

DEVELOPMENT ANALYSIS OF CHILI IMPORTS IN EAST JAVA

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ABSTRACT

East Java Province is one of the leading national chili producers. But, East Java still imports chilies to meet fluctuating demand and prices. The variables of imports, production, consumption, pricing, and currency rates were employed in this study and ranged from 2019 to 2021. This study aims to forecast the volume of chili imports in East Java for the next year (12 months) and analyze the factors that influence chili imports in East Java to determine the most dominant influencing factors. The method used in this study is (Autoregressive Integrated Moving Average) ARIMA model and multiple linear regression analysis. The results of the study show: The development of chili imports in East Java in the prediction results with the ARIMA model (1,1,1) shows that chili imports have a downward trend, and simultaneously chili imports are influenced by production, consumption, price, and exchange rate, with consumption as the most dominant factor. It is hoped that the government will regulate the volume of imports by imposing import quotas and controlling chili prices.

Keywords: chili; forecasting; import

INTRODUCTION

The development of globalization creates a country to carry out international cooperation. International cooperation is a partnership between two or more countries to achieve common goals. One of the forms of cooperation between countries is international trade (Fitriani 2019). The import policy is an international trade policy carried out by Indonesia. Imports are the entry of various commodities into a country's market used as consumer products and raw materials for domestic production (Adhalia et al., 2020). International trade can occur when a government cannot meet its own needs due to limited resources. Almost every country trades with other countries because natural resources, human resources, and technological capabilities are different. The advantage of a country making international trade can later encourage economic growth.

Indonesia is an agricultural country with a broad agricultural sector and plays an essential role in supporting national economic development. Agriculture has the potential to strengthen the domestic food market. However, Indonesia's underutilized resources can cause the domestic food market to depend on imports from other countries. One of the plants imported by Indonesia is chili. Chili can be used in the manufacture of cosmetics, for the food and beverage processing industry, and household purposes as a spice for cooking (Bhattarai and Mariyono 2016). Chili plants have potential and economic value to be developed because they have many benefits, so chili consumption is estimated to increase each year.

According to the Badan Pusat Statistik (2021), there are five major import countries of chili, namely India, China, Malaysia, Thailand, and Vietnam. The types of chili imported by Indonesia are based on the HS code, namely HS 0709601000 chili (fruit of the genus *Capsicum*) fresh or chilled, HS 0904211000 (fruit of the genus *Capsicum*), which is dried, and HS 0904211000 (fruit of the genus *Capsicum*) which is crushed / ground. According to (Pusdatin, 2020) explaining several provinces that contribute to the production of Indonesian chili, East Java Province (31,6%), Central Java (12,13%), West Java (15,44%), North Sumatra (5,89%), Aceh (5,30%), West Nusa Tenggara (4,67%) and Bali

(2,82%). This research is centred on East Java as a producer of chili production centres. Chili is one type of vegetable horticultural plant as the main ingredient in cooking. In 2021 the volume of chili imports fluctuated every month, with the highest import volume occurring in July at 25790 tons, while the smallest import volume occurred in February at 6758 tons.

Chili production in East Java has decreased while consumption is continually increasing. Therefore, to counterbalance the increase in consumption, the government imports from other countries. It can be seen that chili is classified as a seasonal crop that does not substitute for its uses, but its needs are needed every day, and demand cannot supply it outside of harvest. Public order and consumption of chili will always increase. Erianti (2020) stated that the increasing demand for chili is expected from the many developments in the processing industry made from chili raw materials. In addition, there are several problems in chili downstream activities, including inadequate technological capabilities, a sector that is still on a household scale, application of product standards that have not been able to compete, and a lack of competitiveness in the export market. The average productivity of chili each year is multiplying, which causes the price to fluctuate significantly because production is seasonal. There is a decrease in prices during harvest, and when outside crop, there is an increase in prices (Nugrahapsari and Arsanti, 2019). In this case, it will be detrimental to producers and consumers because the cost of chili constantly fluctuates every month. The government seeks to import chili from other countries to maintain chili price stability to overcome the price spike.

The unstable growth rate of imports can have an impact on economic sustainability. As a result, implications must be managed appropriately. This technique will work if economic actors are aware of future market conditions. Therefore it is necessary to forecast import volumes using ARIMA to respond to fluctuating chili imports. To make accurate forecasts in the ARIMA model, the independent variable is not used, but the past value of the independent variable is. As previous research conducted (Lubis et al., 2021) Autoregressive Integrated Moving Average in Forecasting Red Chili Commodities in Indonesia, the best ARIMA model forecasting (3,0,1) with factors that influence it are chili production per month, demand for chili per month, and monthly area harvest. (Putri and Sugiarti, 2021) conducted a study on Developments and Factors Affecting Demand for Industrial Salt Imported Volume in Indonesia. It was concluded that the development of industrial salt import volume in Indonesia, forecast for 2019-2023, tends to increase. The factors that significantly influence the price of imported salt and the quantity of salt. The industry uses salt as raw materials, while the amount of production, the exchange rate, and Indonesia's GDP per capita growth has no significant effect.

Furthermore, research from (Setyawan et al. 2020) Forecasting Analysis Using ARIMA on the Indonesian Wholesale Price Index for Agricultural Commodity Groups 2000-2019 states that the Wholesale Price Index in the agricultural sector has shown an increase in market prices in the farm sector. Comparing previous studies with this research on chili commodities, mostly forecasting on production and price variables, there have not been many studies indicating imports with chili commodities and their development. This is a novelty in this study by focusing on the development of chili import volume in the next period (the next 12 months) using data from the lamp period and what factors influence and which elements are more dominant in chili imports.

A forecasting activity regarding conditions in the future, these problems must be investigated in depth by looking at indicators that affect chili imports in East Java. Then it is obtained that the purpose of the study is to analyze the development of chili imports over the next year (12 months) and the determinants that affect the import of chilies in East Java and to find out the most dominant influencing factors.

MATERIAL AND METHOD

The selection of the object of this research was carried out intentionally because East Java Province is the mainstay province of the national chili supplier, but there are still chili imports. Secondary data is used in this study with a monthly time series scale in the data range from January 2019 to December 2021 sourced from the East Java Central Statistics Agency, the Plantation Service, the East Java Agriculture Service, and the National Strategic Food Price Information Center. The data needed are the volume of chili imports, chili production, chili consumption, chili prices, and the exchange rate. The method in the first objective of this study uses the ARIMA model to determine the level of development of chili imports in East Java by predicting the forecasting of chili imports for the next year (12 months). Data processing with the ARIMA model requires several stages of the procedure, namely; Identifying the model by determining its stationary level, Determining the temporary model obtained from the order (p,d,q), Performing parameter estimation and significance test, Diagnostic checking, selection of the best ARIMA model

The following method in answering the objectives of these two studies uses multiple linear regression analysis to determine the effect of production, consumption, price, and exchange rate on chili imports with the following equation:

$$Y = \beta_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \varepsilon \quad (1)$$

Where: Y : Where: Y : import volume (tonnes), 0 : constant, b_1, b_2, b_3, b_4 : regression coefficient, X_1 : chili production (tonnes), X_2 : chili consumption (tonnes), X_3 : chili price (Rp/Kg) , X_4 : exchange rate (Rp/\$), ε : error term

According to Gunawan (2017), before conducting linear regression analysis, it is necessary to test the feasibility of the model that can be done, namely: classical assumption testing (normality test, multicollinearity, heteroscedasticity, and autocorrelation), coefficient of determination, regression test together (simultaneous test/f), and individual regression test (partial test/t). Furthermore, the coefficient of determination was tested to see how much influence the volume of chili imports had. Then the f test is carried out based on deciding on the test criteria as follows:

- If f count < f table of probability f count > 0,05 significance, then H_0 is accepted and H_1 is rejected, meaning that the independent variable does not affect the dependent variable.
- If f count > f table of probability f count < significance 0,05, H_0 is rejected, and H_1 is accepted, meaning that the independent variables simultaneously affect the dependent variable.

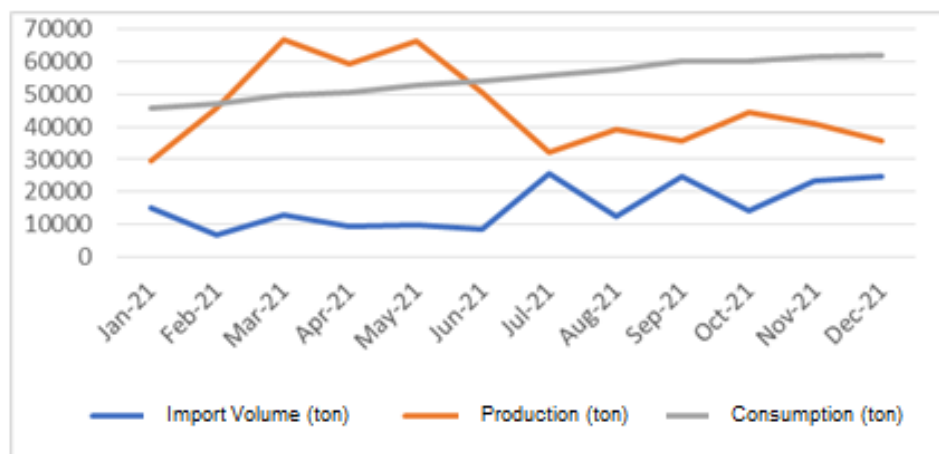
The t-test was carried out to explain the influence of the independent variables individually on the dependent variable, which was later obtained from the t-count value with the test criteria, namely:

- If tcount < t table or probability tcount > 0.05 significance, then H_0 is accepted and H_1 is rejected, meaning that the independent variable tested does not affect the dependent variable.
- If t count > t table or probability t count < t significance 0.05, then the rejection of H_0 and acceptance of H_1 means that the independent variable tested affects the dependent variable.

RESULT AND DISCUSSION

The Development of Chili Imports in East Java

The government implements a chili import policy to meet consumer demand within the limited production produced. The cause of the low level of chili productivity is erratic weather factors. Chili production tends to decrease while chili consumption tends to increase. As a result of this increase in chili consumption, imports will need to be carried out later to meet their needs so that chili imports that occur also tend to increase, as shown in Figure 1.



Gambar 1. Development of import, production, and consumption of chili in East Java (Source: Badan Pusat Statistik, 2021)

Knowing the level of development of chili imports in East Java in the future period is first done by predicting the forecast using the ARIMA model. The ARIMA model functions to forecast time series, which is only based on observations of the behavior of the dependent variable data. Yudarudin (2019) explained that ARIMA has a good level of accuracy in forecasting based on the analysis of variable data that existed in the past. The story of accuracy in predicting must be careful. The ARIMA model also has limited predictive accuracy, but it is more widely used to forecast future values in a

row in time-series data (Abinowi and Sumitra, 2018). The following are several stages in the ARIMA model, including:

Identify the Model By Describing the Data Pattern

The data plot in Figure 2. shows that the volume of chili imports in East Java from January 2019 to December 2022 has an increasing trend with the data pattern on the development of chili imports in East Java. The data pattern formed from the volume of chili imports in East Java is a seasonal pattern. According to (Darsyah 2015), forecasts containing seasonal patterns can be analyzed using the decomposition method, the winters method, and the ARIMA model method. Because the way formed is seasonal, it can be analyzed using the ARIMA model in this study. The increase in chili imports in East Java is due to the condition of chili production that cannot meet consumption, so there are still chili imports every month. The data plot tends to be non-stationary, so a data transformation process with differencing is needed.

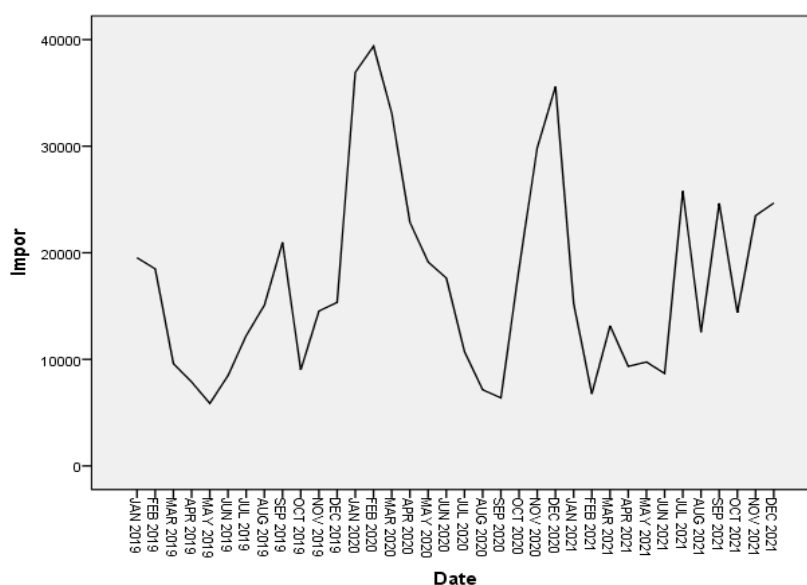


Figure 2. The plot of Time Series scale data (Source: Secondary data processed, 2021)

Carry Out the Differencing Process

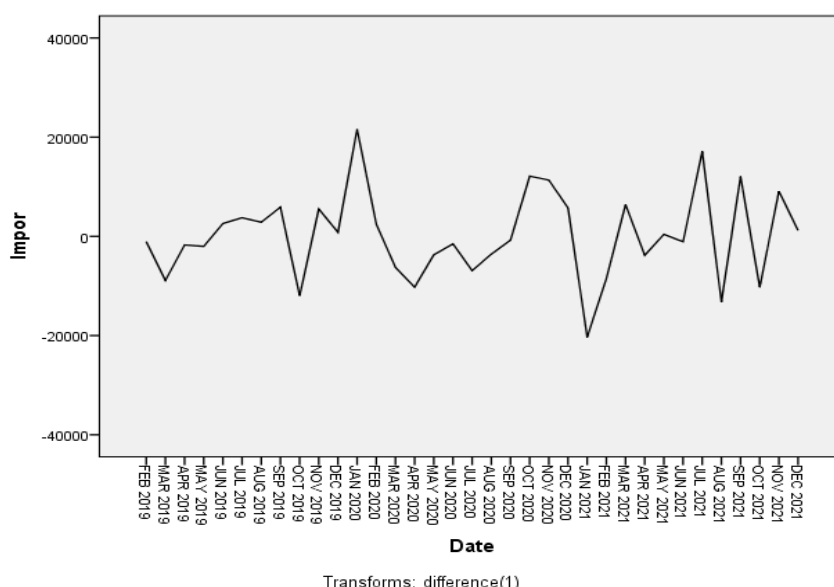


Figure 3. The plot of data transformation (one-time differentiation) (Source: Secondary data processed, 2021)

After the differencing process has been carried out as much as once, it produces a data plot in Figure 3. showing stationary. Puspatika and Kusumawati (2018) state that stationary data should spread randomly along with the data and ensure that its fluctuations have a constant mean value. In this study, it can be seen that the data from the volume of chili imports is not stationary, so it is necessary to do a differencing process. The differencing process differs from the observation value by eliminating the previous data. The data plot results that have gone through the differencing process occur once. Several different methods will be obtained for the value of the order $d=1$.

Identify the Model from the ACF and PACF Plots

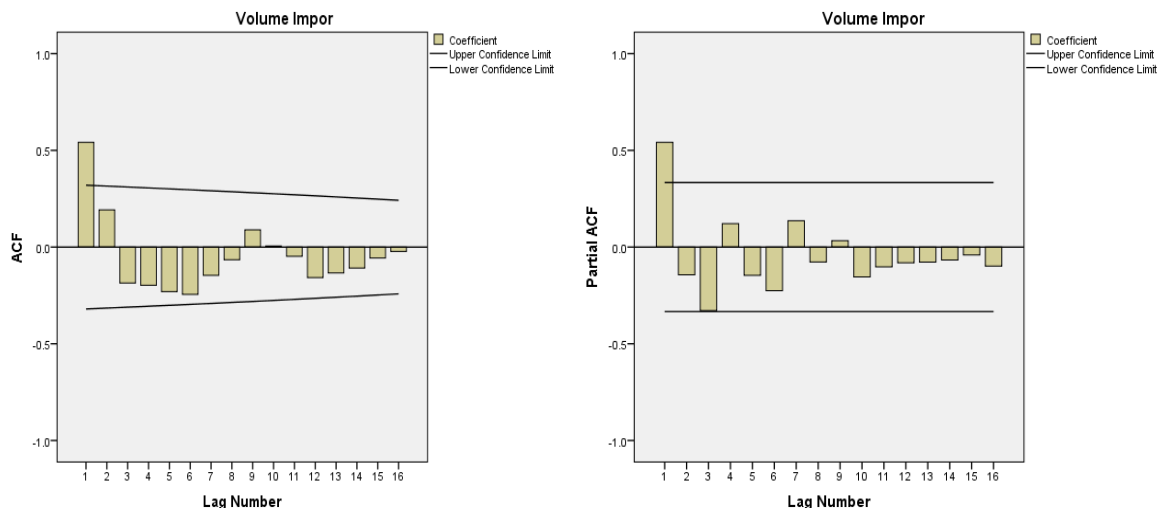


Figure 4. The plot of ACF and ACF of chili import volume transformation data (Source: Secondary data processed, 2021)

In Figure 4. Shows the ACF and PCF plots that form a cut-off pattern. Determination of AR and MA values in the ARIMA method was obtained from data plots with autocorrelation (ACF) and data plots with partial autocorrelation (PACF). The PACF plot is to get a value on the order AR (p), while the ACF plot is to obtain a value on the order MA (q), which is obtained from the exit of the line at the boundary (Nurcahyani and Iqbal 2014). Based on the analysis, it shows that there are PACF and ACF plots that are out of the horizontal boundary line, so from the study, it can be seen that those that are out of bounds area in the first time lag period, that the values for the order $p = 1$ and the order $q = one$ are obtained.

ARIMA Model Selection

In choosing the ARIMA model, values of order p, d , and q were obtained from the previous stage, with each value being 1, so that the ARIMA model set was (1,1,1). Because the possible ARIMA from the chili import volume data is ARIMA (1,1,1), the ARIMA (1,1,1) model was chosen as the best ARIMA model. Paul et al. (2013), it would be better to select a suitable model if the parameters are fewer than many parameters and prioritize a slight lag. Some of the reasons for choosing the best ARIMA model are: parsimonious (simpler is better), the stationary and invertibility coefficients are significant, convergent, has the smallest value from AIC and SC results, chooses the smallest from the regression standard and residual sum square, and determines the most significant value of the adjusted R square value is F count (Firdaus, 2011).

Perform Diagnostic Checking

Diagnostic checking is done using the Ljung-box test to fulfill the residual white noise assumption.

Table 1. Results of diagnostic checking ljung-box test

	Lag	1	4	8	12	16
Box-Ljung Statistic	Value	0,200	7,013	7,596	1,174	14,778
	Sig.	0,656	0,135	0,474	0,290	0,541

Source: Secondary data processed, 2021

Ljung-box is used in testing the assumption of white noise. Ljung-Box is a test that checks whether the presumption of white noise has been met or not. The white noise assumption test compares the p-value and the significance level of $\alpha=5\%$ (Hendikawati 2015). In Table 1. The results of the Ljung-box test show that all lags have a p-value of more than $\alpha=5\%$, which means that the residuals from the ARIMA model (1,1,1) white noise assumptions have been met. So it can be said that according to research from (Bangun, 2019) which explains that if you have to meet the goodness value of the Ljung-box test results, the p-value at the time lag value is more than 0,05, which means that the model is suitable for reference at the forecasting stage.

Comparing the Actual Chili Import plot with the Forecast

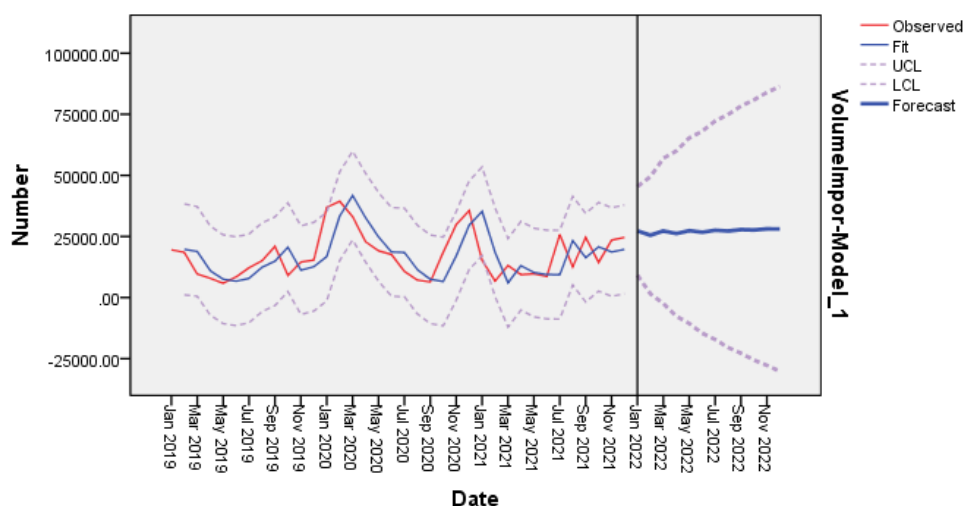


Figure 5. The plot of actual chili imports with forecasting numbers (Source: Secondary data processed, 2021)

Comparison between the actual chili import data plot and the chili import data plot. The plot can be explained that the forecasting results are not far from the basic chili import data plot. The plot movement is indicated by the MAPE value obtained at 44,9%. This is following research from (Nisa et al., 2020) which states that there is no 100% accurate forecast. If the MAPE value is 20-50%, the accuracy of the prediction is still within reasonable limits.

Doing Forecasting

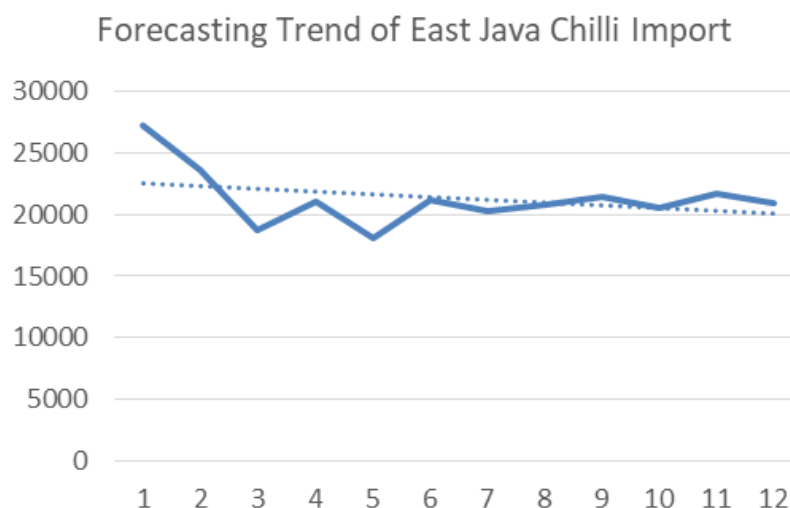


Figure 6. Forecasting results of chili imports (Source: Secondary data processed, 2021)

If seen from the graph, it is explained that the prediction of chili imports for the future period tends to decrease. The highest forecast for chili imports is in January, and the lowest is in May. The actual chili import data in 2022 are January 20,798 tons, February 20,437 tons, March 26,629 tons, and April 25,843 tons. When compared with the results of forecasting, it can be said that the results are that there are differences in the increase and decrease not far from the forecast. In Figure 6. the graph forecasting imports tends to decline because it is predicted that there will be excess production so that an abundant supply of chili will later be able to meet the demand for chili. In predicting something, the government can use it as a reference for determining strategies in policy-making related to imports.

Factors Affecting Chili Imports

This study analyzes the factors that affect the volume of chili imports in East Java by solving them using multiple linear regression analysis. (Basuki 2014) states that multiple linear regression analysis represents the relationship of one dependent variable influenced by several independent variables. The variables studied were the volume of chili imports as the dependent variable and the variables of production, consumption, price, and exchange rate as independent variables. Factors that affect chili imports were analyzed using linear regression equations based on Goodness Off Fit criteria (coefficient of determination, f-test, and t-test) and classical assumptions (normality test, multicollinearity heteroscedasticity, and autocorrelation).

Classical assumption testing is used so that the model avoids deviations. The requirements in classical assumption testing are if the data is usually distributed, there is no heteroscedasticity, there is no multicollinearity, and there is no autocorrelation. Classical assumption testing is used to free the model from deviations (Mahyus, 2015). The data processing that has been done shows that the model has met the requirements of the classical assumptions. The data can have passed the normality test because the standard probability plot graph shows that the plot points are straight around the diagonal line. The multicollinearity test has met the requirements that the model does not have multicollinearity because the results of all variables have a tolerance value above 0,10 and a VIF value below 10. The statistical significance of Durbin-Watson (DW) obtained 1,730. The test results found that the DW value was in the middle between du and 4-du ($1,724 < 1,730 < 2,276$), then it showed that the model did not have autocorrelation. The heteroscedasticity test shows that the model does not experience heteroscedasticity because it can be proven from the scatterplot graph if the points are far apart and do not form a pattern,

Table 2. Results of multiple linear regression analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
Constant	97571.512	46408.138		2.102	0.044
Production	-0.297	0.043	-0.722	-1.862	0.051
Consumption	0.302	0.136	0.239	2.217	0.034
Price	0.078	0.084	0.099	2.926	0.042
Exchange Rate	-5.947	3.096	-0.211	-1.921	0.064
F-count	15.189				0.000
R. Square	0.662				
Durbin-Watson	1.730				

Sources: Secondary data processed, 2021

Table 2. shows the test results from multiple analyses with an R^2 of 0,662, which means chili production, chili consumption, price, and exchange rate affect the volume of chili imports in East Java by 66,2%. In comparison, the remaining 33,8% can be explained by variables other than the model in estimation. Zahara et al. (2021) explain that if the value of R^2 is more than 50% and the resulting R^2 value is close to 1, the independent variable can provide all the information needed by the dependent variable. The regression results obtained show that the value has more than 50% and ranges close to 1, so the regression model is considered good and has accuracy in information. Then the f-test is produced, determining if the independent variables together (simultaneously) significantly affect the dependent variable (Sulaminingsih 2020). The f count value obtained is 15,189 with a significance of 0.000. F count ($15,189 > f$ table (2,68) and the probability f count ($0,000 < \alpha$ (0,05) significance level, which means that chili production (X1), chili consumption (X2), price (x3), and the exchange rate (X4) together (simultaneously) have a significant effect on chili imports in East Java (Y), seeing that the resulting significant value is less than 0,05 meaning that it is following the proposed test criteria.

Furthermore, the results of the t-test are used to determine the factors of each variable (partial) that affect the import of chili, based on decision-making using the significant value and t-count. The value of t-table at a significance of 0,05 obtained the result of 2,040. The following equation model results from multiple linear regression analysis :

$$Y = 97571,512 - 0,297X_1 + 0,302 X_2 + 0,078X_3 - 5,947 X_4 + \varepsilon \quad (2)$$

Based on the equation above, the coefficient values are positive and negative. The coefficient is on the consumption variable, and the price is favorable, while the negative coefficient value is on the production variable and the exchange rate. The results of the explanation of the elements that determine the volume of chili imports in East Java are as follows:

Production (X1)

The value of the regression coefficient on the chili production variable (X1) is obtained by -0,297 with a p-value (0.051) > α (0.050). Then these results indicate that there is acceptance of H0 and rejection of H1, which means partially chili production (X1) has no significant effect on chili imports in East Java. The results of this study are in line with research conducted by Nanda and Rustariyuni (2018), which states that the amount of production hurts chili imports. This means that the results of previous studies explain that the high production of chili owned will later reduce chili imports (Bhattarai and Mariyono 2016). Chili production has not been optimal due to several challenges, including irregular weather, the number of pests and diseases that attack plants, high production costs, and insufficient marketing infrastructure. In addition, the quality obtained from imported chili is better than from domestic chili. So that many switches to using imported chilies, the government and farmers should improve quality, increase productivity, cultivate superior varieties and improve the agricultural and institutional system to achieve food self-sufficiency and not rely on imports.

Consumption (X2)

The coefficient value on the chili consumption variable (X2) is 0.302 with a p-value of (0,034) < α (0,05). Then these results indicate that there is acceptance of H1 and rejection of H0, meaning that partially chili consumption (X2) has a significant effect on the import chili in East Java. The results of this study are in line with research conducted by (Shofiyah and Sugiarti, 2020). The amount of consumption hurts chili imports. This means that the results of previous studies explain that the high consumption of chili can later increase chili imports (Sari, 2016). A large number of direct consumption, industrialization, and dispersion will lead to high demand for chili (Astuti et al., 2021). So it can be said that currently, the high consumption of chili is triggered by household needs and the need for industrial processing, as stated by the Heckscher-Ohlin theory in international trade, which states that the occurrence of international trade is caused by differences in production factors with the number of products produced from each region. In addition, the increasing demand for chili is also caused by the increasing number of residents in an area. The government is trying to import to cover the shortage of chili consumption.

Price (X3)

The coefficient value on the chili price variable (X3) is 0.078 with a p-value of (0,042) < α (0,05) then these results indicate that H1 is accepted and H0 is rejected, meaning that partially the chili price (X3) has a significant effect on import chili in East Java. The results of this study are in line with (Arsanti 2015) that prices positively influence chili imports. This means that the results of previous studies explain that the high cost of domestic chili can certainly increase chili imports (Nugrahapsari and Arsanti 2019). It is evident that chili prices are still fluctuating, so it can be said that the chili price policy has not been effective as a reference for import management. In this study, it seems that the law of demand does not apply where if the price rises, there will be fewer buyers, but in the case of import purchases, it is stated that if the chili price is high, the government tries to overcome the high price spike with imports.

Exchange Rate (X4)

The value of the coefficient on the exchange rate variable (X4) is -5.497 with a p-value of (0,064) > α (0,05). Then these results indicate that there is acceptance of H0 and rejection of H1, meaning that partially the chili exchange rate (X4) has no significant effect on chili imports in East Java. The results of this study are in line with Mahardika and Yuliarmi (2018), the high exchange rate hurts imports. This means that the results of previous studies explain that the high exchange rate of chili owned can later reduce the rate of chili imports. Policy in exchange rates can be influenced by

trade flows in suppressing imports (Silitonga 2019). When importing, payment is required by converting rupiah to foreign currencies. In these conditions, it will affect changes in import activities. If the exchange rate is depressed, the value of the foreign currency strengthens, and the value of the rupiah currency depreciates. The price of imported chili becomes expensive, so imports tend to decrease. Meanwhile, if the exchange rate appreciates, it means that the value of the foreign currency weakens. The rupiah's value strengthens so that the price of imported chili becomes cheaper, and imports will tend to increase.

The Most Dominant Influencing Factor

The most dominant factor testing was obtained from the elasticity analysis of each independent variable in a study (Permadi 2015). The most dominant influencing factor is obtained from the value of the unstandardized coefficient beta results. The consumption variable has the highest Standardized Coefficient Beta value, meaning consumption has the most dominant influence among production, price, and exchange rate variables. This influence is related to consumption patterns, people's income levels, non-consumption demand, and the need for raw materials in the processed industry. This finding is in line with Dewi dan Sutrisna (2016) research that consumption has a dominant effect on imports of horticultural plant species. This shows that high consumption will cause an increase in the number of implications because the number of impacts is increasing based on the consumption needed by the population of East Java.

CONCLUSION AND SUGGESTION

The development of chili imports in East Java in the prediction results with the ARIMA model (1,1,1) shows that chili imports have a downward trend. Simultaneously, production, consumption, price, and exchange rate affect chili imports. The production and exchange rate variables have a negative effect, while the consumption and price variables positively impact. The positive effect on consumption means that each increase in consumption will increase the next import by 0.302 tons, and each price increase will increase imports by 0.078 tons. Based on these findings, it is recommended that import volumes be regulated by imposing import quotas and controlling chili prices. Based on these findings, import volumes are recommended to be handled by setting import quotas and managing chili prices.

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