



Analysis of trend and determinant factors of imported soybean in the period of 2003-2022

Irfan Zikri^{1,2*}, Safrida^{1,2}, Elly Susanti¹, Risty Angelia Putri¹

¹Department of Agribusiness, Faculty of Agriculture, Universitas Syiah Kuala, Banda Aceh, Indonesia

²Center for Sustainable Agriculture and Rural Development, Universitas Syiah Kuala, Banda Aceh, Indonesia

KEYWORDS

Econometric model
Import volume
Soybean production
Supply and demand
Trend analysis

ABSTRACT

The import of soybean is still a necessity for the Indonesian government to meet the gap between domestic demand and supply. This paper aims to analyse the trends of soybean import and its contributing factors in Indonesia. The study employs a descriptive analysis by using secondary data in the form of time series from 2003-2017. Data analysis uses trends analysis and single equation econometric model with Ordinary Least Square (OLS) method. The main finding shows the trends of soybean production are to follow a quadratic pattern, tends to decrease with an average 6.12% per year, while demand and import linearly tend to increase respectively with an average 3.30% and 3.03% per year in 2018-2022. The projection of the production will increase 27.60% in 2018 from the previous year and will gradually continue to decline to 0.4 million tons in 2022. Meanwhile, domestic demand projects 3.3 million tons in 2018 will increase to 3.7 million tons, and import volume is 2.5 million tons in 2018 and will increase to 3.0 million tons by 2022. The main factors contributing to the import partially are domestic production and demands and follow by the exchange rate, the national and international prices of soybeans. Statistically shows the increasing every ton of production will affect to decrease 1.02 tons of import volume, and the increasing every ton of demand will increase 0.99 tons of import volume. Thus, the import policy is still unable to stimulate domestic production to fulfill the increasing domestic demand.

Introduction

Soybeans are still as one of the strategic commodities of Indonesian agriculture after rice and corn. Until now, the demand for domestic soybeans is still high along with the increase in population, and an increase in the number of soybean processing industries. Statistically, the development of Indonesia's population in a linear trend continues to increase from 220,545,214 in 2003 to 263,991,379 in 2017 (FAO, 2018; BPS, 2017). On the other hand, the number of soybean food processing industries also shows an increasing trend from 255 units in 2003 to 346 units in 2017. Based on the 2017 Food and Horticultural Crop Outlook, national soybean consumption in 2016 reached 2.85 million tons, while production was only 860 thousand tons or a deficit of around 1.99 million tons (Ministry of Agriculture Republic of Indonesia, 2017). A report by the Ministry of Commerce of Republic of Indonesia in 2014 projected that during the 2013-2019 period, domestic soybean consumption increases by an

average of 1.73% per year, while projection on production decreases by an average of 1.49% per year (Ministry of Trade Republic of Indonesia, 2014).

The increasing deficit soybean balance requires the government to carry out import policies to meet domestic consumption needs. The allotments of Indonesian soybean consumption needs are mostly for 84.9% processed food needs, 8.5% non-food industry, and the rest for other needs (Ministry of Trade Republic of Indonesia, 2014). Today, the level of domestic production of soybeans is only able to meet the needs of around 35% of the national consumption level, and the rest must be imported (Ningrum et al., 2018). Nationally, soybean production has decreased by an average of 6.37% during the period 2013-2017 (Ministry of Agriculture Republic of Indonesia, 2017; Ministry of Trade Republic of Indonesia, 2018). Especially in 2017 there was a significant decline in production of 36.90% from the previous year. On the other hand, productivity shows an

*Corresponding author

E-mail address: irfanzikri@unsyiah.ac.id

Received on 9 May 2020, revised on 2 June 2020, accepted on 7 June 2020

increase, but tends to stagnate around 0.60% per year. The main factors causing low production are the decrease in land area due to the conversion of soybean land to other food commodities, the impact of extreme climate change, and the less competitive selling price of soybeans (Ministry of Agriculture Republic of Indonesia, 2017; Nuhung, 2013).

The soybean import shows an increase in number from year to year. In 2017 the volume of imports reached 2,538,074 tons, an increase of 12.21% from the previous year. Based on previous studies indicate that trends and projections of soybean imports have a tendency remain to increase from year to year (Aimon and Satrianto, 2014; Aldillah, 2015; Ningrum et al., 2018). The most contributing factors to the need for soybeans imports are due to low domestic production, increased consumption needs, and also a lower level of imported soybean prices. The characteristics of physical and the performance quality of imported soybeans, with a large size and clean are also preferences for consumers to consume (Nainggolan, 2008; Zakiah, 2012; Nuhung, 2013). Consequently, the availability of soybean stocks to meet domestic consumption needs will significantly depend on the volume of imports. Therefore, this paper aimed to analyse trends and projections on soybean imports in 2018-2022 by looking at trends in demand and supply for soybean in Indonesia.

Research Methods

The study employs a descriptive analysis by using secondary data, in the form of time series from 2003-2017, obtained from Food and Agriculture Organization (FAO), Statistics Indonesia (BPS), the Center of Data and Information System (PUSDATIN) Ministry of Agriculture Republic of Indonesia, Macro-Trends, and other official Indonesian government documents (Table 1 and Table 2). The data collection includes the import volume, the international price of soybeans, the exchange rate of Indonesian Rupiah (IDR) against US\$, the local production and demands, the domestic price of soybeans, lag import volume, and the import tariff, as well as number of population

and number of food industry. Projection of soybeans demands, production, and import employ trend analysis. The method can be determined by analysing the graph data or scatter plot (Atmaja, 1997), which is:

- a. if observation data tends to show linear symptoms, use a linear form:

$$Y_i = a + bX \dots\dots\dots (1)$$

where,

$$a = \frac{\sum Y}{n}, \text{ and } b = \frac{\sum XY}{\sum X^2} \dots\dots\dots (2)$$

- b. if observation data tends to show a quadratic pattern, use a quadratic form:

$$aY_i = a + bX + cX^2 \dots\dots\dots (3)$$

where,

$$a = \frac{\sum Y}{n} - c \frac{\sum X^2}{n},$$

$$ab = \frac{\sum XY}{\sum X^2}, \text{ and}$$

$$c = \frac{\sum X^2 \sum Y - n \sum X^2 Y}{(\sum X^2)^2 + n \sum X^4} \dots\dots\dots (4)$$

- c. if the observation data tends to show neither linear nor quadratic, use an exponential form:

$$Y = a.b^x; \log Y = \log a + X \log b \dots\dots (5)$$

where,

$$\sum \log Y = n \log a$$

$$\log a = \frac{\sum \log Y}{n}, \text{ and}$$

$$\log b = \frac{\sum (X \log Y)}{\sum X^2} \dots\dots\dots (6)$$

Description:

- Y_i : forecast for period X
- X : a specified number of time periods
- Y : observed data or base period
- a : estimated value of Y_i when X=0
- b,c : the slope of the line (average change in Y_i for each unit change in X)
- n : number of data

Table 1. The data related to soybean production, demand, and prices in Indonesia 2003-2017

Year	Domestic Production (tons)	Domestic Demand (tons)	Domestic Price (IDR/tons)	Intr. Price (US\$/tons)	Exchange Rate (IDR/US\$)	Import Tariff (%)
2003	671,600	1,863,608	3,278,000	210	9,311	0
2004	723,483	1,837,973	3,499,000	248	8,577	10
2005	808,353	1,893,652	3,876,000	203	8,939	10
2006	747,611	1,878,022	4,036,000	198	9,705	10
2007	592,634	2,001,729	4,588,000	287	9,159	10
2008	776,491	1,947,032	6,212,000	411	9,141	0
2009	974,512	2,286,999	6,588,000	340	9,699	0
2010	907,031	2,647,150	6,664,000	348	1,034	0
2011	851,286	2,930,910	7,254,000	440	9,090	5
2012	843,153	2,729,690	7,514,000	487	8,770	0
2013	779,992	2,554,184	6,905,000	462	9,387	5
2014	954,997	2,484,504	8,326,000	410	10,461	0
2015	963,183	3,190,492	8,327,000	314	11,865	0
2016	860,000	3,120,168	9,327,216	329	13,389	0
2017	542,000	3,079,173	9,627,819	326	13,380	0

Table 2. Population, food industry, and import volume of soybean in Indonesia 2003-2017

Year	Population (1000 persons)	Food Industry (unit)	Domestic Production (tons)	Domestic Demand (tons)	Import Volume (tons)
2003	220,545.2	255	671,600	1,863,608	1,192,717
2004	223,614.6	262	723,483	1,837,973	1,115,793
2005	226,712.7	243	808,353	1,893,652	1,086,178
2006	229,838.2	266	747,611	1,878,022	1,132,144
2007	232,989.1	289	592,634	2,001,729	1,411,589
2008	236,159.3	296	776,491	1,947,032	1,173,097
2009	239,340.5	307	974,512	2,286,999	1,314,620
2010	242,524.1	328	907,031	2,647,150	1,740,505
2011	245,707.5	316	851,286	2,930,910	2,088,616
2012	248,883.2	325	843,153	2,729,690	1,920,490
2013	252,032.3	314	779,992	2,554,184	1,785,327
2014	255,131.1	320	954,997	2,484,504	1,965,811
2015	258,162.1	332	963,183	3,190,492	2,256,932
2016	261,115.5	339	860,000	3,120,168	2,261,803
2017	263,991.4	346	542,000	3,079,173	2,538,074

The analyzing of contributing factor to the import uses a single equation econometric model with OLS (ordinary least square) model. In this equation, the soybean import determines by the international price of soybean, the local price, domestic production, domestic demand, exchange rate, import tariff, and lagged import volume. Mathematically, the soybean import equation model is:

$$M = a_0 + a_1 P_W + a_2 P_L + a_3 PROD_L + a_4 D_L + a_5 ER + a_6 POL_M + a_7 M_{t-1} + e_1 \dots \dots \dots (7)$$

- Description:
- M : import volume (tons)
 - a₀ : constants
 - a₁...a₇ : coefficient of regression
 - e : error
 - P_W : international price (US\$/tons)
 - ER : exchange rate (IDR/US\$)
 - PROD_L : domestic production (tons)
 - D_L : domestic demand (tons)
 - P_L : domestic price (Rp/tons)
 - M_{t-1} : lag import volume (tons)
 - POL_M : import tariff (%)

The next step is to conduct statistical tests, which are t-test, F test, and coefficient of determination (R^2) test.

Results and Discussion

Analysis of Trends and Projection of Soybeans Demand in Indonesia

During the period 2003-2017, the domestic demand for soybean in Indonesia was fluctuating and tending to increase, with a growth rate of about 4.26% per year. In 2003, demand for soybeans was 1.9 million tons and increased to 2.0 million tons in 2007. The substantial increase in demand for soybeans occurred in the 2008-2011, which reached 2.9 million tons in 2011. But after that, there was a decline until 2014 to become 2.5 million tons. In 2015, domestic soybean demand again increased by 28.42% from the previous year, and then slightly showed to decline 2017 (Figure 1). According to the result of the plot tendency towards domestic soybean demand, the analysis model was obtained linearly with the following equation:

$$Y = 1,601,719 + 103,496X \dots \dots \dots (8)$$

The tendency of the escalating shows that the population growth and the soybean food industry have a significant contribution to the increase in demand for domestic soybeans. It implies that an increase in population and an increase in the number of soybean food industries will have an impact on increasing shared demand for soybeans. This condition is also influenced by the improvement of the quality of human development, through the socio-economic indicators, such as per capita income, education level, changing in food patterns and awareness of nutritional needs, as well as affecting the degree of soybeans consumption. Statistically, the trend and projection of population and the number of soybean food industries tend to increase linearly (Figure 2). During the period 2003-2017, the population growth rate was 1.29% per year, and the growth of the soybean food industry was 2.25% per year.

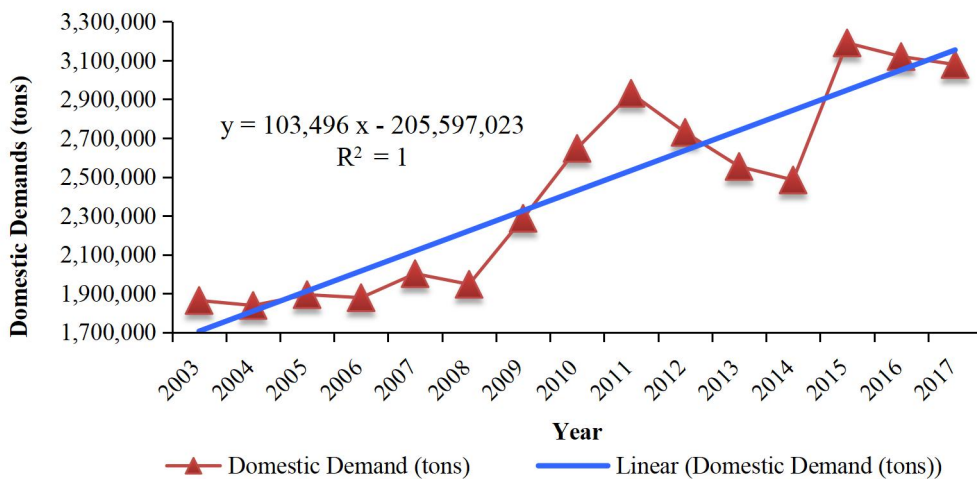


Figure 1. Trends and projection of domestic demand of soybeans in Indonesia 2003-2017

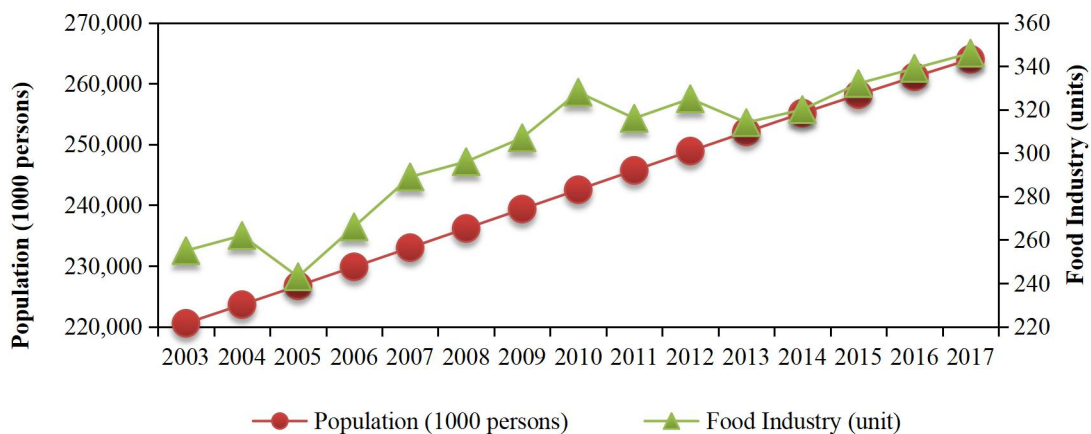


Figure 2. Trends of population and number of soybean food industry in Indonesia 2003-2017

The projection of the demand for domestic soybeans in 2018-2022 shows a trend towards an increase in demand in 2018 around 3.3 million tons to 3.7 million tons in 2022, with a percentage growth of 3.30% per year (Table 3). These results are linearly in line with the projections of population growth of 1.16% per year and the number of soybean food industry 1.99% per year.

The above argument is supported by previous studies (Budhi and Aminah, 2010; Adetama, 2011; GAIN, 2019), which showed that population growth and the soybean food industry directly influence soybean demand in Indonesia. The main factor is increasing awareness of healthy food patterns (nutritional food), which are influenced by the rate of economic growth (per capita income). On the other hand, the high demand for soybean processed products in the form of tempeh, tofu, soy sauce, and tempeh chips also contributed to the growth of the soybean food processing industry. Especially, tofu and tempeh producers need more than half of the total national needs. According to the GAIN report (GAIN, 2019) also shows that the increasing demand for Indonesian soybeans continues to increase in line with the growth of the population and the soybean food processing industry. The total domestic soybean consumption in 2017/2018 reaches 3.01 million tons, an increase of 60,000 tons in the following year period, and is expected to increase to 3.13 million tons in 2019/2020. The main allotment of domestic soybean consumption is for processed food needs,

especially tempeh and tofu. The majority of domestically produced soybeans were used for tofu production, while imported soybeans were used for both tempeh and tofu production.

Analysis of Trends and Projection of Soybeans Production in Indonesia

In the period 2003-2017, the trend of domestic soybean production was very fluctuating and tended to decline, with a growth rate of 0.93% per year (Figure 3). In 2003, total domestic production reached 671,600 tons and increased to 808,353 tons in 2005. The increase in production was due to the increase in world soybean prices. This condition has stimulated domestic soybean farmers to expand soybean-planting areas. But this condition did not last longer, and domestic soybean production declined again until 2007. The lowest reduction in production was occurred in 2017 to 425,246 tons, or lower than 2007. Some of the factors that contributed to the lowest domestic soybean production were low price of domestic soybean, decreasing planted areas due to the conversion of soybean land to other food commodities, extreme climate change, and low incentives received by farmers. Based on the results of the trend analysis of plots on domestic soybean production, the analysis model was a quadratic with the following equation:

$$Y = 572,286 + 66,686X - 3,701.9X^2 \dots\dots\dots (9)$$

Table 3. Projection of population, food industry and domestic demand of soybeans in Indonesia 2018-2022

Year	Population (persons)	Food Industry (units)	Demand (tons)
2018	267,491,800	357	3,257,655
2019	270,622,100	364	3,361,151
2020	273,752,400	370	3,464,647
2021	276,882,700	377	3,568,143
2022	280,013,000	384	3,671,639

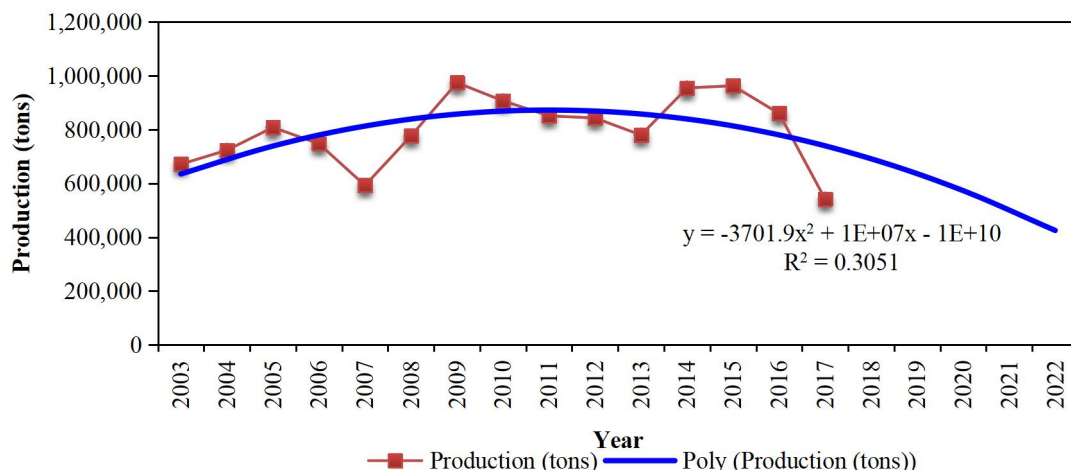


Figure 3. Trends and projection of domestic soybeans production in Indonesia 2003-2017

The trend of increasing demand, which is not accompanied by an increase in production, implies that Indonesia will continue to face increasingly large deficits. This result of projection analysis shows that domestic soybean production will continue to decline from 2018-2022 with a negative growth rate of -6.12% (Table 4). Soybean production is expected to increase by 27.60% in 2018 from the previous year. However, it will gradually continue to decline to 425,246 tons in 2022. This continued decline is due to a lack of incentives received by farmers, so they tend to shift to more profitable commodities such as rice and corn (GAIN, 2019). On the other hand, the establishment of minimum price policies and tightening import policies on rice and corn also influence farmers' confidence in planting these commodities. Therefore, self-sufficiency in soybean will be very difficult to achieve if there are no breakthroughs to increase domestic production. It is not only related to technical aspects, but also necessary to be supported by the determination to motivate and strengthen farmers' participation in cultivating soybeans, including improving the soybean trade system and price incentive, which is supported by the provision of technology, counseling and other incentives (Zakaria, 2010).

Analysis of Trends and Projection of Soybeans Import in Indonesia

The projection between the balance of consumption and production is a significant challenge for the Indonesian government at this time. The projection

of a high demand growth that is not in line with the growth of negative soybean production causes Indonesia to continue to experience a widening deficit. Thus, to meet the demand for domestic soybeans will continue to depend on imports. The import volume of soybeans increased from 1.2 million tons in 2003 to 2.5 million tons in 2017, with a growth rate of 6.19% per year during the period 2003-2017. The supply of Indonesian soybeans mostly comes from importing countries such as America, Argentina, Canada, Malaysia, and China. This condition certainly has unfavorable implications for the climate of domestic soybean production if not immediately addressed. Therefore, programs to increase domestic production must be a priority through providing incentives, both technical and non-technical to stimulate and encourage farmers to cultivate soybeans.

The trend of Indonesian soybean imports from year to year has generally fluctuated but tends to show an increasing pattern (Figure 4). The trend analysis and projections on the Indonesian soybean imports showed a linear pattern with the equation:

$$Y = 840,666 + 103,114X \dots \dots \dots (10)$$

The volume of soybean imports is projected to reach 2.5 million tons in 2018 and will continue to increase to 2.9 million tons in 2022, or grow around 3.03% per year during the period 2018-2022 (Table 5). This condition is in line with population growth and the growth of the soybean food processing industry, which contributes to the increase in soybean consumption needs.

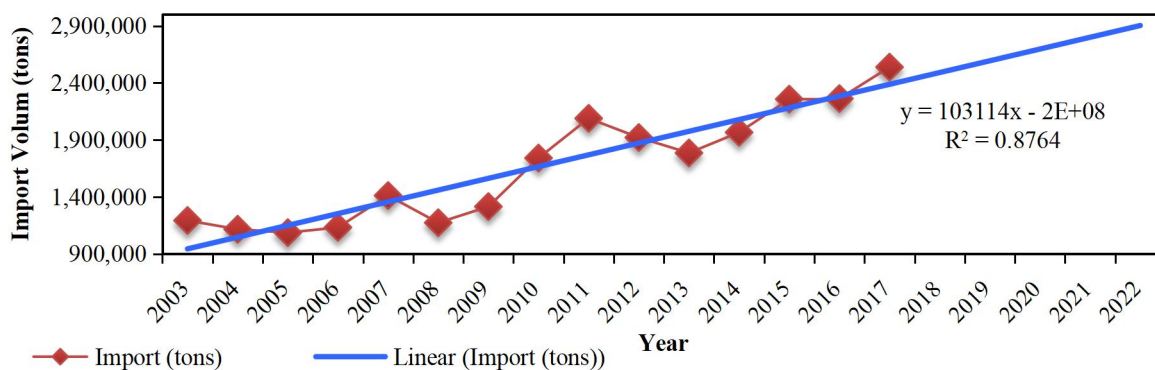


Figure 4. Trends and projection of soybeans import in Indonesia 2003-2017

Table 4. Projection of soybeans production in Indonesia 2018-2022

Year	Production (tons)
2018	691,576
2019	636,099
2020	573,218
2021	502,934
2022	425,246

Table 5. Projection of soybeans import in Indonesia 2018-2022

Year	Import Volume (tons)
2018	2,490,490
2019	2,593,604
2020	2,696,718
2021	2,799,832
2022	2,902,946

Contributing Factors to Soybeans Import in Indonesia

In this analysis, soybean imports influence by the following variables, namely global soybean prices, exchange rates, domestic production rates, domestic demand, domestic prices, previous year's import volume, and the import tariffs. It shows that statistically global price, exchange rates, domestic production, domestic demand, domestic prices, previous year's import volume, and import tariff policies simultaneously affect the Indonesian soybean imports (Table 6). The coefficient of determination in this equation is 0.9997. It implies that this equation has a variation in which the independent variables is able to explain import variable of Indonesian soybean by 99.97%, meanwhile 0.03% is explained by other variables outside the model. However, the following factors: namely domestic production, domestic demands, the exchange rate, the national price, and the international price of soybeans partially have a significant impact on the volume of imports. Meanwhile, the lagged import volume and tariff policy have no significant effect on import volume.

The constant value is 270066.2, meaning that when the factors that affect soybean imports are constant; Indonesia will import soybeans by 270,066.2 tons.

Global soybean prices have a negative and significant effect on the volume of Indonesian soybean imports, with a regression coefficient of minus 376,284. It implies that increasing every 1 dollar/ton increase in global soybean prices will reduce imports of soybeans by 376.28 tons. Conversely, domestic prices have a positive and significant relationship to Indonesian soybean imports. The high price of domestic soybeans is a low production implication, so it is not able to meet demand. Therefore, import policy must be carried out to meet domestic needs. The analysis shows that an increase in domestic soybean prices of IDR. 1,000/ton, it will increase the volume of soybean imports by 26 tons/year. This shows that the response to an increase in domestic prices is the same and even higher compared to the world soybean prices to the volume of soybean imports. This condition shows Indonesia's dependence on imported soybeans is still quite high.

Table 6. Projection of soybeans import in Indonesia 2018-2022

Equitation	Variable	Coefficient	Std.Err	t _{stat}	P _{value}
Import Volume (M)	P _W	-376.284	172.362	-2.18	0.035
	ER	-31.313	11.752	-2.66	0.011
	PROD _L	-1.021	0.037	-27.55	0.000
	D _L	0.996	0.027	35.94	0.000
	P _L	0.026	0.011	2.23	0.031
	M _{t-1}	0.024	0.021	1.12	0.268
	POL _M	-755.728	1123.564	-0.67	0.505
	constant	270066.2	110848.3	2.44	0.019
	R ²		0.9997		
	F _{stat}		3020.63		
	P _{value}		0.000		

Source: secondary data analysis, 2018

The rupiah exchange rate against US dollar has a negative and significant relationship to the volume of imports. This means that every weakening of the rupiah exchange rate against the dollar will reduce the number of soybean imports by 31.31 tons. This is in line with the theory that the weakening of the rupiah exchange rate against the dollar will cause the price of world soybeans to be high so that the ability to import soybeans will decrease.

The analysis also shows a positive import lag value. This implies that there is a tendency for soybean imports to continue to increase from year to year. Meanwhile, the soybean import policy had a negative relationship with soybean imports. This means that government policies on imports can reduce Indonesia's dependence on foreign soybeans. However, these two variables statistically have no significant effect.

Conclusions

Practically, imports have a short-term impact to stabilize the deficit between domestic demand and production. Import policy is expected to have implications for stimulating domestic production so that it can reduce the level of dependence on imports. However, the statistical analysis shows that the soybean import trend will continue to increase as long as the demand balance and production balance continue to experience a deficit. The demand projection continues to increase linearly in line with the increase in population and the number of soybean processing industries. Changes in the population's food patterns towards nutritional needs have contributed to an increase in soybean consumption by increasing the economic welfare of the population. On the other hand, the projection of soybean production shows a declining trend with a quadratic pattern, while the demand

rate experiences growth. The low incentives for local soybeans are a trigger factor for farmers to prefer to plant other food commodities. As a result, Indonesia's soybean demand projection will continue to depend heavily on imports. The main contributing factors to the import are partially upon the domestic production, domestic demands, and follow by the exchange rate, the local and global prices of soybeans. Statistically shows the increasing every ton of production will affect to decrease of 1.02 tons of import volume, and increasing every ton of demand will increase 0.99 tons of import volume. Thus, import policy is still unable to stimulate domestic production to fulfill the increasing domestic demand.

Conflict of interest

Authors declare that there is no conflict of interest.

References

- Adetama, D.S. (2011) 'Analisis Permintaan Kedelai di Indonesia Periode 1978-2008 (Analysis of Soybean Demand in Indonesia 1978-2008)', [Thesis], Universitas Indonesia, Jakarta [In Indonesian]
- Aimon, H., and Satrianto, A. (2014) 'Prospek konsumsi dan impor kedelai di indonesia tahun 2015-2020 (soybean consumption and import prospects in Indonesia 2015-2020)', *Jurnal Kajian Ekonomi*, 3(5), pp 9-23 [In Indonesian]
- Aldillah, R. (2015) 'Proyeksi produksi dan konsumsi kedelai indonesia (Projection of Indonesian soybean production and consumption)', *Jurnal Ekonomi Kuantitatif Terapan*, 8(1), pp 9-23 [In Indonesian]
- Atmaja, L.S. (1997) 'Memahami Statistika Bisnis (Understanding Business Statistics)'. Andi Offset, Yogyakarta [In Indonesian]
- BPS (2017) "Manufacturing Industrial Statistics", Badan Pusat Statistik, Jakarta
- Budhi, G.S., and Aminah, M. (2010) 'Swasembada

- Kedelai: Antara Harapan dan Kenyataan (Soy Self-Sufficiency: Between Hope and Reality)', *Forum Penelitian Agro Ekonomi*, 28(1), pp 55-68 [In Indonesian]
- FAO (2018) FAO STAT, available from <http://www.fao.org/faostat/eng/#data>, accessed May 12, 2019
- GAIN (2019) Indonesia Oilseeds and Products Annual Report 2019, Global Agricultural Information Network (GAIN), USDA Foreign Agriculture Service, available from https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Oilseeds%20and%20Products%20Annual_Jakarta_Indonesia_3-15-2019.pdf accessed June 1, 2019
- Ministry of Agriculture Republic of Indonesia (2017) 'Outlook Tanaman Pangan dan Hortikultura 2017 (Food Crops and Horticulture Outlook 2017)', Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal Kementerian Pertanian Republik Indonesia, Jakarta [In Indonesian]
- Ministry of Trade Republic of Indonesia (2014) Laporan Outlook Pangan Kedelai 2015-2019 (Soybean Food Outlook Report 2015-2019)', Pusat Kebijakan Perdagangan Dalam Negeri, Badan Pengkajian dan Pengembangan Perdagangan, Kementerian Perdagangan Republik Indonesia, Jakarta [In Indonesian]
- Ministry of Trade Republic of Indonesia (2018) 'Analisis Perkembangan Harga Bahan Pangan Pokok di Pasar Domestik dan Internasional Desember 2018', Pusat Pengkajian Perdagangan Dalam Negeri, Badan Pengkajian dan Pengembangan Perdagangan, Kementerian Perdagangan Republik Indonesia, Jakarta. [In Indonesian]
- Nainggolan, K. (2008) 'Ketahanan dan stabilitas pasokan, permintaan dan harga komoditas pangan (Security and stability of supply, demand and prices of food commodities)', *Jurnal Analisis Kebijakan Pertanian*, 6(2), pp 114-139 [In Indonesian]
- Ningrum, I.H., Irianto, H., and Riptanti, E.W (2018) 'Analysis of soybean production and import trends and its import factors in Indonesia', *IOP Conference Series: Earth and Environmental Science*, 142(1), pp. 1-8
- Nuhung, I.A. (2013) 'Kedelai dan politik pangan (soybeans and food politics)', *Forum Penelitian Agro Ekonomi*, 31(2), pp. 123-135 [In Indonesian]
- Sudaryanto, T., and Swastika, D.K. (2007) 'Ekonomi kedelai di Indonesia (Economic soybean in Indonesia) in Sumarno, Suyamto, Widjono, A., Hermanto, and Kasim, H. (eds.) *Kedelai: Teknik Produksi dan Pengembangan*. Puslitbang Tanaman Pangan: Bogor, pp. 1-27 [In Indonesian]
- Tastra, I.K., Ginting, E., and Fatah, G.S.A. (2012) 'Menuju swasembada kedelai melalui penerapan kebijakan yang sinergis (Towards soy self-sufficiency through synergistic application of policies)', *Iptek Tanaman Pangan*, 7(1), pp 47-57 [In Indonesian]
- Zakaria, A.K. (2010) Program pengembangan agribisnis kedelai dalam peningkatan produksi dan pendapatan petani (Soybean agribusiness development program in increasing farmers production and income)', *Jurnal Litbang Pertanian*, 29(4), pp 147-153 [In Indonesian]
- Zakiah (2012) 'Preferensi dan permintaan kedelai pada industri dan implikasinya terhadap manajemen usaha tani (Soybean preference and demand in the industry and its implications on farm business management)', *Jurnal Mimbar*, 28(1), pp 77-84 [In Indonesian]