



Analysis of Garlic Import Demand Trend in Indonesia

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Abstract. This research aims to find out the development patterns and trends in import demand for garlic in Indonesia. Observing the pattern and trend of garlic imports will provide invaluable information for program planning, program evaluation, and policy development activities for domestic garlic development in the future. The data used in this study is the annual demand for garlic imports in Indonesia from 1995-2019. Three trend methods are applied including linear, quadratic, and exponential methods. The best trend was determined by examining the MAD, MES, ME, and MAPE values. The best trend model for garlic import demand in Indonesia, according to this study, is an ascending exponential trend. The trend of garlic import demands in Indonesia increases along with the increase of garlic consumption and domestic garlic production in Indonesia.

Keywords: garlic, import, trend demand

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1. Introduction

Garlic is widely used by the Indonesian, not only consumed in fresh form but also the form of processing. According to [1], garlic ranks as the second most widely consumed after onion. Despite its high economic value, garlic still requires considerable attention in terms of increasing production. Over the past few years, Indonesian garlic production is very low compared to China as the largest garlic producer in the world as well as Myanmar as the largest garlic-producing country in Southeast Asia [2].

Based on Table 1 data, it is known that the average garlic production in 2015-2019 amounted to 28,235 tons per year. Although it tends to rise, the number of domestic production is still not proportional to the much higher amount of garlic consumption. The difference in numbers between the amount of imports and domestic production due to local garlic is less competitive with imported garlic related to price and quality, so people prefer imported garlic over local garlic. Farmers cannot lower the price of local garlic such as the price of imported garlic due to high production costs. Low demand for local garlic is causing farmers to turn to other, more profitable crops.

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When viewed data in Table 1, the imbalance between the amount of consumption and domestic production causes high garlic imports. Data in Table 1 shows that more than 95% of the fulfillment of garlic consumption in Indonesia comes from imports. Such conditions make Indonesia in a position of garlic crisis and become the largest garlic importer in the world [3]. China became the largest exporter of garlic in Indonesia with a contribution of 99.53%. The high import of garlic from China is related to the ACFTA (ASEAN China Free Trade Area) free trade agreement which began in Indonesia on June 15, 2004 through Presidential Decree No. 48 of 2002 [4].

Table 1. Volume of Garlic Imports, Production and Consumption in Indonesia in 2015-2019

Year	Import (ton)	Production (ton)	Consumption (ton)
2015	479.941	20.295	500.029
2016	444.301	21.150	469.646
2017	555.976	19.510	575.176

2018	581.077	39.300	627.197
2019	465.344	88.817	486.413

Source: FAOSTAT, BPS, 2020

Garlic imports have been importing into Indonesia since the 1980s and the number is increasing. This is owing to Indonesia's low garlic output, which is inversely proportional to consumption, resulting in the government importing garlic to fill domestic needs. Based on data on [3], Indonesia becomes the largest importer of garlic in the world in 2019 followed by Brazilia and the USA.

The number of imported garlic cloves entering Indonesia has been steadily increasing year after year, in tandem with the growing demand for garlic. In [5], the Director-General of Horticulture Ministry stated that Indonesia used to achieve garlic self-sufficiency, but this success had ended before the monetary crisis, precisely in 1994. The increase in the number of imported garlic that continues to occur makes researchers want to know the trend of demand for garlic imports in Indonesia. There have been numerous studies on garlic imports in the past, but they have tended to focus on factors that have an impact on demand. For example, research was conducted by [6] on factors affecting garlic imports in Indonesia in 1980-2012. Research by [7] on trends and factors that affect the volume of garlic imports, and [8] on factors that affect the volume of garlic imports and production. In the case of Indonesia, there is still relatively little discussion on the import demand trend.

Previously, there has been a lot of research on import demand trends in various agricultural products, such as those conducted by [9], [10], [11], [12]. There are 3 types of trend analysis commonly used to analyze import demand trends including linear trend analysis, quadratic trend, and exponential trend [13]. The stages of research according to [14], are to describe patterns, determine trend models, model selection, and analyze trends. The selection of the best models is conducted by comparing three error sizes namely, Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), and Mean Square Deviation (MSD) of each model.

2. Materials and Methods

Data used for this research was secondary data of annual import of garlic growth in a time series period 1995-2019 with tons/year, there were 25 annual series. The data sources used come from the Food and Agriculture Organization (FAOSTAT), UN Comtrade, and other source data. The method used in this study is the method of quantitative descriptive analysis. The descriptive analysis method is used to describe the demand for garlic imports in Indonesia. Quantitative analysis is used to determine the trend of garlic import demand in Indonesia. Data analysis implemented in this research was trend analysis with

2.1. Export Demand Trend Analysis

Trend analysis involves statistical analysis of past data. Trend analysis is done using 3 trend methods, namely: linear trend, quadratic trend and quadratic trend [13]. When a data pattern reveals a tendency, either down or up, the linear trend approach uses a trend line [15]. The following approaches can be used to determine linear equations or gars trend: freehand method, semi average method, mathematical method, and least square method. The equation for the linear technique is as follows:

$$Y = a + bX + e \quad (1)$$

The quadratic trend method is a method to see the trend data that is not linear. Short- or medium-term data trends will follow a linear pattern. The quadratic trend method is a method for visualizing non-linear trend data. Trends in the short or medium term will follow a linear pattern. However, it is possible that it will not be linear in the long run. However, if it turns out to be non-linear in the long run [16]

$$Y = a + bX + cX^2 + e \quad (2)$$

Exponential method, to measure a series of times that experience a rapid increase or decrease then used exponential trend method. Exponential equations expressed in the form of time variables (X) are expressed as ranks [15]: $Y = ab^X + e$, where: Y : periodic data, X : time (day, week, month, year), a, b, c: constant number.

2.2. Accuracy Measure

The measure of accuracy of trend results which is a measure of trend error is a measure of the degree of difference between forecasting results and actual data. The inaccuracy (error) of forecasting can be measured by deviation and biased. But ideally, forecasting techniques produce zero deviation and zero bias. There are four commonly used sizes: MAD, MSE, ME and MAPE. These indicators have been applied for many research about determining the best model in forecasting and trend such as [7], [17]. According to [18], smaller measurement values indicate a more accurate estimate as they result in a minimum approximate error.

3. Results and Discussion

In the beginning, Indonesia has achieved garlic self-sufficient, and 1994 was the last year of the glory of Indonesian garlic. Since 1995, Indonesia has seen a substantial increase in garlic imports, which has been followed by a significant decrease in production. The amount of garlic farming, which is currently around 2,000 hectares, compared to around 26,000 ha in 1994, is one of the reasons for the drop in garlic production. Furthermore, according to [19], the low quality of seedlings is the cause of low garlic output in Indonesia. Furthermore, the low productivity of garlic in Indonesia is due to the employment of technology cultures in garlic

growing operations that are not in compliance with Standard Operating Procedure [20]. The procedure to know the trend of garlic import demand in Indonesia is to look at the demand data pattern and then continue to analyze the import demand trend.

3.1. Garlic Import Demand Pattern in Indonesia

Before conducting a trend analysis on garlic import demand, the first thing to do is to see the data pattern. This is done as one of the basic analyses for the trend to be done. Based on the data series the number of garlic import requests in Indonesia in 1994-2019 can be seen in Figure 2, below:

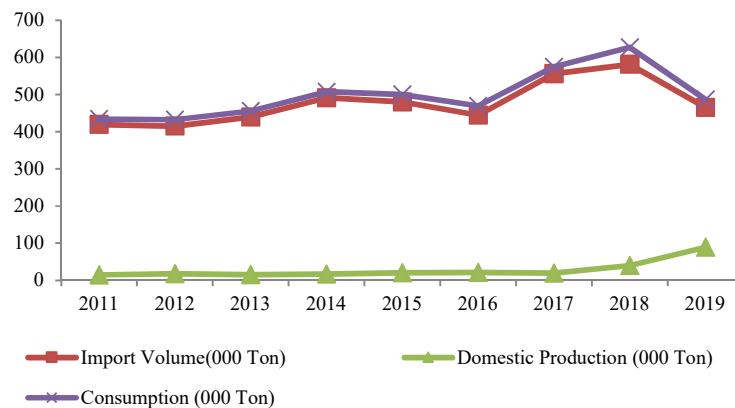


Figure 2. Total Imports, Production and consumption of Indonesian Garlic in 2011-2019 [21]

Source: FAOSTAT, Agricultural Database, 2020

Based on Figure 2, the number of garlic imports has a trend pattern. This is seen from the number of garlic import demand that has increased over a long period. The trend pattern can occur because the demand for garlic imports in Indonesia from 1994 to 2019 tends to increase. These results are following [22] where Indonesia's garlic demand from 1983 to 2013 shows an increasing trend.

The pattern of development of garlic imports has a positive slope, when compared to the law of demand then it will be contrary. But in the law of demand mentioned that the higher the price of an item, the level of demand for the goods will decrease and vice versa assuming other factors are considered fixed (*ceteris paribus*). Furthermore, in figure 2 can be seen if other factors, namely the amount of consumption and the number of Indonesian population each year are not settled but have increased. The increase in the amount of consumption and the number of residents is one of the causes of the demand for garlic imports is getting higher.

Every year the number of people in Indonesia increases. From 1994 to 2019 the average increase in the number of Indonesians was 1.22%, wherein 1994 the population of Indonesia was only around 192,216,500 people, then in 2019 the population of Indonesia had reached 266,911,900 people. The increase in the number of people in Indonesia led to a higher demand

for garlic consumption. The rate of increase in demand for garlic consumption in Indonesia from 1994 to 2019 is 8.70%. In 1994 the amount of garlic consumption in Indonesia was 164,459 tons, then in 2019 the amount of garlic consumption in Indonesia has reached 486,413 tons. To meet the rate of increase in garlic consumption in Indonesia, garlic imports are carried out, where the pattern of garlic demand in Indonesia is influenced by the pattern of increasing garlic consumption and the number of people in Indonesia. This is accordance with [7] sebaiki, that one of the factor that affect the increase in garlic imports in Indonesia is the amount of consumption.

3.2. Trend of Garlic Import Demand in Indonesia

In determining the best trend method, it will first be seen the accuracy of the method against the data used. Based on the results of the test that was late conducted, it can be seen in Table 1, the difference in value from the criteria of the measurement of the accuracy of the method.

Table 2. Model Accuracy Size

Accuracy Size	Trend Method		
	Linear	Exponential	Quadratic
MAD	34,460.40	75,773.42	32,803.22
MSE	2,826,316,543.81	10,957,427,417.48	2,533,757,390.29
ME	-0.52	-657.23	-174.62
MAPE	21.71	33.76	14.02
R-square	0.8882	0.7477	0.8998

Source: *Secondary data (processed), 2020*

Based on the table above can be known that the best method for research analysis of this trend is the quadratic method. The findings of this study are similar to those of [7], who found that the quadratic technique is the best model for analyzing garlic import trends in Indonesia from 2008 to 2018. The equation conducted by the quadratic method is $Y = 1442.1 + 29179X - 341X^2$. Based on this equation, it can be known that the demand for garlic imports in Indonesia is an increasing (positive) trend. The constant value of 1442.1, means that if the time variable value (X) is assumed to be constant or equal to zero, then the import of garlic (Y) is 1442.1 tons/year. The number coefficient values X of 29179, means that the time variable (X) positively affects the number of garlic imports in Indonesia (Y). If the time variable (X) is increasing by one unit of time (a year) then the number of garlic imports (Y) increases (up) by 29179 tons/year is assumed that other independent variables are of a fixed value.

The increasing trend of garlic import demand in Indonesia follows the increasing consumption of garlic in Indonesia and the low amount of domestic garlic production. The average increase in demand for garlic imports each year is 23% and the average increase in garlic consumption in the country is 6% annually. This is in accordance with the statement of [22], that garlic imports

in Indonesia will continue to increase because Indonesia already has a dependence on imported garlic.

The number of garlic import requests in Indonesia increased significantly in 1997 and 1998. The cause of the increase is the open import of garlic freely, this causes garlic importers to import freely and continuously [23]. In 2000, the ASEAN Free Trade Area (AFTA) was established, which caused local garlic to deteriorate due to the freedom to import in the ASEAN area. Furthermore, in 2005, an agreement namely ACFTA (ASEAN-China Free Trade Area) abolished tariffs on garlic imports from China. That is, the import of garlic from China can be done freely without barriers to customs duties and technical duties. Finally from 1994-2014, there was a decrease in the area of garlic harvest by 9.75% per year, with a decrease in the amount of production by 10.75% per year, even in 2014 the amount of garlic consumption in Indonesia was 95% came from imports [4].

From 2017 to 2018 there was a significant increase in the number of garlic imports from 2016 according to the Head of Trade Assessment and Development (BP3) of the Ministry of Trade Kasan Muhri, there are at least two factors that cause the increase in imports, namely the increasing demand for public consumption, the fulfillment of raw materials for industry and capital goods for infrastructure projects. Other factors are predicted as a result of the transfer of export markets [24].

The amount of garlic that was mined from 2018 to 2019 decreased drastically. The decrease in import volume is thought to be due to the government's efforts to self-sufficiency garlic in 2021, where the scheme to achieve this has started from 2017. In addition, the government also stipulates a strict Regulation on Agricultural Regulation No. 37 (2017) which states that importers are required to grow and produce garlic as much as 5% of the volume of applicants RIPH (Recommendations for Import of Horticulture Products) [2].

4. Conclusion

Based on the results of research and discussions that have been done, it conducted be known that: the garlic import demand in Indonesia has a trend pattern. The trend of garlic import demand in Indonesia is increasing. Based on the results of research, suggestions or recommendations given is that more research should be conducted on forecasting demand for garlic imports in Indonesia, to find out how the alleged development of garlic in Indonesia in the future so that the government can provide policies regarding restrictions on garlic imports. In addition, the government through the Ministry of Agriculture can provide an extraordinary program on increasing garlic production.

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