THE FRONTIER OF SOYBEAN DEVELOPMENT POLICY

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INTRODUCTION

Soybean is the third important food crops after rice and maize. It is a source of healthy vegetable protein. The FAO data showed that per capita consumption of soybean (equivalent dry grain) was decreasing from about 11.38 kg/capita in 1990 to about 8.97 kg/capita in 2004. Nevertheless, the total domestic demand is continuously increasing due to both the food industry and population growths. On the other hands, its production was declining, hence soybean deficit is estimated to steadily increasing. For example, the domestic demand for soybean in 2004 was about 2.02 million tons, while its production was only 0.71 million tons. This condition will likely be continue to happen. In other words, Indonesia will be continuously dependent upon import.

Historically, Indonesia was self sufficient in soybean until 1974, with the sufficiency indices higher than one (Swastika, 1997). After that, Indonesia has become an importing country on soybean, although production was increasing until 1992. The area planted to soybean and production reached their peaks in 1992 about 1.67 million ha and 1.87 million tons, respectively. Since then, the area and production continuously declining. There should be some breakthroughs in order to lowering the dependency of Indonesia on soybean import.

This paper is aimed to describe the past and current status of soybean supply and demand as well as the prospect of soybean development. Another objective is to propose an alternative of policy direction to develop soybean production system.

DOMESTIC PRODUCTION AND CONSUMPTION

Area and Production of Soybean

During the last 35 years (1969-2004), area planted to soybean was fluctuated. It was increasing from about 0.554 million ha in 1969 to its peak about 1.665 million ha in 1992, and then sharply declined to only 0.550 million ha in 2004 (Table 1). Some factors might caused the decline in soybean area, such as low price of imported soybean, and competition among secondary food crops in terms of land use. Without import tariff, the price of imported soybean was lower than that of domestically produced soybean. As shown in Table 2, that the price

ratio between imported soybeans and domestically produced soybeans during the last decade (1992-2002) always less than one, although tended to increase. The lower price of imported soybean have encouraged increasing import of soybean. As a result, price of domestically produced soybean was declining. This situation discouraged farmers to grow soybean.

Compared to maize (as one of competitive crop), maize price tended to increase at a low rate (0.98%/year), while soybeans price tended to decline by 3.21 percent per year during the same period. This phenomenon indicated that there was an increasing trend of maize competitiveness relative to that of soybean.

The study of Gonzales *et al.* (1993) showed that soybean was less competitive compared to maize. The study of Ramli and Swastika (2005) reported that soybean in Central Kalimantan was less competitive compared to other secondary crops such as maize, peanuts and sweet potato. Hence, farmers tend to grow other secondary crops since they are more competitive rather than soybean. Therefore, area planted to soybean tends to decline. As shown in Tabel 1, the average growth of area planted to soybean for the last 15 years was –0.02 percent per year.

Tabel 1. Soybean Production and Consumption Balance in Indonesia, 1969-2004

Year	Area (000 ha)	Yield (t/ha)	Production (000 t)	Consumption (000 t)	Balance (000 t)	Net Import (000 t)	% Net Import d)
1969	554	0.70	389	349	40	-1	-
1974	768	0.77	589	526	63	-4	-
1979	785	0.85	670	791	-121	177	22.38
1984	859	0.90	770	1064	-294	400	37.59
1989	1198	1.10	1315	1629	-314	385	23.63
1992 a	1665	1.12	1870	2560	-690	690	26.95
1994	1407	1.11	1565	2365	-800	800	33.83
1997 b	1119	1.21	1357	1973	-616	616	31.22
1999	1151	1.20	1383	2684	-1301	1302	48.51
2001	679	1.22	827	1960	-1133	1135	57.91
2004	550	1.29	707	2015	-1308	1307	64.86
Growth							
1969-1979	3.55	1.97	5.59	8.53	-	-	-
1979-1989	4.32	2.55	6.98	7.49	10.01	8.08	0.55
1989-1997	-0.85	1.25	0.39	2.42	8.79	6.05	3.54
1997-1999	1.42	-0.46	0.95	16.63	45.33	45.38	24.65
1999-2004	-13.73	1.36	-12.56	-5.57	0.11	0.08	5.98
Avg growth	**-0.02**	**1.74**	**1.72**	**5.14**	**9.99 c**	**8.33 c**	**4.35 c**

Source: CAS various years, and FAO 2004.

Note: a = peak year; b = economic crisis; c = 1979-2004 period; d) percentage w.r.t. domestic consumption

Similarly to area, the total national soybean production was also fluctuating, and reached its peak about 1.87 million tons in 1992. After then, the national production sharply declined to about 0.71 million tons in 2004. However, in general it was growing at a rate of 1.72 percent per year during the period of 1969-2004, due to yield growth of 1.74 percent per annum.

Table 2. Prices of Soybean and Maize in Indonesia, 1991-2002.

Year	Domestic Soy [1)] (Rp/kg)	Maize [1)] (Rp/kg)	Imported Soy [2)] (Rp/kg)	Price Ratios	
				Maize/Soy	Imp/Dom
(1)	(2)	(3)	(4)	(3)/(2)	(4)/(2)
1991	493	143	-	0.29	-
1992	454	126	276	0.28	0.61
1993	484	133	278	0.27	0.57
1994	515	158	296	0.31	0.57
1995	472	164	286	0.35	0.61
1996	476	185	303	0.39	0.64
1997	337	123	239	0.36	0.71
1998	330	117	290	0.35	0.88
1999	321	132	234	0.41	0.73
2000	277	114	223	0.41	0.81
2001	324	150	230	0.46	0.71
2002	344	159	298	0.46	0.87
	-3,21	**0,98**	**0.75**		

Source: [1)] FAO, 2005; [2)] Ditjentan, 2004.

Consumption

Almost all of soybean (about 94%) in Indonesia is consumed as processed food, consists of fermented and non-fermented products (Swastika *et al.*, 2005). Among fermented products are tempe, soy-sauce, tauco, etc, and the non-fermented products are tofu, soy-milk, soy-oil, snacks, etc. The soybean meal is used for feed, which occupy about 15-20 percent of feed ingredient (Tangendjaja *et al.*, 2003).

The rapid development of food and feed industries in line with population growth, have resulted into an increase in demand for soybean. For the last 15 years, soybean consumption increased from 0.35 million tons in 1969 to about 2.02 million tons in 2004, or it grew at a rate of 5.14 percent per annum. This high growth of demand could not followed by its domestic production. Therefore, Indonesia is continuously importing soybean from the world market to cover the deficit. As shown in Table 1, that the net import was increasing from 0.18 million tons in 1979 to about 1.31 million tons in 2004, or it grew at a rate of 8.33 percent

per year. Currently, the net import of soybean was about 65 percent to the total domestic demand. On the other hands, soybean meal for feed industry was fully imported.

SOYBEAN DEVELOPMENT POLICY

There is an interesting lesson to learn from the past and current status of soybean production and consumption. It seems that Indonesia in the short and medium terms will not be able to achieve self-sufficiency, although it was obtained before 1975. It is very hard to get back the area planted to soybean more than 1 million ha per year, since in 2004 it was only 0.55 million ha. Similarly, it is also very hard to attain the average yield more than 1.5 tons per ha, since the use of good quality (certified) seed is very limited. Singh (1995) *in* Nugraha (1996) reported that the use of certified soybean seed in Indonesia was only about 2 percent. Furthermore, Seed Directorate in Siregar (1999) reported that the use of certified soybean seed during 1984-1996 was about 6 percent on average, consisted of blue and orange labels. That is one among other reasons, why the national average yield and production of soybean at national level is still low. On the other hands, the demand for soybean in 2004 was 2.02 million tons, and tends to increase in the future.

By using the prices and income elasticities resulted from the study of Simatupang *et al.* (2003), combining with population growth, the projected per capita consumption and total domestic demand for soybean is as depicted in Tabel 3.

As shown in Table 3, the demand for soybean will be increasing from about 2.12 million tons in 2005 to about 2.41 million tons in 2010 and 3.02 million tons in 2020. Let assume that Indonesia needs about 2.5 million tons of maize on average, and an intensive introduction of high yielding varieties resulting into national average yield of 1.5 ton/ha. In this scenario, the area planted to soybean should reach 1.67 million ha, or similar to area in 1992. How to increase area from 0.55 million ha to 1.67 million ha or three times compared to current existing area, is a big question. So that, forcing the program to produce soybean at all cost to obtain self sufficiency is seems to be unrealistic.

The more realistic and applicable policy is reducing import to a certain level based on the available resources. The scenario to reduce import from 65 percent to 40 percent is seems to be more realistic, and it is a frontier target of policy that obtainable. This target is still hard to achieve. There should be some strategic policy to attain this goal.

Table 3. The Projected Demand for Soybean in Indonesia, 2005-2020

Year	Per capita consumption (Kg/cap/yr)	Population (000 people)	Pop. Growth (%)	Total Consumption (000 tons)
2005	9.29	228,480	1.61	2,124
2006	9.39	232,090	1.58	2,179
2007	9.48	235,687	1.55	2,235
2008	9.58	239,270	1.52	2,291
2009	9.67	242,835	1.49	2,349
2010	9.77	246,380	1.46	2,407
2011	9.87	249,903	1.43	2,466
2012	9.97	253,402	1.40	2,525
2013	10.07	256,874	1.37	2,585
2014	10.17	260,316	1.34	2,646
2015	10.27	263,726	1.31	2,708
2016	10.37	267,102	1.28	2,770
2017	10.47	270,440	1.25	2,833
2018	10.58	273,740	1.22	2,896
2019	10.68	276,997	1.19	2,960
2020	10.79	280,210	1.16	3,024

The Directorate General of Food Crops (2005) targeted the growth of soybean production by 7 percent per year. By using this growth scenario, the 60 percent domestic production or 40 percent import will be achieved in 2017, where production is projected to reach 1.70 million tons, while consumption is projected to be 2.88 million tons (Table 4).

The next question is how to achieve this particular production growth? There are two strategic policy to obtain this target, i.e. yield improvement and area expansion. The yield improvement should be done through intensive research and development, in order to create the new high yielding varieties (HYVs). During the 2001-1004 period, at least 11 HYVs have been released by the Indonesian Centre for Food Crops Research and Development (ICFORD), and another two HYVs released by other institutions, as shown in Table 5. In fact, most of area planted to soybean (70%) have used HYVs (Siregar, 1999). However, due to improper quality of seed, the average yield is still low.

The promotion of the use of good quality seed of HYVs should be done through improvement of seed industry and extension activities. There should be a strategic policy to encourage seed growers to improve their business in soybean seed production. Another effort is to improve the extension services, especially regarding the importance and advantages of using good quality seed. These efforts should be followed by the improvement of good seed distribution to the farmers.

Table 4. Projected Production and Consumption of Soybean in Indonesia, 2005-2020 (Scenario 7% production growth)

Year	Dom. Production (000 t)	Dom. Demand (000 t)	Surplus/Deficit (000 t)	% Deficit or Import (%)
2005	756	2124	-1368	64.41
2006	809	2179	-1370	62.88
2007	866	2235	-1369	61.27
2008	926	2291	-1365	59.58
2009	991	2349	-1358	57.81
2010	1060	2407	-1347	55.95
2011	1135	2466	-1331	53.99
2012	1214	2525	-1311	51.92
2013	1299	2585	-1286	49.75
2014	1390	2646	-1256	47.47
2015	1487	2708	-1221	45.08
2016	1591	2770	-1179	42.55
2017	**1703**	**2833**	**-1130**	**39.90**
2018	1822	2896	-1074	37.09
2019	1949	2960	-1011	34.14
2020	2086	3024	-938	31.02
Growth (%/yr)	**7.00**	**2.38**	**-2.48**	**-4.75**

Table 5. The Newly Released (2001–2004) High Yielding Varieties of Soybean in Indonesia

Varieties	Yield potl (t/ha)	Maturity (days)	Grain size	Adaptable to
1. Sinabung	2.5	88	Medium	Low-land
2. Kaba	2.6	85	Medium	Low-land
3. Anjasmoro	2.5	85	Large	Low-land
4. Mahameru	2.5	87	Large	Low-land
5. Panderman	2.5	85	Large	Low-land
6. Ijen	2.5	85	Medium	Low-land, tolerant to UG*
7. Tanggamus	2.7	88	Medium	Dry-land
8. Sibayak	2.5	89	Medium	Dry-land
9. Nanti	2.5	91	Medium	Dry-land
10.Ratai	2.6	90	Medium	Dry-land
11.Seulawah	2.7	90	Medium	Dry-land
12.Merubetiri	2.7	95	Medium	Dry-land
13.Baluran	3.0	80	Medium	Dry-land

Source : ICFORD. 2004. *UG=Army-worm

The area expansion on the other hands, should be done through improvement of cropping intensity on irrigated lowland, rain-fed lowland and upland, as well as the use of idle land that potential for soybean cultivation. The location quotient (LQ) could be used as an indicator to find out the suitable land for soybean cultivation, for both improvement of cropping intensity and the use of idle land. Based on this indicator, Yogyakarta, East Java, NTB, Aceh, Lampung, West Java, Central Java, and South Sulawesi are the provinces where area expansion for soybean production could be promoted. These provinces are currently the main production area of soybean.

To support those above strategy, there should be some police efforts, such as:

(1) Provide seed growers, soybean farmers, and small industry (who use soybean as a raw material) with a soft and simple procedure credit.

(2) Speeding up transfer of technology in seed production as well as soybean farming by revitalizing extension services and farmers field training.

(3) Macro policy, i.e imposing import tariff in order to give an incentive for the farmers to grow soybean.

(4) Provide farmers and other businessmen in agriculture with sufficient infrastructures in order to create a good and efficient agribusiness system.

(5) Promote more research on development of new high yielding varieties of soybean, suitable for some agro-ecosystem and tolerant to some biotic and non-biotic stresses.

CONCLUSIONS AND POLICY IMPLICATIONS

From the above discussion, there are some following conclusions and policy implication can be drawn.

1. Based on the past and current status of soybean production and consumption, it seems unrealistic to expect Indonesia achieving self sufficient on soybean in the short and medium terms. Reducing import from about 65 percent to about 40 percent is likely the more applicable as *the frontier of policy* on soybean production development in the medium even the long terms.

2. In order to reduce the share of soybean import to the total domestic demand, two strategic policy should be taken, i.e: (i) yield improvement through R & D as well as technology dissemination through extension and farmers training; and (ii) area expansion through increase in cropping intensity and the use of idle land suitable for soybean cultivation.

3. To encourage farmers to grow more soybean with a good quality of seed, there should be some policy efforts, such as: provide incentives for seed growers, soybean farmers, and small industry, by imposing import tariff and providing them with soft and simple procedure credit.
4. To promote a well running of agribusiness, the agricultural development should be supported by the development of infrastructures in rural areas.

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