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THE EFFECT OF EXCHANGE RATE, NATIONAL CONSUMPTION, DOMESTIC PRICES, PRODUCTION, CULTIVATED LAND AREA, AND IMPORT TARIFFS ON INDONESIA'S SOYBEAN IMPORT VOLUME

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Abstract

Indonesia imports more than 1.5 million tons of soybeans annually from various countries, from the United States, Canada, Brazil, Argentina, and Malaysia. The purpose of this study is to analyze the effect of the rupiah exchange rate against the United States dollar (exchange rate), domestic soybean consumption, domestic soybean prices, domestic production, soybean planting area, and import duty tariff policies on the volume of soybean imports in Indonesia in the period 2012-2022.The data were obtained from Central Statistics Agency, Ministry of Agriculture, Ministry of Trade, Bank Indonesia, and UN Comtrade through documentation and literature studies. Data were analyzed descriptively and quantitatively with multiple regression tests, and classical assumption tests were also carried out to ensure the regression model met the criteria for normality, multicollinearity, heteroscedasticity, and autocorrelation. The regression results show that the rupiah exchange rate has a negative coefficient, but is not significant (p-value 0.0912 > 0.05). Domestic consumption also has no significant effect on soybean imports (p-value 0.5651 > 0.05), although it has a positive coefficient. Domestic soybean prices have a negative and significant effect on soybean imports (p-value 0.0322 < 0.05), meaning that an increase in domestic soybean prices will reduce imports. Domestic soybean production and soybean planted area also have a negative and significant effect on soybean import volume (p-value 0.0030 and 0.0171 < 0.05). Import duty tariff policies show a positive and significant effect on soybean imports (p-value 0.0041 < 0.05), where a decrease in import duty tariffs increases soybean imports. Overall, these factors explain approximately 51.6% of the variation in soybean import volume in Indonesia.

Keywords*: Soybeans; Import Influencing Factors; Time Series Study; Multiple Regression; Agricultural Economics.*

INTRODUCTION

Soybeans are the third most important crop after rice and corn (FMC, 2022). Soybeans have a potential role as a functional food source due to their high protein and isoflavone content (Adie et al., 2015). Therefore, various soybean products are very diverse, such as tofu, tempeh, soy sauce, oncom, and others. However, soybeans are not a major domestic food crop, because this plant does not originate from tropical countries, but rather subtropical countries such as the United States, Canada, Argentina, Brazil, Uruguay, and others. This makes domestic soybean production tend to be low (Mahdi & Suharno, 2019). Soybeans are annual crops that grow best in subtropical climates with many warm, rainy seasons combined with high temperatures and long days (Taelman et al., 2015). Indonesia is a tropical country, making soybean cultivation difficult and requiring special care to avoid the high risk of crop failure. These have reduced farmer interest in soybean cultivation and resulted in low domestic soybean production.

Low domestic soybean production is also caused by fluctuating planting land every year. Frequent problems include land use competition with other strategic commodities and the rampant conversion of land into residential, industrial, and infrastructure (Center for Agricultural Data and Information Systems, 2020). It is therefore understandable that there is an imbalance between domestic soybean production and demand (**Figure 1 & 2**). The high demand for processed soybean products domestically due to the limited supply of local soybeans requires soybean stocks to be imported. To meet soybean needs, 67.28% or equivalent to 1.96 million tons/year must be imported from abroad each year (Setyawan & Huda, 2022). Indonesia imports more than 1.5 million tons of soybeans annually from various countries, including the United States, Canada, Brazil, Argentina, and Malaysia (Fatika, 2024; Agricultural Market Information System, 2023). The fluctuation of the rupiah exchange rate against the US dollar has a significant

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impact on the price of imported goods, such as soybeans, which affects production costs and product selling prices. These exchange rate fluctuations can reduce people's purchasing power, especially for consumers who rely on imported products. This decline in purchasing power can suppress demand and affect market supply. Imports are influenced by factors such as technology, economies of scale, and cheaper raw materials. Therefore, comparing imported and domestic goods involves considering price, quality, and added value.

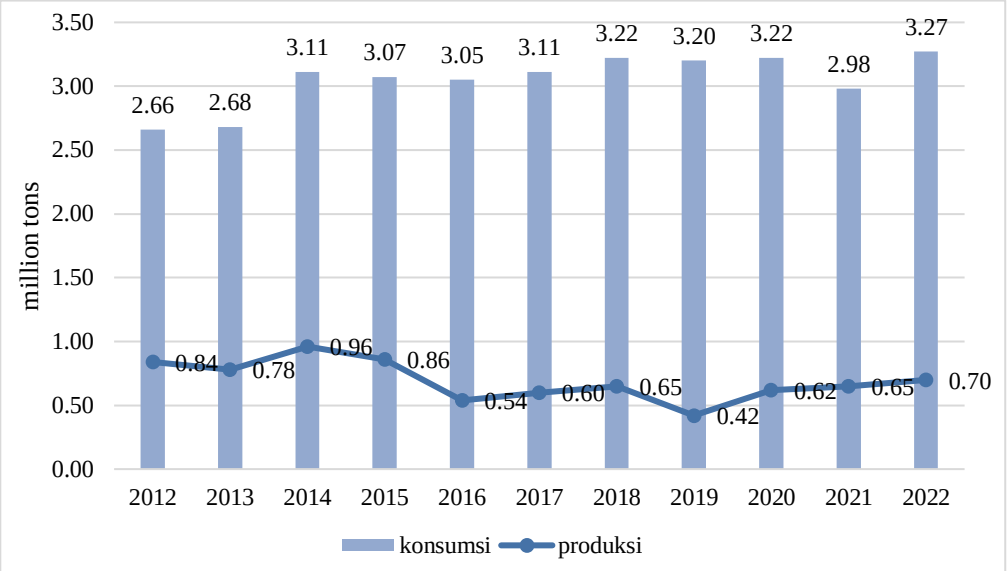

Figure 1. Diagram of Indonesian Soybean Consumption and Production 2012–2022
(Source: Agricultural Market Information System 2023)

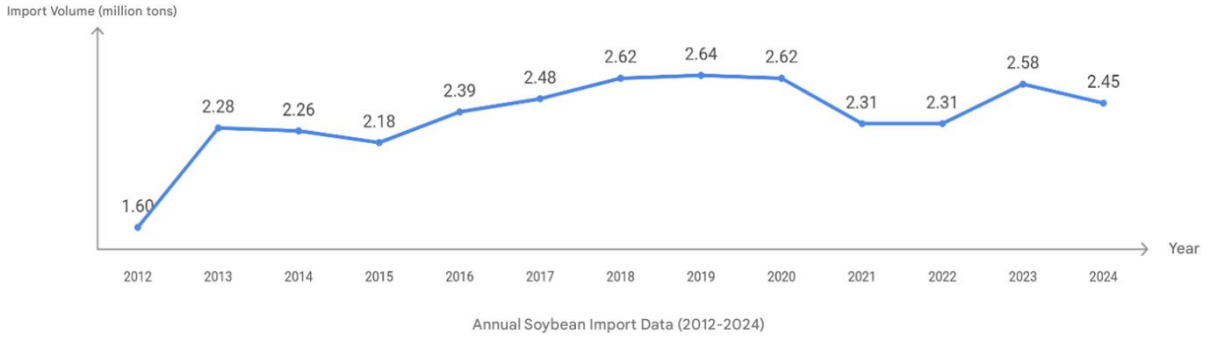

Figure 2. Graph of Indonesia Soybean Import Data 2012-2022
(Source: Agricultural Market Information System, 2023)

Figure 2 shows data on the development of the amount of soybeans imported by Indonesia from 2012-2022. The existence of a higher proportion of soybean imports each year is also driven by the Regulation of the Minister of Finance of the Republic of Indonesia Number 133/PMK.011/2013 which is an Amendment to the Regulation of the Minister of Finance Number 213/PMK.011/2011 concerning the Determination of the Goods Classification System and the Imposition of Import Duty Tariffs on Imported Goods, for soybean commodities which was originally 5% to 0% since 2013 until today (Saragih, 2022) . Various other factors influence the high volume of soybean imports in Indonesia. Therefore, this study aims to analyze the effect of the rupiah exchange rate against the United States dollar (exchange rate), domestic soybean consumption, domestic soybean prices, domestic production, soybean planting area and import duty tariff policies on the volume of soybean imports in Indonesia in the period 2013-2022.

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RESEARCH METHODS

Research Type and Design

This quantitative research uses secondary time series data. The study focuses on factors influencing soybean imports in Indonesia, with an observation period from 2003 to 2022. The variables used include import volume, domestic soybean prices, national consumption, planted area, the rupiah exchange rate against the US dollar, soybean productivity, and the import duty policy for imported soybeans.

Location and Time of Research

This research was conducted at the national level from various relevant agencies, including the Central Statistics Agency (BPS), the Ministry of Agriculture, the Ministry of Trade, the Ministry of Finance, UN Comtrade, the Agricultural Market Information System (AMIS), and previous research.

Data Analysis Technique

The data collection techniques used were documentation and *literature review.* Data collection steps included searching, selecting, recording, categorizing, and processing data. Data were collected through in-person visits to institutions and through the use of relevant institutional websites. The data used in this study included:

Table 1. Types, Units, and Sources of Research Data

No.	Data Types	Unit	Data source
1.	Soybean import volume	Ton	UN Comtrade
2.	Domestic soybean prices	Rp/Ton	Ministry of Trade (Kemendag)
3.	Rupiah exchange rate against the US dollar	Rp/USD	Bank Indonesia (BI)
4.	National Soybean Consumption	Tons/Year	*Agricultural Market Information System* (AMIS)
5.	Production	Ton	*Agricultural Market Information System* (AMIS)
6.	Land area	Million hectares	*Agricultural Market Information System* (AMIS)
7.	Dummy soybean import duty policy	Ton	Minister of Finance Regulation RI No. 133/PMK.011/2013

The research method used is descriptive and quantitative analysis. Descriptive analysis is used to describe the development of production, trade, consumption, prices, exchange rates, land area, and import tariff policies for soybeans in Indonesia. Quantitative analysis is carried out using multiple linear regression using the Ordinary Least Squares (OLS) method to analyze the factors that influence soybean imports, with data processing using E-Views 12. Classical assumption tests include the residual normality test with Jarque–Bera, the multicollinearity test with the Variance Inflation Factor (VIF), the heteroscedasticity test with the Glejser test, and the autocorrelation test with the Breusch–Godfrey Serial Correlation LM Test, to ensure the OLS estimator is BLUE.

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Hypothesis Testing

Testing the relationship between variables is carried out using the F Test to see the influence of independent variables simultaneously, the t Test to see the influence of each variable partially (significant if $p \leq 0.05$), and the coefficient of determination (R^2) to measure how much variation in the dependent variable can be explained by the model.

Indonesia's Soybean Import Model

The estimated model of factors influencing Indonesian soybean imports is formulated as follows:

$$I = \alpha - b_1 NT + b_2 K + b_3 HK + b_4 PK + b_5 LL + b_6 T + \varepsilon$$

Information :

I	= Indonesian soybean imports (tons)
α	= Constant
b_{1-6}	= Regression coefficient
NT	= Rupiah exchange rate against the US dollar (Rp/USD)
K	= Consumption (Tons/Year)
HK	= Domestic soybean price (Rp/Ton)
PK	= National Soybean Production (Tons)
LL	= National Soybean Planting Area (Million ha)
T	= Soybean import duty policy
E	= *Error* element

RESULTS AND DISCUSSION

Identification of Factors Affecting Soybean Imports in Indonesia

The results of the multiple linear regression test show the factors that influence the volume of soybean imports in Indonesia during the 2003–2022 period, with a confidence level of 95% and a significance limit of 0.05 (**Table 2**).

Table 2. Results of Multiple Linear Regression Data Processing

Var	Description	Coefficient	t-count	Sig
α	Constant	16959.61	4,490543	0.0006
NT	Rupiah exchange rate	-5117,544	-1.324226	0.0912
K	Consumption	524,0732	0.590355	0.5651
HK	Soybean Prices	-36.67632	-2.397349	0.0322
PK	Soybean production	-112,8709	-3.645690	0.0030
LL	Area of planted land	-4170,054	-2.649654	0.0171
T	Dummy import duty tariff policy	2466,064	3,480252	0.0041
Adj R- *Square*		0.516148		
F-count		4,378029		
F-table		2.92		
t-table		1,77093		

(Source: Primary Data Analysis, 2024)

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Table 2 contains the results of data processing using multiple linear regression to model the factors influencing the volume of soybean imports in Indonesia. The equation model obtained from Table 11 is as follows:

I = 16959.61 – 5117.544 NT + 524.0732 K – 36.67632 HK – 112.8709 PK – 4170.054 LL + 2466.064 T +ε

The results of the estimated parameters of soybean imports in Indonesia indicate that there are three variables with negative regression coefficients: the rupiah exchange rate (NT), soybean production (PK), and land area (LL), which means that changes in these variables have an inverse effect on soybean imports. Meanwhile, domestic soybean prices (HK), import duty rates (T), and domestic consumption (K) have positive coefficients, which means that changes in these variables have a direct effect on soybean imports. The following are the results of the regression test:

1. Rupiah Exchange Rate: Coefficient -5117.544, indicating a negative impact on soybean imports.
2. Domestic Consumption: Coefficient 524.0732, indicating a positive influence on soybean imports.
3. Domestic Soybean Price: Coefficient -36.67632, indicating a negative impact on soybean imports.
4. Domestic Soybean Production: Coefficient -112.8709, indicating a negative impact on soybean imports.
5. Soybean Planting Area: Coefficient -4170.054, indicating a negative influence on soybean imports.
6. Import Duty Policy Dummy Variable: Coefficient 2466.064, indicating a positive influence on soybean imports.

F Test Results

The F-test results show that the calculated F-value (4.378029) is greater than the F-table (2.92), which means that the independent variables simultaneously have a significant effect on the volume of soybean imports in Indonesia at a significance level of 5%. Thus, all independent variables (exchange rate, consumption, domestic prices, production, planted area, and import duty tariff policy) affect the dependent variable.

Results of the Determination Coefficient Test(R^2)

The coefficient of determination (Adjusted R Square) of 0.516148 indicates that the regression model can explain 51.6148% of the variation in soybean imports in Indonesia, while The remaining 48.3852% is influenced by other factors not included in the model. This means that all independent variables (exchange rate, consumption, domestic prices, production, planted area, and import duty tariff policy) together have a significant effect on soybean imports in Indonesia at a 95% confidence level.

Factors Affecting Soybean Imports in Indonesia

The Effect of Exchange Rates on Indonesia's Soybean Import Volume

The rupiah exchange rate against the US dollar was used as a variable because the dollar is the main currency in international trade and influences import prices, including soybeans. The regression results show a negative exchange rate coefficient (-5117.544), indicating that a weakening rupiah tends to theoretically reduce soybean import volume. However, this effect is not statistically significant (t-count 1.324226 < t-table 1.77093 and probability 0.0912 > 0.05).

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This finding is in line with research by Khairunisa (2022) and Setyawan & Huda (2022), which stated that the exchange rate does not significantly affect soybean imports, because soybean demand remains high and relatively inelastic despite exchange rate fluctuations, considering soybeans are an important and affordable food ingredient.

The Impact of Consumption on Indonesia's Soybean Import Volume

Indonesian soybean imports are driven by high demand for the tofu and tempeh industry, while domestic production is insufficient, so the deficit is met through imports. Regression results show a positive consumption coefficient (524.0732), but it is not statistically significant (t-count = 0.5904 < t-table; p = 0.5651), meaning that increased domestic consumption does not significantly increase imports. This finding aligns with previous studies Setyawan & Huda (2022) and Untari et al., (2023) and is likely due to the persistent strong soybean consumption pattern despite price or supply fluctuations.

The Influence of Domestic Prices on Indonesia's Soybean Import Volume

High domestic prices make imported soybeans more attractive, making them a key factor in determining imports. The regression results show a negative domestic soybean price coefficient, indicating that an increase in domestic prices reduces import volume, with an effect of 36.67632 units per one-unit increase in price. The t-test indicates a significant price effect (t-count > t-table; p < 0.05), indicating that changes in domestic prices have been shown to influence soybean imports. This finding is consistent with previous research by Salman & Wita (2015); Mahdi & Suharno (2019); and Zaini (2008), which indicates that the difference between domestic and imported prices is a major factor in increasing demand for imported products.

The Impact of Domestic Soybean Production on the Volume of Indonesian Soybean Imports

Domestic soybean production is low due to natural factors, declining farmer interest, low local competitiveness, and shrinking land area (production has never been >1 million tons). The regression shows a negative production coefficient (−112.8709), meaning that every 1 unit increase in domestic production reduces imports by 112.8709 tons (ceteris paribus). This effect is significant (t = 3.6457 > t-table; p = 0.0030), so that increasing domestic production is proven to reduce import dependence in line with research by Nainggolan et al., (2016) and Prastia et al., (2019).

The Influence of Soybean Land Area on Indonesia's Soybean Import Volume

The harvested area plays a significant role in soybean imports. Reductions in land area reduce domestic production, leading to increased imports. Regression results show a negative land area coefficient (−4170.054), meaning that every one-unit increase in land area reduces imports by 4170.054 units. A t-test proves this effect is significant (t = 2.6497 > t-table; p = 0.0171). This finding is consistent with previous studies by Untari et al., (2023), Grace et al., (2021), and Utami et al., (2023), which emphasize that land expansion is crucial for increasing production and reducing import dependence.

The Effect of Import Duty Tariff Policy Dummy on Indonesian Soybean Import Volume

The dummy variable for import duty tariffs was used to differentiate conditions before and after the implementation of 5% and 0% tariffs. Lower tariffs encourage imports, while higher tariffs suppress imports and can increase local production. The regression results show a positive dummy coefficient (2466.064), indicating that a tariff reduction from 5% to 0% increases soybean imports by 2466.064 units. The t-test showed a significant effect (t = 3.4803 > t-table; p = 0.0041). This finding is consistent with research by Mahdi & Suharno (2019); Laily et al. (2021); Laksani & Putri (2015), all of which concluded that changes in import duty tariffs affect the volume of agricultural product imports.

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CONCLUSIONS AND SUGGESTIONS

The results show that the exchange rate, domestic soybean prices, soybean production, and planted area have a negative effect on imports, while domestic consumption and a dummy import tariff policy have a positive effect. Of all variables, domestic prices, production, planted area, and tariff changes have been shown to significantly influence import volume. Policy recommendations: strengthen domestic production through increased productivity and land expansion, calibrate import tariffs measurably to protect farmers without compromising supply, and maintain domestic price stability. For further research, it is recommended to include additional variables (international prices, subsidies, climate factors), use higher frequency data (quarterly/monthly), and consider alternative models such as Vector Autoregression (VAR) or Error Correction Model (ECM) for a more comprehensive analysis.

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