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Raw Material Inventory Analysis Using The Material Requirement Planning Method In The Umkm Ayam Penyet Mandoge Waroeng Kandar Kuphi

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Abstract − Raw material inventory is a crucial factor in ensuring the smooth operation of a culinary business. MSME Ayam Penyet Mandoge Waroeng Kandar Kuphi faces challenges in managing inventory, which is often unbalanced between material availability and customer demand. This leads to the risk of excess inventory or shortage of raw materials, which can disrupt the production process. This study aims to analyze raw material inventory management using the *Material Requirement Planning* (MRP) method as a more efficient planning solution. The method used includes collecting historical demand data, production schedules, *lead times* , and calculating raw material requirements using the MRP approach. The results show that the application of the MRP method can improve the efficiency of raw material procurement, reduce storage costs, and minimize the risk of stockouts and overstocks. Thus, the MRP method can be a strategic tool in making inventory management decisions at the MSME scale. Recommendations are given for MSMEs to start shifting from conventional management to a data-based and structured system to increase their competitiveness and business sustainability.

Keywords: *Material Requirement Planning* , Raw Material Inventory, MSMEs, Production Planning.

1. INTRODUCTION

The food and beverage industry is a growing sector in Indonesia. One popular and beloved dish is ayampenyet (smashed chicken). Ayampenyet is a dish originating from Indonesia and boasts a distinctive flavor. In Medan, many micro, small, and medium enterprises (MSMEs) sell ayampenyet, one of which is Ayam Penyet Mandoge at Waroeng Kandar Kuphi. In the production process, Ayam Penyet Mandoge at Waroeng Kandar Kuphirequires a supply of chicken to support its production process. However, in reality, there are often chicken shortages and fluctuations in demand that do not match the amount needed in the production process. Therefore, proper material resource planning is necessary. MRP is a solution that can be implemented because the function of MRP itself is to reduce the risk of raw material shortages and demand fluctuations, as well as minimizing the raw material itself.

To run its business, Ayam Penyet Mandoge at Waroeng Kandar Kuphi requires sufficient raw materials to produce penyet chicken regularly. An efficient and effective supply of raw materials is crucial to maintaining a smooth production process and meeting growing market demand. Therefore, analyzing raw material inventory using *the Material Requirement Planning* (MRP) method is highly relevant to improve the efficiency and effectiveness of raw material inventory management.

To determine the amount of raw materials required by the Ayam Penyet Mandoge MSME business at WaroengKandarKuphi in a given period, the management of the MSME business must use relevant data to forecast the raw material needs of the MSME. This allows for a sound needs plan.

However, the application of the MRP method on a MSME scale is still very limited. Most MSMEs, including Ayam Penyet Mandoge Waroeng Kandar Kuphi, still rely on intuition and manual record-keeping to manage inventory. This indicates a gap between the potential of planning technology and existing management practices in the field. Therefore, an in-depth analysis of raw material inventory management in these MSMEs is necessary, as well as how the MRP method can be applied adaptively according to business capacity and conditions.

This study aims to analyze the raw material inventory system at the Waroeng Kandar Kuphi Mandoge Chicken Penyet MSME using the Material Requirement Planning (MRP) method as an effort to optimize efficient, timely, and low-cost inventory planning.

2. THEORETICAL BASIS

2.1 Material Requirement Planning (MRP)

Material Requirement Planning (MRP) is a computerized system used to plan material requirements in a timely, quantitative, and efficient manner in the production process. Its primary goal is to ensure that raw materials and components are available when needed, minimize excess inventory, and maintain a smooth production process.

MRP is not only understood as a method for calculating raw material requirements, but also as part of a digital supply chain system integrated with information technology such as ERP (Enterprise Resource Planning), Internet of Things (IoT), and artificial intelligence (AI).

MRP can coordinate activities across various functions within a manufacturing company, such as engineering, production, and procurement. Therefore, what's interesting about MRP is not only its function as a support for decision-making, but also its overall role in company activities. (Aurel Yulita Pradyasari et al., 2024)

Prior to the use of MRP, inventory and production control planning was carried out using a reactive approach as follows:

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1. *Reorder point policy* , where inventory is continuously monitored, procurement is carried out when the quantity of inventory has reached a specified level.
2. *Periodic order cycle policy* , where inventory is monitored and at each certain period a number of items are added so that the quantity...

inventory remains at a predetermined inventory level.

2.2 Inventory Control

Inventory management requires the establishment of an inventory control system . According to (Anastasya Bernike Br Ginting et al., 2024), inventory control is a planned approach to determining what to order, when to order, how much to order, and how much inventory to maintain so that costs associated with purchasing and storage are optimal without disrupting production and sales. Inventory control is fundamentally related to two issues:

1. When should an order be placed (*Order level*) and
2. How much to order (*Order quantity*). Quality

2.3 Inventory Model

According to (Setianto & Harinie, 2025) there are two main types of models in inventory management, namely the model for independent inventory and the model for dependent inventory.

a. Independent Inventory Model
   independent inventory model is a model for determining the quantity of materials/goods purchased independently. It is typically applied to inventory purchases where demand is continuous and constant over time. Purchase orders can be placed without considering the final product's usage. Currently, there are four popular inventory models:
   a. Economic Order Quantity (EOQ),
   b. Economic Production Quantity (EPQ),
   c. Back Order Inventory Model,
   d. Quantity Discount Model.

2.4 Forecasting (Demand Forecasting)

Forecasting is an art and science that can predictincidenton time Which will future. Forecast willin volving historical data retrieval (such as last year's sales). Forecasting can also beused as a basis to assist in decision making which is not yet finalstillor No Certain examplein taking decision, inpolicy control of inventory systems , production planning decisions, scheduling need machine, equipment material,as well as can determine the level labor during the production process period. Forecasting is not only usedto estimate product demand only, but it is also widely usedin other systems. In an industry, forecasting is done by various department, like department: marketing, production. marketing. supply. Finance (Reicita, 2020)

Determination of safety stock and reorder point is calculated based on data from the last 1 month of production.

Some forecasting methods commonly used in MRP include:

1. Moving Average:
   Calculate the average of several previous periods to predict the next period.
   Formula:

$$F_{t+1} = (D_t + D_{t-1} + ... + D_{t-n}) / n$$

   Information:
   F_{t+1} : Forecast for period t+1
   D_t : Actual demand in period t
   n : Number of periods
   used in the calculation of the average
2. Quadratic Forecasting:
   Gives greater weight to recent data.
   Formula (simple quadratic smoothing method):

$$F_{t+1} = \alpha D_t + (1-\alpha)F_t$$

Information:
α : Smoothing constant ($0 \leq \alpha \leq 1$)
F_t : Estimate for period t

3. Linear Regression:
Assumes a linear relationship between demand and time.
Formula:

$$Y_t = a + bt$$

Information:
Y_t : Demand in period t
a : Intercept

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b : Gradient
t : Time

3. RESEARCH METHODOLOGY

This research focused on raw materials and the production results of smashed chicken, using *the Material Requirement Planning method* to identify potential raw material issues. The implementation was carried out over a 30-day period, or one month.

The data used in this study comprises primary and secondary data. Primary data was obtained from the company's production documentation. This data comprises data on the number of smashed chicken products produced over a 30-day period over a month. Secondary data consists of direct field observations and interviews with the company regarding raw materials and factors contributing to losses for MSMEs.

4. DISCUSSION

Research on the analysis of raw material inventory in MSMEsFor Waroeng Kandar Kuphi's Mandoge smashed chicken, the processed data consisted of sales and raw material orders for the smashed chicken production process, using the *material requirements planning method* over a one-month time span. The following is a discussion of the data processing results:

1. Data collection

The following are the results of data collection obtained from Waroeng Kandar Kuphi.

Table 1. Data on the Number of Mandoge Crushed Chicken Sales in April 2025

Tahun	Bulan	Permintaan (Porsi)
2025	April	30
		33
		40
		25
		27
		30
		32
		27
		31
		38
		28
		30
		32
		29
		23
		28
		33
		32
		30
		27
2025	April	30
		32
		36
		42
		38
		35
		32
		28
		24
		28

(Data Source From: WaroengKandarKuphi)

2. Constant Method

Aftergetsales data for crushed chicken products, then make a forecast using the Constant method.

Table 2. Product Sales Forecasting Data for April 2025 Using the Constant Method

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t	Dt	Dt'	Dt' - Dt	(Dt' – Dt)²
-15	30	31	1	1
-14	33	31	-2	4
-13	40	31	-9	81
-12	25	31	6	36
-11	27	31	4	16
-10	30	31	1	1
-9	32	31	-1	4
-8	27	31	4	16
-7	31	31	0	0
-6	38	31	-7	49
-5	28	31	3	9
-4	30	31	1	1
-3	32	31	-1	1
-2	29	31	2	4
-1	23	31	8	64
1	28	31	3	9
2	33	31	-2	4
3	32	31	-1	1
4	30	31	1	1
5	27	31	4	16
6	30	31	1	1
7	32	31	-1	1
8	36	31	-5	25
9	42	31	-11	121
10	38	31	-7	49
11	35	31	-4	16
12	32	31	-1	1
13	28	31	3	9
14	24	31	7	49
15	28	31	3	9
Total	**930**	**930**	**-1**	**599**

3. Linear Regression Method

Afterget the *standard error of estimate* value for the constant method then then make a forecast using the linear regression method:

Table 3. Linear Regression Method Forecasting Data for Product Sales in April 2025

t	t^2	Dt	dt.t	Dt'	Dt' - Dt	(Dt' – Dt)²
-15	225	30	-450	30,7	0,7	0,49
-14	196	33	-462	30,72	-2,28	5,19
-13	169	40	-520	30,74	-9,26	85,74
-12	144	25	-300	30,76	5,76	33,17
-11	121	27	-297	30,78	3,78	14,28
-10	100	30	-300	30,8	0,8	0,64
-9	81	32	-288	30,82	-1,18	1,39
-8	64	27	-216	30,84	3,84	14,74
-7	49	31	-217	30,86	-0,14	0,01
-6	36	38	-228	30,88	-7,12	50,69
-5	25	28	-140	30,9	2,9	8,41
-4	16	30	-120	30,92	0,92	0,84
-3	9	32	-96	30,94	-1,06	1,12
-2	4	29	-58	30,96	1,96	3,84
-1	1	23	-23	30,98	7,98	63,68
1	1	28	28	31,02	3,02	9,12
2	4	33	66	31,04	-1,96	3,84
3	9	32	96	31,06	-0,94	0,88
4	16	30	120	31,08	1,08	1,16
5	25	27	135	31,1	4,1	16,81
6	36	30	180	31,12	1,12	1,25
7	49	32	224	31,14	-0,86	0,73
8	64	36	288	31,16	-4,84	23,42
9	81	42	378	31,18	-10,82	117,07

4. Quadratic Method

Afterto get the *standard error of estimate value* for the linear regression method, then Next, make a forecast using the Quadratic method:

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Table 4. Quadratic Method Forecasting Data for Product Sales in April 2025

t	Dt	t^2	t^4	t.Dt	t^2.dt	Dt'	$Dt' - Dt$	$(Dt' - Dt)^2$
-15	30	225	50.625	-450	6.750	30,79	0,7975	0,63
-14	33	196	38.416	-462	6.468	30,79	-2,2028	4,85
-13	40	169	28.561	-520	6.760	30,79	-9,2017	84,67
-12	25	144	20.736	-300	3.600	30,80	5,8008	33,64
-11	27	121	14.641	-297	3.267	30,80	3,8047	14,47
-10	30	100	10.000	-300	3.000	30,81	0,81	0,65
-9	32	81	6.561	-288	2.592	30,81	-1,1831	1,39
-8	27	64	4.096	-216	1.728	30,82	3,8248	14,62
-7	31	49	2.401	-217	1.519	30,83	-0,1657	0,02
-6	38	36	1.296	-228	1.368	30,84	-7,1548	51,19
-5	28	25	625	-140	700	30,85	2,8575	8,16
-4	30	16	256	-120	480	30,87	0,8712	0,75
-3	32	9	81	-96	288	30,88	-1,1137	1,24
-2	29	4	16	-58	116	30,90	1,9028	3,62
-1	23	1	1	-23	23	30,92	7,9207	62,73
1	28	1	1	28	28	30,96	2,9607	8,76
2	33	4	16	66	132	30,98	-2,0172	4,06
3	32	9	81	96	288	31,00	-0,9937	0,98
4	30	16	256	120	480	31,03	1,0312	1,06
5	27	25	625	135	675	31,05	4,0575	16,46
6	30	36	1.296	180	1.080	31,08	1,0852	1,17
7	32	49	2.401	224	1.568	31,11	-0,8857	0,78
8	36	64	4.096	288	2.304	31,14	-4,8552	23,57
9	42	81	6.561	378	3.402	31,17	-10,8233	117,14
10	38	100	10.000	380	3.800	31,21	-6,79	46,10
11	35	121	14.641	385	4.235	31,24	-3,7553	14,10
12	32	144	20.736	384	4.608	31,28	-0,7192	0,51
13	28	169	28.561	364	4.732	31,31	3,3183	11,01
14	24	196	38.416	336	4.704	31,35	7,3572	54,12
15	28	225	50.625	420	6.300	31,39	3,3975	11,54
Total	**930**	**2.480**	**356.624**	**69**	**76.995**	**930**	**-0,0638**	**593,99**

5. Comparison of SEE Values for Each Forecasting Method

Afterget the value from 3 forecasting methods then make a comparison of SEE values for each forecasting method.

Table 5. Comparative data of SEE values for each forecasting method

No	Trend	Persamaan	Nilai SEE
1	Konstan	$Dt' = \frac{\sum_{i}^{n}=0\ dt}{n}$	4,54
2	Linear	$Dt' = a + b.t$ $Dt' = 31 + -0,02\ (t)$	4,60
3	Kuadratis	$Dt' = a + b.t + c.t^2$ $Dt' = 30,94 + (0,02).t + (0,007).t^2$	4,69

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6. Forecast Verification Chart

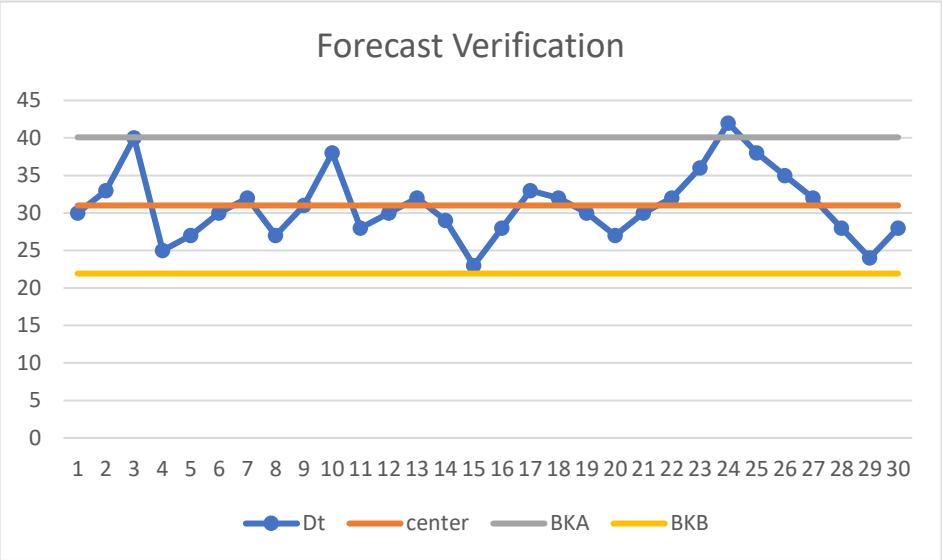

Figure 1. Forecast verification graph

7. Future Forecast Results

AyamPenyet demand is forecasted for the next year. The calculation of AyamPenyet demand is for the months 1-30 in 2025.

5. CONCLUSION

The selection of the forecasting method is done by selecting the smallest SEE value from each forecasting method for the next period. From the calculation results obtained to create a master production schedule in accordance with the forecast made. And the planning of raw material requirements to meet the needs of AyamPenyetMandogeWaroengKandarKuphi can be seen in table 5.2 recapitulation of the planned order release shows that each material has a detailed planned production schedule for each month, indicating the existence of an organized and sustainable planning system.

SUGGESTION

Companies must be able to carefully consider planning material requirements, so that there is no accumulation of raw materials which could result in high losses for the company.

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