Analysis of UPSUS PAJALE program influence toward the decision of farmers in planting soybean commodity (case study: Sumberejo Village, Pagar Merbau Subdistrict, Deli Serdang District)

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Abstract. Soybean is a strategic commodity in Indonesia since it is one of the important foods after rice and corn. Soybean gets more attention in national food policy because most of the Indonesian use soybeans in various processed food products, such as tofu, tempeh, soy sauce, tauco and milk. This study aimed to analyze the decision of farmers if the government program (UPSUS PAJALE) does not exist, whether the farmers still plant soybeans or not and to analyse the factors that influence the decision of farmers in planting soybeans. The samples were 89 farmers who planted soybean commodities. The sampling method used was the simple random sampling method. The analysis methods used were the descriptive method and the logistic regression method. Results showed that from 89 samples, 67 farmers would still decide to plant soybean. Moreover, the dependent variables such as land area, farmer revenue, and government assistance had a significant influence on the decision of farmers to do soybean farming. On the other hand, the independent variables such as age, level of education, experience in farming, number of dependents and selling prices did not have a significant influence to the decision of farmers in conducting the soybean farming.

1. Introduction

Soybean is a strategic commodity in Indonesia because soybean is one of the important food crops after rice and corn. This commodity gets more attention from the government in national food policy because most of the Indonesian population uses soybeans in various processed food products, such as tofu, tempeh, soy sauce, tauco and milk [1]. The multipurpose properties found in soybean cause a high consumption of soybeans in the country. Nowadays, the total soybeans in Indonesia cannot meet the needs then Indonesia must import the soybeans. Production, import and need of Indonesian soybeans in 2011-2016 showed in Table 1.

Factors that cause low local soybean production are the farmers who lack interest in growing soybeans so that the government must import the soybeans. Responding to the increase of domestic soybean demand in a decreased production, the government is currently setting up the UPSUS PAJALE program (Special
Effort of Rice, Corn, and Soybean), to make the program successful in a relatively short period of time. Consequently, the strategic steps in the short term 2015-2017 are needed [2].

This study aimed to analyse the decision of farmers if the UPSUS PAJALE program does not exist, whether the farmers in the study area still plant soybeans or not and to analyse the factors that influence the decision of farmers in planting soybean commodities.

| Table 1. Production, import, and the need for soybeans in Indonesian 2011-2016 |
|-------------------------------|-----------------|-----------------|-----------------|
| Years | Production (Ton) | Import (Ton) | Domestic Needs (Ton) |
| 2010 | 907,031 | 1,740,505 | 2,647,151 |
| 2011 | 851,290 | 1,132,144 | 2,938,176 |
| 2012 | 783,158 | 1,921,206 | 2,600,667 |
| 2013 | 807,568 | 1,192,230 | 2,572,565 |
| 2014 | 874,301 | 1,439,117 | 2,686,283 |
| 2015 | 972,413 | 1,725,383 | 2,656,544 |
| 2016 | 991,122 | 2,256,931 | 2,583,363 |

2. Research Methods

2.1. Methods of research area determination and sample determination

Determination of the study area was conducted purposively at Sumberejo Village, Pagar Merbau Subdistrict, Deli Serdang District because the village had the highest soybean production in Pagar Merbau District and was one of the villages which participate in the UPSUS PAJALE program. The population of farmers in Sumberejo Village was 783 farmers. Moreover, the sample size was determined using Slovin method where the number of samples was 89 persons, and the used sampling method was simple random sampling.

2.2. Data analysis method

The descriptive analysis and logistic regression method were used to identify the problem by using the following formula.

\[
\ln \frac{P_i}{1-P_i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \epsilon_i \tag{1}
\]

Where:

- \( P_i \) = Opportunity of farmers to conduct the soybean farming;
- \( 1 - P_i \) = Opportunity of farmers to not conduct the soybean farming;
- \( X_1 \) = Age; \( X_2 \) = Education; \( X_3 \) = Experience of farming; \( X_4 \) = Dependents; \( X_5 \) = Land area; \( X_6 \) = Revenue of farmer; \( X_7 \) = Price of soybean; \( X_8 \) = Government assistance; \( \epsilon_i \) = Error term.

3. Results and Discussion

The results showed that most farmers would continue to grow soybeans even if there was no UPSUS PAJALE program because the farmers realize that soybean plants are very good at increasing the nutrients in agricultural land.
From the total of 89 samples, 67 farmers decided to continue to conduct soybean farming with a percentage of 75.3%, while farmers who chose the decision not to conduct the soybean farming were 22 people with a percentage of 24.7%. Several factors that caused farmers chose to continue the soybean farming was because according to the farmers, the content of rhizobium in soybean is high and very good for the soil, thus reducing the cost of urea fertilizer for rice plants.

The benefits derived from soybeans caused the farmers to continue to plant soybeans every year, such as the decayed soybean roots in the soil could increase the nutrients in their fields, so that it could reduce the cost of fertilizer for further crops, and more beneficial benefits was the former soybeans planting area could increase the yield of other crops that will be planted later, such as rice. For example, in the first planting season, rice plants will produce 300 kg per 0.04 ha, in the second planting season, the rice yield will decrease to 200 kg per 0.04 ha, if at the third planting season the farmers continue to plant rice, the yield will continue to decrease. Therefore, at the third planting season, farmers always plant soybeans to increase their rice yields, after that their production will increase as before, i.e. 300 kg per 0.04 ha, because if the farmers keep planting rice in three planting seasons in a year result in a declining in the rice production.

This condition was in accordance with [3] that the former soybeans planting area was usually very good for planting rice due to the nodules found in the soybeans roots which could bind the Nitrogen so that the decayed left roots would be very useful for the next crop cultivation. In addition, it also could break the chain of pests.

The main complaint of farmers was that in terms of selling prices of soybeans which are always uncertain and very low, because the government does not always play a role in the price, especially in the harvesting season, the government will not want to buy the harvested soybeans so that the wholesalers will make a very low price. Most of the farmers expected the government to play a role in the price issue of subsidies in the form of seeds and fertilizers. Another factor complained by farmers was the weather uncertainty which made farmers confused in continuing their soybean farming.

### Table 2. The decision of farmer to conduct soybean farming distribution

| Decision          | Decision to Conduct Soybean Farming |
|-------------------|-------------------------------------|
|                   | Total | Percentage |
| Yes               | 67    | 75.3 %     |
| No                | 22    | 24.7 %     |
| Total             | 89    | 100.0 %    |

### Table 3. The factors affecting the decision of farmers in continuing the soybean farming and the partial test results (Wald test)

| Variable                  | B     | Wald | Exp(B) | Sig.  |
|---------------------------|-------|------|--------|-------|
| Constant                  | -11.191 | 0.000 | 0.139  |
| Farmer Age                | -0.178 | 1.033 | 0.837  | 0.309 |
| Education                 | 0.106 | 0.112 | 1.112  | 0.738 |
| Experience of Farming     | 0.317 | 2.410 | 1.372  | 0.121 |
| Dependents                | 1.388 | 3.528 | 4.006  | 0.060 |
| Land Area                 | -40.798 | 5.397 | 0.000  | 0.020 |
| Revenue of Farmer         | 0.000 | 8.192 | 1.000  | 0.004 |
| Price of Soybean          | -0.001 | 1.341 | 0.999  | 0.247 |
| Government Assistance     | 0.000 | 4.745 | 1.000  | 0.029 |
Table 4 showed that the obtained Chi-square value was equal to 5.102 with a significance level of 0.747. The significance level obtained was > 0.05, so the H1 was rejected and the H0 was accepted. Therefore, it could be concluded that there was no difference between the distribution of observations with the estimated frequency distribution. Consequently, it could be concluded that the model was suitable to be used.

| Step | Chi-square | Df | Sig. |
|------|------------|----|------|
| 1    | 5.102      | 8  | 0.747|

Table 5 showed that the obtained G value was equal to 64.994 with a significance level of 0.000. The significance level obtained was 0.000 < 0.05. Based on the decision-making criteria that had been made, then the H1 was accepted and the H0 was rejected. Therefore, it could be concluded that there was at least one independent variable that affected the dependent variable.

From the results of the logistic regression test, it could be concluded that the variables of the land area, the revenue of farmer, and the government assistance influenced the decision of farmers in continuing the soybean farming. On the other hand, the variables of the age, the level of education, the experience of farming, the number of dependents, and the price level did not affect the decision of farmers in continuing the soybean farming.

The marginal effect could be counted using the following formula.

\[
\text{Marginal effect} = B \times P (1 - P) \tag{2}
\]

Where:
- \(P\) = probability of farmers’ decision to continue the soybean farming;
- \(B\) = coefficients of independent variables.

The marginal effect value of land area variable was \(-7.75 \times 10^{-17}\) which means that every 0.1 ha the decrease in land area, it would reduce the decision of farmers probability to continue the soybean farming at \(-7.75 \times 10^{-15}\) %.

The marginal effect value of acceptance variable was 0.0025 which means that every one hundred thousand rupiahs the increase per planting time of farming revenue, it would increase the decision of farmer probability to continue the soybean farming at 0.25%.

The marginal effect value of government assistance variable was equal to 0.005, which means that every one hundred thousand rupiahs the increase per planting season of government assistance, it would increase the decision of farmers probability to continue the soybean farming at 0.5%.

The value of the marginal effect of the land area variable is equal to \(-7.75 \times 10^{-17}\) this means that every decrease of 0.1 ha of land area, it will reduce the probability of the decision of farmers to continue soybean farming as much as \(-7.75 \times 10^{-15}\) %.

The marginal effect value of the Revenue variable is 0.0025, meaning that each increase of one hundred thousand rupiahs is cultivating farm income, it will increase the probability of farmers’ decision to continue the farming business at 0.25%.
The marginal effect value of the government assistance variable is equal to 0.005, meaning that every increase of one hundred thousand rupiahs to cultivate government assistance will increase the probability of farmers' decision to continue the soybean farming by 0.5%.

4. Conclusions
Most farmers in Sumberejo Village would continue to plant soybeans even though there will be no UPSUS PAJALE program. From the total of 89 samples, 67 farmers decided to plant soybeans and the factors that influenced the decision of farmers in conducting the soybean farming in the study area were factors of land area, revenue of farmers and assistance from the government. In contrary, factors such as age, education level, soybean farming experience, number of dependents, selling prices, did not influence the decision of farmers.

References
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