

THE INFLUENCE OF CONSUMPTION, PRODUCTION, PRICE, AND EXCHANGE RATE ON INDONESIA'S RICE IMPORTS



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Abstract

This research investigates how annual rice consumption, domestic rice output, cultivated land area, rice prices, and the exchange rate impact Indonesia's rice import volume from 2009 to 2024. Despite statistical data indicating that national rice production is sufficient to satisfy domestic demand (BPS, 2023), Indonesia continues to import substantial quantities of rice. This contradiction suggests the presence of broader macroeconomic factors influencing import trends. A quantitative inferential method was used in this study, employing multiple linear regression in a log-log model to estimate elasticities. The analysis utilized secondary data from BPS and was conducted using EViews software. To validate the model, several classical assumption tests were conducted, including the Jarque-Bera test for normality ($p = 0.126$), multicollinearity assessment via the Variance Inflation Factor (all VIF values below 10), the ARCH test for heteroskedasticity ($p = 0.5435$), and the Durbin-Watson test for autocorrelation ($DW = 1.84$). The analysis showed that rice prices significantly and positively influence import volume, whereas the exchange rate has a significant negative impact. In contrast, consumption, production, and harvested land area were found to have no statistically meaningful effects. These outcomes suggest that rice importation is more strongly influenced by market conditions and monetary factors than by basic supply and demand imbalances. Therefore, enhancing distribution networks and strengthening the role of institutions like Bulog is critical to decreasing reliance on imports.

Keywords: Rice Import, Consumption, Production, Exchange Rate, Indonesia

INTRODUCTION

As an agrarian country, Indonesia relies heavily on the agricultural sector, particularly in meeting national food needs. Rice, as the primary staple food, plays a crucial role in the daily lives of the population. According to data from BPS (Statistics Indonesia) in 2023, rice consumption in Indonesia reached 22.78 million tons per year, making it the fourth-highest rice-consuming country in the world. With a continuously growing population, the demand for rice is expected to keep increasing, which may eventually affect price dynamics in the domestic market. Although Indonesia is a rice-producing country, domestic production has yet to fully meet national consumption needs. Several factors such as domestic rice prices, harvested land area, the exchange rate of the rupiah against the US dollar, and supply instability contribute to the continued need for rice imports. As a result, Indonesia ranks as the 41st largest rice importer in the world, accounting for 0.78% (USD 195.4 million) of the total global rice import value of USD 24.97 billion (Ministry of Agriculture). This situation is further exacerbated by the fact that Indonesians pay up to 20% more for rice compared to other ASEAN countries (IIRC, 2024), as stated by Carolyn Turk, the World Bank Country Director for Indonesia and Timor-Leste. The imbalance between supply and demand keeps domestic rice prices high and pushes the government to continue relying on imports, especially from countries such as Thailand, Vietnam, and Myanmar.

This phenomenon raises a critical question: why does Indonesia still need to import significant amounts of rice despite its relatively large national production? To address this question, an in-depth analysis is needed to explore various factors that are suspected to influence Indonesia's rice import volume, such as national consumption, domestic production, rice prices, harvested land area, and the exchange rate. This study aims to examine the impact of these variables on rice import volume and ultimately offer policy recommendations based on empirical data to reduce dependency on imported rice. The findings of this research are expected to contribute academically to the fields of food security and agricultural economics, as well as provide strategic input for the government in formulating more effective rice production and distribution policies. Thus, the results of this study are not only relevant in an academic context but also have direct implications for farmers' welfare and national food stability in the future.

REVIEW OF LITERATURE

Theory of Demand and Supply

This theory explains the relationship between the availability of a commodity and the quantity demanded by consumers. According to microeconomic theory, if the demand for a good increases while supply cannot keep up, the price tends to rise, and vice versa (Mankiw, 2018). In the context of rice, the high rice consumption among Indonesians must be matched by domestic production. Otherwise, a supply shortage may occur, prompting the government to import rice to stabilize prices and market availability. Moreover, distribution also plays a role in scarcity when production is abundant but distribution is poor, for instance in areas experiencing rice shortages, prices tend to rise in accordance with the law of supply and demand. This is because when demand remains constant or even increases while supply decreases (*ceteris paribus*), it results in higher prices.

Theory of Food Self-Sufficiency

Food self-sufficiency is a condition where a country can independently meet the food consumption needs of its population through domestic production, without relying on foreign supplies. According to Peljor and Minot (2010), food self-sufficiency is achieved when the domestic agricultural sector can sustainably meet all food needs, particularly staple foods like rice. This concept emphasizes the importance of self-reliance in the national food system to ensure a stable supply, fair prices, and long-term food security. Dependence on imports, as in Indonesia's case, indicates that self-sufficiency has not yet been realized and exposes the country to global fluctuations.

Theory of Food Security

According to the FAO (1996), food security is a condition in which all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to maintain an active and healthy life. The three main pillars of food security are availability, access, and stability. Import dependence can undermine Indonesia's food security stability during global crises, making increased domestic production one of the key strategies to address the issue.

Theory of International Trade (Comparative Advantage)

This theory, first introduced by David Ricardo (1817), states that a country should focus on producing goods in which it has a comparative advantage and import goods that it cannot produce efficiently. However, in the context of staple foods such as rice, many countries tend to avoid relying on imports due to the strategic importance of food security. Hence, protectionist policies and agricultural subsidies are commonly implemented in Indonesia to ensure a stable domestic food supply.

Theory of the Role of State Institutions in Food Stability

Government institutions such as Perum Bulog play a strategic role in ensuring food availability and price stabilization. According to institutional economics theory (North, 1990), institutions are the formal and informal rules that influence economic performance. Revitalizing Bulog such as by expanding rice milling facilities in key production areas can strengthen domestic supply chains and reduce reliance on imports.

Studies Related to Indonesia's Rice Import Policy

Antriyandarti et al. (2024) in their study highlighted that rice import policies in Indonesia play an important role in stabilizing consumer level prices. Although most farmers and traders believe rice imports are unnecessary as they suppress farm-gate prices, econometric analysis using the Vector Error Correction Model (VECM) showed that rice imports significantly reduce retail and wholesale prices and help stabilize domestic rice supplies. The study also stressed that import decisions must consider long-term economic stability and food security. In contrast to the study by Antriyandarti et al. (2024), which focuses on perceptions and short-term impacts of rice imports on price stabilization, this study specifically investigates the direct causal relationships between macroeconomic variables and rice import volumes using a log-log regression model. The log-log form allows the estimated coefficients to be directly interpreted as elasticities, a feature not explored in the previous study. This approach contributes significantly to policy formulation based on the sensitivity of changes in macro variables to rice import volumes.

RESEARCH METHOD

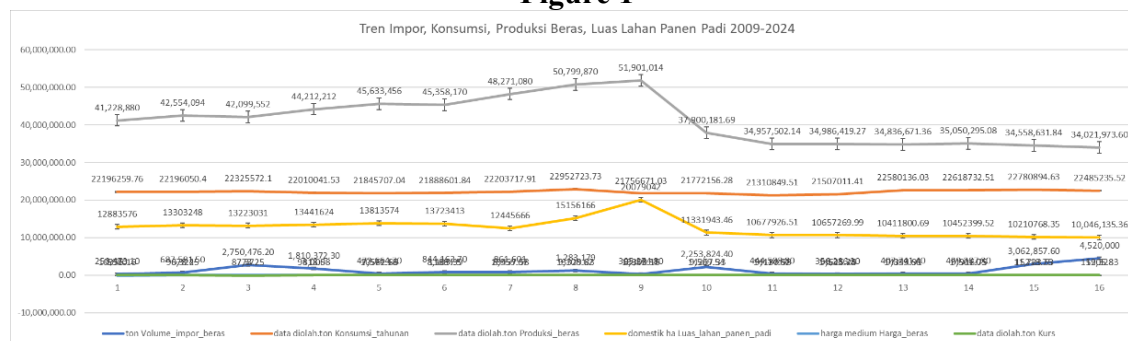
This study employs a quantitative inferential approach using the classical assumption testing method, which includes multiple linear regression in a log-log model, autocorrelation test, multicollinearity test, heteroskedasticity test, and residual normality test, all conducted using EViews software. The log-log method is used to determine the percentage change in the dependent variable resulting from a percentage change in the independent variable. The dependent variable in this study is the volume of Indonesia's rice imports, while the independent variables include annual national rice consumption, domestic rice production, harvested paddy land area, domestic medium-quality rice prices, and the exchange rate of the rupiah against the US dollar. The primary data source is official publications from Statistics Indonesia (Badan Pusat Statistik or BPS) covering the period from 2009 to 2024.

RESULTS AND DISCUSSION

Rice Import Conditions in Indonesia

Rice imports in Indonesia have become a complex and ongoing issue. The following chart illustrates the fluctuating trends in rice imports, consumption, harvested land area, and rice production based on BPS data for the period 2009–2024:

Figure 1



Processed from BPS Data

The fluctuation in rice imports shown in the graph above reflects that import policies do not always take into account production factors and public consumption. According to the data, annual domestic rice production is actually sufficient to meet the national consumption needs without requiring imports. This raises the question: why does the government, through Bulog, continue to carry out significant rice imports? For instance, in 2011, rice imports surged to 2.7 million tons. Similarly, in 2018 imports increased significantly to 2.2 million tons, in 2023 they rose again to 3.06 million tons, and peaked in 2024 at 4.52 million tons. This phenomenon indicates that rice import decisions by the government through Bulog are not solely based on the gap between production and consumption, but also consider other factors such as government rice reserves (CBP), interregional distribution, stock resilience in the face of crises, and price stabilization. Indonesia's CBP is required to be at least 2 million tons of rice, as explained by Bulog, to mitigate the risks of natural disasters, crop failures, and global price shocks (Bulog, 2024). This is supported by a CNBC Indonesia (2024) report, which states that rice imports are a means of price control and are necessary due to uneven distribution, suboptimal grain absorption from farmers, and as a precaution ahead of Ramadan and general elections to keep prices stable.

However, this policy often draws criticism, especially from local farmers who feel disadvantaged. For example, farmers in Central Java have complained that the influx of cheaper imported rice has suppressed the price of their unhusked rice, reducing their income and threatening the sustainability of their farming operations (Center for Food and Agricultural Studies, 2023). Over time, this may lead to a decline in the number of farmers due to low selling prices, which could result in land conversion and a reduction in rice production. When rice production drops, the distribution volume also falls, causing shortages, triggering price hikes, and further increasing import dependence. In terms of rice prices, the impact of rice import policies is not strongly felt by the public. Antriyandarti et al. (2024) found that only 25.25% of consumers reported benefiting from government rice imports in terms of price stabilization, and only 15% of traders mainly in West Java, Yogyakarta, Central Java, and East Java felt the effects. This is because the rice market is already saturated, with 92.5% of the most sold rice being local rice, and about 66% of consumers preferring local varieties.

Estimation Results

In this study, multiple linear regression was conducted using a log-log model, in which all variables both dependent and independent were transformed into natural logarithmic form. The log-log model was chosen to enable the interpretation of regression coefficients as elasticities, representing the percentage change in the dependent variable resulting from a one percent change in an independent variable. The hypothesis testing includes a null hypothesis (H_0), which states that each independent variable has no effect on the dependent variable, and an alternative hypothesis (H_a), which states that each independent variable has a significant effect on the dependent variable. In addition to estimating the regression coefficients, several diagnostic tests were performed to ensure the statistical validity of the model. An autocorrelation test was conducted using the Durbin-Watson statistic, while the Variance Inflation Factor (VIF) test was used to identify potential multicollinearity among the independent variables.

Table 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Centered VIF
Constant (C)	-135.6686	120.5455	-1.125455	0.2867	NA
Log(Consumption)	8.381723	7.199539	1.164203	0.2714	1.131055
Log(Rice Production)	2.147233	2.443230	0.878850	0.4001	6.573535
Log(Harvested Area)	-2.277379	1.956941	-1.163744	0.2715	6.499502
Log(Rice Price)	7.015087	1.445776	4.852127	0.0007	3.902918
Log(Exchange Rate)	-5.985904	1.395045	-4.290833	0.0016	3.862419
Statistic			Value		
R-square			0.763303		
Adjusted R-square			0.644955		
F-statistic			6.449633		
Prob(F-statistic)			0.006272		
Durbin-Watson stat			1.844158		

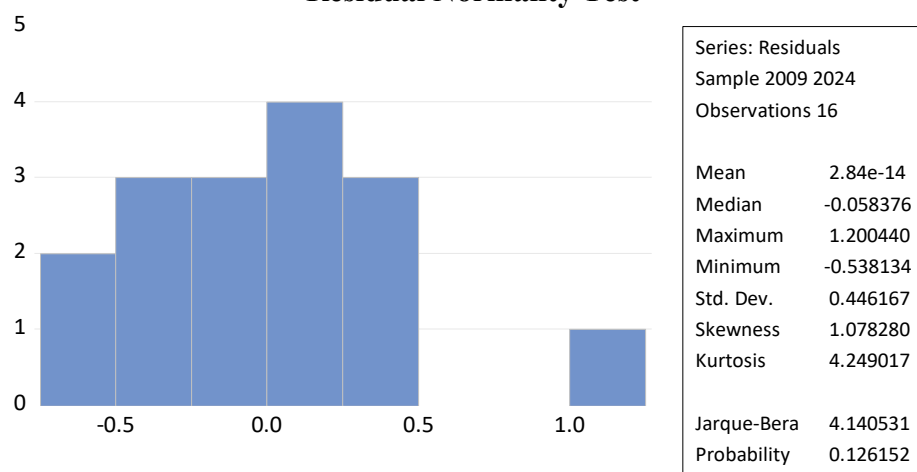
Results from the EViews test

From the regression, the following model is obtained:

$$\ln(\text{rice import volume}) = -135.6686 + 8.381723 \ln(\text{annual consumption}) + 2.147233 \ln(\text{rice production}) - 2.2774 \ln(\text{harvested rice area}) + 7.0151 \ln(\text{rice price}) - 5.9859 \ln(\text{exchange rate}) + u.$$

The R-squared value of 0.7633 indicates that approximately 76.33% of the variation in Indonesia's rice import volume can be explained by the five independent variables studied. However, the more conservative Adjusted R-squared value of 0.644955 suggests that when accounting for model complexity (number of predictor variables), the explanatory power is somewhat lower. The F-statistic probability of 0.0062 (< 0.05) indicates that the regression model is significant simultaneously. Additionally, the Durbin-Watson statistic of 1.8441 shows no autocorrelation, and the multicollinearity test (based on Variance Inflation Factor) reveals that all Centered VIF values are below 10, indicating no serious multicollinearity. These values reflect an adequate model fit within the macroeconomic context, where external factors such as global conditions, market speculation, and food crises also influence import decisions but are not included in this model.

Table 2
Residual Normality Test



EViews Test Results

To ensure that the residuals in the regression model do not deviate from a normal distribution, a normality test was conducted using the Jarque-Bera method. Based on the test results, the Jarque-Bera statistic was 4.140531 with a probability of 0.126152. Since this probability value is greater than the 5% significance level (0.05), it can be concluded that the residuals are normally distributed, meaning the model meets one of the classical assumptions in multiple linear regression. Additionally, visually, the residual histogram also shows a pattern close to a normal distribution, although slightly skewed to the right. This is reflected by a skewness value of 1.078 (positive) and a kurtosis of 4.249, which are still acceptable within the context of residual distribution for macroeconomic data. Therefore, the regression model used in this study can be considered suitable for further analysis as it does not violate the residual normality assumption.

Table 3
ARCH Heteroskedasticity Test

Test Statistic	Value	Probability	Value
F-statistic	0.389154	Prob. F(1, 13)	0.5435
Obs*R-square	0.435973	Prob. Chi-Square (1)	0.5091

Heteroskedasticity testing in this study was conducted using the ARCH test method, which is appropriate for time series data. Based on the test results, the F-statistic probability value was 0.5435 and the Chi-Square probability value was 0.5091. Both values are greater than the 0.05 significance level, so it can be concluded that there is no heteroskedasticity in the log-log regression model used. This indicates that the model meets the classical assumption of constant residual variance, thereby strengthening the validity of the regression estimation results.

Interpretation of Hypothesis Testing **Annual Consumption Variable**

The regression coefficient for the log of annual consumption is 8.3817 with a probability of 0.2714 (> 0.05). This means that every 1% increase in annual rice consumption is estimated to increase rice import volume by 8.38%, but statistically, this effect is not significant at the 5% significance level. This result indicates that although national rice consumption rises, the government does not necessarily increase rice imports, possibly due to compensation from reserve stocks, commodity substitution, or import restriction policies.

Domestic Rice Production Variable

The coefficient for the log of domestic rice production is 2.1473 with a probability of 0.4001 (> 0.05). This means that a 1% increase in domestic rice production is actually followed by a 2.15% increase in rice import volume, although it is not statistically significant. This finding contradicts the initial hypothesis expecting a negative relationship. The cause may be that increased domestic production does not necessarily correspond to rice quality, changing consumption patterns, or uneven rice distribution across regions.

Rice Harvested Area Variable

The coefficient for the log of rice harvested area is -2.2774 with a probability of 0.2715 (> 0.05). Every 1% increase in harvested rice area is estimated to reduce rice import volume by 2.28%, but this relationship is also not significant. The decrease in imports aligns with economic logic that expanding harvested areas increases domestic production and reduces import needs. However, the insignificance may be due to stagnant land productivity or varying soil quality.

Domestic Rice Price Variable

The coefficient for the log of domestic rice price is 7.0151 with a probability of 0.0007 (< 0.05). This means every 1% increase in domestic rice price will raise rice import volume by 7.02%, significant at the 5% level. This result supports the hypothesis that when domestic rice prices increase, the government tends to increase import volume to suppress domestic prices and maintain food stability. This aligns with the findings of Antriandarti et al. (2024), which showed that rice imports can serve as a price stabilization instrument at the consumer level.

Rupiah Exchange Rate against US Dollar Variable

The coefficient for the log of the exchange rate is -5.9859 with a probability of 0.0016 (< 0.05). This means every 1% depreciation of the rupiah (weakening rupiah) will reduce rice import volume by 5.99%, and this effect is significant. A weaker rupiah increases import costs, so the government tends to reduce rice import volume to curb foreign exchange expenditures. Conversely, when the exchange rate strengthens, import costs become cheaper, so import volume may increase.

Conclusion of Hypothesis Testing

Based on the test results, it can be concluded that the domestic rice price variable has a positive and significant effect on the volume of rice imports, and the rupiah exchange rate against the US dollar has a negative and significant effect on the volume of rice imports (the null hypothesis is rejected for both). Meanwhile, the variables of annual consumption, domestic rice production, and rice harvested area do not have a significant effect on rice import volume (the null hypothesis is accepted). These results indicate that domestic price factors and exchange rates are the main considerations in Indonesia's rice import policy, while domestic production and consumption have not yet become strong references in government decision-making.

CONCLUSION

This study aims to analyze the influence of annual rice consumption, domestic rice production, harvested area, domestic rice prices, and exchange rates on the volume of Indonesia's rice imports during the period 2009–2024. The regression analysis results show that domestic rice prices have a positive and significant effect on import volume, while the rupiah exchange rate against the US dollar has a negative and significant effect. This means that when rice prices rise, imports tend to increase to maintain price stability; meanwhile, when the rupiah weakens, imports tend to be suppressed due to higher import costs. Conversely, the variables of consumption, production, and harvested area do not have a significant effect on the volume of rice imports. This explains why, despite domestic production data showing sufficient capacity to meet national consumption needs, the government still imports rice in large quantities. This is reinforced by field conditions, such as the need to fulfill the Government Rice Reserves (Cadangan Beras Pemerintah, CBP), uneven distribution, and price control strategies ahead of critical moments like elections or Ramadan. Therefore, rice import policies are not only based on production and consumption logic but also consider aspects of price stabilization and national food security in the short term. However, long-term dependence on imports can suppress local farmers, reduce production motivation, and threaten the sustainability of the domestic agricultural sector.

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