Soybean Competitiveness Compared to Other Secondary Crops and Its Prospect to Achieve Self-Sufficiency in Indonesia

Dewa K. S. Swastika^a and Bambang Sayaka^{a*}

Professor researchers at the Indonesian Center for Agricultural Socio-Economic and Policy Studies, Jl. Tentara Pelajar No. 3-B Cimanggu, Bogor 16111, Indonesia

Received: November 20, 2019 / Accepted: May 12, 2021

Abstract

Demand for soybean in Indonesia keeps increasing along with population growth. So far, most of the domestic demand is fulfilled through soybean import. This study aims to analyze the prospect of soybean self-sufficiency in the perspective of its competitiveness against other secondary crops in Indonesia. The analysis method applied in this study is comparison of financial farm income between soybean farming against other secondary crops, namely corn, groundnut and mungbean. The results of analysis showed that soybean was not competitive compared to other secondary crops. This was indicated by relatively low farm income of soybean farming compared to those of corn, groundnut, and mungbean. Rational farmers would be expected to choose the more profitable crops rather than growing soybean. Therefore, without significant breakthroughs, the area planted with soybean and its production will keep decreasing. In other words, it is almost impossible to achieve self-sufficiency in soybean.

Keywords: soybean; Indonesia; self-sufficiency

Abbreviations:

BPS	: Statistics Indonesia
FI	: Farm Income
GM	: Genetically Modified
GMO	: Genetically Modified Organism
GOI	: Government of Indonesia
Ha	: hectare
ICFORD	: Indonesian Centre for Food Crops Research and Development
IDR	: Indonesian Rupiah
Kg	: Kilogram
USDA	: United States Department of Agriculture
TCs	: Existing total cost of soybean farming IDR. 000/ha/83 days)
TRs	: Existing Total Revenue of Soybean farming
TRsc*	: Expected Total Revenue of Soybean to compete with corn farming (IDR.000/ha/83 days)
TRsg*	: Expected Total Revenue of Soybean to compete with groundnut farming (IDR.000/ha/83 days)
TRsm*	: Expected Total Revenue of Soybean to compete with mungbean farming (IDR.000/ha/83 days)

1. Introduction

In Indonesia, soybean is a very strategic source of vegetable protein. It is a very popular vegetable food for most Indonesian people. Susilowati et al. (2013) [1] revealed that soybean is a vegetable food that is highly needed and very prospective. Soybeans are consumed in the form of processed foods, such as tofu, tempeh, soy sauce, tauco, soy milk, and various snacks made from soybean. Siregar and Sumaryanto(2003) [2] reported that the demand for soybean in the form of processed food continues to increase along with population growth and an increase in per capita income. Statistical data showed that Indonesia's soybean consumption continue to increase from 2.30 million tons in 1992 to 3.04 million tons in 2017 (USDA 2019) [3]. However, the increase in consumption is not followed by domestic production. Soybean demand increased sharply contrary to the availability of domestic production. Demand for soybean will keep increasing as the demand for its derivatives as protein sources grows overtime (Bantacut 2017) [4]. Simatupang (2012) [5] revealed that during the period of 1992-2012, there was a sharp decline in area planted to soybean to only one third, or decreased about 63 percent for the last 19 years. This decline was mainly due to decrease in competitiveness of soybean compared to rice and other secondary crops, as well as its low competitiveness compared to imported soybean. Soybean harvested area sharply declined from 1.67 million ha in 1992

Corresponding Author

Tel.: +62-251-8333964 ; Fax.: +62-251-8314496 ; E-mail: dwsastika@gmail.com, bambangsayaka@gmail.com

to only 0.38 million ha in 2017 or decreased about 5.97 percent per year during the period of 25 years. The decline in harvested area reflects the lack of interest of farmers in growing soybean, because there is no incentive for them to grow soybean. Zakaria et al. (2010) [6] reported that farmer participation in soybean farming was low. In fact, many farmers switch from soybean crops to other crops, especially corn. The problem is that in the midst of a drastic decline in the soybean area that is allegedly due to its weak competitiveness, the government continues to promote soybean self-sufficiency. Therefore, it is necessary to assess the prospect of achieving soybean self-sufficiency from the perspective of its competitiveness towards other crops. Hasan et al. (2015) [7] revealed that to achieve soybean self-sufficiency in 20 years from 2015, planted area expansion should be at least 70% per year, actual yield of 2.4 tons per hectare and cropping index of 2.0.

Various studies on soybean competitiveness in Indonesia have been carried out using various methods. Several studies revealed that domestic soybean production has no competitiveness, as an import substitution and its competitiveness against other secondary crops (Gonzales et al. 1993; Adnyana and Kariyasa 1995; Sudaryanto et al. 2001; Krisdiana 2012; Nainggolan and Rachmat 2014) [8, 9, 10, 11, 12]. Even Rusastra et al. (2004) [13] reported that soybean farming in East Java on simple irrigated and rainfed land during the second dry season of 2000-2001 financially suffered losses. Only on technical irrigated and semi-irrigated land, soybean farm income was positive, but with a very low value, namely IDR104,137 per ha on technical irrigated land and IDR5,881 per ha on semi technical irrigated land. Meanwhile, corn and groundnut farming in the same season benefited far higher than soybean. The corn farm income ranged from IDR424,985 per ha on rainfed land to IDR923,281 per ha on technical irrigated land. Groundnut farm income was between IDR1,177,360 on rainfed land and IDR1,331,349 per ha on technical irrigated land. By using Policy Analysis Matrix, Sari and Prajanti (2016) [14] and Bowo et al. (2016) [15] reported that economically soybean did not have comparative advantage where the Domestic Resource Cost (DRC) was greater than 1.00. These studies concluded that it is better to import soybean rather than producing it domestically.

In contrast to previous studies, this study did not analyze the competitiveness of domestic soybean against imported soybean which is produced efficiently in large-scale in the exporting countries, so that production costs are low. The closest competition is among secondary crops in the same region, due to limited land. The second difference is that the analysis of soybean competitiveness in previous studies rarely compares soybean farming with other crops. If there is a comparison with other secondary crops, generally using an analysis of the costs and farm income of secondary crops farming in one season, while the average harvesting age of

soybean is different from other crops. Therefore, in this study financial analysis was carried out by comparing the farm income of soybean farming with other crops with the same time period, using average harvesting age of soybean. The third difference is the coverage of the area and the sample of farmers. In previous studies in Indonesia, the researchers used the coverage of the regency/district area or the province, while this study used data from Statistics Indonesia (BPS 2017) [16] which was the result of a survey of secondary cost structures in 2017 with coverage of all Indonesia (34 provinces). The aim of the study was to analyze the prospect of soybean self-sufficiency in the perspective of its competitiveness against other secondary crops in Indonesia.

2. Methodology

Data Sources

The study was done by reviewing relevant literatures and collecting as well as analyzing the secondary data, especially cost structure of secondary food crops, provided by FAO, BPS-Indonesia and Ministry of Agriculture. The BPS data was the results of Cost Structure of Secondary Food Crops Cultivation Household Survey 2017 (SOUT2017-SPW). The survey of BPS-Indonesia involved: 12,708 soybean farmers, 77,536 corn farmers, 35,529 groundnut farmers, and 16,841 mungbean farmers (BPS, 2017) [16]. Another source of data, especially on average harvesting age of each *secondary* crop is the Indonesian Center for Food Crops Research and Development (ICFORD, 2016) [17].

Data Analysis

Analysis of the competitiveness of soybean against other *secondary* crops can be used as a tool in determining the choice of crops that are more profitable for farmers. Adnyana and Kariyasa (1995) [9] revealed that the analysis of competitiveness among commodities can be used as a tool to determine the minimum yield that must be produced by a commodity, at a certain price, in order to compete with other commodities that also use the same land in the same season. In addition, this analysis can also be used as a tool to determine the minimum price of a commodity (in this case soybean) on a certain yield, so that it can still compete with other commodities (for example: corn, groundnut, mungbean, etc.). By knowing the minimum yield and price of a commodity in order to compete with other commodities, farmers can determine what commodity is the best to produce. This study was using cost and benefit analysis of soybean and analyze its competitiveness with other three *secondary* crops, namely corn, groundnut, and mungbean at the same time frame. Mathematically the financial analysis of soybean

competitiveness against other crops can be formulated as follows:

$$FI_s = TR_s - TC_s \dots\dots\dots (1)$$

Where:

FI_s = Farm income earned from soybean farming (IDR/ha/season)

TR_s = Total Revenue of soybean farming (IDR/ha/season)

TC_s = Total Cost of soybean farming (IDR/ha/season)

The same formula can be applied for other crops:

$$FI_o = TR_o - TC_o \dots\dots\dots (2)$$

Where:

FI_o = The income earned from other crops farming (IDR/ha/season)

TR_o = Total Revenue of other crops farming (IDR/ha/season)

TC_o = Total Cost of other crops farming (IDR/ha/season)

To be able to compare between the farm income of soybean and other crops (for example corn), it is necessary to consider the harvesting days after planting of each crop, so that a comparison of farm income can be made at the same time period. From the literature review, the average harvesting days of soybean was obtained at 83 days after planting, 97 days after planting for corn, 94 days after planting for groundnut, and 63 days after planting for mungbean (ICFORD, 2016) [17]. Assuming the differences in the harvesting age of these commodities are generally accepted, then to be able to compete with corn, the farm income of soybean should be at least $(83/97) \times$ the farm income of corn per season. Similarly, in order to compete with groundnut and mungbean, the farm income of soybean should be at least $(83/94)$ multiplied by per season farm income of groundnut and $(83/63) \times$ per season farm income of mungbean.

- If $FI_s > (83/97) \times FI_c$, then soybean farming is more profitable than corn farming.
- In contrast, if $(83/97) \times FI_c > FI_s$, then corn farming is more profitable than soybean farming.
- The same formula can be applied for the competitiveness of soybean against groundnut and mungbean.

Where:

FI_s = Farm income earned from soybean (IDR/ha/season)

FI_c = Farm income earned from corn (IDR/ha/season)

- The rational farmers will choose the most profitable commodity.

In other words, in order for soybean farming can compete with corn farming, the expected total revenue of soybean farming must mathematically fulfill the following formula:

$$TR_{sc}^* - TC_s \geq (83/97) FI_c \text{ or } TR_{sc}^* \geq TC_s + (83/97) FI_c \dots (3)$$

Where:

TR_{sc}^* = Expected total revenue of soybean farming, with its farm income equivalent to that of corn farming per 83 days (in IDR/ha/83 days).

FI_c = Farm income earned from corn farming (in IDR/ha/97 days)

At current price, the minimum yield of soybean to be able to compete with corn should be:

$$Y_s^* = TR_{sc}^* / P_s \dots\dots\dots (4)$$

Where:

Y_s^* = Expected minimum yield of soybean in order to be able to compete with corn (kg/ha/83 days)

P_s = farm gate actual price of soybean (IDR/kg)

At current actual yield of soybean (Y_s), the expected minimum price of soybean (P_s^*) to be able to compete with corn should be:

$$P_s^* = TR_{sc}^* / Y_s \dots\dots\dots (5)$$

Where:

P_s^* = Expected minimum price of soybean in order to be able to compete with corn farming (IDR/kg)

Y_s = Current actual yield of soybean (kg/ha/83 days).

The similar formulas of equations (4) and (5) can be applied for competitiveness of soybean against groundnut as well as mungbean.

3. Results and Discussion

By applying equation (1) and (2), the cost structure and farm income of each *secondary* crop are as presented in Table 1. *Secondary* yields differed among crops in which corn as one of grain crops had the highest yield compared to those of soybean, groundnut, and mungbean as legumes. Nevertheless, corn price was the lowest compared to the other *secondary crops* and it still had a high revenue. Groundnut had the highest price and it gave the highest revenue and farm income per season. Soybean had the second shortest harvest period after mungbean, but its income was the lowest among other *secondary crops* indicating that soybean had the lowest competitiveness among *secondary crops*. The lowest income of soybean farming among secondary food crops

was also reported by (Saptana et al. 2017) [18]. They reported that by taking into account land rent in Java, the average profits of corn, groundnut and cassava in 2017 farming were IDR8.12, IDR3.68, and IDR3.24 million per ha respectively, while the profit of soybean in the same year was only IDR0.23 million per ha.

Table 1 Cost and benefit analysis of *secondary crops* in Indonesia, 2017

Cost and Benefit	Soybean	Corn	Ground-nuts	Mung-bean
Seed (IDR. 000)	591.02	899.12	1,419.46	447.17
Fertilizers (IDR. 000)	449.18	1,370.09	626.83	273.22
Pesticides (IDR. 000)	363.57	552.02	195.57	613.05
Labor (IDR. 000)	4,272.07	4,951.13	6,908.30	4,293.63
Land rent (IDR. 000)	2,613.33	1,792.48	1,808.96	2,213.33
Land tax (IDR. 000)	76.25	58.28	79.82	69.51
Loan interest (IDR. 000)	10.90	44.47	15.75	10.55
Levies (IDR. 000)	52.85	42.19	29.26	21.24
Insurance (IDR. 000)	1.36	1.30	3.91	0.85
Tools rent (IDR. 000)	208.44	230.03	309.21	186.97
Depreciation (IDR. 000)	179.17	156.42	239.83	158.67
Fuels (IDR. 000)	113.46	132.57	130.32	93.48
Others (IDR. 000)	114.26	168.04	151.85	113.85
Total cost (IDR. 000)	9,045.85	10,197.14	11,919.07	8,498.52
Yield (kg/ha)	1,509	5,096	1,318	1,158
Price (IDR/kg)	6,808.69	2,822.91	12,236.39	8,958.51
Total revenue (IDR. 000)	10,274.31	14,385.53	16,127.56	10,373.95
Farm income per season ((IDR. 000/ha)	1,228.46	4,188.39	4,208.49	1,878.43
B/C Ratio	0.14	0.41	0.35	0.22
Harvesting age (days)	83	97	94	63
Farm income per 83 days ((IDR. 000/ha)	1,228.46	3,584.34	3,716.01	2,474.76

Source: BPS (2017) [2019] and ICFORD (2016), data processed.

Note: the value is in thousand Indonesian rupiah

Even negative farm income of soybean has been reported by Suryani et al. (2017) [19]. They reported that the average farm income of soybean in West Java, East Java and West Nusa Tenggara (NTB) was -IDR2.93 million per ha. Meanwhile, the average farm income of corn in West Java, East Java, Lampung and South Sulawesi in the same year was IDR7.34 million per ha. The study of Sayaka et al. (2018)

[20] revealed that soybean farming in Lampung, West Java and South Sulawesi showed negative profits of -IDR2.68, -IDR 1.65 and -IDR 0.58 million per ha, respectively.

On the other hand, the farm income of corn farming in the same areas were IDR7.43, IDR9.34, and IDR2.54 million per ha, respectively. Only in Grobogan and Wonogiri Regencies, Central Java Province, soybean farming gave positive income because soybean in these areas was sold to a government project as seed (Roessali et al. 2019; Sayaka et al. 2018 [20, 21]. However, the income of corn farming in Central Java was much higher than that of soybean.

Table 2 shows that soybean farm income was relatively low among *secondary crops*, i.e. IDR1,228,460 per ha. To be competitive with corn, soybean farm income has to increase to IDR3.58 million per ha. It should be increased to each of IDR3.72 million and IDR2.47 million per ha to compete with groundnut and mungbean, respectively. There are two possible soybean farm income improvements. First, given the existing selling price the soybean yield should be increased such that its total revenue will be enhanced. Second, given the existing yield, the soybean selling price should be boosted, resulting in better revenue.

Table 2 Expected total revenue and farm income of soybean to compete with other *secondary crops* (IDR.000)

Commodity	Total Cost (TCs)	Total Revenue	Farm income
Soybean	9,045.85	10,274.31	1,228.46
Corn	9,045.85	12,629.73	3,583.88
Groundnut	9,045.85	12,761.86	3,716.01
Mungbean	9,045.85	11,520.61	2,474.76

Source: BPS (2017) [19], data processed.

Crops offering high farm income will become the farmers' preference. Given the higher farm income the farmers earn, they will have better livelihood (Suprehatin et al. 2015) [21]. Cash income generated by crops grown and livestock raised determine farmers' preferences (Bekele 2004) [22]. Amaruzaman et al. (2015) [23] found that small farmers' preferences on crops were their impacts on household income and ease of maintenance. Thus, given current soybean farming profitability the farmers will not prioritize this commodity over time. Therefore, it is difficult to expect farmers to grow more soybean in order to boost soybean production, particularly to achieve self-sufficiency.

Given the soybean price at farm level, i.e. IDR6,809/kg, it is hard to compete with other *secondary crops* (Table 3). Given actual yield of soybean, its price has to increase to at least IDR7,635 to compete with mungbean. Even its price has to be increase to IDR8,370/kg in order to compete with

corn. A higher price of soybean about IDR8,457/kg is needed to be able to compete with groundnut.

Table 3 Competitive yields and prices of soybean against other secondary crops in Indonesia, 2017

Commodity	Yields (kg/ha)	Soybean Competitive Price (IDR/kg)
Soybean	1509	6,808.69
Corn	1855	8,369.60
Groundnut	1874	8,457.16
Mungbean	1692	7,634.60

Source: BPS (2017) [19], data processed

The relatively low price of soybean is partly due to low import price of this commodity. Most soybean was imported from United States especially processed into tofu and tempeh. Since 2013 the Government of Indonesia (GOI) does not apply import tax to soybean as it will enhance prices of food products made of soybean and thus it is inflationary. In 2018 GOI considered to re-impose soybean import tax in order to enhance domestic soybean price produced by local farmers (Reuter.com 2018) [25]. However, the plan to re-impose soybean import tariff has not been realized until now. Imposing soybean import tariff of 15% to 20% will improve wholesale soybean price by 77.8% to 84.5% at domestic prices (Arnawa et al. 2015) [26]. GOI is constrained by Generalized System of Preferences (GSP) offered by United States, so far. Under GSP, Indonesia receives reduced tariffs on about \$2 billion worth of its exports to the United States, including some agricultural, textile and timber products.

Soybean yield is possible to be enhanced through technical efficiency improvement. A study conducted by Asmara et al. (2017) [27] in East Java Province, i.e., in Jember, Tuban, and Banyuwangi Regencies, showed that technical efficiency of soybean farming was 0.81 and its cost efficiency was 0.48 resulting its allocative efficiency of 0.59. Soybean technical efficiency was relatively higher than those of rice and corn, i.e., 0.68 and 0.73. To some extent, the soybean farmers have already optimal in applying technology for soybean farming. Land ownership and extension may enhance soybean farming technical efficiency. The soybean farmers in Banyuwangi Regency, East Java Province, substituted their soybean farms with sweet citrus trees and dragon fruit crop to compensate losses (Hazmi et al. 2018) [28].

Indonesia's soybean production system also deals with the unavailability of land specifically allocated for soybean production. Soybean is only a secondary crop or non-priority crop which can be replaced any time by other priority crops or other crops with higher economic value commodities (Sumarno and Adie 2010) [30]. As long as no

land specifically allocated for soybean, all short-term programs to boost soybean production, will not be able to meet soybean demand in a sustainable manner. In the existing land, soybean will never be able to compete with other crops like corn, groundnut and mungbean. Thus, farmers will grow less and less soybean continuously. Therefore, soybean production will decline and Indonesia will keep depending on imported soybean. The soybean production tended to decline since 1992 to 2017.

In 2017 and 2018 the Government of Indonesia launched a program of soybean self-sufficiency by providing free seed for farmers. The government has provided free seed assistance for about 216,770 ha of soybean farming, and about 190,290 ha was realized. All of these programs have not succeeded in boosting soybean production. The self-sufficiency program by providing seed assistance by government is a short-term program which is impossible to be a sustainable program. It is impossible for the government to continuously provide free seed assistance for a long time throughout the country due to limited agricultural development budget. On the other hand, to achieve a sustainable soybean self-sufficiency it is required to continuously improve area planted to soybean and yield enhancement. Area expansion is difficult to achieve, since land scarcity is the main problem in national soybean production.

Soybean crop grown in Indonesia is not a GMO, but the country imports GM soybean from other countries (Reuter.com 2013) [31]. To some extent, growing non-GM soybean uses relatively more pesticides to control pests and diseases which affects environment sustainability. To grow a GM soybean, it is necessary to assess economic sustainability impacts at farm and macro-economic levels, as well as environment sustainability (i.e., water and air quality, climate change and land conversion, soil health, short term vs. long terms considerations), and social sustainability (i.e., land distribution and employment) such as a study on GM soybean production in Argentina (Choumert and Phélinas 2016) [32].

4. Conclusion and Policy Recommendation

Soybean is not competitive compared to other secondary crops. It is indicated by the lowest profit of soybean farming among the secondary crops. This low competitiveness is considered as the main factor caused the continuous decline in area planted to soybean, because less incentive for farmers to grow more soybean. The land formerly planted with soybean has been converted to other crops. The rational farmers will decide to grow the more profitable crop.

Without significant breakthrough, it is almost impossible to increase soybean production to achieve self-sufficiency. Therefore, pushing self-sufficiency in soybean is not a realistic policy. However, efforts to increase soybean production in order to reduce dependency on imports still need to be given more priority. One strategy among others is to enhance soybean price at farm level, together with imposing tariffs on imported soybean. Another strategy to boost soybean farming profitability is to improve soybean yield by intensive introduction of modern technology. However, by considering the continuous decline in area planted to soybean as well as no significant breakthrough in providing attractive prices for domestic soybean to make it competitive with other *secondary* crops, it is impossible to encourage farmers to grow more soybean to achieve self-sufficiency. Price subsidy for domestic soybean might be another strategic policy to encourage farmers to grow more soybean.

It is necessary that GOI allows farmers to grow GM soybean gradually starting from limited to larger planted areas. Monitoring and evaluation are conducted to assess on its yield, economic, environmental, and social impacts as well as its resistance to drought and pests and diseases.

Acknowledgements

This research was funded by Ministry of Agriculture Indonesia. We thank Dr. Sudi Mardianto, Director of Indonesian Center for Agricultural and Socio-Economic Policy Studies, for his support such that this paper got published.

References

- [1] Susilowati, E., Oktaviani, R., Arifin, B. & Arkeman, Y. The Decrease of Production of Indonesian Soybean and Efforts to Ensure the Certainty of The Vegetable Protein Supply: A Literature Review. *International Journal of Information Technology and Business Management*. 2013. 9 (1), 1–5.
- [2] Siregar, M. & Sumaryanto. Analisis Daya Saing Usahatani Kedelai Di DAS Brantas (Analysis of Soybean Competitiveness in Brantas Watershed). *Jurnal Agro Ekonomi (Agricultural Economics Journal)*. 2003. 20 (1), 50–71.
- [3] USDA (United States Department of Agriculture). Food balancesheet. <https://www.indexmundi.com/agriculture/?country=id&commodity=soybean-oilseed&graph=exports>. 2019. Accessed: 7 May 2019
- [4] Bantacut, T. Pengembangan Kedelai untuk Kemandirian Pangan, Energi, Industri, dan Ekonomi (Soybean Development for Food Sovereignty, Industry, and Economy). *Pangan*. 2017. 26 (1), 81–96.
- [5] Simatupang, P. Meningkatkan Daya Saing Ubikayu, Kedelai dan Kacang Tanah untuk Meningkatkan Pendapatan Petani, Ketahanan Pangan, Nilai Tambah, dan Penerimaan Devisa (Competitiveness Improvement of Cassava, Soybean, and Groundnut Toward Improvement of Farmers Income, F.In: Rahmania, A.A., Yusnawan, E., Taufiq, A., Sholihin, Suharsono, Sundari, T. & Hermanto (eds.) *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi (Proceeding on Legume and Tubers Research Results)*. Malang, Pusat Penelitian dan Pengembangan Tanaman Pangan. 2019. pp.1–12.
- [6] Zakaria, A., Sejati, W. & Kustiari, R. The Analysis of Competitiveness of Soybean Commodity According to Agro Ecosystem: The Case in Three Provinces of Indonesia. *Jurnal Agro Ekonomi (Journal of Agricultural Economics)*. 2010. 28 (1), 21–37.
- [7] Hasan, N., Suryani, E. & Hendrawan. Analysis of Soybean demand and Production to Develop Strategic Policy of Food Self-Sufficiency: A System Dynamics Framework. *Procedia Computer Science*. 2015. 76, 605–6012.
- [8] Gonzales, L.A., Kasryno, F., Perez, N.D. & Rosegrant, M.W. Economic incentives and comparative advantage in Indonesian. *Food Crop Production. Research Report 93*. Washington DC. 1993.
- [9] Adnyana, M.O. & Kariyasa, K. Model Keuntungan Kompetitif Sebagai Alat Analisis dalam Memilih Komoditas Pertanian Unggulan (Competitive Advantage Model as a Tool of Analysis in Choosing Superior Agricultural Commodity). *Informatika Pertanian*. 1995. 5 (2).
- [10] Sudaryanto, T., Rusastra, I.W.R. & Saptana. Perspektif Pengembangan Ekonomi Kedelai di Indonesia (Perspective of Soybean Economic Development in Indonesia). 2001. *Forum Agro Ekonomi (FAE)*. 19 (1), 1–2.
- [11] Krisdiana, R. (2012) Daya Saing Dan Faktor Determinan Usahatani Kedelai Di Lahan Sawah. *Jurnal Penelitian Pertanian Tanaman Pangan*. 2012. 31 (1), 6–12. Available from: doi:10.21082/jpftp.v31n1.2012.p. Accessed: 10 May 2019.
- [12] Nainggolan, K. & Rachmat, M. Prospek Swasembada Kedelai Indonesia. *Pangan*. 2019. 23 (1), 83–92.
- [13] Rusastra, I.W., Rachman, B. & Friyatno, S. Analisis Daya Saing dan Struktur Proteksi Komoditas Secondary.In: Salim et al. (ed.) *Efisiensi dan Daya Saing Sistem Usahatani Beberapa Komoditas Pertanian di Lahan Sawah*. Bogor, Puslitbang Sosial Ekonomi Pertanian. 2004. pp.28–49.
- [14] Sari, B.J.W.P. & Prajanti, S.D.W. (2016) Competitive Advantage Analysis of Soybean Farming in Indonesia. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan*. 2016. 17 (2), 143. Available from: doi:10.23917/jep.v17i2.1641. Accessed: 10 May 2019.
- [15] Bowo, A., Nurayati, A. & Imleesh, R. Analysis of Competitiveness and Government Policy on Rice, Corn and Soybean Farming. *JEJAK Journal of Economics and Policy*. 2016. 8 (2), 159–169.

- [16] BPS (Indonesia Central Agency of Statistics). Hasil Survei Struktur Ongkos Usaha Tanaman Secondary (Results of Cost Structure of Secondary Crops Cultivation Household Survey). ISBN:978-602-438-181-3. Jakarta. 2017. 114pages.
- [17] ICFORD (Indonesian Centre for Food Crops Research and Development). Deskripsi Varietas Unggul Tanaman Pangan 2010-2016 (Description of Food Crops Superior Varieties 2010-2016). 2016. Bogor.
- [18] Saptana, Purwantini, T.B., Sunarsih, Zakaria, A.K., Muslim, C. & Rachmita, A.R. (2017) Panel Petani Nasional: Analisis Indikator Pembangunan Pertanian dan Perdesaan pada Agroekosistem lahan Kering Berbasis Secondary dan Sayuran (*National Panel Farmers: Analysis of Agricultural and Rural Development Indicators in Secondary and Vegetables Base*). 2017. Bogor.
- [19] Suryani, E., Suryana, A., Ariani, M., Aldillah, R. & Gunawan, E. Kebijakan Insentif Harga Produk Pertanian Strategis Mendukung Ketahanan Pangan Berkemandirian (*Price Incentive Policy on Strategic Agricultural Products to Support Food Security*). 2017. Jakarta.
- [20] Roessali, W., Ekowati, T., Prasetyo, E. & Mukson Economic Aspect of Soybean Farming Sustainability in Central Java, Indonesia (*Competitiveness of Soybean against Rice and Corn*). Earth and Environmental Science. 2019. 250, 1-7.
- [21] Sayaka, B., Swastika, D., Mayrowani, H. & Saputra, Y. (2018) Desain dan Alternatif Kebijakan Mewujudkan Swasembada Kedelai (Design and Policy Alternatives to Achieve Soybean Self-Sufficiency). Pusat Sosial Ekonomi dan Kebijakan Pertanian. 2018. Bogor.
- [22] Suprehatin, Umberger, W.J., Yi, D., Stringer, R. & Minot, N. The Effect of Indonesian Farmer Preferences for Crop Attributes in the Adoption of Horticultural Crops: A Best-Worst Scaling Approach the Effect of Indonesian Farmer Preferences for Crop Attributes in the Adoption of Horticultural Crops: A Best-Worst Scal. 2015. San Francisco.
- [23] Bekele, W. Analysis of Farmers' Preferences for Development Intervention Programs: A Case Study of Subsistence Farmers from Eastern Ethiopian Highlands. In: African Development and Poverty Reduction: The Macro-Micro Linkage. Somerset West, Development Policy Research Unit, Trade and industrial Policy Strategies, and Cornell University. 2004. p.20.
- [24] Amaruzaman, S., Lusiana, B. & Leimona, B. (2015) Vulnerability of smallholder farmers and their preferences on farming practices in Buol District, Indonesia. 2015. [Online] Nairobi. Available from: doi:10.5716/WP15724.PDF [Accessed: 18 October 2019].
- [25] Reuter.com Indonesia Says Scrapping Plans to Bring Back Soybean Import Tax. July 11, 2018. <https://www.reuters.com/article/us-usa-trade-indonesia/indonesia-says-scrapping-plans-to-bring-back-soybean-import-tax-idUSKBN1K10Q9.2018>. 2018. Accessed: June 16, 2019.
- [26] Arnawa, I., Tamba, I. & Anindita, R. The Impact of Market Power on Soybean Price in Indonesia. Asia Pacific Journal of Sustainable Agriculture, Food and Energy. 2015. 3 (1), 1-6.
- [27] Asmara, R., Fahriyah & Hanani, N. Technical, Cost and Allocative Efficiency of rice, corn and soybean farming in Indonesia: Data envelopment analysis approach. Agricultural
- [28] Socio-Economics Journal. 2017. [Online] 17 (2), 76-80. Available from: <https://agrise.ub.ac.id/index.php/agrise/article/view/239/226> [Accessed: 30 October 2019].
- [29] Hazmi, M., Hadi, S. & Sutiarto, E. Substitution Analysis of Farm Pattern of Soybean (*Glycin max*) with Sweet Citrus Fruit (*Citrus sp.*) and Dragon Fruit (*Hylocereus undatus*) in Southern Banyuwangi. Advances in Engineering Research. 2018. 172, 319-324.
- [30] Sumarno, Adie, M.M. Strategi Pengembangan Produksi Menuju Swasembada Kedelai Berkelanjutan (*Production Development Strategy toward Sustainable Soybean Self-Sufficiency*). Bulletin Iptek Tanaman Pangan. 2010. 5 (1):49-63.
- [31] Reuter. Interview-Indonesia agriculture ministry argues case for GMO foods. 2013. November 14. <https://www.reuters.com/article/indonesia-agrimin/interview-indonesia-agriculture-ministry-argues-case-for-gmo-foods-idUSL4NolZ1K920131114> [Accessed: 4 December 2019].
- [32] Choumert J., Phélinas P. "Is GM Soybean Cultivation in Argentina Sustainable?", *Études et Documents*, n° 14, CERDI. 2016. http://cerdi.org/production/show/id/1818/type_production_id/1 [Accessed: 3 December 2019].