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# Forecast Of Rice Reserves in Special Region Of Yogyakarta

***Peramalan Cadangan Pangan Beras di Daerah Istimewa Yogyakarta***

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**ABSTRACT**
Food is one of the basic human needs. A priority food commodity is rice. The Special Region of Yogyakarta Province is one of the areas that has agricultural land that is able to supply the food needs in the area. However, the population in the Special Region of Yogyakarta is growing annually, having an impact on the food needs that have to be met. The study aimed to determine the food reserves, especially rice reserves, in the Special Region of Yogyakarta. This study used a descriptive analytical method and ARIMA forecasting model. The study used time series data from 2011 to 2021 obtained from the dataku application managed by BAPPEDA of the Special Region of Yogyakarta. The data consisted of rice production data, per capita consumption data, and population data. The results showed that the rice reserves in the Special Region of Yogyakarta from 2011 to 2021 decreased over years. Based on the forecasting results, the best model was ARIMA c(9,1,6). In addition, the result of the rice reserve forecast from 2022 to 2025 also showed a decreasing trend from year to year. Therefore, it is crucial for the government to make efforts to maintain food availability to achieve local food security.

Keywords: ARIMA, Food Reserves Rice, Forecasting, Special Region of Yogyakarta

***ABSTRAK***
*Pangan merupakan kebutuhan pokok masyarakat di suatu daerah. Pangan yang lebih spesifik menjadi komoditas prioritas adalah beras. Provinsi Daerah Istimewa Yogyakarta merupakan salah satu daerah yang memiliki lahan pertanian yang masih bisa memasok kebutuhan pangan dalam daerah. Di sisi lain pertumbuhan penduduk di Daerah Istimewa Yogyakarta semakin bertambah setiap tahunnya. Hal ini berdampak pada kebutuhan pangan yang harus dapat dipenuhi. Tujuan dari penelitian ini adalah untuk mengetahui nilai cadangan pangan terutama beras yang ada di Daerah Istimewa Yogyakarta. Penelitian ini menggunakan metode deskriptif analitik dan metode analisis forecasting model ARIMA. Data yang digunakan dalam penelitian ini adalah data time series dari tahun 2011 sampai tahun 2021 yang diperoleh dari aplikasi dataku yang dikelola oleh BAPPEDA*

*Daerah Istimewa Yogyakarta. Data yang digunakan adalah data produksi beras, data konsumsi per kapita dan data jumlah penduduk. Hasil penelitian menunjukkan bahwa nilai cadangan pangan beras di Daerah Istimewa Yogyakarta dari tahun 2011 hingga 2021 mengalami penurunan dari tahun ke tahun. Berdasarkan hasil forecasting diperoleh model terbaik yaitu ARIMA c(9,1,6). Nilai forecast cadangan pangan beras dari tahun 2022 hingga tahun 2025 juga mengalami penurunan dari tahun ke tahun. Dengan demikian perlu adanya upaya pemerintah dalam menjaga ketersediaan pangan untuk mewujudkan ketahanan pangan daerah.*

*Kata kunci: ARIMA, Cadangan Pangan Beras, Daerah Istimewa Yogyakarta, Peramalan*

## INTRODUCTION

The potential of the rice reserves of the community in the Special Region of Yogyakarta is very interesting to study. The Special Region of Yogyakarta is a unique area in terms of its agricultural product potentials. In terms of land, however, the Special Region of Yogyakarta does not have very large areas of agricultural land. On the other hand, the number of populations in this province continues to increase, leading to an increase in the consumption of rice as a staple food. This condition may cause a problem if the government fails to meet the food needs of its community. This means that achieving food security is highly crucial.

Various problems in ensuring food security in Indonesia are multidimensional, involving economic, social, political, and environmental aspects. The food security system consists of three subsystems, i.e., food availability, access, and utilization. Various parameters can be used to measure the performance of food security (Suryana, 2014). One of the systems to maintain the stability of food security is to implement food reserve. Government food reserves are food reserves that are managed and distributed by the government to meet urgent food needs. Food reserves are highly needed in relation to a demand for food in large quantities yet in a relatively short time which potentially triggers an increase in market prices, an uncertainty factor related to harvest and production, and seasonal price variations that commonly occur (Erwidodo, 2015). Community food reserves are the food reserves of households, mills, traders, or industry (Muttaqin and Murtianto, 2009).

Based on research conducted by Pusvita, Sriati and Adriani (2019), it is stated that food reserves affect food security, namely food availability and food stability. Thus, strengthening food reserves is one of the strategies to achieve food security in a region. Rice is a strategic commodity that is not only an economic commodity but also a political commodity (Zakaria, 2009; Sari et.al., 2020) which will have a significant impact on the community if it is not managed properly for its availability. Based on the description that has been mentioned, this study aims to determine the potential of rice food reserves in the Special Region of Yogyakarta through forecasting methods.

The purpose of forecasting is to assist in the planning and decision-making process (Prasetyono & Anggraini, 2021). The Autoregressive Integrated Moving Average (ARIMA) model is a statistical method that is suitable for predicting a number of variables quickly, simply, cheaply and accurately. This method also only requires variable data to be predicted (Hartati, 2017). Research conducted by Ruslan, Harahap and Sembiring (2013) also uses the ARIMA method for forecasting because this method is able to overcome the complexity of time series and other forecasting situations. Based on the advantages of the ARIMA method, this study uses the ARIMA method as a method for forecasting rice food reserves in the Special Region of Yogyakarta.

## METHOD

In selecting the location, this study used a purposive sampling. This study also used a descriptive analytical method by using secondary data obtained from the *dataku* application managed by BAPPEDA of the Special Region of Yogyakarta. The secondary data were in the form of time-series data on rice production and rice consumption from 2011 to 2021. The analysis method of this study used the ARIMA model for the forecasting and calculation of food reserves.

The amount of food reserves is the difference between the amount of rice production with public consumption, so the amount of consumption has to be determined first. Per capita rice consumption is multiplied by the number of populations in the Special Region of Yogyakarta to obtain the cumulative rice consumption of the Special Region of Yogyakarta Province. Once all the amounts have been known, then the difference between the amount of rice production with the amount of community consumption can be known, thus the amount of food reserves, especially for rice commodities can also be known. The following is the formula for calculating food reserves (Suroso, 2017).

$$PCP = Rnet - Kkr$$

where:

PCP = potential of food reserve

Rnet = net rice production

Rnet = production paddy netto (Ppn) x conversion of rice netto

PPn = production paddy x conversion of paddy netto

Kkr = cumulative rice consumption

The analysis method to predict the amount of rice reserves is the Box-Jenkins Method (ARIMA). The forecasting stages in this study are as follows:

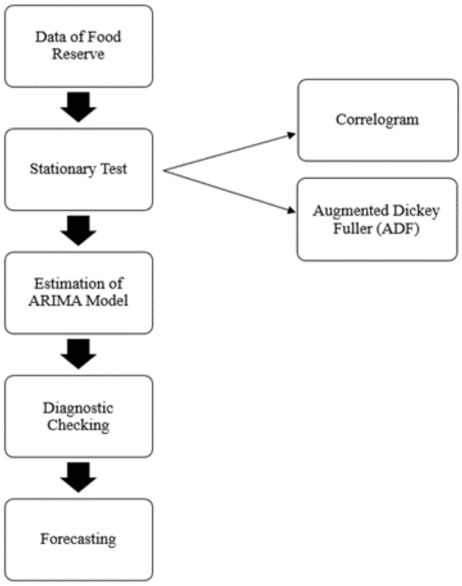


Figure 1. Analytical Framework

1. Stationarity test

   The first analysis was to determine whether the data were stationary. A stationarity test aims to prevent spurious regression. Stationary data are data that have no unit root but have a constant mean and variance (Viana et al., 2017). A stationary test can be performed using the following ways:

   a. Correlogram, i.e., by looking at the ACF (autocorrelation function) and PACF (partial autocorrelation function). Data are considered stationary when the autocorrelation and partial autocorrelation values decrease with time lags (Rosyid et al., 2021).

   b. Augmented Dickey Fuller (ADF), i.e., by comparing the absolute statistic value of ADF with the test critical value. Data are considered stationary when the value of ADF $|>|$critical test value$|$ at α = 1%, α = 5% or α = 10% (Viana et al., 2017).

2. Estimation of ARIMA Model

Estimation of ARIMA model can be done by looking at the correlogram table, namely the values of p, d and q.

p = (AR) : the last PACF at certain lag
d = (I) : the amount of differencing
q = (MA) : the last ACF at certain lag

The estimation of the best ARIMA model can be obtained using a trial-and-error method. The best model is the one that shows significant results of t-test and F-test, high $R^2$, large Log-likelihood value, and low Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC) (Santoso, 2011).

3. Diagnostic Checking

Diagnostic Checking is performed to test whether the model obtained is correct. Some of the methods that can be used are as follows: (Rosyid et al., 2021).

a. If the model is specified correctly, the error must be random error or a white noise process or no correlation between errors, so the autocorrelation function of the error is not significantly different from zero.
b. Modified Box-Pierce (Ljung-Box) is used to test whether all the errors of the autocorrelation functions are not different from zero. The autocorrelation value is considered to be not different from zero or the model has been specified correctly if statistical value Q < the critical value in the chi-square table with k-p-q degrees of freedom.

The following is the formula to determine the value of Q:

$$Q = n\,(n+2) \sum \frac{r_k^2}{n-k}$$

Where:

$r_k$ : error of a lag k autocorrelation coefficient
n : the number of stationary series observations

If there are many models that pass the diagnostic checking test, then the best model is determined by looking at the smallest coefficient according to the principle of parsimony. If there are still more than one best models after this principle has been applied, then the next step is to look at the smallest Mean Square Error (MSE) value. If the MSE values of some of the best models are not significantly different, then all the models can be selected based on the results of ex post forecast (Al Rosyid et. al., 2021).

4. Forecasting

After determining the best model, then a forecast can be done. The best forecast model can be determined by looking at the Mean Absolute Percent Error (MAPE) value, i.e., the error value of the actual value ($Y_t$) with the forecast value ($F_t$) (Al Rosyid et. al., 2021).

## RESULTS

Rice as a staple food has become a community’s need. The community's need for rice as the main source of carbohydrate has caused the demand of this commodity to increase. Rice production is one of the important factors in analyzing rice availability. It is crucial to expand agricultural land or to increase the production capacity of the same land area to improve the cultivation of rice crops (Rohman and Maharani, 2017).

Table 1 shows that the rice production in the Special Region of Yogyakarta is fluctuating. In 2011 to 2013, the rice production increased, but from 2014 to 2021 the rice production decreased, reaching 518,097 tons.

Table 1. Net Rice Production Special Region of Yogyakarta

| Year | Net Production of Paddy Rice (Ton) | Net Production of Field Rice (Ton) | Total of Net Rice Production (Ton) | Total of Net Rice Production (Kg) |
|---|---|---|---|---|
| 2011 | 352.651.460 | 102.271.160 | 454.922.620 | 454.922,620 |
| 2012 | 397.991.850 | 112.675.290 | 510.667.140 | 510.667,140 |
| 2013 | 450.324.580 | 124.893.600 | 575.218.180 | 575.218,180 |
| 2014 | 448.777.060 | 104.678.000 | 553.455.060 | 553.455,060 |
| 2015 | 405.813.000 | 123.755.420 | 529.568.420 | 529.568,420 |
| 2016 | 444.465.840 | 106.340.210 | 550.806.050 | 550.806,050 |
| 2017 | 423.402.720 | 126.407.420 | 549.810.140 | 549.810,140 |
| 2018 | 313.785.900 | 135.520.350 | 449.306.250 | 449.306,250 |
| 2019 | 397.693.520 | 121.495.880 | 519.189.400 | 519.189,400 |
| 2020 | 411.862.520 | 122.975.200 | 534.837.720 | 534.837,720 |
| 2021 | 389.560.090 | 128.537.720 | 518.097.810 | 518.097,810 |

Source: Secondary Data BAPPEDA DIY Analysis (2022)

There are many factors for the decrease in the rice production in the Special Region of Yogyakarta, such as a massive land conversion. The land conversion in the Special Region of Yogyakarta occurs very quickly, evident from the declining agricultural land areas annually. Based on research conducted by Janti et. al., (2016) the factors that encourage land conversion in Bantul Regency, one of the regencies in DIY, are increased population growth, increased demand for non-agricultural land, the phenomenon of pinched rice fields, pressure for living needs, high land fragmentation due to law inheritance, soil type, environmental degradation, climate, and the small budget allocation for the agricultural sector. The solution to this is to strictly implement the rules that prohibit the conversion of agricultural lands, affirmation of UU Nomor 41 Tahun 2009 tentang Perlindungan Lahan Pertanian Pangan Berkelanjutan, and Perpres Nomor 59 Tahun 2019 tentang Pengendalian Alih Fungsi Lahan Sawah. In addition, increasing production capacity can also be achieved through intensification by applying various technologies.

Food reserves are closely related to a community's cumulative food consumption. The majority of the populations in the Special Region of Yogyakarta consume rice as a staple food. Therefore, to measure the availability of food reserves, this study used the production and consumption of rice. The table below presents the amount of rice consumption by the population in the Special Region of Yogyakarta.

Table 2. Rice Consumption of Special Region of Yogyakarta

| Year | Rice Consumption (kg/perkapita/year) | Total Population | Rice Needs (Kg) |
|---|---|---|---|
| 2011 | 98,11 | 3.509.997 | 344.365.806 |
| 2012 | 86,00 | 3.552.462 | 305.511.732 |
| 2013 | 92,40 | 3.594.854 | 332.164.510 |
| 2014 | 92,40 | 3.637.116 | 336.069.518 |
| 2015 | 88,30 | 3.679.176 | 324.871.241 |
| 2016 | 93,60 | 3.587.921 | 335.829.406 |
| 2017 | 92,70 | 3.631.015 | 336.595.091 |
| 2018 | 88,30 | 3.631.015 | 320.618.625 |
| 2019 | 83,40 | 3.656.108 | 304.919.407 |
| 2020 | 82,20 | 3.671.189 | 301.771.736 |
| 2021 | 82,20 | 3.677.446 | 302.286.061 |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Based on Table 2, it can be seen that the highest rice consumption was in 2011, namely 98.11 kg of rice per capita per year. However, the consumption decreased until 2021, namely 82.20 kg of rice per capita per year. In fact, from 2011 to 2021, there was an increase in the number of populations every year in this province. However, the need for rice decreased. This is due to a significant decrease in the per capita consumption.

It is believed that the decrease in the rice consumption in the Special Region of Yogyakarta is due to diversification of food choices available to the people in this province. Based on research conducted by Ismiasih et.al. (2013), in general, the households in rural areas of which most of the populations are low-income and work in subsistence farming to grow rice and other crops have more diverse food choices than households in urban areas of which most of the populations are not low-income and have other occupations. In addition, there is currently a tendency to switch to more diverse foods for health benefits. When there is an increase in income, people will pay more attention to healthier, more quality, and more diverse food choices for a good nutritional intake.

Table 3. Rice Reserves of Special Region of Yogyakarta

| Year | Rice Production (kg) | Rice Consumption (kg) | Rice Reserves in DIY (kg) |
|---|---|---|---|
| 2011 | 454.922.620 | 344.365.806 | 110.556.814 |
| 2012 | 510.667.140 | 305.511.732 | 205.155.408 |
| 2013 | 575.218.180 | 332.164.510 | 243.053.670 |
| 2014 | 553.455.060 | 336.069.518 | 217.385.542 |
| 2015 | 529.568.420 | 324.871.241 | 204.697.179 |
| 2016 | 550.806.050 | 335.829.406 | 214.976.644 |
| 2017 | 549.810.140 | 336.595.091 | 213.215.049 |
| 2018 | 449.306.250 | 320.618.625 | 128.687.625 |
| 2019 | 519.189.400 | 304.919.407 | 214.269.993 |
| 2020 | 534.837.720 | 301.771.736 | 233.065.984 |
| 2021 | 518.097.810 | 302.286.061 | 215.811.749 |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Food reserves can be obtained from the difference between the amount of rice production and the amount of cumulative rice consumption in the Special Region of Yogyakarta. The amount of food reserves can be seen in Table 3. The food reserves of an area are related to the availability of staple food, i.e., a surplus production which is then stored using a good warehousing system managed by the local government or the central government. The food reserves can be used as a source of food when needed, for example when there is food shortage in other areas, when a disaster occurs, or when there is an increasing price of basic commodities.

The management of food reserves in the Special Region of Yogyakarta has been regulated in Local Regulation of Special Region of Yogyakarta Number 4 of 2018 concerning Food Reserves. In its implementation, the Provincial Government bought rice of which the amount is calculated based on the percentage of the consumption needs that can be met by the local production. After that, the rice is stored and managed by a private party that has met a certain requirement, namely having a good storage system and warehouse facilities to store the rice reserves. The government can take the rice reserves as needed. However, it is important for the government of this province to note that the Special Region of Yogyakarta is a tourist destination area which also has many educational centres. This should be a concern in relation to the availability of food reserves to meet the consumption needs and it is also necessary to record and monitor the population who enters and leaves the Special Region of Yogyakarta.

Therefore, it is necessary to forecast rice reserves until 2025. The forecast can help the local government provide rice for public consumption and help face food shortages, supply and price disruptions, as well as emergencies throughout that may occur in the Special Region of Yogyakarta. The first step in forecasting using the ARIMA model is to identify the data stationarity using the unit root test.

Table 4. The Stasionerity Test Results of Rice Reserves in Special Region of Yogyakarta 2011-2021

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey Fuller test statistic | | -3,576765 | 0,0320 |
| Test critical values : | 1% level | -4,420595 | |
| | 5% level | -3,259808 | |
| | 10% level | -2,771129 | |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Table 4 shows the results of the stationary test using the unit root test. Based on research conducted by (Wigati et. al., 2016) the data is said to be stationary if the ADF value > the critical value. The results shown in table 4 are known that t statistic of ADF │3.576765│> test critical value│3.259808. This means that the rice reserve data in the Special Region of Yogyakarta were stationary at the first difference level with a confidence level of 95%. Once the data had been declared stationary, the next analysis was to determine the best ARIMA model through a trial-and-error method by considering the autocorrelation line and the partial correlation line from the Barlett band.

Table 5. Correlogram of Rice Reserves in Special Region of Yogyakarta 2011-2021

| Autocorrelation | Partial Correlation | | AC | PAC | Q-Stat | Prob |
|---|---|---|---|---|---|---|
| . *| . | | . *| . | | 1 | -0,135 | -0,135 | 0,2426 | 0,622 |
| . **| . | | . **| . | | 2 | -0,282 | -0,306 | 1,4395 | 0,487 |
| . |* . | | . | . | | 3 | 0,127 | 0,040 | 1,7155 | 0,633 |
| . | . | | . | . | | 4 | 0,066 | 0,009 | 1,8035 | 0,772 |
| . **| . | | . **| . | | 5 | -0,258 | -0,221 | 3,4023 | 0,638 |
| . **| . | | . **| . | | 6 | -0,221 | -0,329 | 4,8645 | 0,561 |
| . |** . | | . |* . | | 7 | 0,298 | 0,086 | 8,4118 | 0,298 |
| . | . | | . | . | | 8 | -0,003 | -0,057 | 8,4122 | 0,394 |
| . *| . | | . | . | | 9 | -0,092 | 0,033 | 9,4327 | 0,398 |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Based on Figure 1, we could determine the best model by determining the best AR and MA degree. The AR model shows the relationship between dependent variable Y with an independent variable of which the value is the value of Y in the previous period. Meanwhile, the MA model shows the dependence of dependent variable Y on the residual values in the previous period sequentially.

Table 6. The Best ARIMA Model of Rice Reserves in Special Region of Yogyakarta 2011-2021

| No | Best Model | $R^2$ | Adj $R^2$ | S.E. of Regression | Log-likelihood | AIC | SIC |
|---|---|---|---|---|---|---|---|
| 1 | ARIMA (7,1,0) | 0,933 | 0,915 | 15512783 | -187,314 | 38,06284 | 38,15361 |
| 2 | ARIMA (9,1,0) | 1,000 | 1,000 | 621,850 | -180,830 | 36,76601 | 36,85679 |
| 3 | ARIMA (9,1,6) | 1,000 | 1,000 | 1,360 | -173,190 | 35,43811 | 35,55914 |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Based on the results of the trial and error to determine the best ARIMA model, there were three best models obtained (Table 5), namely ARIMA c(7,1,0); ARIMA c(9,1,0), and ARIMA c(9,1,6). The next step was to perform diagnostic checking on the three models. The results of the diagnostic checking showed that the three models were normally distributed and had homoscedasticity. In addition, the significance of t test, F test, value of $R^2$ and adj $R^2$, Log-likelihood value, and the value of Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC) were also taken into account. Based on Table 5 and the results of the diagnostic checking, the best model to be used for forecasting was ARIMA model c(9,1,6) which obtained significant results of t test and F test with a confidence level of 99% (Table 6) and had a high value of $R^2$ and adj $R^2$, namely 1,000 and the smallest value of AIC and SIC, namely 35,43811 and 35,55914 (Table 5) compared to the other two ARIMA models. This is also in accordance with research conducted by Pradana et al (2020) which states that the best ARIMA model can be seen from the smallest AIC value, the largest Log-likelihood value and the smallest estimated sigma squared value.

Table 7. Output Regression of Rice Reserves in Special Region of Yogyakarta 2011-2021

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 38672179 | 15865536 | 2,437496 | 0,0506 |
| AR(9) | -1,000000 | 3,03E-16 | -3,30E+15 | 0,0000 |
| MA(6) | -0,432245 | 0,026360 | -16,39803 | 0,0000 |
| SIQMASQ | 1,110280 | 1,199053 | 0,925964 | 0,3902 |

| | | | |
|---|---|---|---|
| R-squared | 1,000000 | Mean dependent var | 10525493 |
| Adjusted R-Squared | 1,000000 | S.D. dependent var | 53047311 |
| S.E. of regression | 1,360318 | Akaike info criterion | 35,43811 |
| Sum squared resid | 11,10280 | Schwarz criterion | 35,55914 |
| Log likelihood | -173,1905 | Hannan-Quinn criter. | 35,30533 |
| F-Statistic | 4,56E+15 | Durbin-Watson stat | 1,958348 |
| Prob (F-statistic) | 0,000000 | | |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

Based on Table 6, the regression output of ARIMA model c(9,1,6) is: D(Y) = 38672179-1,000000$AR_{(9)}$-0,432245$MA_{(6)}$. This means that the rice reserves in the Special Region of Yogyakarta (DIY) was affected by the rice reserves in DIY in the last nine months and the remaining food reserves in DIY in the last six months.

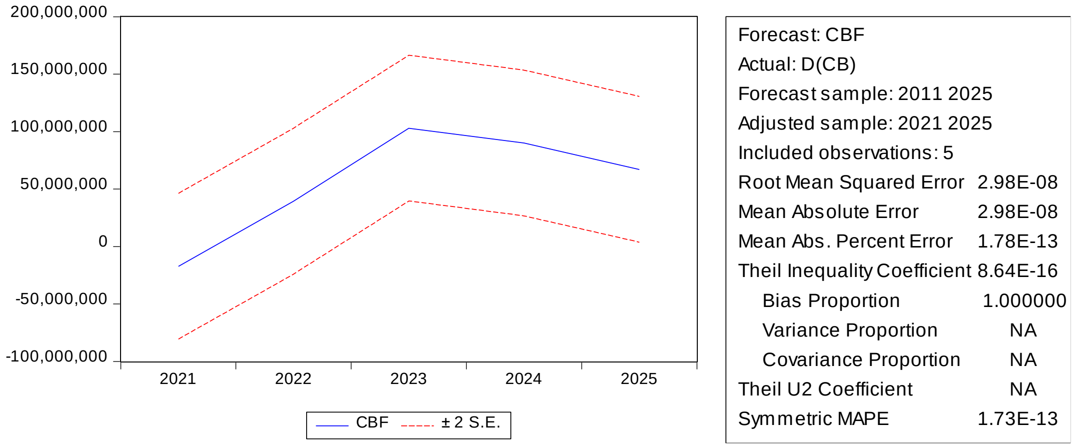


Figure 2. Forecasting Chart Model ARIMA (9,1,6) of Food Reserves in Daerah Istimewa Yogyakarta with Dynamic Model
Source : Secondary Data BAPPEDA DIY Analysis (2022)

Once the best model, i.e., ARIMA model c(9,1,6) had been obtained, forecasting using a dynamic method with the model could then be performed. Figure 2 shows that the forecasting graph of the rice reserves in the Special Region of Yogyakarta from 2022 to 2023 tends to increase annually, but in 2024 and 2025 the graph tends to decrease. In addition, the increase and decrease in the rice reserves in the Special Region of Yogyakarta can also be seen in Table 7.

Table 8. Forecasting Results of Food Reserves in Special Region of Yogyakarta 2022-2025

| Year | Food Reserves in DIY (kg) |
|---|---|
| 2022 | 39.446.096 |
| 2023 | 103.012.487 |
| 2024 | 90.032.721 |
| 2025 | 67.064.894 |

Source : Secondary Data BAPPEDA DIY Analysis (2022)

A decrease in the rice reserves in the Special Region of Yogyakarta has an impact on the food security of this province, including food availability, access, and utilization. One of the factors that affect rice availability is rice production which declines annually due to a competition in land and water use, high land conversion, and climate change. In addition to the production-related factors, rice consumption factors also affect the decline in the rice reserves in the Special Region of Yogyakarta. One of the causes of the decreased consumption is the Covid-19 pandemic. The pandemic has caused the tourism sector in the Special Region of Yogyakarta to decline, thus decreasing the consumption in tourism-related industries, including culinary centres. In addition, the decline is also affected by the fluctuating number of populations who come and go due to education or employments. During the pandemic, learning, teaching, and working activities are done from home, so the number of newcomers who live in this province decline, thus declining food consumption.

Based on the results of the Forum Group Discussion published at the website of the Coordinating Ministry of Economic Affairs of the Republic of Indonesia conducted by some representatives from the Ministry of Economy, Ministry of Agriculture, Department of Agriculture and Food Security of DIY, Department of Industry and Trade of DIY, Department of Agriculture and Food Security of Sleman Regency, and the Central Bureau of Statistics in 2021, the government has made various on-farm and off-farm efforts to ensure food availability to achieve food security. The on-farm efforts include the provision of sprinkle irrigation, integrated pest control, prevention of land conversion, and implementation of sustainable food-reserve garden (P2L) policy. On the other hand, the off-farm efforts include diversifying local-food-based food, developing farming corporations, organizing events that sell low-price basic commodities, distributing and monitoring local government food reserves, monitoring food distribution, calling on traders not to stockpile, and monitoring goods and services trades to ensure consumer protection.

## CONCLUSION

Based on the results of the study, it can be seen that the amount of rice reserves in the Special Region of Yogyakarta from 2011 to 2021 decreased annually. Meanwhile, based on the results of the forecasting analysis using the ARIMA model, the amount of rice reserves in the Special Region of Yogyakarta from 2022 to 2025 also decreases annually. Therefore, efforts to ensure food availability in the Special Region of Yogyakarta are needed, i.e., prohibiting land conversion, making technological innovations for food crop cultivation, especially rice, and optimizing the function of the community's food barn, which is actually the local wisdom of the community in this province.

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