SOCA: Jurnal Sosial Ekonomi Pertanian
Vol. 15, No. 2, May 2021, Page 345 - 356
ISSN: 2615-6628 (E), ISSN: 1411-7177 (P)
Accredited SINTA 2

https://ojs.unud.ac.id/index.php/soca

The Effectiveness of Fertilizer Subsidy: How the Impact to the Production

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Submitted : December 14th, 2020 ; Revised : January 7th, 2021; Accepted: February 6th, 2021

Keywords:
Effectiveness, fertilizer subsidy, highest retail price

Abstract

A lot of budgets had spent by the government on fertilizer subsidies. However, in its implementation there were still many obstacles. Therefore, the effectiveness of subsidies and their impact on production was interesting to study. The aim of this research was to describe the effectiveness of fertilizer subsidies and to determine the impact of the effectiveness of fertilizer subsidies on rice production. This research was conducted in Sukaasih Village, Sukatani Sub-district, Bekasi Regency. The research sample was determined by the multistage sampling method which resulted 109 farmers samples. The data that had been obtained were analyzed using frequency distribution analysis and multiple linear regression. The results showed that the implementation of fertilizer subsidies in Sukaasih Village was not effective. Variables that affected rice production were land area, the use of NPK fertilizer, SP-36, the use of seeds, and the effectiveness of fertilizer subsidies. Therefore, the government needs to tighten the target and application of subsidized fertilizers by collaborating with related parties so that subsidized fertilizers can be effective, on target, and efficient because the effectiveness of subsidized fertilizers affected rice production.

How to Cite (APA 6th Style):
Adiraputra, P., Supyandi, D., & Java, W. (2021). The Effectiveness of Fertilizer Subsidy : How the Impact to the Production. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(2), 345–356
https://doi.org/https://doi.org/10.24843/SOCA.2021.v15.i02.p10

INTRODUCTION

The fertilizer subsidy policy had pros and cons every year to year. On the one hand, the government is still sticking with the fertilizer subsidy policy to maintain food security by maintaining production levels. Production can be maintained to meet food needs by providing good inputs, one of them was fertilizer. The application of adequate fertilizers in quantity, quality and continuity was needed to reduce the regression in soil fertility and increase sustainable productivity (Hartatik, et al., 2015) so that if fertilizer subsidies were reduced, it was feared that it will disrupt productivity. On the other hand, the budget allocation for the fertilizer subsidy policy was very large. The Indonesian government should start cutting the fertilizer subsidy budget and switch it to other programs, especially related to investment in agricultural technology. The development of technology in the agricultural sector had greater benefits and was able to increase long term productivity than fertilizer subsidies that just happened without any progress every year (Asian Development Bank, 2019).

Fertilizer subsidies were still considered necessary because fertilizers had an important role in increasing agricultural production. Fertilizer was an important strategic element in order to increase productivity and was an inseparable part of the farming system in the context of agricultural development. (Darwis and Supriyati, 2013). However, in fact there were still many obstacles that occurred during the application of fertilizer subsidies, such as fertilizer scarcity, prices above HET, fertilizer smuggling abroad, subsidized fertilizer flowed to non-subsidized and inter-regional markets (Kariyasa and Yusdja, 2005). In addition, there was market dualism, unequal distribution, higher subsidy costs compared to the benefits that received. (Susila, 2010). Rizieq (2010) stated that fertilizer prices were higher than HET due to a weak supervision and the difference between allocations and real fertilizer needs in the field.

The Fiscal Policy Agency (2017) also mentioned the problems that arise, including: the fabrication of subsidized and non-subsidized fertilizers, spreading the issue of the scarcity of subsidized fertilizers so the price became expensive, hoarding occurred and the replacement of subsidized fertilizer packaging into unsubsidized fertilizers and so on. As a result, many farmers had not been able to fully experience the benefits of fertilizer subsidies. If we compare the data between fertilizer subsidy allocation and rice production at the national level (Table 1), especially in the 2015-2016 period, changes in the fertilizer subsidy budget allocation were not very linear with rice production, so the effectiveness of the fertilizer subsidy policy can be questioned.

Table 1. National Rice Production of Year 2014-2018

No	Year	Production (ton)	Budget Allocation of Fertilizer Subsidy (trillion rupiah)
1	2014	70.846.465	21,0
2	2015	75.397.841	31,3
3	2016	79.354.767	26,9
4	2017	81.148.594	28,8
5	2018	83.037.150	33,6

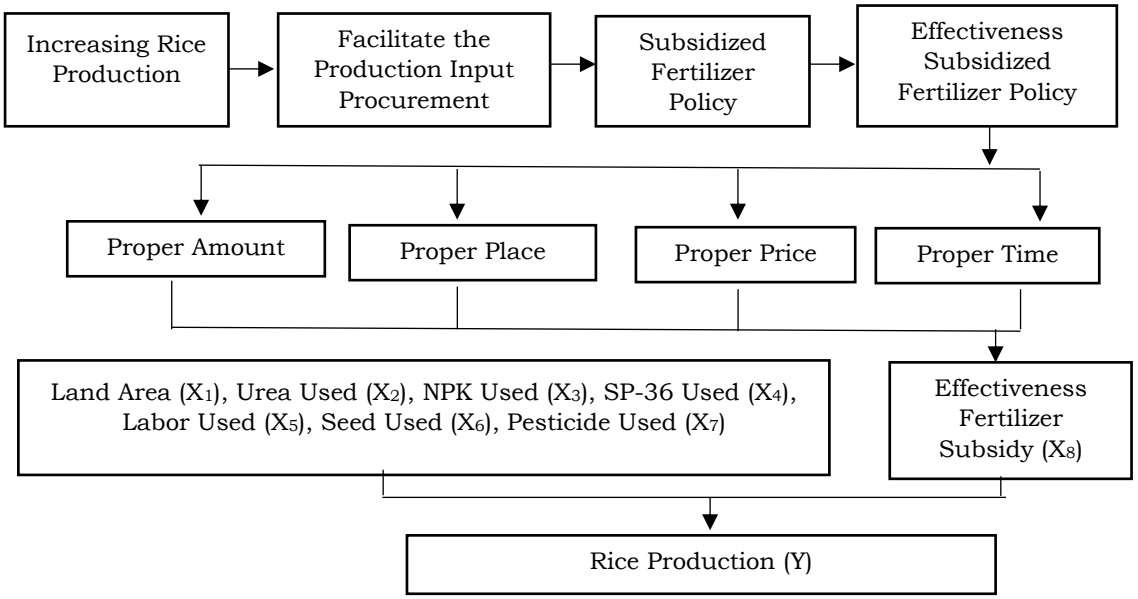
Source: Indonesian Ministry of Agriculture and Indonesian Ministry of Finance, processed (2019)

The effectiveness of fertilizer application was focused on balanced fertilization according to site-specific recommendations or recommended technical standards of fertilizer application. Balanced fertilization must be supported by accessibility to obtain cheap fertilizer (Ministry of Agriculture, 2020). The Ministry of Agriculture formulated policies so that the distribution of subsidized fertilizers can achieve the six proper principles (amount, type, time, place, quality, and price) (Jorgi, et al., 2019). However, two of the six indicators, which were the proper quality and the proper type were not used as indicators because they were difficult to quantify. According to Marisa (2011) the fertilizer subsidy policy based on these four indicators was categorized as ineffective. However, Hariningtyas (2014) stated in his research that the fertilizer subsidy policy in Kendal Regency was very effective on proper time indicators.

The innovation of this research was to examine the effect of fertilizer subsidies effectiveness at the village level, which was in Sukaasih Village and with several different variables. Based on that explanation, research that discussed about the implemented effectiveness of fertilizer subsidy policy including its impact on rice production in Sukaasih Village, Sukatani Sub-district, Bekasi Regency was important to be conducted. Therefore, this research aims to 1) describe the implementation of the fertilizer subsidy policy in Sukaasih Village, Sukatani Sub-district, Bekasi Regency and 2) examine the impact of the effectiveness of fertilizer subsidies on rice production in Sukaasih Village, Sukatani Sub-district, Bekasi Regency.

RESEARCH METHODS

The fertilizer subsidies were a policy to support increasing national rice production. This policy needs to be ensured that its effectiveness was right on target and beneficial for farmers. The measurement of effectiveness was conducted with four indicators. Then the results of the effectiveness measurement were used as one of the variables to determine the factors that affect rice production.



Picture 1. Framework

The research object was the effectiveness level of the fertilizer subsidy and its effect on rice production. Rice was chosen as the research commodity because it was a source of staple food for the Indonesian people. The research was conducted in Sukaasih Village, Sukatani Sub-district, Bekasi Regency. The determination of the research location in Sukatani Sub-district was based on the consideration that Sukatani Sub-district was one of the agricultural areas and one of the sub-districts with the largest allocation of subsidized fertilizers in 2020 in Bekasi Regency. The selection of Sukaasih Village as the research location was based on the reason that Sukaasih Village was the village with the second largest rice field area in Sukatani Sub-district. The research design used was quantitative research with survey methods. The sampling technique used was multistage sampling that produce 109 respondents

The first research aim was analyzed using the calculation of the effectiveness percentage. The effectiveness of the fertilizer subsidy policy was calculated by the effectiveness formula in Table 3. The proper four indicator criteria were presented in Table 2.

Table 2. Proper Four Indicator Criteria

No	Indicator	Criteria
1	Proper Price	Purchase has to be suitable with selected HET. Urea fertilizer: Rp1.800/Kg, NPK: Rp2.300/Kg, SP-36: Rp2.000/Kg, ZA: 1.400/Kg, Organic: Rp500/Kg
2	Proper Time	Must be available every time the farmer need.
3	Proper Place	Farmer must purchase from selected official retail.
4	Proper Amount	Must be in accordance with government advice on fertilizer used. The advice to use NPK compound fertilizer, which were urea of 200 kg/ha and NPK of 300 kg/ha or 200kg/ha urea fertilizer, 100kg/ha SP-36 fertilizer and 100kg/ha NPK fertilizer which based on PUTS and the agreement of association counselor of Sukatani Sub-district.

Source: Arisandi (2016)

Table 3. Fertilizer Effectiveness Formula Based on Proper Four Indicator

a. Proper Price	***b. Proper Place***
Proper price = $\frac{nh}{n}$x 100% Information: nh = Fertilizer purchase that appropriate to HET (person) n = Total respondent	Proper place = $\frac{nt}{n}$x 100% Information: nt = Purchase of subsidized fertilizer at official retail n = Total respondent
c. Proper Time	***d. Proper Amount***
Proper time = $\frac{nw}{n}$x 100% Information: nw = Fertilizer is available when needed (person) n = Total respondent	Proper amount = $\frac{nj}{n}$x 100% Information: nj = Fertilizer used in accordance with what submitted and recommended (person) n = Total respondent

Source: Arisandi (2016)

Table 4. Measurement Parameter of Effectiveness

No	Effectiveness Percentage Interval (k)	Criteria
1	k ≤ 40%	Very ineffective
2	40% ≤ k ≤ 60%	Ineffective
3	60% ≤ k ≤ 80%	Adequate effective
4	80% ≤ k ≤ 90%	Effective
5	90% ≤ k ≤ 100%	Very effective

Source: Arisandi (2016)

The effectiveness valuation criteria were calculated per effectiveness parameter. The measurement can also be conducted to evaluate the effectiveness generally (all parameter) by average the total percentage of four indicator of effectiveness.

The second research aim was analyzed using multiple linear regression. The design of multiple linear regression as follows:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon}$$

Whereas:

Y = Rice Production (Kg),
X_1 = Land Area (Ha),
X_2 = the Used of Urea Fertilizer (Kg),
X_3 = the Used of NPK Fertilizer (Kg),
X_4 = the Used of SP-36 Fertilizer (Kg),
X_5 = Labor Used (person),
X_6 = Seed Used (kg),
X_7 = Pesticide Used (liter),
X_8 = the Effectiveness of Subsidized Fertilizer Policy (%),
β_0 = Constant,
β_i = regression coefficient for X_i (i = 1,2,…8),
ε = *error term*

RESULT AND DISCUSSION

The Effectiveness of Fertilizer Subsidy Policy in Sukaasih Village, Sukatani Sub-district, Bekasi Regency

a. Proper Price

Based on Table 5, the average purchase price of subsidized fertilizer was above the highest retail price. The difference between the purchase price and HET was caused by the retail stall taking too much profit from selling subsidized fertilizers. This happened because there were administrative costs if farmers did not buy fertilizers in cash and transportation costs were charged to farmers.

Table 5. Average purchase price of fertilizer

No	Description	Urea	NPK	SP-36
1	Average purchase price of fertilizer (Rp/kg)	2.013	2.530	2.317
2	Supposed Price (HET) (Rp/kg)	1.800	2.300	2.000
3	Difference (Rp/kg)	213	230	317

Source: Primary data, processed (2020)

All respondents bought subsidized fertilizers that were not in accordance with HET. Stall or retailers that officially sell subsidized fertilizers also did not follow the HET rules in selling subsidized fertilizers. Adnyana and Mokhtar (2019) also stated that the price of subsidized fertilizer received by farmers was different from what was set. The average purchase price of subsidized fertilizer in Malawi was also above the set price because there were farmers who bought at full price or do not get subsidized fertilizer coupons (Holden & Lundeka, 2010).

The farmers in Sukaasih Village did not know about the HET rules. So that, farmers accepted whatever price was set at the stall so that price increases were considered as a natural thing, especially if certain conditions occurred such as scarcity. Therefore, almost all respondents considered that the price of fertilizer received was convenient with expectations.

b. Proper Amount

As of 23.85% of the total respondents had performed fertilizer in accordance with the recommended dose, while the other 76.15% had not performed fertilizer in accordance to the recommended dose. The amount of fertilizer used in each type were varies, some were below the recommendation or above the recommendation. This result was in accordance with the research of Gulati and Banerjee (2015) which stated that the fertilizer subsidy policy in India caused excessive use of fertilizers which lead various problems.

c. Proper Place

All respondents bought subsidized fertilizer at the official supplier that had been determined. Farmers bought subsidized fertilizers at the nearest location, which called Dian Jaya stall located in Sukahurip Village. Dian Jaya stall was determined to be a place to buy subsidized fertilizer for farmers in three villages, which were Sukaasih, Sukahurip, and Banjarsari villages. Overall, respondents said that the Dian Jaya stall was located quite close to the location of their house or rice field and was not difficult in terms of access or transportation. This result was different from the research of Mustapha, et al. (2016) which stated that there were farmers whose residence or farm location was far from the distribution of subsidized fertilizers so they did not get access.

d. Proper Time

A total of 86 respondents or 78.9 percent of the total respondents said that they got fertilizer when it was needed. This means that the level of effectiveness on the proper time indicator can be categorized as effective. This result was different from the research results conducted by Hariningtyas (2014) in Kendal Regency which stated that the effectiveness of fertilizer subsidies on the proper time indicator was categorized as very effective with a percentage of 100%.

Table 6. Percentage of The Effectiveness of Fertilizer Subsidy Policy in Sukaasih Village

No.	Indicator	Proper (%)	Not-Proper (%)	Amount (%)
1	Proper Price	0	100	100
2	Proper Amount	23,85	76,15	100
3	Proper Place	100	0	100
4	Proper Time	78,90	21,10	100
	Average	50,69	49,31	100

Source: primary data, processed (2020)

Based on Table 6, the overall effectiveness was 50.69% which can be categorized as ineffective. This was caused by indicators of the proper price and the proper amount. Fearon, et al. (2015) also stated that the fertilizer subsidy program in Ghana was not effective and efficient even though having a large budget allocation.

The Impact of Subsidized Fertilizer Effectiveness to the Rice Production in Sukaasih Village

The effectiveness of the fertilizer subsidy policy was used as an independent variable in the regression model derived from the results of the effectiveness analysis that discussed previously.

Table 7. Result of Multiple Linear Regression

No	Variable	Regression Coefficient	p-value
1	Constant (C)	-0,877933	0,007*
2	Land Area	2,630687	0,000*
3	Urea Fertilizer	0,0004015	0,836
4	NPK Fertilizer	0,0046854	0,015*
5	SP-36 Fertilizer	0,0061635	0,003*
6	Total Labor	0,2024797	0,186
7	Seed Used	0,057614	0,001*
8	Pesticide Used	0,0871557	0,385
9	Subsidized Fertilizer Effectiveness	0,0141035	0,010*
	R-*square*	0,9328	-
	p-value F test		0,000

Information:
*) Significant on 5% real standard

The regression equation model for the factor that affect rice production in Sukaasih Village was:

$$Y = -0,877933 + 2,630687\ X_1 + 0,0004015\ X_2 + 0,0046854\ X_3 + 0,0061635\ X_4 + 0,2024797\ X_5 + 0,057614\ X_6 + 0,0871557\ X_7 + 0,0141035\ X_8 + \varepsilon$$

Based on Table 7, the value of r-square was 0.9328. The r-square value showed that the dependent variable of rice production in general can be explained by all in the equation, which was 93.28%. The F test value listed in Table 7. was 0.000 < =

0.05. That means all the independent variables contained in the model collectively had a significant effect on the independent variables with a significance level of 5%.

Based on Table 7, the land area variable (X1) had a p-value = 0.000 < = 0.05. This means that the land area had a significant positive effect on the 5% level of significance on the amount of rice production. The regression coefficient value of the land area variable was 2.630687, indicated that each additional 1hectare rice field area will also increase rice production by 2.630687 tons assuming the other independent variables were constant. Ifgayani, et al. (2019) stated that large land ownership will be more efficient when compared to narrow land ownership in rice farming. Tarimo, et al. (2013) also stated that the addition of land for agriculture will increase the production of agricultural commodities as well.

The use of urea fertilizer (X2) had a p-value = 0.836 > = 0.05. This means that the use of urea fertilizer was not significant to rice production at a significant level of 5%. The regression coefficient value from the variable of urea fertilizer used was 0.0004015 which indicated that each additional 1 kg of urea fertilizer that used will also increase rice production by 0.0004015 tons assuming other independent variables were remain. This result was different from the research results conducted by Kusuma (2018) which stated that the use of urea fertilizer can increase rice production for several types of varieties including the Mekongga variety that used by rice farmers in Sukaasih Village, Sukatani Sub-district. In addition, Dembele, et al. (2019) also stated that the use of urea fertilizer can affect production.

The variable of NPK fertilizer used (X3) had a p-value = 0.0015 < = 0.05. This means that the use of NPK fertilizer had a significant effect on production which was on 5% significant level. The regression coefficient value of the use of NPK fertilizer was 0.0046854 indicated that every 1 kg increase in the use of NPK fertilizer will also increase rice production by 0.0046854 tons assuming the other independent variables were constant. The variable of SP-36 fertilizer used (X4) had a p-value = 0.003 < = 0.05. This means that the use of SP-36 fertilizer had a significant effect on rice production at 5% significant level. The regression coefficient value of the use of SP-36 fertilizer was 0.0061635, indicated that every 1 kg increase in the use of SP-36 fertilizer will also increase rice production by 0.0061635 tons assuming the other independent variables were constant. These results were in accordance with the research results by Bachtiar, et al. (2013) which stated that the application of SP-36 fertilizer can increase rice production including dry weight of grain, dry weight of straw, number of tillers, and plant height even without the addition of organic fertilizer.

The variable of total labor (X5) had a p-value = 0.186 > = 0.05. This means that the use of labor had no significant effect on rice production at a significant level of 5%. The value of the regression coefficient of the total labor variable was 0.2024797 which indicated that additional labor of 1 person will also increase rice production by 0.2024797 tons assuming the other independent variables were constant. This result was not in accordance with the research results of Murdiantoro's (2011) which stated that the labor variable had a positive and significant effect on rice production because the majority of respondents used additional workers in almost all stages, from land cultivation to rice harvesting. The use of additional worker outside the land

owner's, the results obtained from each agricultural production process will be more optimal and will ultimately affect the increase in rice production.

Based on the research results, the majority of farmers in Sukaasih Village, Sukatani Sub-district, Bekasi Regency were cultivator who work alone in one area of land so they did not have additional labor. The use of labor in Sukaasih Village usually came from internal sources such as children, wives, or other family members, so that the work will not be too optimal because the majority of farmers in Sukaasih Village only use family labor. These results were in accordance with the research of Kostov, et al. (2018) which stated that family labor was inefficient and not statistically significant.

The use of seeds (X5) had a significant positive effect on the model that used because the variable of seed that used had a p-value = 0.001 < = 0.05. The regression coefficient value of the seed used variable was 0.057614, indicated that every 1 kg increase in the use of seed will also increase rice production by 0.057614 tons assuming the other independent variables were constant. Haque, et al. (2012) also stated that the use of quality seeds can increase rice production. This research results were in accordance with the production theory expressed by Nicholson (1991) that the production function was a function that showed an item that can be produced using an alternative combination of capital (K) and labor (L) or Q = f (K, L). Seed was one of the inputs of agricultural production that can be categorized as capital. All respondents in Sukaasih Village stated that they used certified seeds in accordance with the direction from the counselors and the Agriculture Office of Bekasi Regency, so that they were able to increase rice production compared to uncertified seeds. The use of good production inputs by determining the ideal planting distance can increase production yields.

The use of pesticides (X7) in this research had no significant effect on rice production because it had a p-value = 0.385 > = 0.05. The regression coefficient value of the pesticide used variable was 0.0871557, indicated that each a liter increase in the use of pesticide will also increase rice production by 0.0871557 tons with the assumption that the other independent variables were constant. Susanti, et al. (2019) also stated that the use of pesticides did not have a significant effect on rice production. Different results were stated by Stephenson, et al. (2020) that the use of pesticides at the proper dose can increase production. Based on the research results, the use of pesticides in Sukaasih Village was adjusted to the pests that appeared.

The effectiveness of the fertilizer subsidy (X8) had a positive and significant effect on rice production with a p-value = 0.010 < = 0.05 and a coefficient of 0.0141035. The regression coefficient of the subsidized fertilizer effectiveness variable was 0.0141035. This means that every 1% increase in the percentage of effectiveness will increase rice production by 0.0141035 tons with the assumption that other independent variables were constant. If the effectiveness of fertilizer subsidies was seen per indicator, it was clear that the effectiveness of fertilizer subsidies affected rice production. For example, on the proper time indicator, if farmers did not get subsidized fertilizers on time, the rice that had been planted will miss the ideal period for fertilizing. If farmers did not want to miss this ideal period, they will buy non-subsidized fertilizers which price will be far above subsidized fertilizers. The price difference was certainly a large nominal for farmers and can be

more efficient if allocated to other farming needs to increase production. Dharmveer (2015) also stated that fertilizer subsidies can increase production. However, there were other results from Zaumah and Zakaria (2019) which stated that the fertilizer subsidy program was negatively related to rice production.

CONCLUSION

The fertilizer subsidy policy in Sukaasih Village, Sukatani Sub-district, Bekasi Regency, if reviewed from the four indicators, it can be concluded that it was not effective because farmers did not buy subsidized fertilizers that compatible with the determined price. In addition, the use of subsidized fertilizers in cultivation was still not in accordance with the recommended dose of fertilizer for rice that had been determined. The factors that significantly affected rice production in Sukaasih Village, Sukatani Sub-district, Bekasi Regency were land area, use of NPK and SP-36 fertilizers, use of seeds, and effectiveness of fertilizer subsidies. The use of urea fertilizer, labor, and pesticides did not significantly affect rice production.

RECOMMENDATION

The government must ensure the acceleration and mitigation of obstacles to implementing farmer cards in the regions. The distribution implementation and use of subsidized fertilizers must be tightened with collaboration from related parties so that the recipients and use of subsidized fertilizers can be effective, on target, and efficient because the effectiveness of fertilizer subsidies policies can affect rice production. The lack of this research that it did not participate in assessing the implementation of the farmer card because it was still in the preparation stage in Bekasi Regency. The recommendation for further research was to examine the effectiveness of the farmer card implementation because the farmer card will be used as a requirement for farmers to obtain subsidized fertilizer.

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