Analysis of the effectiveness of fertilizer subsidy policy and its effect on rice production in Karanganyar Regency

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Abstract. The research aims to know the factors which affect rice production, and to know the effectiveness of fertilizer subsidy policy on rice production in Karanganyar Regency. The fertilizer subsidy policy was based on four indicators of fertilizer subsidy namely exact price, exact place, exact time, and exact quantity. Data was analyzed using descriptive quantitative and qualitative and multiple linear regression. The result of research showed that fertilizer subsidy policy in Karanganyar Regency evaluated from four indicators was not effective because the distribution of fertilizer subsidy to farmers still experience some mistakes. The result of regression analysis showed that production factors such as land area, use of urea fertilizer, use of NPK fertilizer, and effectiveness of fertilizer subsidy policy had positive correlation and significant influence on rice production, while labor utilization and use of seeds factors had no significant effect on rice production in Karanganyar Regency. This means that if the fertilizer subsidy policy is more effective, rice production is also increased.

1. Introduction
Subsidized fertilizer according to Regulation of the President of Republic of Indonesia Number 77 Year 2005 is fertilizer where the procurement and distribution gets subsidy from the government for the needs of farmers implemented on the basis of government programs in the agricultural sector. This regulation also determines the type of subsidized fertilizer consisting of inorganic fertilizers (urea, SP36, ZA, NPK) and organic fertilizers. According to [1], the main objective of fertilizer subsidy is that the price of fertilizer at the farm level can remain affordable by farmers, so that it can support productivity and food security program.

The effectiveness level of the fertilizer subsidy policy is measured based on six indicators called the 6 (six) principles appropriately. Based on the Regulation of the Minister of Trade No. 15 / M-DAG / PER / 4/2013, these principles are the principle of procurement and distribution of subsidized fertilizer covering the exact type, quantity, price, place, time and quality. The indicators used in this study focused on the precise four consisted of price, place, time, and amount. These four indicators are selected because it’s can be quantified and then interpreted.

[2] explains that effectiveness (results) is the relationship between output with goals or targets to be achieved. The notion of effectiveness is basically related to the achievement of the objectives or targets of the policy. Operational policy is said to be effective if the process of the activity reaches the final goals and objectives of the policy. According to [3], effectiveness is an agreed target for joint efforts. Based on the understanding of effectiveness according to the two experts mentioned above, it
can be summarized that the effectiveness is a measure of achievement targets that show the realized output that has been achieved from the output that should be achieved.

2. Methods

2.1 Basic Method of Research
The basic method used in this research was descriptive method. This method focused on solving the problems that exist in the present and the actual. The collected data was compiled, described and then analyzed [4]. The research used survey technique by taking samples from one population and using questionnaire as the main data collection tool [5].

2.2 Method of Determination of Research Location
Determination of research location was done purposively based on certain considerations according to the purpose of research [5]. This research was conducted in Lemahbang Village, Jumapolo Subdistrict and Kaliboto Village, Mojogedang Subdistrict; both in Karanganyar Regency. Determination of the location was done with consideration of the district that has the largest rice field area in Karanganyar Regency.

2.3 Types and Data Collection Methods
The data collected in this research consisted of primary and secondary data. The primary data was obtained from interviews with respondents (rice farmers). The secondary data was a complementary data scope of general condition of Karanganyar Regency which was obtained from BPS Karanganyar Regency and other supporting data from related institutions.

2.4 Data Analysis Method

2.4.1 Effectiveness Analysis of Fertilizer Subsidy Policy
The effectiveness of the fertilizer subsidy policy was calculated by the effectiveness formula in Table 1.

**Table 1. Formulation of Effectiveness of Urea and NPK Fertilizer Distribution with the Four Precise Indicator**

| Indicator                  | Formula                                      | Note                                                                 |
|---------------------------|----------------------------------------------|----------------------------------------------------------------------|
| Exact Price               | Exact Price = \( \frac{n_h}{N} \times 100\% \) | \( n_h \) = Number of sample farmers who obtained fertilizer according to HET (people) \( N \) = Total number of sample farmers (people) |
| Exact Place               | Exact Place = \( \frac{n_t}{N} \times 100\% \) | \( n_t \) = Number of sample farmers who buy fertilizer at authorized retailers (people) \( N \) = Total number of sample farmers (people) |
| Timely                    | Timely = \( \frac{n_w}{N} \times 100\% \)      | \( n_w \) = Number of sample farmers who think fertilizer is available when needed (people) \( N \) = Total number of sample farmers (people) |
| Exact Quantity            | Exact quantity = \( \frac{n_j}{N} \times 100\% \) | \( n_j \) = Number of sample farmers who do the fertilization according to the recommended dose (people) \( N \) = Total number of sample farmers (people) |

Source: Arisandi [6]
The criteria of effectiveness of fertilizer subsidy policy are appropriately presented in Table 2.

| Percentage Effectiveness Interval(k) | Criteria         |
|-------------------------------------|------------------|
| k ≤ 40%                             | Very ineffective |
| 40% ≤ k ≤ 60%                       | Ineffective      |
| 60% ≤ k ≤ 80%                       | Quite effective  |
| 80% ≤ k ≤ 90%                       | Effective        |
| 90% ≤ k ≤ 100%                      | Very effective   |

Source: Arisandi [6]

2.4.2 *Analysis of Factors Affecting Rice Production* To examine other factors affecting rice production in Karanganyar Regency, multiple linear regression model was applied:

\[ Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e \]

Note:
- \( Y \) = Rice production (kilograms)
- \( X_1 \) = Land area (hectare)
- \( X_2 \) = Use of urea fertilizer (kilograms)
- \( X_3 \) = Use of NPK fertilizer (kilograms)
- \( X_4 \) = Use of labor (HKP)
- \( X_5 \) = Use of seed (kilograms)
- \( X_6 \) = Effectiveness of fertilizer subsidy policy (%)

2.4.3 *Analysis of Effectiveness of Fertilizer Subsidy Policy on Rice Production* The effectiveness of fertilizer subsidy policy on rice production in Karanganyar Regency can be seen in t-test of effectiveness variable of fertilizer subsidy of linear regression equation.

3. Results and Discussion

3.1 *Effectiveness Analysis of Fertilizer Subsidy Policy on Rice Production*

Urea fertilizer had the highest retail price set by the government of IDR 1,800 / kg. But in fact the price of urea fertilizer received by respondents on average amounted to IDR 1,880 / kg so there was a difference of IDR 80 / kg from the actual price. The price of NPK fertilizer at the highest retail price set by the government was IDR 2,300 / kg. But in fact, the average price of NPK fertilizer to be paid by respondents was IDR 2,430 / kg so there was a difference of IDR 130 / kg with the highest retail price of NPK fertilizer. This price difference occurred because retailers wanted to take a greater return for their transportation costs to be incurred retailers.

| Component                  | Urea  | NPK   |
|----------------------------|-------|-------|
| Average purchasing price (IDR/kg) | 1,880 | 2,430 |
| The highest retail price (IDR/kg)    | 1,800 | 2,300 |
| Difference (IDR/kg)              | 80    | 130   |

Source: Primary Data Analysis, 2017

Percentage of each indicator of the effectiveness of fertilizer subsidies is presented in Table 4. About 43.75% of the farmers obtained subsidized fertilizer at the highest retail price. This indicated that the distribution of urea fertilizer and subsidized NPK was not effective, because it was included in the interval (40% ≤ k ≤ 60%).
Table 4. Percentage of Effectiveness Rate of Fertilizer Subsidy Policy

| Effectiveness Level Indicators | Exact (%) | Not Exact (%) | Total (%) |
|-------------------------------|-----------|---------------|-----------|
| Price                         | 43.75     | 56.25         | 100       |
| Place                         | 65        | 35            | 100       |
| Time                          | 42.5      | 57.5          | 100       |
| Quantity                      | 20        | 80            | 100       |
| Average                       | 42.80     | 57.20         | 100       |

Source: Primary Data Analysis, 2017

Based on the exact place indicators, 65% of farmers bought fertilizer in the village, while 35% outside the village. From the percentage of accuracy of the place, it could be quite effective because the number of farmers who bought in the village are included in the intervals of 60% ≤ k ≤ 80%. Based the exact time indicator, 57.5% of farmers who stated that “fertilizer was not always available when needed” usually had to make purchases outside the village to obtain the necessary fertilizer during rice production. This showed that when viewed from the indicators on time, fertilizer subsidy was ineffective because only 42.5% of farmers experienced that fertilizer was always available when needed. This percentage was included in the interval 40% ≤ k ≤ 60% (ineffective). Moreover, only about 20% of farmers used urea and NPK fertilizer with the exact quantity as recommended, while 80% not as recommended. The use of fertilizer by farmers is usually done in accordance with the experience of farming and soil conditions, and farmers do not pay attention to the recommended dose of fertilizers. The accuracy of the amount was only 20% which mean very ineffective, because included in interval k ≤ 40%.

Thus, overall based on the four indicators of the effectiveness of fertilizer subsidy policy in Karanganyar Regency was ineffective. This was indicated by the average rate of accuracy of fertilizer subsidy of 42.80%, where this percentage was included in the interval 40% ≤ k ≤ 60%.

3.2 Factors Affecting of Rice Production

The statistical test results for the F test are shown in Table 5.

Table 5. F test results Factors Affecting Rice Production in Karanganyar Regency

| Model       | $F_{arithmetic}$ | $F_{table}$ | Sig. |
|-------------|------------------|-------------|------|
| Regression  | 87.007 *         | 2.490       | 0.000|
| Residual    |                  |             |      |
| Total       |                  |             |      |

Source: Primary Data Analysis, 2017

Based on Table 5 the factors comprise of land area, use of urea fertilizer, use of NPK fertilizer, use of labor, use of seeds, and effectiveness of fertilizer subsidy policy simultaneously influenced rice production. Thus, further analysis can be done. The t test results are shown in Table 6.

The variable of land area, use of urea fertilizer, use of NPK fertilizer, and effectiveness of the fertilizer subsidy policy partially influenced the rice production due to the t arithmetic value ≥ t table (Table 6). While the variable use of labor and the use of seeds partially did not affect the production of rice because the value of t arithmetic ≤ t table.

The value of the regression coefficient showed how much the independent variable influences the dependent variable. If there is an increase of independent variable (Xi) of 1 unit then the production of rice increases by $\beta$ unit. If there is an increase of land area of 1 hectare then the production of rice increased by 2072.751 kg, while other factors are considered constant or constant. Increasing the use of urea fertilizer by 1 kg increased rice production by 858.035 kg, while another factor is considered
constant. Meanwhile, if there is an increase in the use of NPK fertilizer of 1 kg then the production of rice increased by 662.05 kg, while other factors are considered constant or constant.

| Table 6. Coefficient Analysis Factors Affecting Rice Production in Karanganyar Regency |
|---------------------------------|-----------------|------------------|------------------|
| Variabel                        | Regression Coefficient | t arithmetic | t tabel |
| Constant                        | 3847,500         | 37.751          | 2.032           |
| Land area                       | 2072.751 ***     | 20.002          | 2.032           |
| Use of urea fertilizer          | 858.035 ***      | 8.313           | 2.032           |
| Use of NPK fertilizer           | 662.057 ***      | 6.414           | 2.032           |
| Use of labor                    | -9.418 ns        | -0.091          | 2.032           |
| Use of seeds                    | -83.204 ns       | -0.806          | 2.032           |
| Fertilizer subsidy policy       | 289.444 ***      | 2.804           | 2.032           |

Source: Primary Data Analysis, 2017

Model equation of factors influencing rice production in Karanganyar Regency was as follows:

\[ Y = 3847.500 + 2072.751 X_1 + 858.035 X_2 + 662.057 X_3 - 9.418 X_4 - 83.204 X_5 + 289.444 X_6 \]

The value of \( R^2 \) square or coefficient of determination of 0.941 or 94.1%. This showed that variant of rice production variables could be explained by the variable of land area, the use of urea fertilizer, the use of NPK fertilizer, the use of labor, the use of seed, and the effectiveness of fertilizer subsidy policy of 94.1%. The remaining 4.9% was influenced by other variables outside the model such as the use of pesticides, the use of fertilizers other than urea and NPK, the type of irrigation used, and others.

3.3 The Effectiveness Effect of Fertilizer Subsidy Policy on Rice Production

Effect of effectiveness of fertilizer subsidy policy on paddy production in Karanganyar Regency can be seen from t test result. T test was used to determine the effect of independent variables on rice production partially. The value of t arithmetic (2.804) > t table (2.032) then \( H_0 \) was rejected, meaning the hypothesis \( \beta_6 = 0 \) was unacceptable. This showed that the variable effectiveness of fertilizer subsidy policy partially influences the production of rice in Karanganyar Regency. The regression coefficient value of effectiveness of fertilizer subsidy policy was 289.444. The positive coefficient indicated a direct relationship between the effectiveness of fertilizer subsidy policy and rice production in Karanganyar Regency. This means that if there is an increase in the effectiveness of fertilizer subsidy policy of 1% then the production of rice increased by 289.444 kg, while other factors are considered constant or constant.

The effectiveness of fertilizer subsidy policy was closely related to the use of fertilizer by farmers. According to indicator of price and quantity, if farmers get fertilizer according to the highest retail price then farmers can use fertilizer according to the recommended dose without replacing or reducing the quantity of fertilizer used for each land. While seen from the exact indicators of the place and time, if the fertilizer was always available when needed and can be obtained in the village, it will facilitate farmers in getting fertilizer. Thus, the use of fertilizer can be optimized and can increase rice production.

This study was in accordance with [7] where rice production in Malaysia cannot be solved without fertilizer subsidies and farmers cannot afford to buy their own fertilizer. If the fertilizer compensation is complete, it must be given to encourage farmers to buy their own. In order to improve yields and meet increasing demand for rice. This study simulated the impact of NPK fertilizer subsidies on rice production. Simulation results with the decline of incidents died of 4.502 tons per hectare to 3.081 tons per hectare.

The other result was consistent with [8] research in Sri Lanka where the price of subsidized fertilizer influences the use of fertilizer by rice farmers. This study also discussed the fertilizer subsidy program "Kethata Aruna" to increase the use of fertilizer per unit area in previous rice farmers. This
program can also control the use of fertilizer, where previously rice farmers use more urea fertilizer from TSP and MOP fertilizer.

Accordingly, [9] research in Nandi North District, Kenya observed the relationship between corn production with fertilizer subsidy, the amount of fertilizer and the use of certified seed. The utilization of fertilizer also had a positive relationship with the land area owned by farmers. Another result of this study was inadequate transportation costs, input prices and inadequate input supplies were the main challenges being experienced by farmers in Nandi Utara District, Kenya. Therefore, it can be concluded that fertilizer subsidy affected to the production of farming.

4. Conclusion
The policy of fertilizer subsidy in Karanganyar Regency was evaluated from four indicators consisted of exact price, exact place, exact time, and exact quantity. This policy was not effective because the distribution of fertilizer subsidy to farmers still experience some inaccuracies. The production factors of land area, the use of urea fertilizer, the use of NPK fertilizer, and the effectiveness of fertilizer subsidy policy had a positive influence on rice production, while the factor use of labor and the use of seed had no effect on rice production in Karanganyar Regency. The effectiveness of fertilizer subsidy policy had a positive effect on rice production in Karanganyar Regency. This means that the more effective the fertilizer subsidy policy is, the more rice production increases.

The government should improve the mechanism of distribution of fertilizer subsidies because fertilizer subsidy policy was categorized as not effectively. The fertilizer subsidy policy still needs to be implemented and paid more attention in the distribution because based on the research result that the effectiveness of the fertilizer subsidy policy had a positive effect on rice production. In addition, farmers should also pay more attention to other factors such as land area, use of labor, and the use of seeds to provide an increase to rice production.

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