is carried out by workers in charge of the plantation. Inspection costs are costs incurred to check the quality of coffee beans that have been harvested. Good beans are included in the Grade A group while defective beans will be distinguished and not processed with good quality coffee beans.

Table 5. Breakdown of ordering costs into three components

No.	Cost	Rate (IDR/order)	Totals (IDR/order)
1.	Cost Telephone	900	900
2.	Cost Freight Wages	5,000	5.000
3.	Cost Inspection	2,500	2.500
	Totals		8,400

Table 6. Raw Materials Storage Cost

Raw Materials	Unit	Unit Price (IDR/unit)	Ordering Costs (IDR)	Weekly Storage Costs (IDR/unit)
Coffee beans	g	60	8,400	0.05
Packaging	unit	4,500	8,400	3.75
Stickers	unit	600	8,400	0.5

3.5.2. Storage Cost

Storage costs are costs incurred during the process of stacking raw materials in the company's warehouse. Stacking is in the storage warehouse that has been prepared by CV Kopi Citarasa Persada so there is no need to pay rent. The warehouse does not have electricity, but there are warehouse maintenance costs. Table 6 contains details of the cost of storing raw materials incurred by the company. Coffee beans have a price IDR 60 per gram with a weekly storage cost

of IDR 0.05 per gram of coffee beans. Packaging has a price per unit of IDR 4,500 with a storage cost per unit of IDR 3.75. Sticker raw materials have a price of IDR 600 per unit with a storage cost of IDR 0.5 per unit. Storage costs are obtained from the price of each raw material multiplied by the number of days in a week and divided by the amount of ordering costs incurred by the company.

3.6. Determination of Raw Material Inventory with the MRP Methods

- **Netting**

The calculation of net needs is useful for knowing the net needs of the ingredients that make up Robusta ground coffee. This calculation includes the amount of raw material inventory that already exists or is being ordered. The net need for this raw material is assumed to be zero (0). Robusta ground coffee production needs in January and February 2024 are the same as 472 products. While the Bill of Materials in producing 1 product consists of 1.2 kg Robusta coffee beans, 1 sticker and 1 packaging. From these components, the calculation of net requirements or netting for each raw material is done as follows:

Hard Skin coffee beans	: 1.2 kg × 944	= 1,132.8 kg
Packaging	: 1 pcs × 944	= 944 pcs
Stickers	: 1 pcs × 944	= 944 pcs

Net calculation of raw materials for Robusta ground coffee products with inventory in hand amounted to 0 because they wanted to do a net calculation. The results obtained by the company require raw materials per week as much as 141.6 kg of coffee beans, 944 pcs of packaging and 944 pcs of stickers to produce 944 units of Robusta ground coffee products.

- **Lot Sizing**

According to Destiato (2022), Lot Sizing is a calculation system in Material Requirements Planning that functions as determining the most optimal production schedule and net requirements. Net needs that have been obtained for each raw material, it is necessary to plan for the repurchase of these raw materials. Purchase planning is carried out by determining the amount of raw material required and when the optimal time of purchase is carried out. In this research, lot determination is calculated using three lot sizing methods, namely Lot For Lot, Part Period Balancing and Wagner Within Algorithm.

Lot for Lot

Lot for Lot calculations of raw material purchases are made every week according to the needs of the company. The costs that arise in this method are only ordering costs because the raw materials are not stored. Table 7 shows the final result of the Lot for Lot calculation.

Table 7. Final results of raw material calculation Lot for Lot method

No.	Raw Materials	Total Inventory Costs (IDR)
1.	Coffee seems	67,200
2.	Packaging	50,400
3.	Stickers	50,400

Based on Table 7, it shows that each raw material purchase cost is influenced by the cost of raw material orders made per week. The cost of purchasing Robusta coffee beans is obtained as a result of IDR 67,200 using this method, because ordering occurs consecutively per week for 2 months. Ordering the number of coffee beans in the first week of January 2024 is different from the next week because the company still has 120 kg of inventory on hand. The cost of purchasing packaging and stickers obtained the same result of IDR 50,400. This equation is influenced by the company's on-hand inventory of 300 pcs per material, so that there is only an order for raw materials again starting from the third week of January 2024.

Part Period Balancing

The Part Period Balancing method is one of the lot calculation techniques used to calculate the combination of raw material requirements for each period so as to produce parts with a value close to EPP. This calculation is done by summing up the company's raw material requirements for several periods until the storage costs incurred are greater than or equal to the ordering costs. Part of the period that is close to the EPP value will be selected as a combined period. Table 8 shows the final result of the Part Period Balancing calculation on each raw material.

Table 8. Final results of raw material calculation of Part Period Balancing method

No.	Raw Materials	Total Inventory Costs (IDR)	
		Part Period Balancing	Wagner Within Algorithm
1.	Coffee seems	16,948.68	8,602.24
2.	Packaging	11,497.5	15,037.5
3.	Stickers	8,843	9,285

Based on Table 8 shows the final results in the calculation of each raw material used for the production of robusta ground coffee using the Part Period Balancing method. The cost of purchasing coffee beans is obtained as a result of IDR 16,948.68,- using this method, because the order occurs once per month. Coffee bean orders occurred in the first week of January 2024 and the fourth week in February 2024. The cost of purchasing packaging obtained a result of IDR 11,497.5,- by ordering raw materials once in two months, namely the third week. Meanwhile, the cost of purchasing sticker raw materials obtained results of IDR 8,843,- by ordering raw materials once in two months, namely the third week. Ordering packaging and stickers is done once in two months due to the availability of on hand owned by the company.

Wagner Within Algorithm

Wagner Within Algorithm calculations are used in all orders in various ways. This method can fulfill the schedule for each raw material requirement required each period with the optimal solution (Nasution, 2021). The method used in this calculation is done using logarithms.

Based on Table 8, it shows the final results in the calculation of each raw material used for the production of robusta ground coffee using the Wagner Within Algorithm method. The cost of purchasing coffee beans is obtained as a result of IDR 8,602.24,- using this method, because the order occurs once for two months. Coffee bean orders occur in the first week of January 2024. The cost of purchasing packaging obtained a result of IDR 15,037.5,- by ordering raw materials once in two months, namely the third week of January 2024. Meanwhile, the cost of purchasing sticker raw materials obtained results of IDR 9,285,- by ordering raw materials once in two months, namely the third week of January 2024. Ordering packaging and stickers is done once in two months due to the availability of on hand owned by the company.

3.1 Comparison of Actual Raw Material Inventory Control

After calculating the final results of purchasing each raw material using three methods (Wagner Within Algorithm, Lot for Lot, and Part Period Balancing) were then compared. These results are compared and analyzed to judge which method produces the minimum value. Table 9 provides an overview of the comparison of the three methods for each raw material for coffee beans, packaging and stickers.

Table 9. Comparison of Lot Sizing Results

No.	Raw Materials	Lot Sizing Methods		
		Lot For Lot (IDR)	Part Period Balancing (IDR)	Wagner Within Algorithm (IDR)
1.	Coffee beans	67,200	16,948.68	8,602.24
2.	Packaging	50,400	11,497.5	15,037.5
3.	Stickers	50,400	8,843	9,285

Based on Table 9, it can be explained that the most optimal type of method for each raw material is different. For example, coffee bean raw materials from the three lot sizing calculations of the Wagner Within Algorithm method with the minimum cost of IDR 8,602.24. Therefore, coffee bean raw materials will be used with the calculation results of the Wagner Within Algorithm method. For packaging raw materials have the lowest cost using the Part Period Balancing method with an order cost of IDR 11,497.5. Finally, sticker raw materials where the minimum cost generated from the three methods is in the Wagner Within Algorithm of IDR 9,285. Thus, in preparing the Material Requirements Planning table will be adjusted to the number of lots each according to the method with the minimum cost. The method that has been determined as inventory control in purchasing Robusta ground coffee raw materials is a method that has passed feasibility testing and has been compared to other methods. The company's operational efficiency will be good when implementing the purchase of raw materials according to the most efficient method so that the company will receive revenue maximization and minimize storage costs in the future.

4. CONCLUSION

The application of the Material Requirements Planning method to the planning of robusta ground coffee raw materials which include Hard Skin beans, packaging and stickers at CV Kopi Citarasa Persada can be concluded if the raw material inventory planning carried out still uses conventional methods based on estimates. If raw materials such as stickers run out before placing an order, the company will leave and sell the product without a brand. The need for raw materials is not optimal due to planning activities carried out for a year in 2023 without estimates, which will have an impact on production continuity. The results of forecasting with the Moving Average comparison technique are more significant because it has a small MAD value compared to the Single Exponential Smoothing technique to determine demand in January and February of 2024. The processing results of the Material Requirements Planning (MRP) method using lot sizing to compare the optimal raw material costs in the Lot For Lot technique, Part Balancing Period and Wagner Within Algorithm have different values. Coffee bean raw materials have optimal costs when calculating with the Wagner Within Algorithm technique with a value of IDR 8,602.24. Packaging raw materials have an optimal cost with the Part Period Balancing calculation technique of IDR 11,497.5. Meanwhile, the sticker raw material obtained an optimal cost of IDR 9,285 with the Wagner Within Algorithm technique. The importance of an efficient raw material inventory control system is important for all companies to maintain optimality in the production process.

REFERENCES

Aida, N., Kantun, S., & Tiara. (2022). Analisis pengendalian persediaan bahan baku menggunakan metode EOQ pada pabrik tahu di Kabupaten Jember. *Adi Bisnis Digital Interdisiplin (ABDI Jurnal)*, ***4***(1), 9-16. https://doi.org/10.34306/abdi.v4i1.890

Deftania, A., Meri, M., & Linda, R. (2022). Analisis pengendalian persediaan bahan baku dengan metode economic order quantity. *UNES Journal of Scientech Research*, ***7***(1), 035-045.

Destianto, A.S. (2022). Rancang Bangun Sistem Pendukung Keputusan Pemilihan Metode Lot Sizing Terbaik Untuk Pengendalian Persediaan Bahan Baku Pada UD. Tanjung Sari. [*Undergraduated Thesis*]. Universitas Dinamika.

Dinas Pertanian Kabupaten Pasuruan. (2020). *Hasil produksi kopi di Kecamatan Tutur Kabupaten Pasuruan tahun 2019*. https://satudata.pertanian.go.id (Accessed on December 5, 2024).

Eunike, A., Setyanto, N.W., Yuniarti, R., Hamdala, I., Prasetyo, R., & Fanani, A.A. (2020). *Perencanaan Produksi dan Pengendalian Persediaan*. Universitas Brawijaya, Malang.

Guillaume, R., Thierry, C., & Zieliński, P. (2017). Robust material requirement planning with cumulative demand under uncertainty. *International Journal of Production Research*, ***55***(22), 6824–6845. https://doi.org/10.1080/00207543.2017.1353157

Haydar, R., & Nurrahman, A. (2022). Aplikasi dashboard pengendalian persediaan bahan baku menggunakan EOQ probabilistik pada pabrik beras. *Jurnal Riset Teknik Industri*, ***2***(2), 151-160. https://doi.org/10.29313/jrti.v2i2.1329

Irwansyah. (2020). Penerapan Material Requirements Planning Dalam Perencanaan Persediaan Bahan Baku Jamu Perkasa Pada PT. Nyonya Meneer Semarang. [*Undergraduated Thesis*]. Universitas Diponegoro.

Kholil, M., Chandra, A., & Hanum, B. (2019). *Perencanaan Pengendalian Produksi & Logistik*. Mitra Wacana Media, Bogor.

Limakrisna, N. (2019). *Teori dan Kasus Manajemen Operasi*. Deepublish, Yogyakarta.

Martono, V.R. (2018). *Manajemen Operasi Konsep & Aplikasi*. Salemba Empat, Jakarta.

Maury, J., Dundu, A.K.T., & Arsjad, T.T. (2018). Perencanaan biaya berdasarkan jumlah dan waktu pemesanan dengan metode MRP (Material Requirement Planning) (Studi kasus: dilakukan pada proyek pembangunan terminal AKAP Tangkoko Bitung). *Jurnal Sipil Statik*, ***6***(10), 861-866.

Nasution, H., & Situmorang, M.I.F. (2015). Analisis pengendalian persediaan produk untuk meminimumkan biaya persediaan dengan algoritma Wagner-Within. *KARISMATIKA*, ***1***(3), 61-71.

Pratama, D.A., Hidayati, S., Suroso, E., & Sartika, D. (2020). Analisis peramalan permintaan dan pengendalian persediaan bahan baku pembantu pada industri gula (Studi kasus PT. XYZ Lampung Utara). *Jurnal Penelitian Pertanian Terapan*, ***20***(2), 148–160. https://doi.org/10.25181/jppt.v20i2.1636

Pratama, K.L. (2019). Standard Operating Procedure in Couvee Coffee Using Material Requirements Planning Approach. [*Undergraduated Thesis*]. Universitas Islam Indonesia.

Purwoko, S. (2022). *Perencanaan dan Pengendalian Produksi*. Deepublish, Yogyakarta.

Ramawati, R., Soedarto, T., & Nurhadi, E. (2019). Pengolahan kopi dan analisis nilai tambah kopi robusta di Kecamatan Tutur Kabupaten Pasuruan. *Berkala Ilmiah Agribisnis AGRIDEVINA*, ***8***(2). https://doi.org/10.33005/adv.v8i2.1859

Rhufyano, A., Robbani, M., Arifin, H., Mufti, J., & Lazuardy, A. (2022). Optimizing Efficiency through Application of the Materials Requirement Planning and Demand Forecasting: A Case Study of a Small and Medium-Sized Enterprise in the Tea Beverage Industry. In *5th European International Conference on Industrial Engineering and Operations Management*, https://doi.org/10.46254/EU05.20220243

Sofyan, D.K. (2017). Analisis persediaan bahan baku buah kelapa sawit pada PT. Bahari Dwikencana Lestari. *Industrial Engineering Journal*, ***6***(1), 50–56.

Tersine, R. (1994). *Principle of Inventory and Materials Management.* Fourth Edition. PTR Prentice Hall Inc., New Jersey.