Does soybean production in Indonesia still have competitiveness advantages? A policy analysis matrix approach

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Abstract. The soybean production in Indonesia still faces several challenges causing production depended on import supplies. This paper aims to assess the competitiveness advantages of soybean production. Policy Analysis Matrix (PAM) was used to examine its competitiveness using secondary data and deliberating results of previous studies. The results of the study in 2015 showed that domestic production still could afford private and social prices. Soybean nearly did not show competitiveness advantages reflected from the ratio of DRC and PCR that were almost one. The government interventions brought various impacts, for instance farmers paid cheaper inputs by 26.67% and there was inefficiency of government policy towards the output. The government policy to assure profit in the long term was also insufficient reflected from the EPC (1.03) and PC (0.06). From the SRP variable, it described that the government not all farmers received a benefit from the government policy. The sensitivity analysis resulted: (i) the combination of increasing soybean price + procurement price at 8,000 IDR/kg and (ii) the increasing import tariff by 5% + procurement price at 8,000 IDR/kg provided the most favorable impacts.

1. Introduction
Soybean plays an important role in Indonesia since it supplies food and feed production, source of income for farmers and agro-industries (tofu, tempeh, soya sauce production) [1, 2]. Soybean production, conversely, does not fulfill the demand so that Indonesia is highly dependent on imports. In 2018 the domestic production was 967,870 ton whilst the domestic consumption reached 2.26 million ton. The average growth of productivity tended to stagnant by 0.25%/year in 2014-2018 [3], therefore the farm production is still far from its potential.

Aside from these obstacles, there are opportunities to increase soybean production by raising the competitiveness of domestic soybean mentioned by [4, 5, 6, 7] and the study of soybean’ competitiveness is still interesting. An approach namely Policy Analysis Matrix was used to answer those questions. This method is claimed as one of the quantitative policy analysis methods with several advantages. It allows to investigate the effect of policy on competitiveness and farm-level revenues, the influence of investment policy on economic efficiency and comparative as well as the impact of policy on agricultural technologies development [4, 8, 9]. These benefits are also confirmed in other studies. PAM is able to disaggregate loss and profit identification at various levels [10, 11]. It combines measurement
of comparative and competitive advantages (economic and financial analysis) [12,14]. It offers a simple yet powerful tool to translate government policy and externalities in a quantitative and systematic way [15,16,17], and it does not require a high cost on calculation [18]. This method also provides information and a description of how policy interventions and market failures bring distortions toward a production system [19,20]. This paper aims to assess the competitiveness of soybean production in order to formulate the proper strategy of soybean development in Indonesia. What are the factors influencing the competitiveness of soybean production in Indonesia and to what extent can soybean production be developed in Indonesia.

2. Research methods

2.1. Research location, sources, and types of data

The research used the soybean production system in 2015 in Indonesia as a case study. All the sources of research data were gathered from secondary data using documentation methods raised from relevant literature. Data were obtained from the Indonesian Bureau of Statistics at the national level, the National Development Planning Agency (BAPPENAS), the Indonesian Ministry of Agriculture, the Indonesian Ministry of Trade, Food and Agriculture Organization (FAO), World Bank Organization, and results of previous research studies. Types of secondary data included panel data of cost structure of soybean, productivity, production, harvested area, consumption, supply and demand of soybean, import and export soybean released by Indonesian Bureau of Statistics and Food and Agriculture Organization (FAO) from 2005 – 2014. Equally, data of cropping system, total output, capital, labor, prices (private and social prices), direct costs and indirect costs were also compiled to meet the question of research.

Social costs were calculated to show the economic value of inputs and output used in soybean production (economic analysis). Economic analysis basically was measured using shadow prices or opportunity costs regardless policy intervention (taxes and subsidies). To estimate the economic values of tradable inputs, it used world market price as a comparison, which were determined at the border price. Since tradable inputs for soybean production consisted both of imported and exported components, then it was necessary to differentiate between them. The imported inputs were valued using cost, insurance and freight (c.i.f) price whilst the exported goods were appraised by free on board (f.o.b) price. The shadow price and calculation of tradable inputs-outputs was represented in table 2 while the cost and income structure of soybean farming both at private and social price was shown in table 3.

To adjust premium exchange rate, this research employed Shadow Exchange Rate (SER) method. SER was defined as SER = OER (1 + fx premium) where OER was the official exchange rate. OER released by Indonesian Central Bank in 2015 (per 31 October) was 13,707 Indonesian Rupiah (IDR)/1 US$ (http://www.bi.go.id/id/moneter/informasi-kurs/referensi-jisdor/Default.aspx) while fx premium was 7.5% Hence, in 2015 SER: = 13707 (1 + 7.5 %) = 14735.025 IDR/US $.

2.2. Data analysis

Policy analysis matrix (PAM) was employed in this paper using the concept developed by Monke and Pearson [8]. This method covers comparative advantage calculated from shadow prices (economic analysis) and competitive advantage valued using private prices (financial analysis) (table 1).

Table 1. Policy Analysis Matrix (PAM) approach.

| Components       | Revenues | Costs                  | Profits |
|------------------|----------|------------------------|---------|
|                  |          | Tradable Inputs        | Domestic Factors |         |
| Private Prices   | P₁       | P₂                     | P₃       | P₄       |
| Social Prices    | S₁       | S₂                     | S₃       | S₄       |
Divergences

\[ D_1 = P_1 - S_1; \quad D_2 = P_2 - S_2; \quad D_3 = P_3 - S_3; \quad D_4 = P_4 - S_4 \]

Notes: Private profit = \( P_4 = P_1 - (P_2 + P_3) \); Social profit = \( S_4 = S_1 - (S_2 + S_3) \); \( D_1 \) (output transfers) = \( P_1 - S_1 \); \( D_2 \) (input transfers) = \( P_2 - S_2 \); \( D_3 \) (factor transfers) = \( P_3 - S_3 \); \( D_4 \) (net transfers) = \( P_4 - S_4 \) or \( D_4 = D_1 - (D_2 - D_3) \)

To get on overall overview of analyses from this approach, several indicators were derived:

(i) Private and social profitability: \( P_4 \) and \( S_4 \). The production is privately profitable when the value of \( P_4 > 0 \) whilst production can earn a positive social profit when \( S_4 > 0 \).

(ii) Efficiency of soybean production: (a) Comparative advantage/Domestic Resource Cost Ratio (DRCR): \( S_3 / (S_1 - S_2) \). Comparative advantage = DRCR < 1 and comparative disadvantage = DRCR > 1 and (b) Competitive advantage/Private Cost Ratio (PCR): \( P_3 / (P_1 - P_2) \). Competitive advantage = PCR < 1 and competitive disadvantage = PCR > 1.

(iii) Effects of government policies in soybean production consisting of:

- Nominal Protection Coefficient Output (NPCO): \( P_1 / S_1 \). NPCO > 1 = government protects domestic outputs (output price received by farmers greater than price without government intervention) and NPCO < 1 = government does not protect domestic outputs (output price received by farmers smaller than price without government intervention).
- Nominal Protection Coefficient Inputs (NPCI): \( P_2 / S_2 \). NPCI < 1 = government subsidies tradable inputs and NPCI > 1 = government does not subsidy tradable inputs.
- Effective Protection Coefficient (EPC): \( (P_1 - P_3) / (S_1 - S_3) \). EPC > 1 = government implements protection or provides incentives to farmer and EPC < 1 = government does not implement protection or disincentives to farmers.
- Profitability Coefficient (PC): \( P_4 / S_4 \). PC > 0 = effect of net transfers on private profit so it exceeds social profit (government provides incentives for producers).
- Subsidy Ratio to Producers (SRP): \( D_4 / S_1 \). SRP > 0 = government policy carries positive impacts for farmers and SRP < 0 = government policy implies negative impacts for farmers.

Table 2. The shadow price and calculation of tradable inputs-outputs in soybean production, 2015.

| Type of inputs | Annotation | Currency |
|----------------|------------|----------|
| Urea (Nitrogen fertilizer) *) | Urea is exported from Indonesia | US Dollar |
| Steps to estimate economic’ values of Urea | Calculate cost, insurance, freight (c.i.f) price at point of import ➔ world market price of Urea in 2015 | US Dollar |
| | Deducted by freight, insurance and unloading at point of import | f.o.b (US dollar) |
| | Convert with shadow exchange rate (SER) | IDR |
| | Deducted with: (i) local seaport transport cost, (ii) local transport and marketing cost from seaport wholesalers fertilizer, (iii) cost of transport, marketing and local storage cost from wholesalers to retailers, (iv) cost of transport, marketing and local storage cost from retailers to farmers (price at farm gate) | IDR |
| KCl (Potassium Chloride fertilizer) *) | KCl is imported to Indonesia | US Dollar |
Steps to estimate economic’ values of KCl

- Calculate f.o.b price at point of export \( \rightarrow \) world market price of Pottasium chloride f.o.b Vancouver
- Add f.o.b with freight, unloading and insurance at point of import in Indonesia
- Convert c.i.f using shadow exchange rate (SER)
- Add costs of (i) local seaport charges in seaport, (ii) local transport and marketing from to wholesalers, (iii) local transport and marketing from wholesaler to retailers, (iv) transport, marketing and local storage cost (price at farm gate)

SP-36 (Phosphate fertilizer) *)

Steps to estimate economic’ values of SP-36

- Calculate f.o.b price at point of export \( \rightarrow \) world market price of
- Adding f.o.b with freight, unloading and insurance at point of import
- Convert c.i.f using shadow exchange rate (SER)
- Add costs of (i) local seaport charges in seaport, (ii) local transport and marketing from to wholesalers, (iii) local transport and marketing from wholesalers to retailers, (iv) transport, marketing and local storage cost (price at farm gate)

Table 3. Cost and income structure of soybean production at private and social price per ha in Indonesia, 2015.

| Remark | Financial Analysis | Economic Analysis |
|--------|--------------------|-------------------|
|        | Price (IDR) | Input Non Tradable (IDR) | Input Tradable (IDR) | Total (IDR) | Price (IDR) | Input Non Tradable (IDR) | Input Tradable (IDR) | Total |
| A. Cost | 10,401,776 | 1,235,536 | 11,637,311 | 9,222,386 | 1,685,098 | 10,793,814 |
| 1. Production Inputs | | | | | | |
| 1. Seed | 10000 | 0 | 400,000 | 400,000 | 10,375 | 0 | 415,000 | 415,000 |
| 2. Fertilizer | | | | | | |
| a. Nitrogen (Urea) | 2,188 | 0 | 184,778 | 184,778 | 3,187 | 0 | 269,232 | 269,232 |
| b. Phosphate (SP-36) | 2,500 | 0 | 150,000 | 150,000 | 7,291 | 0 | 437,444 | 437,444 |
### 3. Pesticides

| Type          | Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|---------------|------------|------------|------------|------------|------------|------------|
| a. Liquid     | 153,750    | 92,250     | 215,250    | 307,500    | 161,822    | 97,093     |
| b. Solid      | 65,000     | 26,000     | 60,667     | 86,667     | 68,413     | 27,365     |

### 4. Labor

| Type                      | Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|---------------------------|------------|------------|------------|------------|------------|------------|
| a. Land preparation       | 42,500     | 772,083    | 0          | 772,083    | 42,500     | 772,083    |
| b. Planting and replanting| 42,500     | 726,042    | 0          | 726,042    | 42,500     | 726,042    |
| c. Spraying               | 42,500     | 619,792    | 0          | 619,792    | 19,125     | 278,907    |
| d. Fertilizing            | 42,500     | 425,000    | 0          | 425,000    | 12,750     | 127,500    |
| e. Weeding                | 42,500     | 1,568,958  | 0          | 1,568,958  | 29,750     | 1,098,271  |
| f. Harvest and Post Harvest| 42,500  | 2,110,833  | 0          | 2,110,833  | 42,500     | 2,110,833  |

### 5. Rent of Equipment

| Type                      | Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|---------------------------|------------|------------|------------|------------|------------|------------|
| a. Power Thresher         | 164,690    | 82,345     | 82,345     | 164,690    | 49,407     | 115,283    |

### B. Equipment Depreciation

| Type                      | Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|---------------------------|------------|------------|------------|------------|------------|------------|
| a. Hoe                    | 89,462     | 13419      | 31,311     | 44,731     | 89,463     | 31,311     |
| b. Sickle                 | 36,838     | 5,526      | 12,893     | 18,419     | 36,838     | 5,526      |
| c. Sprayer                | 473,625    | 28,418     | 66,308     | 94,725     | 473,625    | 66,308     |

### C. Land Rent

| Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|------------|------------|------------|------------|------------|------------|
| 3,255,840  | 0          | 3,255,840  | 0          | 0          | 3,255,840  |

### D. Others

| Type                      | Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|---------------------------|------------|------------|------------|------------|------------|------------|
| a. Fuel                   | 72,620     | 72,620     | 0.00       | 72,620     | 72,620     | 0          |
| b. Water fee, land tax, retribution | 285,620 | 285,620 | 0.00 | 285,620 | 285,620 | 0 |

### E. Interest rate of capital

| Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|------------|------------|------------|------------|------------|------------|
| 317,030    | 0          | 317,030    | 159,773    | 0          | 159,773    |

### II. Revenue

| Quantity 1 | Quantity 2 | Quantity 3 | Quantity 4 | Quantity 5 | Quantity 6 |
|------------|------------|------------|------------|------------|------------|
| 7,440      | 11,703,120 | 7,507      | 11,807,753 | 1,013,939  |            |

### 2.3. Sensitivity analysis
Sensitivity analysis was constructed using some variables to examine the effects on PAM indicators. This analysis covered (i) the change of soybeans at the world market, (ii) the trend of fertilizer prices, (iii) the effect of increasing import tariff and (iv) the movement of exchange rate towards DRC ratio, PC ratio, NPCO, NPCI, EPC and SRP indicators.

3. Results and discussion

3.1. The profitability of soybean production

One of the important indicators in PAM analysis is private and social profitability. It measures the profit received by soybean farmers in private costs drawn from financial analysis whilst social profitability reflects the profits earned at social prices. Based on the calculation, soybean production in Indonesia was still profitable as pointed out by positive profitability both at a private and social price. The private profitability of soybean was 65,809 IDR/ha/season. Thus, soybean farmers had an opportunity to develop their enterprises at the current market prices. Nevertheless, in real value, the profit earned was relatively small and the benefit-cost ratio (BCR) at the private price was 1.01.

It also reveals that the benefit was very close to the cost. For social profitability, each hectare of soybean economically was able to produce profit about 1,013,939 IDR/ha/season. Since social profit was estimated using opportunity cost, the positive gain from soybean production reflected the positive efficiency of its production, thus soybean production might be still attractive farmers. However, there was dissimilarity between the value of private and social profitability. The total private cost was higher than social cost reflecting when even the policy supports are presence, farmers still should compensate a greater cost. These divergences caused farmers paying input production at higher prices, so it reduced their profits. The negative transfer output was about 104,633 IDR/ha/season demonstrating the government policies had not fully provided the optimal incentives for supporting soybean production (table 4).

Table 4. Private and social profitability of soybean production in Indonesia using PAM analysis (ha/season), 2015.

| Items                        | Revenue (IDR) | Input Costs (IDR) | Profit (IDR) |
|------------------------------|---------------|-------------------|--------------|
|                              |               | Tradable         | Non Tradable|               |
| Private price                | 11,703,120    | 1,235,536         | 10,401,776   | 65,809        |
| Social price                 | 11,807,753    | 1,685,098         | 9,108,716    | 1,013,939     |
| Policies & market distortion impact | (104,633) | (449,563)         | 1,293,060    | (948,130)     |

DRCR = 0.90

PCR = 0.994

Note: bracket signs indicate a negative value

3.2. Comparative and competitive advantage of soybean production (domestic resource cost ratio and private cost ratio)

The comparative and competitive advantage of soybean was measured by the domestic resource cost ratio (DRCR) and private cost ratio (PCR). The value of DRCR was less than 1 or soybean production in Indonesia still had comparative advantages which indicated the domestic soybean production requiring less input production (cost and quantities) than imported soybean. To produce one hectare of
soybean in the domestic country needed 90% of total imported soybean. It was equal to 10% of foreign exchange that can be reserved for the national budget instead of relying on imported supplies.

Despite its comparative advantage, the DRC ratio was close to one in which was susceptible to alterations of peripheral factors. The price-output good was subjective to the price volatility in the world market. With the import dependency ratio is more than 80% [3], the increase of soybean price at the international market allowed a larger revenue at the social price; whilst the currency devaluation would alter the increasing cost of tradable inputs. These changes in particular affected the total revenue and the structure of cost ratio. With the tendency of slowly absorption in the developing countries to overcome volatilities [21], the dynamics of prices would possible to adjust the comparative advantage. DRC ratio would tend diverse over time due to the changes in related component costs and prices [22]. The comparative advantage of soybean was also related to the characteristics of regions including agro-ecosystem and local policies. Soybean production ought to consider the dissimilarities of potencies and challenges in each region. Some previous researches [4,5,7,23-25] had exposed various DRCR of soybean production between different regions. PCR value was 0.994 describing every single IDR only entailing 0.994 IDR of inputs for managing production. Domestic production had a competitive advantage because it was able to pay the domestic costs as a charge of the utilization of existing resources or it could compete at the current market price. Similar with DRCR, PC ratio revealing the domestic soybean production almost had not a competitive advantage. To increase its competitiveness, it would require the consistency of domestic policy, in particular, solving the market distortion caused by an incentive of the output price. In support, it will require better management to increase the efficiency of production like optimizing non-tradable expenditures.

### 3.3. Nominal Protection Coefficient Output (NPCO) and Nominal Protection Coefficient Inputs (NPCI)

Nominal protection coefficient output (NPCO) represents the efficiency of government protection by comparing tradable private (input) costs and tradable social (input) costs. Based on the calculation, NPCO of soybean production was 0.991 reflecting farmers receiving the lower price of their soybean than social price due to the weakness of government protection towards the price. This result illustrates the government’s trade-restrictive policy causing the private price decreasing by 0.9%. The efficiency of government protection in output production also affected the interest and passion of farmers to grow soybeans. When the government could not afford to protect farmers then it will influence the sustainability of agricultural production.

Meanwhile, nominal protection coefficient inputs (NPCI) figure out how far the government policy brings an effect on inputs paid by farmers. The NPCI was 0.733 or farmers paid 26.67% cheaper inputs than social prices. The disparity of input price between private and social prices was caused by government incentives through input subsidies, which were fertilizers and seed. This protection helped farmers enhancing their access to input production both quantity and the price. NPCI of seed was 0.964 or farmers obtained lower prices by 3.6% for seed than without subsidy. Nonetheless, examining the percentage, it was realized that only a small number of farmers who profoundly received the impact of such protection policy, which was possibly triggered by the obstacles in seed subsidy; whereas NPCI of fertilizers was 0.487 means that farmers paid a lower price of fertilizers by 51.3% than without the involvement of the government.

NPCO and NPCI of soybean production were varied among the regions. NPCO and NPCI were about 1.04 – 1.06 and 0.97 – 0.99 in West Java, East Java and South Sulawesi [5]. Study case in East Java showed that NPCO was 0.802 – 0.95 while NPCI was 0.85 – 1.39 [4,24] whereas [7] stated that NPCO and NPCI value in East Java were 1.08 and 0.88, respectively. Meanwhile, in Central Java, NPCO and NPCI were investigated around 0.82 – 1.21 and 1.00 – 1.15, respectively [23].

### 3.4. Effective protection coefficient (epc) and profitability coefficient (pc)

The effective protection coefficient is the ratio of a difference between revenue and tradable input costs on private price and social price as a description of whether the government policy brings impact on
tradable inputs and output. EPC was 1.03 or the government policy brings the net impact by allowing the production system to obtain a higher value-added at 3%. This indicator describes the aggregate effect of two policies from inputs transfer and output protection. Referring to the previous result of output protection, general protection is more contributed to the positive effect of input protection. The coefficient of protection is below the average of producer protection in the agricultural sector. The producer protection in Indonesia from 2010 to 2014 was about 1.165 – 1.310 with an increasing trend of 1.03% every year or it is above the rate of protection in soybean production [26]. Thus, in general, the incentive for soybean producers was not assigned as the main priority by the government policy.

The profitability coefficient describes the assistance from the government to the producers through incentive policy by adjusting the difference between producers’ profit at the market price and the profit received by farmers at a social price. The result of the PC analysis was positive (0.06). It reveals that the government still provides an incentive to farmers; yet, it might be not sufficient to assure the sustainability of progressive profit in the long term. This indicator is important because it expresses whether market distortion bringing a positive impact to farmers.

3.5. Effectiveness of input subsidies (subsidy ratio to producers)

The implementation of the subsidy is below the objective in which means not all targeted farmers have received the subsidy. The higher price of fertilizers on the market is the main issue arisen from the shortage in certain season (planting season). The SRP indicator showed a negative ratio by minus 0.08. It describes that the government policy has not yet brought a significant benefit to all soybean farmers. The divergences due to inputs subsidies could not levitate the profit received by the producers, and it refers to the inefficiency level of the implementation. It also realized that the leverage power of the intervention does not constantly osculate entire farmers. There are 8% of soybean farmers who are disadvantaged by the government strategy.

3.6. Sensitivity Analysis

The additional examination can be drawn to provide more information on how the dynamics and changes of some related government interventions might alter the important indicators in PAM analysis particularly the comparative advantages, the competitive advantages and effectiveness of various protections. The result of the simulation is presented in Table 5.

Table 5. Sensitivity analysis of related variables and the change on PAM indicators of soybean production in Indonesia, 2015.

| Variables                                      | DRCR | PCR  | NPCO | NPCI | EPC  | SRP  |
|------------------------------------------------|------|------|------|------|------|------|
| a) Existing condition                          | 0.90 | 0.994| 0.991| 0.733| 1.03 | -0.07|
| b) Increasing the world market price of soybean by 2.95% | 0.887*| 0.994| 0.968| 0.733| 1.01 | -0.09|
| c) Changing price of fertilizers: increasing price of Urea by 1.27%; decreasing price of SP-36 by 0.424% and increasing price of KCl by 0.553% | 0.91 | 0.994| 0.991| 0.729*| 1.04*| -0.07|
| d) Increasing trend of exchange rate by 15%     | 0.790*| 0.994| 0.864| 0.662*| 0.90 | -0.18|
e) Increasing import tariff of soybean:
   - 5%  
     0.871*  0.999  0.949  0.733  0.98  -0.11
   - 10%  
     0.833*  0.994  0.918  0.733  0.95  -0.14

f) Combination of (a) – (e) and procurement price policy

1. Increasing price of soybean + procurement price 8,000 IDR/kg  
   0.885*  0.916*  1.041*  0.733  1.09*  -0.02*

2. Changing price fertilizers + procurement price 8,000 IDR/kg  
   0.91  0.916*  1.066*  0.728  1.12*  0.00*

3. Increasing exchange rate + procurement price 8,000 IDR/kg  
   0.789*  0.916*  0.929  0.661*  0.97  -0.11

4. Import tariff + procurement price  
   - Tariff 5% + 8,000 IDR/kg  
     0.871*  0.917*  1.025*  0.733  1.07*  -0.03*
   - Tariff 10% + 8,000 IDR/kg  
     0.833*  0.917*  0.987  0.733  1.03  -0.07

Note: * = positive effect

Instead of analysing a single policy, for example calculation the economic impact of increasing price of soybean at the farmer level and soybean import tariff [7] or decreasing of soybean tariff, increasing prize of fertilizers and increasing of exchange rate [22], in this analysis there are four combinations, which are (i) increasing price of soybean + procurement price, (ii) changing price fertilizers + procurement price, (iii) increasing exchange rate + procurement price and (iv) import tariff (5% and 10%)+procurement price. As drawn in Table 3, those mix policies and market distortion generate alterations. Looking for the most favorable impacts indicated by the improvement on PAM indicators, the combination of the change price of soybean at the international market and the minimum price of soybean received by farmers (8,000 IDR/kg) creates a positive inducement including augmenting the comparative advantage roughly 2.6%. The competitive advantages coefficient has correspondingly upgraded by 7.8%, so to earn the same profit than before, it requires less cost of production about 7.8 IDR/ha. It also permits the increasing of output price by 5% which allows farmers to enjoy more profit. The positive signs, additionally, are reflected from the EPC and SRP indicators. The number of farmers who are disadvantaged by government policy declined by approximately 71%. Nonetheless, this policy incentive might be tough to be implemented. Reckoning the world market price is difficult to be controlled by a domestic intervention.

In contrast, the adoption of import tariff and procurement price policy is more sensitive to be taken. Implementation 5% import tariff of soybean, as an illustration, is under the agreement of bounded tariff, and it will not change the parity price noticeably. The notable advantages are also shown by improving most of the indicators. The comparative advantage will improve by three percent; whereas the
competitive advantages increased by about 7.7%. Farmers then could afford more profit due to a higher output price approaching 3.4% excluding the improvements of the NPCI indicator, which remains constant. The positive inducement is also shown through the coefficient of protection (increasing by 3.8 percent) as well as the SRP indicator. It presents a slightly higher ratio nearly two times than the prevailing attainment. If the profitability to cultivate soybean in the domestic country is getting better and the government interventions can postulate incentive for farmers, these improvements then expected can encourage farmers to continue and maintain their production.

4. Conclusion
Using PAM analysis, soybean production still has a promising prospect as indicated by positive revenue. In spite of the product generates a lower profit at the private market price. Due to the government policies and market distortion, there is a gap between revenue in these two prices. Using DRCR and PCR indicator, it additionally can be seen that domestic production only provides comparative not the competitive advantages. It implies that the soybean produced from Indonesia faces challenges to compete in the international market.

The objective of reducing quantities of import recently only affords to obtain the contribution of the social profits whilst not all soybean farmers receive the benefits from the government intervention. The fact that comparative and competitive indicators in the current phase are dissimilar with the previous studies and varied for specific regions indicating the dynamics of related aspects, in particular, the supporting policies and the world market of soybean. Examining government intervention, it has objectives to support the domestic production and farmers, yet not all the implementation of the policies shows positive impacts. It is also strengthened by the distribution of subsidies where some farmers do not receive these supports. The sensitivity analysis PAM related to a combination of government policies provided a positive change toward its indicators. Thus, a single policy might not be effective to improve the competitive advantages of soybean production.

References
[1] FAO 2015 Soybean import Food and Agricultural Organization Retrieved from ttp://www.foodsecurityportal.org/api/countries/fao-import-soybeans
[2] MoA 2015 Rencana strategis kementerian pertanian 2015 – 2019 [Strategic plan of the ministry of agriculture] Ministry of Agriculture
[3] Pusdatin 2018 Outlook kedelai komoditas pertanian sektor tanaman pangan [Soybean outlook agricultural commodities in the food crop sector] Pusat Data dan Sistem Informasi Pertanian Sekretaris Jenderal Kementerian Pertanian p 72
[4] Pearson S R, Gotsch C, Bachri S 2003 Applications of the policy analysis matrix in Indonesian agriculture http://web.stanford.edu/group/FRI/indonesia/newregional/newbook.pdf
[5] Zakaria A, Sejati W K, Kustiarti R 2010 Analisa daya saing komoditas kedelai menurut provinsi agro ekosistem: kasus di tiga provinsi di Indonesia [Analysis of the competitiveness of soybean commodities by agro-ecosystem province: cases in three provinces in indonesia] Jurnal Agro Ekonomi 28(1) pp 21–37
[6] Bowo P A, Nurayati A, Imleesh R M M 2016 Analysis of competitiveness and government policy on rice, corn and soybean farming Journal of Economics and Policy 9(2) pp 159-169
[7] Haryanto T 2019 Impact of government policies on the competitiveness of soybean farming system in indonesia: study in bangsalsari district, east java province Journal of Developing Economies 04(1) pp 52-62
[8] Monke E A, Pearson S R 1998 The policy analysis matrix for agricultural development Outreach Program Stanford University
[9] Fatah F A, Cramon-Taubadel S V 2017 Profitability and competitiveness of rice farming in Malaysia: a policy analysis matrix *Asian Journal of Agriculture and Development* 14(2) pp 31-47

[10] Kanaka S, Chinnadorai M 2013 The policy analysis matrix of rice cultivation in India *European Journal of Physical and Agricultural Sciences* 1(1) pp 8–19

[11] Alvez C E d S, Belarmino L C, Padula A D 2017 Feedstock diversification for biodiesel production in Brazil: using the policy analysis matrix (pam) to evaluate the impact of the pnpb and the economic competitiveness of alternative oilseeds *Energy Policy* 109 pp 297-309

[12] Ilham N, Rusastra W 2009 Daya saing komoditas pertanian: konsep, kinerja dan kebijakan pengembangan [Competitiveness of agricultural commodities: concept, performance and development policies] *Pengembangan Inovasi Pertanian* 3(1) pp 38–51

[13] Makama S A, Amrutha T J, Patil S S, Wali S B 2016 Export competitiveness of Indian rice: a policy analysis matrix approach *International Journal of Innovative Research and Development* 5(1) pp 339–344

[14] Posadas-Domínguez R R, Razo-Rodríguez O E D, Almaraz-Buendia I, Pelaez-Acero A, & Espinosa-Muñoz V, Rebollar-Rebollar S, Salinas-Martínez J A 2018 Evaluation of comparative advantages in the profitability and competitiveness of the small-scale dairy system of tulancingo valley, Mexico *Tropical Animal Health and Production* https://doi.org/10.1007/s11250-018-1516-8

[15] Yao S 1997 Rice production in Thailand seen through a policy analysis matrix *Food Policy* 22(6) pp 547–560

[16] Yao S 1999 Efficiency impacts of government policy on agricultural production in the presence of externalities *Journal of Environmental Management* 55 pp 57–67

[17] Elsedig A A A, Mohd M I, Fatimah M A 2015 Assessing the competitiveness and comparative advantage of broiler production in Johor using policy analysis matrix *International Food Research Journal* 22(1) pp 116-121

[18] Zheng S, Lambert D, Wang S, Wang Z 2013 Effects of agricultural subsidy policies on comparative advantage and production protection in China: an application with a policy analysis matrix model *The Chinese Economy* 46(1) pp 20–3

[19] Stoforos C, Kavicic S, Erjavej E, Mergos S 2000 Agricultural policy analysis model for Slovenian agriculture In: Giannias D.A. (edss.), Mergos G. (ed.) Selected readings on economies in transition Chania: CIHEAM pp 91-102 (Cahiers Options Méditerranéennes; n. 44)

[20] Mohanty S, Fang C, Chaudhary J 2002 Assessing the competitiveness of Indian co on production: a policy analysis matrix approach *CARD Working Papers Paper 328* p 18

[21] OECD 2011 Competition assessment toolkit, vol. I: principles *Organization for Economic Co-Operation and Development* www.oecd.org/daf/competition/46193173.pdf

[22] Henneberry S, Henneberry D 1989 International trade policies *In Agricultural policy analysis tools for economic development* Ed. Tweeten, Luther (pp 322 – 354) Westview Press

[23] Rusastra W, Rachman B, Friyanto S 2004 Analisis daya saing dan struktur proteksi komoditas palawija [Analysis of the competitiveness and protection structure of secondary crops] In Efisiensi dan Daya Saing Sistem Usahatani Beberapa Komoditas Pertanian di Lahan Sawah pp 28–46 Indonesian Center for Agricultural Socio Economic and Policy Studies

[24] Siregar M, Sumaryanto 2003 Analisis daya saing usahatani kedelai di DAS Brantas *Jurnal Agro Ekonomi* 21(1) pp 50–71
[25] Khai H V, Yabe M 2013 The comparative advantage of soybean production in Vietnam: a policy analysis matrix approach. *In A Comprehensive Survey of International Soybean Research-Genetics, Physiology, Agronomy and Nitrogen Relationships* IntechOpen Chapter 7 pp 161 - 179 http://dx.doi.org/10.5772/51000

[26] OECD 2015 Agricultural policy monitoring and evaluation 2015 *Organization for Economic Co-Operation and Development* p 35