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The Effect of Import Tariff Policy on Indonesian Soybean Consumption and Production

Irada Sinta^{a*}, Hasnah^b, Dwi Yuzaria^c

^aFaculty of Agriculture, Universitas Andalas, Kampus UNAND Limau Manis, Padang, West Sumatra 25163, Indonesia

^bFaculty of Agriculture, Universitas Andalas, Kampus UNAND Limau Manis, Padang, West Sumatra 25163, Indonesia

^cFaculty of Animal Husbandry, Universitas Andalas, Kampus UNAND Limau Manis, Padang, West Sumatra 25163, Indonesia

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ABSTRACT

This study aims to determine the factors affecting consumption and production of national soybean and the effect of soybean import tariff on domestic soybean consumption and production. This research was conducted in March - April 2017. The data used in this study is a secondary data in form of annual with a time series of 30 years ranged from 1986-2015. The result shows that the import quantity of soybean is affected by the variable of exchange rate; soybean consumption and import tariff. The price of imported soybean and exchange rate significantly affect domestic soybean price. While domestic soybean price and population significantly influence soybean consumption where a soybean productivity is highly responsive to wage rates. The simulation result shows that the quantity of imported soybean and soybean consumption increase with the tariff exemption ($T = 0\%$) compared to condition when it is applied. Whereas, the domestic soybean price decreases at the exemption of tariffs compared to a condition when it is applied. Our study reveals that the application of tariffs had no effect on soybean production and productivity. The result of forecasting without alternative tariff imports, which has been analysed during the next 7 years, shows that in the next few years, Indonesia will not be able to achieve the self-sufficiency of soybeans.

1. Introduction

Soybean is plant with major source of protein. As an inexpensive source of protein, soybean has long been known and used in a variety of food products, such as tofu, tempeh and soy sauce. Soy is also an important raw material for animal feed industry. Soybean (*Glycine max*) is known as “the food of the people” because it is the healthiest vegetable protein source. The need for these proteins will increase with increases in the number of population, while on the other hand,

the provision of protein sources in Indonesia is still insufficient.

The increase in consumption is not only influenced by the population, but also influenced by changes in consumption preferences of soy and its derivatives. Increased consumption of soy was not accompanied by increased production of soybeans. According to statistics, the domestic soybean production only amounted to 807.57 thousand tons in 2013. The production is only able to meet 42.5% of domestic consumption so that there is excess demand by 1.65

*Corresponding author:
iradasinta94@gmail.com

million tonnes to be imported. The tendency of an increasing market share of imported soybean in Indonesia, showed that the domestic soybean market has good prospects.

The fulfilment of soybean needs will be met in two ways: through domestic production and imports. Many people in the country hope that soy can be met through domestic production (self-sufficiency) and the import is only done if the domestic production cannot meet the needs of soybeans. In fact, soybean imports still continue flowing into the domestic market. Continuous dependence on imports of soybeans will disserve Indonesia's economic position. Although domestic consumption is met, but the welfare of soybean farmers must also be considered.

Indonesia should have mechanisms to protect itself in the interim time from the threat of cheap soy imports from abroad. According Swastika et al. (2007) import barriers are the most simple and easy to do is to increase tariffs. Tariff is a trade policy used as a source of government revenue, but the role of tariff extends to be a tool to protect domestic industry (Krugman and Maurice, 1999, in Pangestika et al, 2015).

Theoretically import tariffs could increase the price of domestic goods in the importing country. As a result, for the consumer in the importing country will relatively suffer losses. The producers in the importing country will gain. According to Salvatore (2014) there are several impacts of the implementation of import tariffs, that is the impact of the imposition of consumption tariff on consumption (Consumption Effect of the Tariff) which reduced domestic consumption. The impact of the imposition of tariffs on production (Production Effect of the Tariff) is an increase in domestic product (particularly against commodity which was originally more in imports). The impact of the imposition of tariffs on trade (Trade Effect of the Tariff) that the decline in imports due to rising prices in the importing country.

The description above shows that import tariffs are considered to affect the consumption and production of soybean in Indonesia. The importance of this research is to find out how the impact of changes in import tariff on soybean consumption and production performance in Indonesia. Thus, the research questions are:

1. What are the factors that affect consumption and production of soybean in Indonesia?

2. How is the effect of soybean import tariff policy on soybean consumption and production in Indonesia?

2. Research methods

The data used in this study are secondary data from annual data to the timeframe (time series) from 1986-2015. Sources of data in this study were obtained from several agencies, the Central Bureau of Statistics (BPS), and is taken from the official website of the World Bank, FAO, the official website of the Ministry of Finance (MoF), Ministry of Agriculture (MOA) and the literatures that support the preparation of this research.

Simultaneous equation model is used to determine the relationship between the exogenous variables against endogenous variables in a simultaneous relationship.

Simultaneous equations consisting of the equation of identity and structural equation. Identity equation in this study is the production function is:

$$PKD = LK * PK \dots\dots\dots(1)$$

Where:

PKD = Domestic Soybean Production (Tonne)

LK = Soybean Harvest Area (Ha)

PK = Soybean Productivity (Tonne/Ha)

Simultaneous equations consisting of a structural equation in this study are as follow.

a. Soybean Imports Equation

$$IK = e_0 + e_1 HKIT + e_2 NTR - e_3 PKD + e_4 KKN - e_5 TIK + u_4 \dots\dots\dots(2)$$

Where:

IK = Imports of Soybean (Tonne)

HKIT = International Soybean Prices (US\$/Tonne)

NTR = Rupiah Exchange Rate (Rp/US\$)

PKD = Domestic Soybean Production (Tonne)

KKN = National Soybean Consumption (Tonne)

ICT = Tariff on Soybean Imports (%)National

b. Soybean Price Equation

$$HKN = a_0 + a_1 HKI + a_2 NTR - a_3 IK + u_1 \dots\dots(3)$$

Where:

HKN= National Soybean Prices (Rp/ Kg)

HKI = Imported Soybean Prices (US\$/Tonne)

NTR = Rupiah Exchange Rate (Rp/US\$)

IK = Imports of Soybean (%)

u = Variables or Disturber

c. Soybean Consumption Equation

$$KKN = b_0 - b_1 HKN + b_2 JP + u_2 \dots \dots \dots (4)$$

Where:

KKN = National Soybean Consumption (Tonne)

HKN = National Soybean Price (Rp/kg)

JP = Total Population

u = Variables or Disturber

d. Soybean Productivity

$$PK = d_0 + d_1 LK + d_2 TU + d_3 HKN + u_3 \dots \dots \dots (5)$$

Where:

PK = Soybean Productivity (Ton/Ha)

LK = Soybean Harvest Area (Ha)

TU = The Wage Rate

HKN = National Soybean Prices

Scenarios for historical simulations are: Determination of soybean import tariffs by 10 percent, 15 percent, and 0 percent. Forecasting carried out during the period 2016-2022.

3. Results and Discussion

3.1. Factors Affecting Soybean Economy

The results of model identification with order condition method and rank condition method showed that all the equations in the model is over-identified as based on the calculation results obtained by value $(K-k) > (m-1)$. The statistical criteria used in the model estimation results are quite convincing. From the 4 structural equations, 3 equations (75 percent) who had a determination coefficient ranged from 0.77 to 0.95, then 1 equation (25 percent) have a coefficient of determination of 0.4. This shows that generally exogenous variables in structural equation are able to explain the endogenous variables. The results of the model estimation can clearly be seen in Table 1.

Table 1. Results Prediction Model National Soybean Consumption and Production

Endogenous variables	F value	Prob> F	R ²
The quantity of imported soybeans	16.42	0.0001	0.774
National soybean prices	179.34	0.0001	0.954
Soybean consumption	7.48	0,0026	0.357
Soybean productivity	80.62	0.0001	0.903

Based on these criteria, taking into account long enough period of observation, the results are representative estimation models in describing consumption and production of soybean in Indonesia.

3.2. Soybean Import Quantity

The coefficient of determination of Indonesian soybean imports model is 0.773. This means that the diversity of endogenous variables able to be explained by the exogenous variables in the model of International soybean prices, Rupiah exchange rate, the amount of soybean production, soybean consumption amount at 77.3 percent. While the remaining 22.7 percent is explained by other factors outside the model. Result of regression analysis of Indonesia's soybean imports can be seen in Table 2.

F test obtained F statistic-value at 16.42 which is greater than the F table at 2.60 on five percent confidence level. This value indicates that the exogenous variables in the model together significantly affect Indonesia's soybean imports. Based on the t statistical test, it can be seen that consumption of soybean and soybean import tariffs significantly affect confidence interval $(\alpha) = 0.05$ and variables Rupiah exchange rate significantly affect soybean imports at $\alpha = 0.10$.

3.3. National Soybean Prices

The coefficient of determination of national soybean price equals to 0.953. This means that the diversity of endogenous variables able to be explained by the exogenous variables in the model of imported soybean price, Rupiah exchange rate, and soybean imports by 95.3 percent. While the remaining 4.7 percent is explained by other factors

outside the model. Result of regression analysis of domestic soybean prices can be shown in Table 3.

Table 2. Regression Analysis on Soybean Imports Quantity Equation

Variables	The regression coefficient	t-value	Pr > t
Intercept	-10.3369	-1.45	0.159
International soybean price	0.214674	1:45	0.160
Rupiah exchange rate	0.254892	1.73	0.098 (**)
Soybean production	-0.00597	-0.02	0.987
National soybean consumption	1.466200	4.01	0.001 (*)
Import tariff	-0.02869	-1.89	0.072 (**)
R ² : 0.773	F-cal: 16.42	Prob F <0.0001	

Description: (*) = ($\alpha = 0.05$)
(**) = ($\alpha = 0.10$)

Table 3. Regression Analysis in National Soybean Prices Equation

Variables	The regression coefficient	t-count	Pr > t
Intercept	-4.69871	-2.86	0.0082
Imported soybean price	0.758659	6.66	<.0001 (*)
Rupiah exchange rate	1.023037	12:59	<.0001 (*)
Soybean imports	-0.04013	-0.27	0.7865
R ² : 0.953	F-cal: 179.34	Prob F <0.0001	

Description: (*) = ($\alpha = 0.05$)

Exogenous variables included in the national soybean price equation significantly affect the domestic soybean price. It can be seen from the value of Prob F < 0.0001 and F-calculated value of 179.34 is greater than the F-table value is 2.96 at $\alpha = 0.05$. The results of the t statistical test shows that the price of imported soybean and the Rupiah exchange rate significantly affect the domestic soybean price at $\alpha = 0.05$.

3.4. Soybean Consumption

Soybean consumption equation has a coefficient of determination of 0.356. This means that the diversity of endogenous variables able to be explained by the exogenous variables in the model of the national

soybean prices, and the total population of 35.6 percent. While the remaining 64.4 percent is explained by other factors outside the model. The regression analysis of soybean consumption can be shown in Table 4.

Table 4. Regression Analysis on Soybean Consumption Equation

Variables	The regression coefficient	t-count	Pr > t
Intercept	-26.8869	-2.50	0.0186
National soybean prices	-0.45433	-3.82	0.0007(*)
Total population	3.666716	-3.86	0.0006(*)
R ² : 0.356	F-cal: 7.48	Prob F > 0,0026	

Description: (*) = ($\alpha = 0.05$)

Statistic results using the F test show that F-calculated value of 7.48 greater than F-table at 3.34 on the real level of five percent. This value indicates that the exogenous variables in the model together significantly affect the consumption of soybean. In t-test results, it can be seen that the national soybean price variable, the number of population significantly affect the national soybean consumption at $\alpha = 0.05$.

3.5. Soybean Productivity

Soybean productivity equation has a coefficient of determination of 0.902. This means that the diversity of endogenous variables able to be explained by exogenous variables in the model, there are soybean harvest area and the wage rate of 90.2 percent. While the remaining 9.8 percent is explained by other factors outside the model.

Table 5. Regression Analysis on Soybean Productivity Equation

Variables	The regression coefficient	t-count	Pr > t
Intercept	-2.07964	-2.35	0.0266
The area of harvest	0.088930	1:50	0.1460
The wage rate	0.171578	2.63	0.014 (*)
National soybean prices	0.054666	1:02	0.3170
R ² .902	F-cal: 80.62	Prob F <0.0001	

Description: (*) = ($\alpha = 0.05$)

Statistic results using the F test obtained F-calculated value of 80.62 is greater than Ftable at 2.96 on the real level of five percent. This value indicates that the exogenous variables in the model together significantly affect soybean productivity. Based on t test results can be seen that the wage level variables significant affect soybean productivity at $\alpha = 0.05$.

3.6. Policy Simulation

Simulation is intended to determine the extent of the effect of a policy to the changes of the used endogenous variables. Simulations in this study was the removal or exemption of import tariffs (T=0%), import tariffs at a rate of 10% and 15%.

Model Validation

According Sitepu and Sinaga (2006), that the model will produce U-Theil coefficient close to zero, otherwise if the approach of the models is considered less able to explain the actual data. U-Theil coefficient values (U) ranges between 0-1. If $U = 0$ then estimating model is perfect, but on the contrary if $U = 1$ then the prediction model is not perfect. The validation results can be seen in Table 6. Based on these criteria, a model built in this study had a fairly good predictive power and valid so that the model can be used as an analytical tool in the simulation of alternative policy because it had predicted values are quite close to the actual value. In this research, historical simulations for the period 1986-2015 and forecasting simulations for the period 2016-2022.

Table 6. Results of the Model Validation

Endogenous variables	RMS% Error	The U coefficient
The quantity of imported soybeans	1.7711	0.0090
National soybean prices	2.8230	0.0137
Soybean consumption	1.1236	0.0056
Soybean productivity	3.4884	0.0181
Soybean production	0.3020	0.0015

Effect of Import Tariff Policy Simulation

Historical simulation scenarios of soybean import tariff change is made to see how the influence of each application of the policy. Policy simulation scenarios in this study is determination of soybean import tariff by 0 percent, 10 percent and 15 percent. The results of determination of soybean import tariff policy simulation can be seen in Table 7.

Table 7. Results of the simulation soybean import tariffs

Varia- bles	Basic simulation	Determination of Import Tariff		
		0%	10%	15%
HKN	7.8871	7.8808	7.8814	7.8818
KKN	14.4901	14.4930	14.4927	14.4926
PK	1.2433	1.2430	1.2430	1.2430
IK	14.0353	14.1925	14.1767	14.1689
PKD	14.9058	14.9054	14.9055	14.9055

The existence of import tariffs will hamper the import volume for rates lead to higher prices of imported soybeans, the increase of soybean import price will lead to increase in domestic soybean price. The results of the historical simulation analysis show that the application of the import tariff affects the increase of soybean price at the national level. In this case the price of soybeans increased at the prevailing tariffs compared to freed tariffs (T=0).

The simulation result shows that the increase in tariffs to 10 percent and 15 percent would increase the national soybean prices compared to the freed tariffs. Soybean deals in the domestic market is dominated by imported soybean, hence the increase in import tariffs affect the soybean price at national level. Furthermore, the increased of the price also indirectly reduce the consumption of soybean in Indonesia.

Determination of import tariffs that apply so far had a significant affect the decrease of soybean consumption compared with the current import tariffs are freed (T=0). Our simulation results show that higher levels of soybean import tariffs on Indonesian soybean consumption is likely to decrease. It can be seen from the values obtained when the tariffs of 10 percent and 15 percent shows the number of consumption is lower than the tariff elimination (T=0%).

Soybean demand in the domestic market is dominated by imported soybean. Therefore, the increase in import tariffs, which means the increase in price of imported soybean will reduce the total demand of soybean in the domestic market. Overall consumption of soybean on the prevailing tariffs indicate that the protection of the government was able to reduce the demand of soybean in Indonesia. If this demand would be met by domestic production with favorable prices, then the rising of soybean demand will give benefit to the farmers and also reduce imports.

Historical simulation results when the tariff was freed and the prevailing tariff was applied, it shows that the application of the import tariff does not affect the productivity of soybean in Indonesia, soybean productivity even when the applied prevailing tariffs tend to increase compared to freed tariffs ($T=0\%$). It is anticipated by farmers as producers of soybean in addition to considering the amount of import tariffs, they also consider other factors include government policies to remove subsidies on fertilizer, the high cost of soybean production thus lowering the interest of farmers to plant soybean compounded by the problem that the area decreases or occurrence land constraints due to the increased conversion of agricultural paddy fields or other productive agricultural land, this has resulted in productivity had not increased.

The main source of soybean production problems in Indonesia are the domestic demand for soybean has never been fulfilled due to the limited area of soybean cultivation. As quoted from RPJPN that increasingly limited food availability caused by the increasing conversion of paddy fields and other productive agricultural land, this causes a low increase in agricultural productivity, as well as the poor condition of the irrigation network and irrigation infrastructure in the fields of production. The Ministry of Agriculture continued the soybean planting area expansion program in 2014, covering an area of 340 thousand hectares in order to increase the production of soybean (Abdillah, 2014).

Our findings imply that the implementation of import tariffs significantly affect the decrease in imports of soybean in Indonesia. The higher import tariffs, then the soybean imports will also decrease. In Table 7 is presented that the decrease in soybean imports large enough at the prevailing tariffs compared to freed tariffs ($T=0$) and the subsequent application of

the import tariff of 10% and 15% result in decrease of import volume compared with the freed of import tariffs, but the value obtained is still a little higher at 1.03 and 0.97 compared with baseline. This shows that the government's policy on soybean import tariffs is the right step in the effort to reduce imports, but must be supported by efforts to increase the production and productivity of domestic soybeans, because if not, then the processed industry and domestic animal feed will be threatened to lose because of the absence of soybean raw materials.

Implementation of import tariffs that do not show any significant impact on the productivity and production of soybeans, it is also suspected due to the quality of imported soybeans are good enough, then the demand for imported soybeans still occur and result in local soybean not considered by consumers. It will make the farmers are reluctant to increase soybean production. It can be seen from the results in Table 7 that the value of productivity and soybean production unchanged at the level of the tariff of 0 percent, 10 percent and 15 percent.

According to research by Aryanie (1999), both local and imported soybean respective moisture content 15.06 and 10.92, 32.55 and 29.95 levels of protein and fat content of 19.60 and 22.10 (percent dry basis). Based on organoleptic test, imported soybeans are preferred from local soybeans because the resulting of *tempe* is more tender in texture. This is due to local soybean seed size smaller than imported soybean so that with the same unit volume, the more use of local soybean causes *tempe* from local soybeans is denser and less tender. Sudaryanto (1996) states that the preferences of consumers are more likely to import soybeans because the quality is better, relatively large grain size and uniform, and the cheaper price. *Tempe* Industry prefers imported soybean, because the productivity is higher, while the tofu industry prefers local soybean because the soybean extract is higher than imported soybean.

3.7. Soybean Economic Performance Forecasting

To determine the performance of soybean development in the future, forecasting simulation against endogenous variables in the research model of soybean development policy in Indonesia. To perform forecasting, then previously done forecasting of the exogenous variables in the model first. Forecasts for

exogenous variables were calculated using a linear trend method. Forecasting results can be seen in Table 8.

Table 8. Results of Forecasting without Alternatives Policy 2016 to 2022

Obs	Year	HKN	KKN	PK
1	2016	13 336	1789218	1.5198
2	2017	14 944	1874637	1.5130
3	2018	17487	1926108	1.5195
4	2019	20 482	1956969	1.5314
5	2020	24219	1975626	1.5454
6	2021	28 620	1987162	1.5603
7	2022	32 960	1994573	1.5755

Obs	Year	IK	PKD
1	2016	2317155	2518314
2	2017	2387269	2278892
3	2018	2465555	2130144
4	2019	2550836	1991503
5	2020	2642310	1923006
6	2021	2739442	1723211
7	2022	2841887	1567668

Forecasting results showed that the soybean self-sufficiency cannot be implemented until 2022 if without alternative policy, because of the results of the projection show that the national soybean consumption tends to increase, while an increase in productivity of soybean is not proportional to the increase in consumption of soybean, even soybean productivity had decreased in 2017 and 2018 when compared to 2016, so that soybean imports also increased. Therefore, it needs a national strategy to increase soybean production to fulfill the needs of the domestic soybean. From Table 8 it can be seen that there was a deficit in the balance of soybean for several years to come.

4. Conclusions and Recommendations

4.1. Conclusions

1. The quantity of imported soybeans is affected by the variables, there are Rupiah exchange rate, consumption of soybean and soybean import tariffs. Variable national soybean prices are very influential to imported soybean prices and the Rupiah exchange rate.

National soybean prices and population affect the national soybean consumption and soybean productivity influenced by the level of wages.

2. The simulation shows that imports of soybeans and soybean consumption experience the increase on freed tariff ($T=0\%$) compared to the imposition of tariffs. National soybean prices decreased on freed tariffs compared with the prevailing tariffs. The application of tariff has no effect on soybean production and productivity.

3. From the results of forecasting without import tariff alternatives policy shows that the next few years Indonesia has not been able to achieve self-sufficiency in soybeans, as seen from the increased consumption of soybean was not accompanied by an increase in soybean production, so in the next few years there will be a deficit and resulted in soybean imports continue to rise.

4.2. Recommendations

1. Further research need in-depth research by the formulation of more comprehensive models and simulations of other policies on the factors affecting the production and national soybean consumption so that will be more comprehensive like policy simulation on increases national soybean price, policy simulation on increases soybean harvest area and other crop areas.

2. It will be needed a strategies and government policies in the context of efforts to increase productivity and national soybean production that has not been able to fulfil domestic demand.

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