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Sales Forecasting Analysis of Minyakita using POM-QM Application (Case Study: PT. Java Agri Sukses Makmur)

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A B S T R A C T

This observation analyzes Minyakita sales forecasting at PT Java Agri Sukses Makmur using the POM-QM application. Accurate sales forecasting is important for stock planning and management. Sales data were collected through interviews conducted over three months (March-May 2025). Three forecasting methods were employed, namely linear trend a*nalysis, Single Exponential Smoothing,* and *Simple Moving Average*. The results of *Trend Analysis Linear* show a sales pattern that tends to increase. The regression equation is Demand(y) = 11,267.68 + 881.664xTime. Although the Bias value (0.001) is close to zero, error values such as MAD (4,663,778), MSE (28,397,000), and Standard Error (5,837.5) show a fairly high error rate. However, the MAPE value (30.745%) is considered feasible for medium-term forecasting. The correlation coefficient of 0.496 and R^2 of 0.246 indicate a moderate relationship, with the variation in sales explained by time accounting for only 24.6%. *Single Exponential Smoothing* (\alpha=0.1) resulted in a Bias of 1,684.15 (tends to underestimate) and MAPE of 32.77%, with a forecast of 17,307.56 units for the next period. *Simple Moving Average* shows a MAPE of 27.191% (feasible), with a forecast of 19,616.25 cartons. Overall, the linear trend model is suitable for identifying long-term patterns, but less responsive to short-term fluctuations. These forecasting results are expected to support PT Java Agri Sukses Makmur in production and marketing strategies.

Contribution to Sustainable Development Goals (SDGs):
SDG 2: Zero Hunger
SDG 8: Decent Work and Economic Growth
SDG 9: Industry, Innovation, and Infrastructure
SDG 12: Responsible Consumption and Production

1. INTRODUCTION

1.1. Research Background

Cooking oil is one of the basic needs of the Indonesian people whose consumption is relatively high and stable throughout the year [1]. According to data from the National Food Agency (Bapanas), in 2023 the average Indonesian consumes 9.56 kilograms/capita/year of cooking oil. This figure shows an increase of 0.9% compared to 2022 (year-on-year/yoy), although it has not yet reached the consumption level of 2021, as shown in Figure 1.1. This situation is a great opportunity for agro-industrial companies to develop their business, one of which is by packaging and selling palm cooking oil.

PT Java Agri Sukses Makmur, an agro-industrial company based in Mojokerto District, specialises in packaging and marketing palm cooking oil. The company produces various brands, including Sayana, Master Koki, and Minyakita, which are included in the government's oil subsidy program. Companies are required to have the right planning strategies in dealing with the dynamics of fluctuating market demand, one of which is through

sales forecasting [2]. Forecasting is the process of estimating an event or value that will occur in the future using historical data and pattern or trend analysis, with the intention of minimizing the error rate [3].

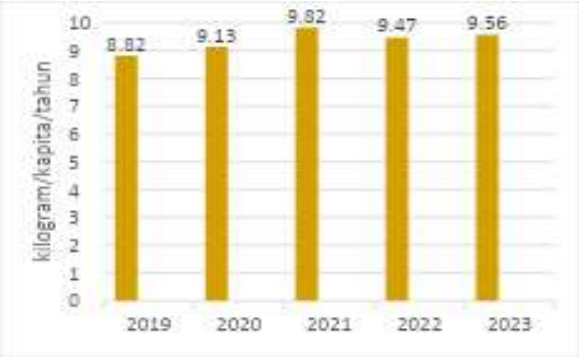


Fig. 1. Per Capita Cooking Oil Consumption of Indonesian People (2019-2023) Source: National Food Agency (2024).

Accurate sales forecasting is crucial for maintaining product availability, optimising distribution, and minimising the risk of stock shortages or excesses in the market [4]. Inaccuracies in oil sales forecasting can result in supply chain disruptions and potential business losses. This suggests the need for a systematic approach, aided by software capable of processing historical sales data. The POM-QM application can provide recommendations for determining the best forecasting methods, including linear regression, moving average, and exponential smoothing [5]. The use of this application can help companies produce more accurate and practical predictions, thereby supporting more informed decision-making in the face of market demand dynamics. Therefore, the author aims to contribute to PT Java Agri Sukses Makmur by helping to analyse palm cooking oil sales forecasting more precisely and in a data-driven manner. Accurate forecasting results are expected to provide clear information to the company regarding product demand patterns, so that they can be used as a basis for developing more effective production and marketing strategies in the future.

The sales forecasting analysis conducted by the author not only has a positive impact on the company but also makes a valuable contribution to the broader community. The author indirectly plays a role in upholding the Tri Dharma of Higher Education, particularly in the fields of research and community service. The form of community service is evident in the sales forecasting analysis activities at PT Java Agri Sukses Makmur, which aims to enhance the company's operational efficiency and ensure that product distribution continues to run smoothly. Academically, it can also enrich the literature regarding the application of POM-QM applications in sales forecasting in the food sector.

1.2. Research Objective

The purpose of this paper is to present the results of observations, as well as the author's contribution to PT Java Agri Sukses Makmur. The primary objective of the author is to assist the company in forecasting sales of Minyakita products at PT Java Agri Sukses Makmur through a forecasting analysis using the POM-QM application. The results of the observations we made at PT Java Agri Sukses Makmur can be summarized as follows provide benefits for several parties, including as follows:

1. For the author, the results of this observation provide a deeper understanding of forecasted Minyakita sales at PT Java Agri Sukses Makmur through POM-QM analysis.
2. For companies, the results of this study can help them in production planning, stock management, financial preparation, and implementing more efficient strategies.
3. For workers, sales forecasting can enhance work efficiency and provide opportunities for achieving measurable targets.

2. MATERIALS AND METHODS

The observation of PT Java Agri Sukses Makmur's palm cooking oil packaging strategy was conducted over a four-month period. The observation was conducted at PT Java Agri Sukses Makmur, located on Jl. Raya Jarot Dusun Gangsir, RT. 01, RW. 08, Cinandang, Dawarblandong District, Mojokerto Regency, East Java. The data collection method used is divided into two types of data, namely:

1. Primary Data, is data collected directly through primary sources, such as interviews, surveys, experiments, and so on [6]. The data in this observation was obtained from interviews with several company staff using a reference list of questions that had been prepared. Questions asked about sales data, product prices, product types and sizes and product packaging. The data collected spans three months, from March to May 2025.
2. Secondary data refers to research data that is already available and can be utilised for other researchers' studies [7]. Secondary data were obtained from the National Food Agency in 2024, as well as relevant literature.

3. RESULT AND DISCUSSION

An analysis of Minyakita sales data at PT Java Agri Sukses Makmur was conducted over the past three months as part of a more accurate and data-driven business planning effort. This data was recorded every week, so there were a total of 12 weeks of observation. Through the weekly forecasting approach, the company aims to identify emerging sales patterns, including trends, seasonality, and short-term demand fluctuations. The cooking oil industry market has potential in palm oil export opportunities [8]. The results of the forecasting analysis are expected to help companies make more informed decisions, particularly regarding future sales strategies. Table 1 and Figure 2 present Minyakita sales at PT Java Agri Sukses Makmur for a 12-week period.

The graph in Figure 2 shows sales data for Minyakita *pouch* packaging products for 12 periods, which includes 3 months (March - May 2025). It can be seen that sales fluctuate quite significantly. In the initial period (periods 1-3), sales tended to decline, then experienced a sharp increase starting in period 4 until it peaked in period 6. Following this, there was a decline in period 7, followed by alternating increases and decreases until period 12, which again exhibited an upward trend. The tight competition in the cooking oil industry prompts producers to seek ways to attract consumer interest [9] continually. To continue competing in the market, PT Java Agri Sukses Makmur requires sales forecasting to predict future demand accurately. The existing sales data is then further analysed using the Trend

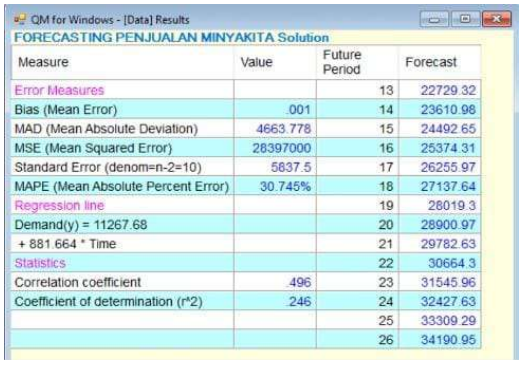
Analysis, Linear, Single Exponential Smoothing, and *Simple Moving Average* methods.

Table 1. Sales Data of Minyakita Products in *Pouch* Packaging March - May 2025.

Month	Week	Total Sales Oil
March	1	15455
	2	9100
	3	7950
	4	10256
April	5	22159
	6	28252
	7	15965
	8	16380
May	9	21938
	10	14521
	11	16394
	12	25612
	Total	203982

Fig. 2. Sales Chart of Oilita Products in *Pouch* Packaging March-May 2025.

3.1. Trend Analysis Linear


QM for Windows - [Data] Results

FORECASTING PENJUALAN MINYAKITA Solution

Measure	Value	Future Period	Forecast
Error Measures		13	22729.32
Bias (Mean Error)	.001	14	23610.98
MAD (Mean Absolute Deviation)	4663.778	15	24492.65
MSE (Mean Squared Error)	28397000	16	25374.31
Standard Error (denom=n-2=10)	5637.5	17	26255.97
MAPE (Mean Absolute Percent Error)	30.745%	18	27137.64
Regression line		19	28019.3
Demand(y) = 11267.68		20	28900.97
+ 881.664 * Time		21	29782.63
Statistics		22	30664.3
Correlation coefficient	.496	23	31545.96
Coefficient of determination (r^2)	.246	24	32427.63
		25	33309.29
		26	34190.95

Fig. 3. Table of Calculation Results of Linear Trend Analysis Method with POM- QM.

The Linear Trend Analysis method is used to study trends that indicate values expected to increase or decrease in a linear manner. The time to use this model is adjusted to the needs, but the data used must be available and appropriate [10]. Based on the results of the POM-QM application for forecasting Minyakita sales at PT Java Agri Sukses Makmur, using the time series method with a linear trend analysis model, it can be concluded that the sales pattern exhibits an increasing *trend* over time. The resulting regression line equation is *demand* (y) = 11267.68 + 881.664 × *time*, which means that each addition of one time period is expected to increase demand by 881.664 ≈ 882 units.

Error measures in the POM-QM table show a bias value of 0.001, which is very close to zero. This means that the model does not tend to *significantly overestimate the forecasting results*. The MAD (*Mean Absolute Deviation*) value which reaches 4,663,778 indicates a significant average deviation from the actual data. The MSE (*Mean Squared* Error) value of 28,397,000 and the standard error of 5,837.5 indicate that the error rate of the model is still quite high. Meanwhile, the MAPE (*Mean Absolute Percent Error*) figure of 30.745% indicates that the error rate compared to the actual data is moderate and still suitable for use in medium-term forecasting. From a statistical perspective, the correlation coefficient is 0.496, indicating a moderate relationship between the time and sales variables. Meanwhile, the coefficient of determination (R^2) of 0.246 indicates that only about 24.6% of the sales variation can be explained by the time factor, while other factors outside the model influence the remaining variation.

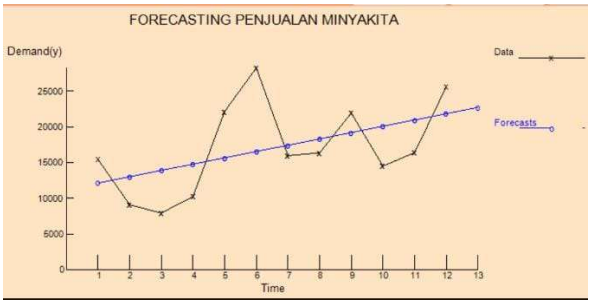


Fig. 4. Graph of Calculation Results of *Linear Trend Analysis* Method with POM-QM.

The forecasting results graph displays a comparison between real data (represented by a black line that fluctuates) and forecast results from the model (illustrated by a more consistent blue line). It can be seen that, although the actual sales figures vary significantly, the linear trend line reflects a positive general pattern. Therefore, the linear trend model is quite useful for showing patterns over the long term, but is less responsive to short-term and dynamic changes.

3.2. Single Exponential Smoothing

According to Mollah and Saputra (2022), the *Single Exponential Smoothing* Method is a forecasting technique that utilizes the latest data repeatedly in the calculation process [11]. The weight for each data is denoted by the symbolα , whose value is determined freely. The purpose of giving this weight is to reduce the error rate in forecasting results. Calculations with the *Single Exponential Smoothing* method for Minyakita sales data at PT Java Agri Sukses Makmur are assumed with an α coefficient value of 0,1.

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QM for Windows - [Data] Results

EXPONENTIAL SMOOTHING Minyakita Solution

Measure	Value
Error Measures	
Bias (Mean Error)	1684,148
MAD (Mean Absolute Deviation)	5169,759
MSE (Mean Squared Error)	44096140
Standard Error (denom=n-2=9)	7341,341
MAPE (Mean Absolute Percent Error)	32,771%
Forecast	
next period	17307,56

Fig. 5. Table of Calculation Results of the *Single Exponential Smoothing* Method with POM-QM.

The results of the Single Exponential Smoothing method calculation table using the POM-QM application show that the bias value (Mean Error) is 1,684.15. This indicates that the model tends to underestimate, i.e., it forecasts lower than reality. This value is positive, meaning that the average forecasting result is smaller than the actual data. The MAD (Mean Absolute Deviation) value of 5,169.76 indicates the average absolute error in the forecasting results, illustrating a considerable deviation between the prediction and reality. The MSE (Mean Squared Error) value reached 44,096,140, indicating that large errors in the data have a significant impact on accuracy, as the error is squared. The Standard Error value of 7,341.34 shows the variation or spread of errors that occur in the forecasting process. The MAPE (Mean Absolute Percent Error) value is recorded at 32.77% which is quite accurate for forecasting standards. The forecasting results for the next period (13th period) are 17,307.56, which will be the basis for the projection and planning of Minyakita production at PT Java Agri Sukses Makmur.

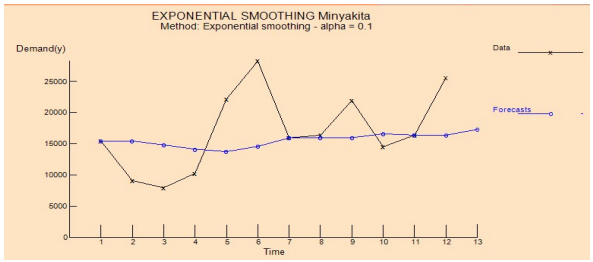

Fig. 6. Graph of Calculation Results of Single Exponential Smoothing Method with POM-QM.

The graph above shows a fairly sharp variation in actual demand (shown by the black line with a cross). The demand for Minyakita experiences drastic fluctuations, as seen in Periods 6 and 12, which show spikes in demand, while Period 3 records low demand. The forecasting line (depicted by the blue line and circle marks) using the *Single Exponential Smoothing* method with a value of $\alpha = 0.1$ appears to be flat and responds slowly to changes in demand. This reflects the nature of a low α value, where the forecasting results become more stable and less influenced by short-term changes in demand.

3.3. Simple Moving Average

QM for Windows - [Data] Results

FORECASTING PENJUALAN MINYAKITA Solution

Measure	Value
Error Measures	
Bias (Mean Error)	3252.531
MAD (Mean Absolute Deviation)	5974.281
MSE (Mean Squared Error)	62693760
Standard Error (denom=n-2=6)	9142.849
MAPE (Mean Absolute Percent Error)	27.191%
Forecast	
next period	19616.25

Fig. 7. Table of Calculation Results of *Simple Moving Average* Method with POM-QM.

The time series method has several forecasting models, one of which is *simple moving average*. *Forecasting* with the *Simple Moving Average* method is used to simplify the analysis of fluctuating data patterns [12]. The results of the POM-QM calculation show as in Figure 7. The table figure shows the results of forecasting Minyakita's sales, as well as the forecast value for the next period. The indicators used in forecasting measurements are three indicators. These indicators are MAD, MSE, and MAPE. The MAD (*Mean Absolute Deviation*) value is 5974.281. The MSE (*Mean Squared Error*) value is 62693760. The MAPE (*Mean Absolute Percent Error*) value is 27.191%. According to Nabillah and Ranggadara [13], the MAPE value of 20-50% indicates the ability of a decent forecasting model. It can be seen that forecasting with the Simple Moving Average model for Minyakita products is a feasible forecasting approach. Forecasting sales of Minyakita for the next period is 19.616.25 cartons or 19,616 cartons.

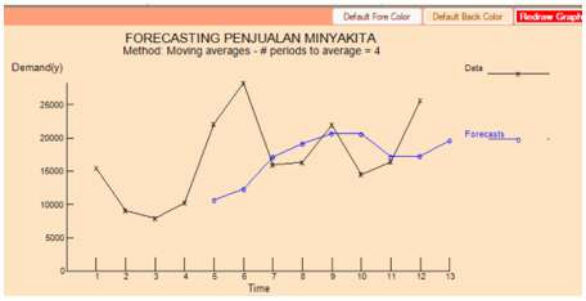

Fig. 8. Graph of the Calculation Results of the *Simple Moving Average* Method with POM-QM.

The graph in Figure 8 shows real data on the black line and *forecasting* data on the blue line. There are fluctuations in the sales of Minyakita products in both actual and forecasted data. The highest sales data graph in week 6 exceeds 25,000 cartons, while the lowest in week 3 is less than 10,000 cartons. The forecasting graph shows an increase starting from week 6, with the highest value in week 9. Furthermore, there is a decrease until week 12, followed by the rise again in week 13. It is known that the demand forecast for Minyakita products in week 13 is less than 20,000 cartons. *The period-to-average value shows the number 4, which is obtained by averaging* the previous period.

Table 2. Comparison of 3 Sales Forecasting Methods: Linear Trend Analysis, Single Exponential Smoothing, and Simple Moving Average Methods.

Method	Error Size Value		
	MAD	MSE	MAPE
Trend Analysis Linear	4663.778	28397000	30.745%
Single Exponential Smoothing	5169.759	44096140	32.771%
Simple Moving Average	59747.281	62693760	27.191%

The table displays the error indicators, namely MAD (Mean Absolute Deviation), MSE (Mean Squared Error), and MAPE (Mean Absolute Percentage Error), for three forecasting models: Trend Analysis Linear, Single Exponential Smoothing, and Simple Moving Average. The results of the POM-QM analysis indicate that the Trend Analysis Linear model yields an MAD value of 4,663.778 and an MSE of 28,397,000. The indicator value of this forecasting model has the lowest value compared to the other two models. It can be seen that the linear trend analysis model has the smallest error rate. However, the MAPE error value of 30.745% is higher than that of the Simple Moving Average model, which has a MAPE value of 27.191%. It can be seen that the Trend Analysis Linear forecasting model is the most effective and is recommended for forecasting the sales of Minyakita products. This is because the MAD and MSE values indicate a smaller error value compared to other models.

4. CONCLUSION

Based on the observations we have made and performing *forecasting* calculations with the *Trend* Analysis Linear, Single Exponential Smoothing and, Simple Moving Average, several conclusions can be drawn as follows:

1. The sales pattern of Minyakita products at PT Java Agri Sukses Makmur is increasing, based on TAL analysis, with an estimated 881,664 units.
2. The MAD, MSE, and SE values indicate a high error rate; however, the MAPE value of 30.745% is classified as moderate and still feasible for forecasting, with an estimated value of 19,616.25 cartons in the next period.
3. The coefficient of determination (R^2) of 0.246 indicates that only about 24.6% of the sales variation can be explained by the time factor, while other factors outside the model influence the remaining variation.
4. The SES method yields a bias value of 1,684.15, which is also quite accurate for forecasting purposes.

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