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Analysis of Raw Material Inventory Management for Processed Nutmeg Juice Products (Case Study in UD Tomasiwa, Morella Village Leihitu District, Central Maluku Regency)

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A R T I C L E I N F O

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A B S T R A C T

This study aims to (1) Determine thecharacteristics of the nutmeg juice business in Morella Villageand (2) Analyzeraw material inventory management for processed nutmeg juice products. The sampling method used was purposive sampling. This study employed a mixed method approach, integrating both qualitative and quantitative methods, based on primary and secondary data sources. The analysis tools used were Economic Order Quantity (EOQ), Safety stock, Reorder point (ROP), and Total inventory cost (TIC). The research findings indicate that Morella Nutmeg Juice businessis a household-based micro-enterprise that operates using owner's equity and is individually owned. The averageprocessing capacity is approximately 2,467 nutmegfruits, equivalentto 74 kg of nutmeg pulp. Production process was carried out of 59 times a year, with an average raw material consumptionof 13,230 nutmeg fruits per month. The raw materials ordering cost IDR50,000 per order, while annual holding costs amounted to IDR4,200,000. The application of was the Economic Order Quantity (EOQ) method indicated an optimal order quantity of approximately 28,037 unit per order, with an ordering frequencyof 6 to 7 times per year. The safety stock and the reorder point were each calculated at 19,314 units. The total inventory cost under the EOQ method amonted to IDR644,856, which was significantly lower than the company's existing inventory costofIDR3,254,290. There fore, the eoq method can help determinethe optimal raw material orderquanty, there by reducing inventory costs and minimizing therisk of raw material shortages

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INTRODUCTION

Inventory management constitutes a pivotal dimension of operational management, functioning to guarantee the availability of raw materials at an optimal threshold, thereby ensuring a seamless production process without incurring stock surpluses or deficits. Previous research shows that the application of the Economic Order Quantity (EOQ) method and measurable inventory control can reduce total inventory costs by up to 15% in the nutmeg processing industry in Ambon (Khairuddin, 2020).Correspondingly research on the Nunilai SME in Hutumuri Village shows that calculating reorder points and safety stock sustains small-business production despite raw material supply fluctuations (Maitimu & Pattiopon, 2019).Critical variables within inventory management encompass the projection of raw material requirements, procurement costs, holding costs, reorder points, and safety stock parameters (Khairuddin, 2020). Morella Village, situated in the Leihitu District of Central Maluku Regency, represents a prominent nutmeg-producing region in Maluku. Morella Village is highly recognized for its innovative nutmeg derivatives, specifically nutmeg juice produced by local Micro, Small, and Medium Enterprises. This product has been commercialized across various territories in Maluku and exhibits substantial potential to penetrate the national market. Consequently, this inquiry endeavors to comprehensively comprehend the raw material inventory management embedded within Morella Nutmeg Juice processed products.

LITERATURE REVIEW

Empirical evidence reveals that the raw material inventory management within the Morella nutmeg juice enterprise remains rudimentary, relying heavily on experiential intuition and market demand fluctuations. This phenomenon signifies that the Morella nutmeg juice venture has not yet implemented an optimized inventory control framework. According to Assuari (2008), the strategic objective of inventory management is to sustain production continuity while simultaneously minimizing total inventory expenditures.

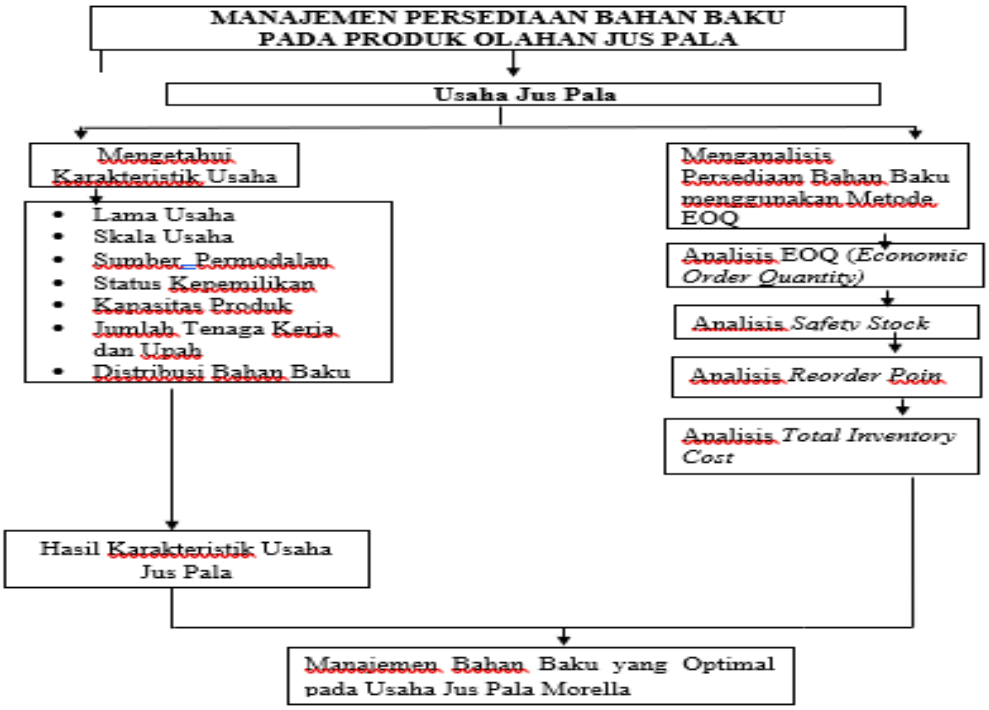
Raw materials utilized within the industry are procured through local purchases, imports, or internal processing, all of which constitute raw material costs (Mulyadi, 2010). Consequently, inventory management must be executed effectively to avert material stockouts. This study employs the Economic Order Quantity (EOQ) method, which enables the enterprise to manage inventory efficiently and make informed decisions, ensuring the procurement process avoids both surpluses and deficits (Heizer and Render, 2011). Furthermore, Heizer and Render (2010:99) elucidate that the reorder point designates a specific inventory threshold indicating when the company must initiate a replenishment order to prevent stock depletion.

Several prior studies have underscored the critical importance of inventory management within the nutmeg-based industry. Khairuddin (2020) investigated CV. Maenusa Spices in Ambon and demonstrated that the implementation of the Economic Order Quantity (EOQ) method could yield inventory cost savings of up to 1.5 million IDR annually. Similarly, Maitimu & Pattiopan (2019) examined nutmeg meat processing SMEs in Hutumuri, emphasizing the pivotal role of

safety stock in maintaining production continuity. Conversely, Dumatubun et al. (2021) highlighted macro-level development strategies for nutmeg seed commodities—encompassing institutional and marketing aspects—yet fell short of addressing raw material inventory management issues.

Based on prior literature, the vast majority of studies predominantly center on nutmeg seeds or large-scale processing industries, thereby failing to accommodate the unique challenges encountered by MSMEs operating in the nutmeg-based beverage sector. Consequently, this study is expected to bridge that empirical gap.

Figure 1. Framework



Gambar 1. Kerangka Pemikiran

METHODS

Data Collection Techniques

Data collection techniques were executed through direct observation, semi-structured interviews, and documentation gathered directly at UD Tomasiwa, the Morella Nutmeg Juice Industry.

Data Analysis Methods

a. Economic Order Quantity (EOQ)

$$EOQ = \sqrt{\left(\frac{2.D.S}{H}\right)}$$

Description:
EOQ= Economic Order Quantity of raw materials per month
D= Total raw material procurement volume per month
S= Ordering/Procurement cost per order
H= Holding/Storage cost per month

b. Safety Stock

$$SS = Z \times SD$$

Description:
S = Standard Deviation
Z = Standard normal distribution corresponding to the service level
SD = Standard Deviation

$$SD = \sqrt{\sum \left(\frac{x - y}{n}\right)}$$

Description:
SD = Standard Deviation
x = Actual raw material consumption
y = Forecasted raw material utilization
n = Data points

c. Reorder Poin

$$ROP = SS + (LT \times AU)$$

Description:
ROP = Reorder Poin
LT = Lead time
SS = Safety stock
AU = Average daily raw material usage

d. Total Inventory Cost

The optimal total inventory cost for nutmeg raw materials is derived from the summation of the total procurement cost and the total holding cost. The optimal quantity of nutmeg raw materials per order is denoted by Q. The annual holding cost per unit is symbolized by H, whereas the procurement cost for nutmeg per order is symbolized by S."

TIC = Total Ordering Cost + Total Holding Cost

$$TIC = \left(\frac{D}{Q}\right) \times S + \left(\frac{Q}{2}\right) \times H$$

Description:
TIC = Total raw material inventory cost
Q = Optimal quantity per order
H = Holding cost per unit of nutmeg raw material
S = Procurement cost per order for nutmeg raw materials
D = Total utilization of nutmeg raw materials

RESULTS

The Historical Evolution of Morella Nutmeg Juice

Juice The Morella Nutmeg Juice enterprise was established in 2008. In its inception, the beverage currently consumed was originally formulated as a syrup, hence the product was initially designated as Morella Nutmeg Syrup. Initially, the producers only manufactured confections derived from nutmeg flesh, such as candied nutmeg. Consequently, in 2009, the chairperson of the production unit sought methodologies to streamline the product's consumption format. By 2010, the nutmeg syrup product was successfully transformed into a

ready-to-drink Nutmeg Juice commodity, which continues to be actively manufactured to the present day.

Characteristics of the Morella Nutmeg Juice Enterprise

The characteristics of the Morella Nutmeg Juice business reflect a home-based micro-enterprise established in 2008, operating as a sole proprietorship funded by self-capital. The average processing capacity of the nutmeg juice business is approximately 2,467 nutmeg fruits per month, producing about 74 kg of nutmeg flesh to be processed into juice. Production capacity is non-fixed because it depends on raw material availability, so production frequency ranges from 8 times per month during harvest season to 3–4 times outside harvest season, with an average production quantity of 1,633 bottles. The Morella Nutmeg Juice business employs 7 permanent workers who are paid based on working days. Raw materials are sourced from local farmers or villagers; however, during sudden demand surges, the business must purchase raw materials outside the Leihitu Peninsula through suppliers known to the enterprise.

Sales Performance of Morella Nutmeg Juice

Sales are a critical aspect of the production process. In raw material management, sales heavily influence the purchasing and utilization of raw materials in nutmeg juice production. The Morella Nutmeg Juice enterprise conducts production eight times during peak season, with each batch using 50 kg sacks containing 800 fruits.

Table 1. Table Nutmeg Juice Commercialization

Moon	Production Quantity per month (times)	Number of Sales per month (Bottles)
January	8	2.800
February	4	1400
March	4	1400
April	8	2.800
May	4	1400
June	4	1400
July	8	2.800
August	4	1400
September	4	1400
October	8	2.800
November	3	**1.120**
December	-	-
Total		**19.600**

Nutmeg Raw Material Purchasing and Usage

Table 2. Purchasing and Usage of Nutmeg Raw Material

Moon	Production Quantity Per Month	Purchase & Usage Per Production (fruit)	Total Usage
January	8	4000	32000

February	4	2000	8000
March	4	2000	8000
April	8	4000	32000
May	4	2000	8000
June	4	2000	8000
July	8	4000	32000
August	4	2000	8000
September	4	2000	8000
October	8	4000	32000
November	3	1600	4800
December	-	-	-
Total	59	29.600	180.800
Average	5.36	2.467	13.230

Based on Table 2, the purchasing and usage frequency of nutmeg raw materials in the nutmeg juice enterprise spans one year. The total purchasing and usage of raw materials fluctuate monthly according to availability influenced by harvest seasons. High raw material usage occurs in January, April, July, and October at 32,000 fruits per month, indicating scaled-up production due to higher harvest yields. Conversely, usage declines to 8,000 fruits per month in March, May, June, August, and September, reflecting reduced supply. In November, usage decreases further to 4,800 fruits across only three production runs. In December, no production or purchasing occurs due to packaging bottle and carton stockouts while awaiting orders from Jakarta. Overall, annual raw material purchasing and usage reach 180,800 nutmeg fruits, averaging 13,230 fruits monthly.

Ordering Cost

Ordering cost is the cost that arises during the process of purchasing and ordering raw materials that must be borne by the company (Assuari, 2016).

Table 3. Ordering Cost

Fee Type	Total Cost Per Order (Rp)
Transportation costs	**50.000**
Call charges	-
Total	**50.000**

Table 3 shows that the ordering cost incurred by the Morella Nutmeg Juice business only consists of a transportation cost of IDR 50,000, while telephone costs are not incurred during the ordering process. This transportation cost is spent only during the harvest season because the raw material purchases are made directly in the forest. Outside the harvest season, the Nutmeg Juice business does not incur transportation costs because the raw material needs are obtained from local farmers and community members who deliver their harvest

directly to the business location. Before the production process is carried out, the enterprise first informs the community regarding the required nutmeg raw materials so that the needed supply can be available according to production needs.

Holding Cost

Table 4. Holding Cost

Electricity Cost per Month	Size of Electric Current	Total Storage Fee for a Year
IDR 350,000	220 Kwh	**4.200.000**

Based on Table 7, it can be ascertained that the annual holding cost incurred by the Morella Nutmeg Juice enterprise amounts to IDR 4,200,000. Subsequently, the unit holding cost for the nutmeg raw materials is computed. To calculate the holding cost per unit of nutmeg raw material, the following mathematical formula is applied:

$$\text{Raw Material Holding Costper Unit}=\frac{Total\ Holding\ Cost}{Total\ Raw\ Material\ Requirement}$$

Table 5. Holding Costs

Total Storage Fee (Rp)	Total Material Requirements Baku (Fruit)	Storage Fee per piece (Rp)
4.200.000	294.400	**23**

Based on Table 6, it can be known that the holding cost per unit of raw nutmeg material owned by Morella Nutmeg Juice is IDR 23. This result is obtained from dividing the total holding cost by the total raw material requirement over a year of IDR 4,200,000 by the total annual raw material requirement.

Analysis of Raw Material Inventory Using the Economic Order Quantity Method

The following calculates the optimal economic order quantity for the Morella Nutmeg Juice enterprise. The calculation is as follows:

$$EOQ = \sqrt{\left(\frac{2.D.S}{H}\right)}$$

$$= \sqrt{\frac{2x180.800x50.000}{23}}$$

$$=\sqrt{786.086}$$

$$= 28.037 \text{ fruits}$$

Meanwhile, the order frequency calculation is as follows:

$$\text{Frequency of use}= \frac{annual\ nutmeg\ consumption}{EOQ}$$

$$= \frac{180.800}{28.037} = 6{,}44$$

Based on these calculations, it is known that the quantity of raw nutmeg material ordered according to the Economic Order Quantity (EOQ) method is 28,037 fruits per order, with a frequency of 6.44 times per year, rounded to 6–7

times annually. Thus, Morella Nutmeg Juice must place orders in specific months within a year, purchasing 28,037 fruits per order.

Safety Stock

Table 6. Safety Stock

Moon	X	Y	(x-y)	$(x-y)^2$
January	32000	13230	18770	**352.312.900**
February	8000	13230	-5230	**27.352.900**
March	8000	13230	-5230	**27.352.900**
April	32000	13230	18770	**352.312.900**
May	8000	13230	-5230	**27.352.900**
June	8000	13230	-5230	**27.352.900**
July	32000	13230	18770	**352.312.900**
August	8000	13230	-5230	**27.352.900**
September	8000	13230	-5230	**27.352.900**
October	32000	13230	18770	**27.352.900**
November	4800	13230	-8430	**71.064.900**
December	-	-	-	**-**
Total	180.800			**1.644.433.900**

Description:
X= Monthly consumption rate
Y= Average monthly consumption rate
N= Number of months

$$SD = \sqrt{\sum \left(\frac{x-y}{n}\right)}$$
$$= \sqrt{\sum \left(\frac{1.644.433.900}{12}\right)}$$
$$= \sqrt{137.036.159}$$
$$= 11.706$$

With this standard deviation value, the amount of safety stock in 2025 is
SS= 1,65 x Standard Deviation
SS= 1,65 x 11.706
SS= 19.314 fruits

From these calculations, it can be known that in 2025, Morella Nutmeg Juice must provide a safety stock of 19,314 nutmeg fruits to avoid running out of raw materials

Reorder Poin

Based on the empirical computations utilizing the Economic Order Quantity (EOQ) framework, the reorder point (ROP) for the Morella Nutmeg Juice enterprise is calculated by augmenting the safety stock with the product of the lead time and the average raw material consumption rate. The analytical results indicate that the strategic reorder point value amounts to 16,201 units.

ROP = Safety Stock + (lead Time x Average consumption rate)
=19.314 + (0 x 2.467)
= 19.314 fruits

The results indicate that reordering should occur when nutmeg inventory reaches 19,314 fruits. Because raw materials are sourced directly from local suppliers without a fixed lead time, the reorder point (ROP) relies solely on safety stock. Consequently, Morella Nutmeg Juice must reorder immediately at this 19,314-unit threshold to prevent supply shortages and ensure uninterrupted production.

Total inventory cost

$$TIC = \left(\frac{D}{Q}\right) \times S + \left(\frac{Q}{2}\right) \times H$$

$$TIC = \left(\frac{180.800}{28.037}\right) \times 50.000 + \left(\frac{28.037}{2}\right) \times 23$$

TIC = 322.431,07 + 322.425,5

TIC = 644.856

Based on the total inventory cost calculation using the Economic Order Quantity (EOQ) method above, it can be known that the total inventory cost incurred by Morella Nutmeg Juice in 2025 is IDR 644,856.

DISCUSSION

Based on the calculation results using the Economic Order Quantity (EOQ) method, Morella Nutmeg Juice must place raw material reorders of 28,037 units per order. This result shows that the Morella nutmeg juice enterprise can order raw materials in an optimal quantity so that inventory costs can be minimized. Meanwhile, the raw material ordering frequency is 6.44, rounded to 6–7 times per year. The safety stock result is also 19,314 units; Morella Nutmeg Juice must maintain safety stock to anticipate uncertainties in raw material usage during the production process. Furthermore, the ROP result also shows 19,314 units because Morella Nutmeg Juice does not use lead time, making both values identical. Overall, the analytical tools used—EOQ, safety stock, reorder point, and total inventory cost—greatly assist Morella Nutmeg Juice in proper inventory control and can minimize total inventory costs, maintain raw material availability, and support the production process.

CONCLUSIONS AND RECOMMENDATIONS

The characteristics of the Morella Nutmeg Juice business show that it is a home-based processing enterprise established in 2008 and actively producing to date. Based on business scale, it is classified as a micro-enterprise under applicable regulations. In terms of capital, it uses equity capital, allowing independent management without reliance on debt financing. Ownership status is a sole proprietorship. The average processing capacity of Morella Nutmeg Juice reaches approximately 2,467 nutmeg fruits, equivalent to 74 kg of nutmeg flesh, to be processed into nutmeg juice. Production capacity varies depending on raw material availability, with production frequency ranging from 8 times during harvest season to 3–4 times during off-season, averaging 1,633 bottles monthly. Raw material distribution relies on local community members as primary suppliers, while external suppliers are used for sudden demand surges.

The enterprise employs 7 workers, predominantly women, most of whom hold high school diplomas and possess extensive operational experience.

Inventory management of raw materials in the Morella nutmeg juice business is still carried out simply based on experience and market demand. Purchasing raw materials is conducted 59 times a year with an ordering cost of IDR 50,000 per order. The total ordering cost over one year reaches IDR 2,950,000, while the total holding cost is IDR 4,200,000 per year with a holding cost per unit of raw material of IDR 23. Based on the Economic Order Quantity (EOQ) method analysis, the Morella Nutmeg Juice business can determine a more optimal raw material order quantity of 28,037 fruits per order so that inventory costs can be better controlled. In addition, the use of safety stock indicates that the Morella Nutmeg Juice business needs to provide a safety stock and reorder point of 19,314 fruits to avoid raw material shortages. And for the total inventory cost (TIC) calculation result, it shows that the total inventory cost that must be incurred by the company is IDR 644,856.57. These calculation results can be applied by the Morella Nutmeg Juice business for the year 2026.

FURTHER STUDY

This study acknowledges certain inherent limitations; hence, further longitudinal research focusing on Raw Material Inventory Management for Processed Nutmeg Juice is imperative to refine these empirical findings, while simultaneously expanding the academic horizons and insights of both readers and future researchers.

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