ISBN : 978-602-72006-2-3

PROCEEDING

OF ISAE INTERNATIONAL SEMINAR

BANDAR LAMPUNG, AUGUST 10-12, 2017

"STRENGTHENING FOOD AND FEED SECURITY AND ENERGY SUSTAINABILITY TO ENHANCE COMPETITIVENESS"

Agricultural & Biological Engineering

LEMBAR PENGESAHAN

Judul	:	Analysis of Minimizing The Soybean Import in Indonesia : Forecast of Its Production and Consumption
Penulis	:	Agus Hudoyo dan Indah Nurmayasari
Jenis Publikasi	:	Proceeding of ISAE International Seminar Bandar Lampung, August 10-12, 2017 "Strengthening Food and Feed Security and Energy Sustainability to Enhance Competitiveness"
Halaman	:	F11, Halaman 585-590
ISBN	:	978-60272006-2-3
Penerbit	:	Departement of Agricultural Engineering, Faculty of Agriculture, University of Lampung
Alamat	:	Prof. Dr. Ir. Sumantri Brodjonegoro Street, No. 1, Gedong Meneng Rajabasa, Bandar Lampung City, Lampung Province, Indonesia, 35141
Email	:	isae@fp.unila.ac.id
Waktu Penerbitan	:	Februari 2018

Bandar Lampung, 26 Februari 2018

Mengetahui,
Ketua Jurusan Agribisnis
Fakultas Pertanian Universitas Lampung.

Dr. Ir. Fembriarti Erry Prasmatiwi, M.P.
NIP. 196302031989022001

Penulis,

Dr. Ir. Agus Hudoyo M.Sc.
NIP. 196008181986101001

Menyetujui,
Ketua LPPM
Universitas Lampung,

Wamiana, Ph.D.
NIP. 196302161987031003

Dekan Fakultas Pertanian
Universitas Lampung,

Prof. Dr. Ir. Irwan Sukri Banuwa, M.Si.
NIP. 196110201986031002

PROCEEDING
OF ISAE INTERNATIONAL SEMINAR
BANDAR LAMPUNG
AUGUST 10-12, 2017

"Strengthening Food and Feed Security and Energy Sustainability to Enhance Competitiveness"

DEPARTEMENT OF AGRICULTURAL ENGINEERING
FACULTY OF AGRICULTURE
UNIVERSITY OF LAMPUNG

PROCEEDING

OF ISAE INTERNATIONAL SEMINAR BANDAR LAMPUNG AUGUST 10-12, 2017

"Strengthening Food and Feed Security and Energy Sustainability to Enhance Competitiveness"

EDITORIAL TEAM :

Dr. Ir. Agus Haryanto, M.P.

Dr. Ir. Sugeng Triyono, M.Sc

Sri Waluyo, S.T.P., M.Si., Ph.D.

Dr. Ir. Sandi Asmara, M.Si

Dr. Diding Suhandy, S.T.P, M.Agr.

Dr. Mareli Telaumbanua, S.T.P., M.Sc.

Cicih Sugianti, S.T.P., M.Si.

Winda Rahmawati, S.T.P., M.Sc.

Tri Wahyu Saputra, S.T.P, M.Sc.

PROCEEDING OF ISAE INTERNATIONAL SEMINAR
BANDAR LAMPUNG, AUGUST 10-12, 2017

"Strengthening Food and Feed Security and Energy Sustainability to Enhance Competitiveness"

ISBN	**:**	**978-602-72006-2-3**
Published by	**:**	**Departement of Agricultural Engineering, Faculty of Agriculture, University of Lampung**
Address	:	Prof. Dr. Ir. Sumantri Brojonegoro street, No. 1, Gedong Meneng, Rajabasa, Bandar Lampung, Lampung, Indonesia 35141
E-mail	:	isae@fp.unila.ac.id
Published date	**:**	**February 2018**

PREFACE

Alhamdulillahirabbil'alamin, I would like to express how grateful we are to finished "Proceeding of ISAE International Seminar 2017, Bandar Lampung, August 10-12, 2017 with theme "Strengthening Food and Feed Security and Energy Sustainability to Enhance Competitiveness". We are here to communicate and gather dissemination of information and research results in the field of agriculture as part of planning the development of agriculture in the future towards food and biomass-based energy self-sufficiency. Through this proceeding, we shared the problem, ideas, knowledge and technology to arrange solutions that communicated and discussed at ISAE International Seminar, Bandar Lampung, August 10-12, 2017. This proceeding contains 118 papers that divided by 8 categories namely Agricutural Engineering, Agribussiness, Agricutural Technology, Agricutural Science, Energy, Food, Natural Resources, and Sistem and Agricultural Management from many universities and many institutes in Indonesia.

I would like to extend gratitude for all authors of the proceeding who communicate and share their research results, editorial team who work together to execute this proceeding, Agricultural Engineering Departement of University of Lampung, Faculty of Agriculture of University of Lampung, University of Lampung, PERTETA and committee members. Salutations to Dr. Ir. Sam Herodian, M.S. as Profressional Staff of The Minister of Agriculture of Republic of Indonesia; Ir. Sutono, MM as Regional Secretary of Lampung Province ; Prof. Dr. Ir. Hasriadi Mat Akin, M.P. as Rector University of Lampung; Prof Dr. Ir. Irwan Sukri Banuwa, M.Si. as Dean of Agricultural Faculty of University of Lampung; Prof. Mikio Umeda from Kyoto University, Japan; Prof. Dr. Ir. Irwandi Jaswir, M.Sc. from International Islamic University, Malaysia; Dr. S. D. Filip To, PHD. PE from Mississippi State University, USA; Dr. Rosanna Marie C. Amongo from University of the Philippines Los Baños, The Philippines; Prof. Dr. Ir. Lilik Sutiarso, M.Eng. from Universitas Gadjah Mada, Indonesia; and Prof. Raden Achmad Bustomi Rosadi, M.S. from University of Lampung.

Last, we hope that you will have a great memories about the experience in Bandar Lampung and the relationship that have managed at Seminar can become better in the future.

Best Regard,

Dr. Ir. Sandi Asmara, M.Si
Chairman of ISAE IS 2017

OPENING SPEECHERS OF SEMINAR

Ir. Sutono, M.M.

Regional Secretary of Lampung Province

Prof. Dr. Ir. Hasriadi Mat Akin, M.P.

Rector of University of Lampung

Prof. Dr. Ir. Irwan Sukri Banuwa, M.Si.

Dean of Agricultural Faculty of University of Lampung

Prof. Dr. Ir. Lilik Sutiarso, M.Eng

Chairman of PERTETA

Dr. Ir. Sandi Asmara, M.Si

Chairman of ISAE IS 2017, Lampung

KEYNOTE SPEAKERS OF SEMINAR

Dr. Ir. Sam Herodian, M.S

Ministry of Agriculture, Indonesia

Dr. S. D. Filip To, P.hD. P.E.

Mississippi State University, USA

Prof. Dr. Ir. Irwandi Jaswir, M.Sc

International Islamic University, Malaysia

Prof. Mikio Umeda

Kyoto University, Japan

KEYNOTE SPEAKERS OF SEMINAR

Dr. Rosanna Marie C. Amongo

University of The Philippines Los Banos, The Philippines

Prof. Dr. Ir. Lilik Sutiarso, M.Eng

Universitas Gadjah Mada, Indonesia

Prof. Dr. Ir. R. A. Bustomi Rosadi, M.S.

University of Lampung, Indonesia


AGRICULTURAL AND BIOLOGICAL ENGINEERING DEPARTEMENT
FACULTY OF AGRICULTURE – UNIVERSITY OF LAMPUNG

LIST OF PAPER CODES

TABLE OF CONTENTS

B : Agribusiness

C : Agricultural Technology

D : Agricultural Science

E : Energy

F : Food

G : Natural Resources

H : System and Agricultural Management

F.11

ANALYSIS OF MINIMIZING THE SOYBEAN IMPORT IN INDONESIA: FORECAST OF ITS PRODUCTION AND CONSUMPTION

Agus Hudoyo[1] and Indah Nurmayasari[1]

[1]*Department of Agribusiness, Faculty of Agriculture, University of Lampung*
Jl. Sumantri Brojonegoro No. 1, Bandar Lampung 35141, Indonesia

E-mail: agus.hudoyo@gmail.com

ABSTRACT

Since 1975, Indonesia has been importing soybean. In 2014, Indonesia imported almost 2 million tons. It implies that the production of soybean has not been fulfilling its consumption. Indonesia would like to minimize it. This paper attempts to analyze the possibility for decreasing the soybean import. Data used are the FAO's data in the period 1961-2014. Data are analyzed by econometric models and time series analysis. The result revealed that Indonesia still needs the soybean import.

Keywords : Soybean, Production, Consumption, Import

I. INTRODUCTION

Indonesia has been a soybean importer since 1975 (the FAO's data). In addition, the growth of its import increases. This is shown that the production of soybean has not been enough for its need. Since soybean is one of the important foods, it has priority to increase its production. In this case, even the government has a target that Indonesia can be self-sufficiency in soybean.

Hermanto at al. analyzed the soybean outlook in the period 2015-2019 by analyzing three scenarios. This study is shown that Indonesia cannot be self-sufficiency. However, Indonesia can decrease the amount of soybean import [1]. By using time series analysis, Hadi forecasted the production and the consumption of soybean in Indonesia [2]. The result of this study is similar with the previous study done by Hermanto et al. In short run, Indonesia can decrease the soybean import by increasing its productivity and harvested area. In the long run, these two attempts could make Indonesia self-sufficient in soybean.

The other study is done by Adillah. It used the simultaneous forecast [3]. One of the results of this study is Indonesia can decrease the soybean import because the production growth is higher than the consumption growth.

Although those three previous studies already tried to predict the production and the consumption of soybean in Indonesia, we still need to know the possibility that Indonesia can decrease its import due to the slow growing of its production and the fast grow of population. Therefore, we need to forecast the production and the consumption of soybean and then compare them.

II. MATERIALS AND METHODS

The production of soybean is affected by the production factors used. We consider the acreage of land and the amount of seed used for growing soybean are the production factors that affect its production. Other production factors, such as fertilizer and labor, are not included in the model analysis. These data are not available. Because most of the time the use of fertilizer, labor and other production factors is proportional with the acreage of land for growing soybean, we can assume that they are complement with the land.

The farmers have preference whether to plant soybean or other crops in their land. They always compare the profits of many crops depending on the price and the productivity of each crop. Since 1994, the mass adoption or the diffusion of the hybrid corn has been making the farmers prefer corn to soybean. Therefore, we included this factor in the model analysis for the soybean production. The empirical model for the soybean production can be seen in Equation (1).

$$Prod_t = b_o + b_1 AH_t + b_2 Seed_t + b_3 D_t + e_{1t} \quad (1)$$

where :
t : 1961. 1962, ..., 2014
Prod : Soybean production (million tons)
AH : Area Harvested for soybean (million hectares)
Seed : Seed planted for soybean (million tons)
D : Dummy variable for the diffusion of the hybrid corn
D = 0 for t: 1961, 1962, ... , 1993
D = 1 for t: 1994, 1995, ... , 2015
b : Parameter estimates
e : Error term

For forecasting the independent variables, *AH* and *Seed*, we use time series analysis, ARIMA. A general empirical model for ARIMA can be seen in Equation (2).

$$X_t = \beta_1 X_{t-1} + ... + \beta_p X_{t-p} - e_t - \alpha_1 e_{t-1} - ... - \alpha_q e_{t-q} \quad (2)$$

where :
t : 1961. 1962, ..., 2014
X : Variable being forecasted
β, α : Parameter estimates
e : Error term
AH : Area Harvested for soybean (million hectares)
Seed : Seed planted for soybean (million tons)

The domestic supply of soybean is its production minus the use for seed and its losses. The amount of seed used and the losses are forecasted by ARIMA.

Soybean can be directly consumed as a food. We call it Food. It can be processed to tempeh, tofu, vegetable oil etc. We call it Processing. Therefore, the consumption of soybean can be as the Food or the Processing. The summation of the food and the processing is the consumption of soybean. We use ARIMA for forecast the Food and the Processing.

If the domestic supply is smaller than the consumption of soybean, we need to import it, vice versa.

The main source of the data is the FAO's website the other source of data is Central Agency on Statistics Indonesia.

III. RESULTS AND DISCUSSION

A. Production and Domestic Supply

The data used for estimating the empirical model of the soybean production is from 1961 until 2015. In this period, the minimum production was 0.35 million tons in 1963 and the maximum one was 1.87 million tons in 1992. During this period, the soybean production growth had been 1.79 percent/year. The production and the area harvested for soybean can be seen in Fig. 1.

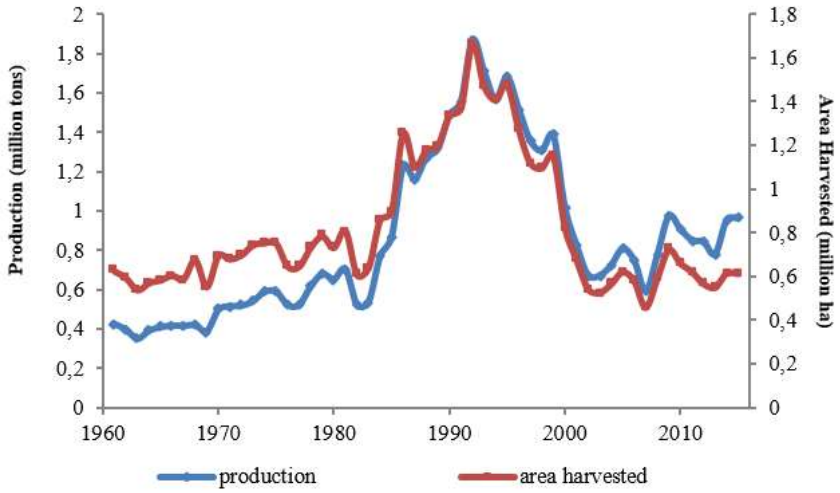

Fig. 1. The production and the area harvested for soybean in Indonesia, 1961-2015

Fig. 1 shows that after the maximum production reached in 1993, it had been declining. After 2000, the production had been below one million tons.

Fig. 1 also shows that the production had been fluctuating with the harvested area. The ration between the production and the harvested area is the productivity of the land. The maximum productivity was 1.57 tons/ha in 2015 and the minimum one was 0.62 tons/ha in 1968.Since the production had been going together with the harvested area, the growth of the productivity is low, i.e. only 1.64 percent/year. This growth also can be seen in Fig. 2.

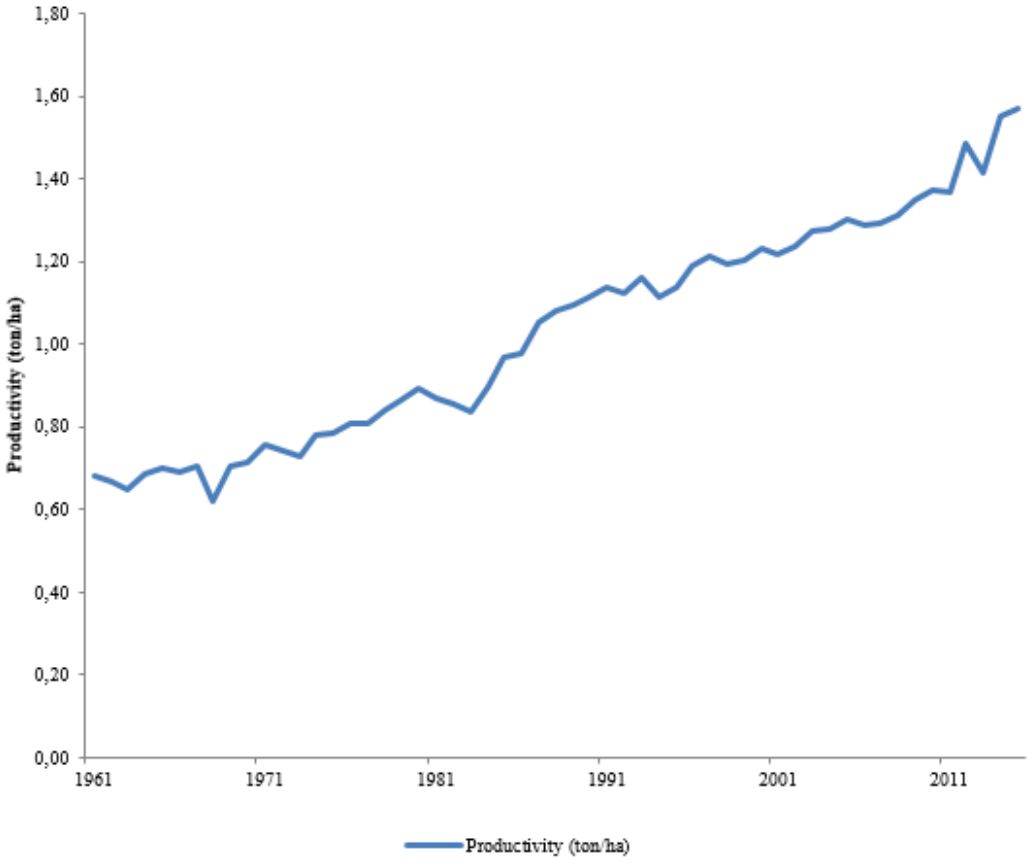

Fig. 2. The productivity of soybean in Indonesia, 1961-2015

By using the OLS method, the estimation of the empirical model for the soybean production can be seen in Table 1.

Table 1. The Estimated Forecast Model for Soybean Production

Independent variables	Coefficient	t-value
Intercept	-0.231*	-6.162
Area harvested	0.999*	25.639
Seed	9.158*	8.234
Dummy	-0.178*	-8.212
F-value	979.7930*	
R Square	0.9830	
Standard error	0.0546	
Observations	55	
DW	1.488	

*: Statistically significant at the 1% level

Note:

Dependent variable: Rice Production (million tonnes)

Independent variables: Area Harvested (million hectars); Seed (million tonnes); and Year (1961=1, 1962=2, ..., 2015=55)

Table 1 shows that all the independent variables are significant. In addition, their signs follow the theory. For example, on the average, holding the other variables constant, if the area harvested increases one hectare, the production will increase 1 ton. The sign of dummy variable also makes sense since the hybrid corn is a substitution crop for soybean.

The R Square is quite high. The Durbin Watson (DW) value shows that the model does not have the autocorrelation problem. Therefore, the forecast model shown in Table 1 can be used for predicting the soybean production.

Firstly, we forecast the area harvested and the seed by using ARIMA. Secondly, we substituted these values to the soybean forecast model. The result of this calculation can be seen in Table 2.

Table 2. The Forecast of Soybean Production

Year	Confidence Interval (95%)		
	Average	Lower limit	Upper limit
2017	0.92	0.58	1.25
2018	0.95	0.61	1.29
2019	0.98	0.64	1.32
2020	1.01	0.67	1.34
2021	1.04	0.70	1.38
2022	1.07	0.73	1.40
2023	1.10	0.76	1.44
2024	1.13	0.79	1.46
2025	1.16	0.82	1.50
2026	1.19	0.85	1.52
2027	1.22	0.88	1.55
2028	1.25	0.91	1.58

The domestic supply is the production minus the use for seed and the losses. We forecast these using ARIMA. We calculate the forecast of soybean domestic supply (Table 3).

Table 3. The Forecast of Soybean Domestic Supply (million tons)

Year	Confidence Interval (95%)		
	Average	Lower limit	Upper limit
2017	0.73	0.40	1.07
2018	0.76	0.43	1.10
2019	0.79	0.45	1.13
2020	0.82	0.48	1.15
2021	0.85	0.51	1.18
2022	0.87	0.54	1.21
2023	0.90	0.57	1.24
2024	0.93	0.59	1.26
2025	0.96	0.62	1.29
2026	0.98	0.65	1.32
2027	1.01	0.68	1.35
2028	1.04	0.70	1.38

B. Consumption

We consume soybean as the seed called Food or the processed food called Processing, i.e. tempeh, tofu etc. Therefore, we forecast the amount of soybean for Food and for Processing. ARIMA is used for forecasting them. The summation of Food and Processing is the soybean consumption. Its forecast can be seen in Table 4.

Table 4. The Forecast of Soybean Consumption

Year	Confidence Interval (95%)		
	Average	Lower limit	Upper limit
2017	2.60	1.68	3.51
2018	2.64	1.61	3.67
2019	2.67	1.54	3.81
2020	2.71	1.47	3.95
2021	2.75	1.40	4.09
2022	2.78	1.34	4.23
2023	2.82	1.28	4.36
2024	2.86	1.21	4.50
2025	2.89	1.15	4.64
2026	2.93	1.09	4.77
2027	2.97	1.03	4.91
2028	3.00	0.97	5.04

C. Import

The difference between the consumption and the domestic supply is the import of soybean. The result of the forecast for the soybean import can be seen in Table 5. We use the average of consumption for calculating the confidence interval.

Table 5 shows that Indonesia still needs to import soybean to fulfil its consumption. In 2017, on the average, the soybean import will be 1.87 million tons. It increases slowly, i.e. 0.47 percent/year. In 2028, the average of soybean import will be 1.96 million tons.

The amount of import can be decreasing if the production is relatively high, i.e. in the upper limit of the production confidence interval. Therefore, the efforts of increasing the soybean production is still important in order to minimize its import.

Table 5. The Forecast of Soybean Import

Year	Confidence Interval (95%)		
	Average	Lower limit	Upper limit
2017	2.60	1.68	3.51
2018	2.64	1.61	3.67
2019	2.67	1.54	3.81
2020	2.71	1.47	3.95
2021	2.75	1.40	4.09
2022	2.78	1.34	4.23
2023	2.82	1.28	4.36
2024	2.86	1.21	4.50
2025	2.89	1.15	4.64
2026	2.93	1.09	4.77
2027	2.97	1.03	4.91
2028	3.00	0.97	5.04

IV. CONCLUSION

Since the soybean production is far less then its consumption, Indonesia still needs to import soybean. In 2017, on the average, the soybean import will be 1.87 million tons. It increases slowly, i.e. 0.47 percent/year. In 2028, the average of soybean import will be 1.96 million tons.

The amount of import can be decreasing if the production is relatively high, i.e. in the upper limit of the production confidence interval. Therefore, the effort for increasing the soybean production is still important in order to minimize its import.

REFERENCES

[1] Hermanto, Delima, Hasri Azahari, Muchjidin Rachmat, Nyak Ilham, I Ketut Kariyasa, Supriyati, Adi Setiyanto, Rangga Ditya Yofa, and Edy Supriyadi Yusuf. 2015. "*OUTLOOK KOMODITAS PANGAN STRATEGIS TAHUN 2015-2019",* Laporan Analisis Kebijakan Tahun 2015. Pusat Sosial Ekonomi dan Kebijakan Pertanian, Badan Penelitian dan Pengembangan Pertanian.

[2] Abida Hadi. 2013. Analisis Produksi dan Konsumsi Kedelai Domestik dalam Rangka Mencapai Swasembada Kedelai di Indonesia. *Tesis*. Departmen Ekonomi Sumberdaya dan Lingkungan. Institut Pertanian Bogor.

[3] Rizma Aldillah. 2015. Proyeksi Produksi dan Konsumsi Kedelai Indonesia. *Jurnal Ekonomi Kuantitatif Terapan*. Vol. 8 (1)