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Forecasting National People's Salt Production with Time Series Model Using POM-QM for Windows

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Abstract

Every year, the need for national salt continues to increase. However, the performance of salt production in Indonesia has not succeeded in achieving the target according to the 2015-2019 KKP strategic plan that has been set. This study aims to obtain a time series forecasting method and an estimate of the exact amount of national salt production in 2022 to meet the salt needs in Indonesia. The data used in the research are the 2012-2021 Directorate General KP3K/PRL performance report, the 2012-2021 KKP performance and annual reports, and the 2020-2024 KKP strategic plan. Forecasting analysis techniques use naive methods, moving averages, weighted moving averages, exponential smoothing, exponential smoothing with trend, and trend analysis using the POM-QM for Windows 3 program. The results show that the total production in 2022 is 1,277,392 tons by using trend analysis. Trend analysis has forecasting errors based on the smallest MAD, MSE, and MAPE values compared to other methods so that the results of this forecasting can be used for policy design in the future.

Keywords: Forecasting, Time Series, Trend Analysis, People's Salt, POM-QM

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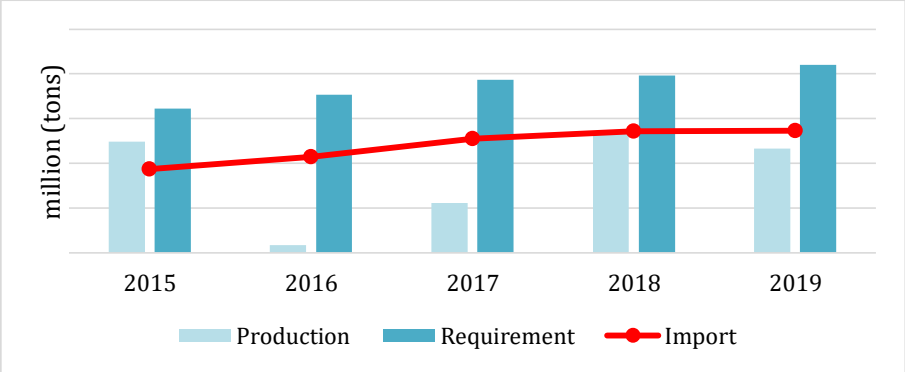
INTRODUCTION

Salt is one of several essential commodities in various parts of people's lives that are used for household to industrial purposes. Salt is used in the household sector for daily purposes. However, in the industrial sector, many productions of various industrial goods, such as cosmetics, PVC pipes, the textile industry, soap, and other industrial products are made of salt. The need for salt in Indonesia is increasing every year, but the amount of salt production are still unable to meet all current needs, so to meet this need, the government imports salt. The following chart of the needs, imports, and production of national salt in 2015-2019:



Source: Jayani (2019)

Figure 1. National Salt requirement, Import, and Production

Based on the chart above, it can be explained that the total production in 2019 was 2.85 million tons, decreasing from the previous year. Salt production in 2017-2018 was 1.1 million and 2.7 million tons, respectively. The lowest national salt production happened in 2016, from 2.9 million tons to 118 thousand tons. While every year the need of salt always is increasing along with population and industrial growth. In 2019, the national demand was 4.2 million tons, an increase from the previous year, so the government allocated salt imports in 2019 to 2.72 million, an increase compared to 2018, which was 2.71 million tons. The highest salt imports occurred in 2017, from 2.1 million tons to 2.6 million tons. On the other hand, the performance of national salt production has also been unable to reach the target. This can be seen in the following table:

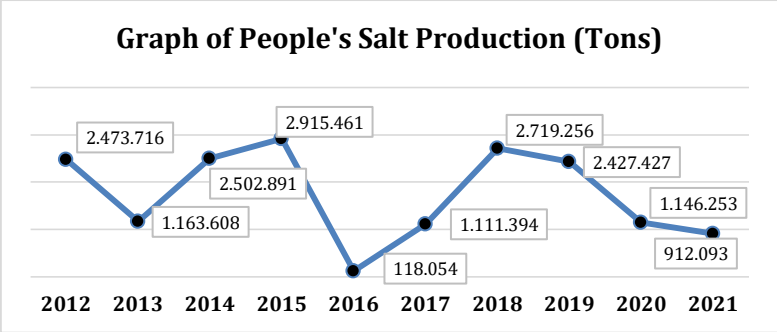
Table 1. National Salt Production Performance Achievements

	2015	2016	2017	2018	2019
2015-2019 KKP Strategic Plan Target (million tons)	3,3	3,6	3,8	4,1	4,5
Performance Agreement (million tons)	-	3	-	-	-
Realization (million tons)	2,9	0,118	1,1	2,7	2,85
Achievement Percentage (%)	87,9	3,9	28,9	65,9	63,3

Source: DJPRL-KKP Performance Report 2015-2019

Based on the table above, it can be seen that the performance of national salt production for five consecutive years has not been able to meet the targets set in the 2015-2019 KKP Strategic Plan. The target in the Strategic Plan is to increase production every year, while in reality, the amount of national salt production fluctuates. The realization of

national salt production so far has only been able to meet around 63.3%-87.9% of the predetermined target. As for the amount of people's salt production, it can be seen in the following figure:



Source: Data Processing Results (2022)

Figure 2. Graph Plot of the Amount of People's Salt Production

Figure 2 shows that the amount of national salt production for the last ten years has fluctuated yearly. People's salt production has declined in the past four years, totaling 1,807,163 tons. In addition, in terms of production performance, it has not been able to achieve the target of the 2015-2019 KKP strategic plan that has been set. To overcome this, it is necessary to have an appropriate national salt production plan to achieve the target and meet domestic salt needs. Therefore we need a forecast that can be used as an alternative in making strategies and references for making national salt production policies.

Forecasting itself can be understood as a procedure for projecting the size of needs or events that include quality, location, quantity, and time that must be met in the future to achieve predetermined goals (Kusumawardani, Afandi and Riani, 2019). Forecasting aims to anticipate data on past events or business-related events in the future because the results can impact one's decision-making and be used as the basis for long-term planning efforts in an organization's processes (Ahmad, 2020). Forecasting results can be used to make several considerations related to estimating the amount of inventory, the amount of budget costs, the amount of available production capacity, and to estimate product marketing plans (Badi'ah and Handayani, 2020). With this forecast, the government can use it as a reference to make policy decisions in terms of efforts to increase salt production for farmers or estimate the quantity of imports needed.

The forecasting approach generally consists of 2 ways, namely quantitative forecasting and qualitative forecasting (Heizer and Render, 2016). This study uses quantitative forecasting time series models. Its forecasting is a quantitative method based on a series of data tied to a period variable using observational data based on various time series variations (hours, days, weeks, months, quarters, quarters and years)(Auliasari, Kertaningtyas and Kriswantono, 2019). According to Nugraha and Suletra (2017), the time series forecasting methods are naive, moving average, exponential smoothing, and trend projection. The naive method is forecasting for each period which is equal to the actual value of the previous period, and the moving average is a method that takes the average of a number of the latest actual values and is updated every time there is new data available,

exponential smoothing is a weighted average method based on forecasting plus the percentage of forecasting error (Stevenson, 2021), while trend projection is a time series forecasting method that adjusts the trend line to a set of historical data points which then projects the trend line into the future to make a forecast (Heizer, Render and Munson, 2020).

The best forecasting method is the optimal method which has the lowest error rate than other methods with a predetermined error rate lower limit (Badi'ah, Odelia and Syauqi, 2022). According to Lusiana and Yuliarty (2020), this forecasting error test is used by comparing the forecasting results with actual data, where the magnitude of the forecasting error can be calculated using several calculation methods, namely MAD (Mean Absolute Deviation), MSE (Mean Square Error), MFE (Mean Forecast Error), and MAPE (Mean Absolute Percentage Error). Completing this forecast can use the help of the POM QM program for Windows, a software was designed to perform the calculation needed to make decisions in the field of production and marketing (Rotinsulu, Dundu and Tjakra, 2020).

Based on the description above, this study aims to obtain the best time series forecasting method and find out the estimated amount of national salt production in 2022 so that the results of this forecast can be used for future policy design in meeting the salt demand in Indonesia.

RESEARCH METHOD

This study uses a descriptive quantitative approach that uses a time series forecasting model. According to Sugiyono and Setiyawami (2022), descriptive research is research that measures the value of one or more independently in quantitative methods. While time series is a forecasting technique that uses a series of past data to make forecasts, whereas the quantitative forecasting method of this time series model consists of a naive approach, moving averages (moving average and weighted moving average), exponential smoothing (exponential smoothing with constant smoothing and exponential smoothing with trend adjustment), and trend projection (Heizer, Render and Munson, 2020). All quantitative forecasting methods in this study use historical data.

The data used in this study is secondary data in the form of people's salt production data for the last ten years between 2012-2021 obtained from the performance report of the Directorate General of KP3K/PRL (https://kkp.go.id/djprl/kategori/317-Lakip), KKP performance reports (https://kkp.go.id/kategori/179-LAKIP-KKP), and KKP annual reports (https://kkp.go.id/kategori/181-Laporan-Tahunan). In addition, data on national salt production targets were obtained from the KKP strategic plans for 2015-2019 and 2020-2024 (https://kkp.go.id/kategori/320-Rencana-Strategis-). The data collection is from documentation and literature study by reading and studying literature or sources related to the problems studied.

Data analysis techniques are carried out to predict the amount of national salt production by using time series quantitative forecasting methods, namely naive method, moving averages, weighted moving averages, exponential smoothing, exponential smoothing with trend, and trend analysis using POM-QM for Windows 3 software to obtain forecasting results and Statgraphics 19 to find the optimal alpha and beta values in the exponential smoothing and exponential smoothing with trend methods. Such program assistance can make it easier to make decisions or answer problems that are researched and

analyzed further. The selection of the best forecasting method is based on the minor forecasting error using ranking. The ranking decides from the highest to the lowest alternative (Syah, 2016). In this study, the highest ranking is at rank 1, with the smallest forecasting error value. The smaller the value generated by the measuring instrument, the better the forecasting method used (Susatyo, Jufriyanto and Rizqi, 2022).

RESULTS AND DISCUSSION

Data Analysis Results

The data collection used in this study is to forecast the next period using past data, namely data on people's salt production starting from 2012 to 2021 in the following table:

Table 2. National People's Salt Production Data for 2012-2021

Year	Total Salt Production (Tons)
2012	2.473.716
2013	1.163.608
2014	2.502.891
2015	2.915.461
2016	118.054
2017	1.111.394
2018	2.719.256
2019	2.427.427
2020	1.146.253
2021	912.093
Total	**17.490.153**

Source: Performance Report of the Directorate General of KP3K/PRL and KKP, KKP Annual Report (2012-2021)

The data above is national salt production data for the last 10 (ten) years, and it can be seen that the amount of production fluctuates every year by forming a trend data pattern. The amount of people's salt production during the last ten years has fluctuated, in which it can be seen that the production trend in 2013-2015 and 2016-2018 has increased while in 2018-2021, the amount of production has decreased. The highest amount of people's salt production occurred in 2015, 2,915,461 tons, and the lowest was in 2016 at 118,054 tons. From 2015 to 2016, there was a very drastic decline because the factor that caused the small salt production in 2016 was due to the occurrence of weather anomalies due to the La Nina occurrence.

Forecasting National People's Salt Production with Time Series Model

To calculate the amount of national salt production, the solution is to use the POM-QM program assistance. The following are some of the results of the calculation of the national salt production forecast using the time series method:

a. Naive Method

The naive method is a very simple forecasting method, which is often used as a comparison because of the ease of obtaining forecasting results and only using the previous actual value data (At-1) as a forecast for the current period, and so on (Kumila *et al.*, 2019; Ramdani and Azizah, 2020). The results of the calculation of the national people's salt production forecasting with the naive method can be seen as follows:

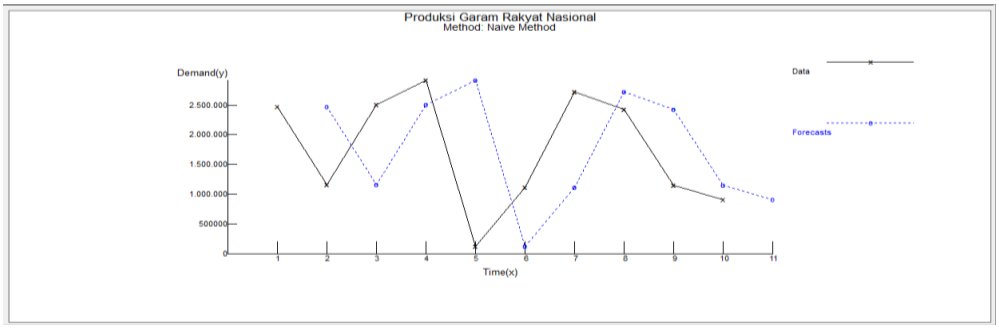
Table 3. Forecasting Results with Naive Method

Measure	Value
Error Measures	
Bias (Mean Error)	-173514
MAD (Mean Absolute Deviation)	1140859
MSE (Mean Squared Error)	1873234000000
Standard Error (denom=n-2=7)	1551916
MAPE (Mean Absolute Precent Error)	3
Forecast	
Next period	912093

Source: Data Processing Results (2022)

Based on the results of data processing for forecasting national salt production using the nave method using POM QM for Windows software, it is known that the Mean Absolute Deviation (MAD) value is 1140859, the Mean Squared Error (MSE) value is 1873234000000, and the Mean Absolute Percent Error (MAPE) value is 3. The naive method predicts that the national salt production will be 912,093 tons in the next period.

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM software for Windows. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using the naive method.



Source: Data Processing Results (2022)

Figure 3. Graph with Naive Method

b. Moving Averages

Moving average is a technique that averages a number of the latest actual values and updates them when new values become available (Saptaria, 2016). Determining the forecast in the future requires historical data for a certain period. The longer the moving average period, the more visible the smoothing effect in the forecast or the resulting smoother moving average (Rachman, 2018). In this study, moving averages use 3 months. The results of the calculation of the national people's salt production forecasting with moving averages can be seen as follows (Table 5).

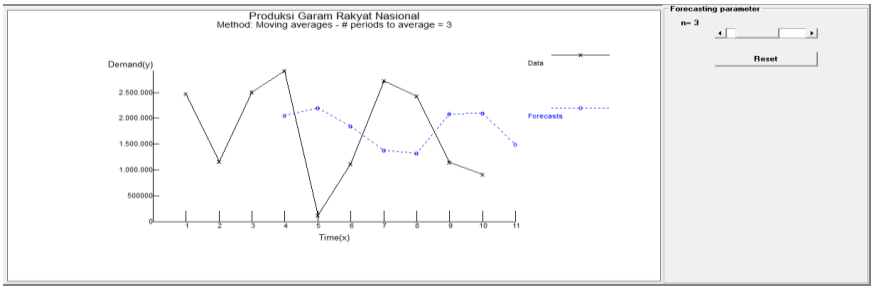
Based on the results of data processing for forecasting national salt production using moving averages using POM QM for Windows software with n = 3, it is known that the Mean Absolute Deviation (MAD) value is 1178981, the Mean Squared Error (MSE) value is 1559389000000, and the Mean Absolute Percent Error value (MAPE) of 3. Moving averages with n = 3 predict that the national salt production will be 1,495,258 tons in the next period.

Table 4. Forecasting Results with Moving Averages

Measure	Value
Error Measures	
Bias (Mean Error)	-231114
MAD (Mean Absolute Deviation)	1178981
MSE (Mean Squared Error)	1559389000000
Standard Error (denom=n-2=7)	1477547
MAPE (Mean Absolute Precent Error)	3
Forecast	
Next period	1495258

Source: Data Processing Results (2022)

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM for Windows software. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using moving averages.



Source: Data Processing Results (2022)

Figure 4. Graph with Moving Averages

c. Weighted Moving Averages

The Weighted Moving Average (WMA) is a form of improving the Simple Moving Average (SMA) by giving more weight to newer data than older data (Kumila *et al.*, 2019). In this study, weighted moving averages with n used is 3, and the weight of the previous period will be charged at 0.5; the weights for the previous two periods are 0.3, and the weight for the previous 3 periods is 0.2. The choice of these weights is because if they add up, they must reach 1.0, and the weight of the latest period is the weight that is given the greatest value, which shows the latest data will better describe the current situation compared to the data of the previous period and the data of the two previous periods. This is also the same as the research conducted by Damayanti and Rapani (2017), wherein forecasting using the weighted moving average method using a weight of 0.2; 0.3 and 0.5 (weighted in the last three months). The results of the calculation of the national people's salt production forecasting with weighted moving averages can be seen as follows (Table 5).

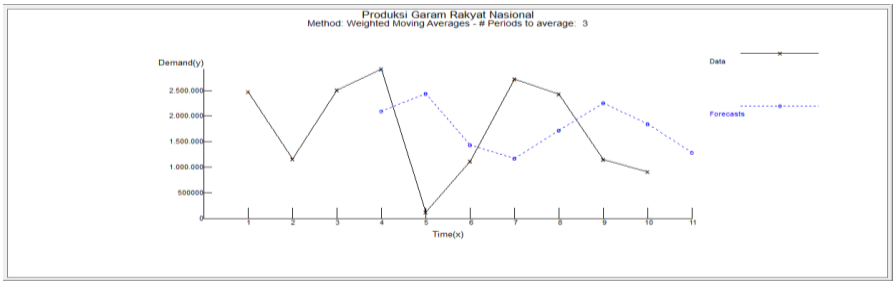
Based on the results of data processing for forecasting national salt production with weighted moving averages using POM QM for Windows software, it is known that the Mean Absolute Deviation (MAD) value is 1108679, the Mean Squared Error (MSE) value is 1594249000000, and the Mean Absolute Percent Error (MAPE) value is 3. Weighted moving averages predict that the national salt production will be 1,285,408 tons in the next period.

Table 5. Forecasting Results with Weighted Moving Averages

Measure	Value
Error Measures	
Bias (Mean Error)	-229819
MAD (Mean Absolute Deviation)	1108679
MSE (Mean Squared Error)	1594249000000
Standard Error (denom=n-2=7)	1493971
MAPE (Mean Absolute Precent Error)	3
Forecast	
Next period	1285408

Source: Data Processing Results (2022)

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM for Windows software. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using weighted moving averages.

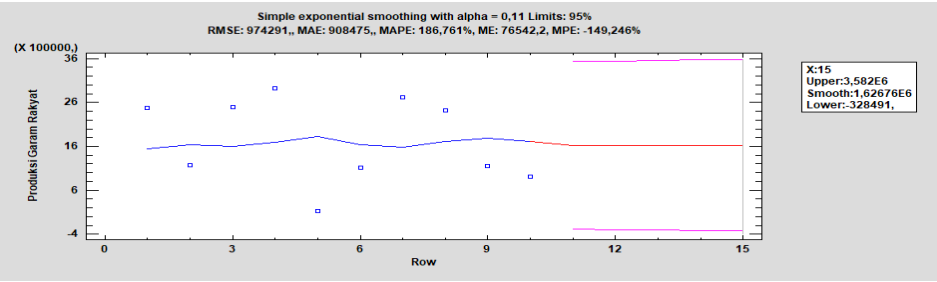


Source: Data Processing Results (2022)

Figure 5. Graph with Weighted Moving Averages

d. Exponential Smoothing

The exponential smoothing method is a data forecasting technique using mathematical logic where historical data will be processed based on the difference between actual and historical data for the previous period by considering the real level used (Santosa *et al.*, 2020). The exponential smoothing method has an alpha constant value range of 0.1 to 0.9, where closer to 1 means the latest data is given greater weight (Saptaria, 2016). To determine the appropriate load to be applied to exponential smoothing forecasting, this study uses the help of Statgraphics 19 software. The use of this software is intended to find the most optimal alpha load to be used in forecasting the amount of national salt production. The results of the alpha load obtained can be seen as follows:



Source: Data Processing Results (2022)

Figure 6. Optimal Alpha Load for Exponential Smoothing

Based on testing using Statgraphics, the most optimum alpha value to be assigned in predicting national salt production is 0.11. Therefore, the exponential smoothing forecasting in this study uses an alpha of 0.11. The results of the calculation of the national people's salt production forecasting with exponential smoothing can be seen as follows:

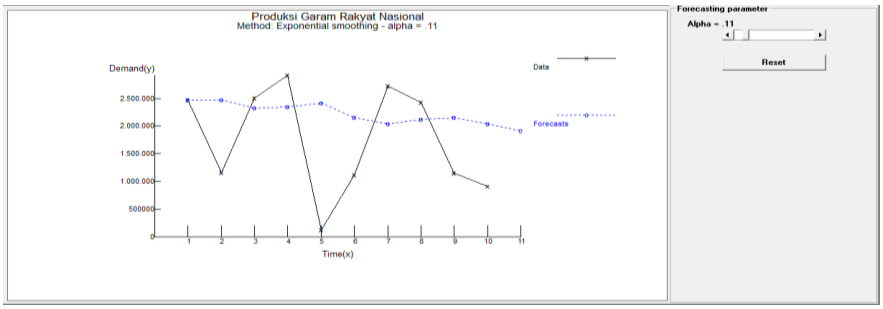
Table 6. Forecasting Results with Exponential Smoothing

Measure	Value
Error Measures	
Bias (Mean Error)	-562232
MAD (Mean Absolute Deviation)	945631
MSE (Mean Squared Error)	1251255000000
Standard Error (denom=n-2=7)	1268368
MAPE (Mean Absolute Precent Error)	3
Forecast	
Next period	1917106

Source: Data Processing Results (2022)

Based on the results of data processing for forecasting national people's salt production with exponential smoothing using POM QM for Windows software, it is known that the Mean Absolute Deviation (MAD) value is 945631, the Mean Squared Error (MSE) value is 1251255000000, and the Mean Absolute Percent Error (MAPE) value is 3. Exponential smoothing predicts that the national salt production will be 1,917,106 tons in the next period.

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM for Windows software. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using exponential smoothing with alpha 0.11.



Source: Data Processing Results (2022)

Figure 7. Graph with Exponential Smoothing

e. Exponential Smoothing with Trend

The exponential smoothing with trend method is a trend line analysis model used as a forecasting model if the historical pattern of actual data shows an upward trend over time (Mahardhika and Susanto, 2017). The exponential smoothing method has an alpha constant value range of 0.1 to 0.9, where closer to 1 means the latest data is given a greater weight (Saptaria, 2016). To determine the appropriate load to be charged in exponential smoothing with trend, this study uses the help of Statgraphics 19 software. The use of this software is

intended to find the most optimal alpha and beta loads to be used in forecasting national salt production. The results of the alpha and beta loads obtained can be seen as follows:

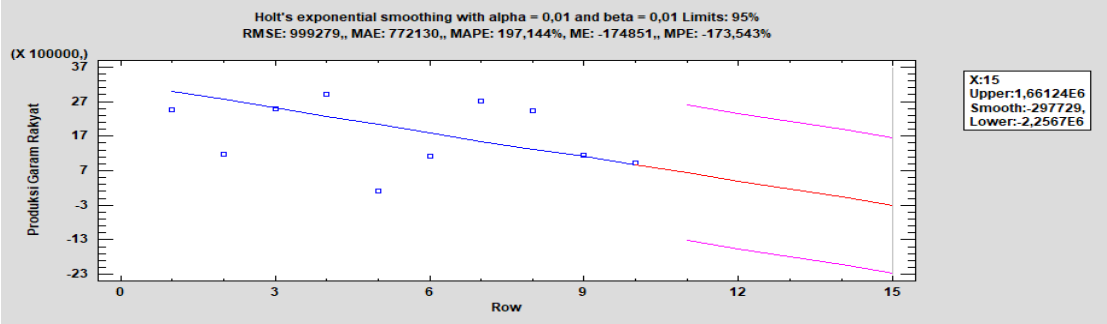


Figure 8. Optimal Alpha and Beta Loads for Exponential Smoothing with Trend

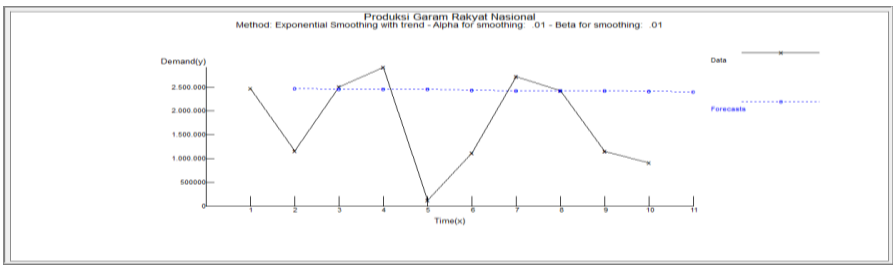
Based on testing using Statgraphics, the most optimum alpha and beta values to be charged in predicting national salt production are alpha of 0.01 and beta of 0.01. Therefore, this study's exponential smoothing with trend forecasting uses an alpha of 0.01 and a beta of 0.01. The results of the calculation of the national people's salt production forecasting with exponential smoothing with trend can be seen as follows:

Table 7. Forecasting Results with Exponential Smoothing with Trend

Measure	Value
Error Measures	
Bias (Mean Error)	-776588
MAD (Mean Absolute Deviation)	951840
MSE (Mean Squared Error)	1466505000000
Standard Error (denom=n-2=7)	1373138
MAPE (Mean Absolute Precent Error)	3
Forecast	
Next period	2400631

Source: Data Processing Results (2022)

Based on the results of data processing for forecasting national salt production with exponential smoothing with trend using POM QM for Windows software, it is known that the Mean Absolute Deviation (MAD) value is 951840, the Mean Squared Error (MSE) value is 1466505000000, and the Mean Absolute Percent Error (MAPE) value is of 3. Exponential smoothing with trend predicts that the national salt production will be 2,400,631 tons in the next period.



Source: Data Processing Results (2022)

Figure 9. Graph with Exponential Smoothing with Trend

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM for Windows software. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using exponential smoothing with trend with alpha 0.01 and beta 0.01.

f. Trend Analysis

Trend Analysis is a method that separates three components between trend, cyclical and seasonal factors from basic patterns that tend to characterize economic and business data series (Wardah and Iskandar, 2016; Iwan, Rahayu and Yulianto, 2018). The results of the calculation of the national people's salt production forecasting with trend analysis can be seen as follows:

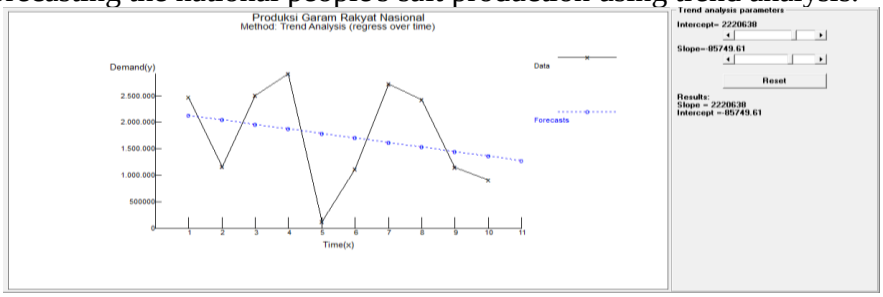
Table 8. Forecasting Results with Trend Analysis

Measure	Value	Future Period	Forecast
Error Measures		11	1277392
Bias (Mean Error)	0	12	1191643
MAD (Mean Absolute Deviation)	781560	13	1105893
MSE (Mean Squared Error)	772216100000	14	1020144
Standard Error (denom=n-2=7)	982482	15	934394
MAPE (Mean Absolute Precent Error)	2	16	848644
Regression line		17	762895
Demand(y)=2220638		18	677145
-85750*Time(x)		19	591395
Statistics		20	505646
Correlation coefficient	0	21	419896
Coefficient of determination (r^2)	0	22	334147
		23	248397
		24	162647

Source: Data Processing Results (2022)

Based on the results of data processing for forecasting national salt production with trend analysis using POM QM for Windows software, it is known that the Mean Absolute Deviation (MAD) value is 781560, the Mean Squared Error (MSE) value is 772216100000, and the Mean Absolute Percent Error (MAPE) value is 2. Trend analysis predicts that the national salt production will be 1,277,392 tons in the next period.

The figure below shows a graph of national salt production and forecasting obtained from data processing using POM QM for Windows software. The black line shows the actual data on the amount of national people's salt production, and the blue line shows the results of forecasting the national people's salt production using trend analysis.



Source: Data Processing Results (2022)

Figure 10. Graph with Trend Analysis

Evaluation of Time Series Forecasting Method

This research was conducted to determine the most appropriate forecasting method to be used in forecasting the national salt production based on the error rate of each forecasting method used. The level of accuracy of the forecasting method is assessed by Mean Absolute Deviation (MAD), Mean Squared Error (MSE), and Mean Absolute Percent Error (MAPE). The method that has a lower error rate indicates that the method is a more accurate forecasting method. The following is a summary of the results of measuring the error rate of each forecasting method:

Table 9. Results of Error Rate Calculation of Each Method

Method	MAD	MSE	MAPE
Naive Method	1140859	1873234000000	3
Moving Averages	1178981	1559389000000	3
Weighted Moving Averages	1108679	1594249000000	3
Exponential Smoothing	945631	1251255000000	3
Exponential Smoothing with Trend	951840	1466505000000	3
Trend Analysis	781560	772216100000	2

Source: Data Processing Results (2022)

From the error rate measurement for each forecasting method, a ranking is given between one and six. One indicates the lowest error rate value, while six indicates the highest or most inaccurate error rate. The ranking of the results of the measurement of the error rate of the forecasting method can be seen as follows:

Table 10. Ranking of Error Rates for Each Forecasting Method

Method	MAD	MSE	MAPE	Total Ranking	Ranking
Naive Method	5	6	6	17	6
Moving Averages	6	4	5	15	5
Weighted Moving Averages	4	5	4	13	4
Exponential Smoothing	2	2	2	6	2
Exponential Smoothing with Trend	3	3	3	9	3
Trend Analysis	1	1	1	3	1

Source: Data Processing Results (2022)

According to the information above, Trend Analysis is in the top position with the lowest error rate, namely with a Mean Absolute Deviation (MAD) of 781560, a Mean Squared Error (MSE) value of 772216100000, and a Mean Absolute Percent Error (MAPE) value of 2. In the second position are Exponential Smoothing with a Mean Absolute Deviation (MAD) of 945631, a Mean Squared Error (MSE) value of 1251255000000, and a Mean Absolute Percent Error (MAPE) value of 3. In the third place, Exponential Smoothing with Trend with a Mean Absolute Deviation (MAD) of 951840, the value of Mean Squared Error (MSE) of 1466505000000, and the value of Mean Absolute Percent Error (MAPE) of 3. In the fourth position, the Weighted Moving Averages with Mean Absolute Deviation (MAD) of 1108679, the value of Mean Squared Error (MSE) of 1594249000000, and the Mean Absolute Percent Error (MAPE) value of 3. In fifth place, Moving Averages with a Mean Absolute Deviation (MAD) of 1178981, the value of Mean Squared Error (MSE) of 1559389000000, and the value of Mean Absolute Percent Error (MAPE) of 3. And finally, in sixth place, the Naive Method with Mean Absolute Deviation

(MAD) of 1140859, the value of Mean Squared Error (MSE) of 1873234000000, and the Mean value Absolute Percent Error (MAPE) of 3.

Seeing this, the government should be able to use forecasting with the Trend Analysis method to predict the amount of national salt production. The results of forecasting the amount of national salt production using the Trend Analysis method in 2022 are 1,277,392 tons. The results of this study are in line with the research of Sidqi and Sumitra (2020), which explains that the Trend Analysis method has the highest level of accuracy compared to ARIMA and Single Exponential Smoothing so that the results of Trend Analysis forecasting can be used for the decision-making process about forecasting in the future. Rahmi's (2020) research results also show that the best forecasting method is the Linear Trend method, with the smallest error value compared to the Naive and Moving Average methods. And the results of research by Wardah and Iskandar (2016) show that in terms of the error rate and ranking of trend analysis, the error rate is lower than other methods.

The forecasting results from the Trend Analysis method show that the national people's salt production in 2022 is only capable of producing 1,277,392 tons, which means the results of forecasting the national people's salt production are still far from the salt production performance target in the strategic plan of the Ministry of Maritime Affairs and Fisheries for 2020-2024, where in 2022, the production target is 3.2 million tons (Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, 2020). By knowing the value of the results of forecasting the national people's salt production, the government at the district, provincial, and national levels can use it as a reference for decision-making in strategic planning or policies to increase the amount of national salt production. In addition, if it is necessary to import salt to meet demand, then the results of this forecast can also be used as a basis for determining the quota for the amount of salt needed to be imported, either for 2022 or in the coming year, to meet domestic salt needs. So that the quantity of imported salt is in accordance with the needs, as opposed to being arbitrarily set at a high quota, which can be detrimental to salt farmers in Indonesia.

In addition, there are several other benefits of using forecasting methods, especially the Trend Analysis method, in an organization or business to make several considerations, including:

1. In accounting, forecasting can be used in estimating the costs incurred to produce national salt for the people.
2. In the financial sector, forecasting can estimate the need for equipment, time, and the amount of funding needed for national salt production activities.
3. In human resources, forecasting can be used to estimate the training plans that must be given to salt farmers to increase production and improve national salt quality.
4. In the field of marketing, forecasting results can be used to determine the selling price of people's salt produced by salt farmers.
5. In operations, forecasting can make production schedules, capacity planning, inventory planning, etc. related to smallholder salt production activities.

This is in line with what was stated by Stevenson (2021) that forecasting affects decisions and activities throughout the organization, namely in accounting, finance, human resources, marketing, management information systems, operations, and other parts of an organization.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the study, it shows that of the six-time series forecasting models, which include the naive method, moving averages, weighted moving averages, exponential smoothing, exponential smoothing with trend, and trend analysis, the right or best forecasting method for forecasting the amount of national salt production is the trend analysis method because it has the smallest forecasting error value based on MAD, MSE, and MAPE compared to other methods. The results of forecasting the national people's salt production in 2022 using the trend analysis method are 1,277,392 tons. Thus, the forecasting results in this study can be used by the government as a reference for decision-making in strategic or policy planning to increase the amount of national salt production and can also be used as a basis for determining salt import quotas in meeting domestic salt needs for 2022 or in the year to come. In addition, forecasting can also be used to make some judgments in the areas of accounting, finance, human resources, marketing, and operations.

In this study, only six simple time series forecasting models are used in future research can use other time series methods as stated in the POM-QM software, including linear regression/least squares, multiplicative decomposition (seasonal), additive decomposition (seasonal), and user defined (error analysis), so it is hoped that more accurate results can be obtained.

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