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The Effect of Urea and NPK Fertilizer Usage on Farmers Receiving Fertilizer Subsidies

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Abstract. The implementation of subsidized fertilizer policies has been implemented in Indonesia since the 1970s until now. The government's policy of spending a budget to subsidize fertilizer prices has yet to be able to encourage increased productivity of agricultural products. This indicates that the government's efforts in input price subsidies must be more effective in stabilizing rice productivity in terms of the subsidized fertilizer policy expenditure budget. The objectives of this research are 1) to analyze the effectiveness of subsidized fertilizer distribution and 2) to analyze the effect of using urea and NPK fertilizers on farmers who receive fertilizer subsidies for rice production. This research uses primary data by directly interviewing respondent farmers in Kertajati District and Majalengka District, Majalengka Regency. The assessment of the effectiveness of the subsidized fertilizer policy can be measured using six appropriate indicators, namely the exact type, exact quantity, exact price, exact place, exact time, and exact quality. The effect of urea and NPK fertilizers was analyzed using the Cobb-Douglas production function with the ordinary least squares method. This research found that the effectiveness of subsidized fertilizer distribution in Majalengka District has a percentage level of effectiveness above 74.2% (quite effective). Analysis of the effect of using urea and NPK fertilizer shows that the independent variables that positively and significantly influence rice production are seeds, use of urea fertilizer, and labor. Different things happen to the NPK fertilizer, and using a mixture of subsidized and non-subsidized fertilizers has no significant effect on rice production.

Keywords*:* effectiveness; fertilizer usage; ordinary least square; rice production; subsidized fertilizer

INTRODUCTION

Increasing agricultural productivity can realize national agricultural development. One of the production input factors needed in agricultural business activities is fertilizer. Using other production inputs such as superior seeds, air, specifications, and labor will only provide maximum results if fertilizer does not accompany it. Fertilizer doses that do not comply with recommendations will impact low agricultural productivity and farmer income (Suryana et al., 2018). Therefore, the government must ensure that fertilizer is available on the market in terms of quantity, quality, and affordability for farmers. The government intervenes in fertilizer availability by providing fertilizer subsidies for farmers.

Indonesia has implemented a subsidized fertilizer policy since the 1970s. Input price subsidies, domestic gas incentives, and gas subsidies have been implemented in the agricultural sector. Price subsidies are the subsidy systems the government has implemented for the longest time. The price subsidy is calculated based on the difference between the cost of production (HPP) and the highest retail price (HET), and distribution costs multiplied by volume. The Ministry of Agriculture governs the agricultural sector's affairs, including managing fertilizer subsidies. From 2018 to 2021, the realization of the distribution of fertilizer subsidies has changed from IDR 33,612.7 billion in 2018 to IDR 27,155.3 billion in 2021. Budget allocation for fertilizer subsidies for the 2023 State Revenue and Expenditure Budget (APBN) amounts to IDR 25,276.6 billion,

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and is the second highest allocation for non-energy subsidies.

According to Minister of Agriculture Regulation No. 01 of 2024 about "amendments to Minister of Agriculture Regulation number 10 of 2022 concerning procedures for determining the allocation and highest retail price of subsidized fertilizer in the agricultural sector," recipients of subsidized fertilizer are farmers who carry out farming in the food crop subsector (rice, corn, soybeans), horticulture (chilies, shallots, garlic), plantations (coffee, sugar cane, cocoa) with a maximum land area of 2 Ha each planting season and priority is given to small farmers who carry out farming with a maximum land area of 0.5 Ha. Through the regulation, the government limits the types of subsidized fertilizers given to farmers, namely organic fertilizers and inorganic fertilizers in the form of urea and NPK fertilizers. Both fertilizers influence agricultural production significantly, so they are prioritized for subsidies.

The subsidized fertilizer policy in Indonesia has had a good influence on the productivity or income of farmer households. According to Nauly (2019), rice production will increase by 0.8% and farmers' grain prices by 0.24%, caused by an increase in the government's introductory purchase price and fertilizer subsidies of 5% each. In line with research by Hermawan (2014), which states that the subsidized fertilizer policy can increase grain production by 0.046%, and specifically increasing subsidized fertilizer types urea and TSP by 15% will have an impact on increasing rice productivity by 1.23%, harvest area by 1.22%, and rice production by 2.49. Research on subsidized fertilizers on a micro scale has not been widely conducted in Indonesia. In addition, the effect of urea and NPK fertilizer use on productivity needs to be analyzed due to the restrictions on the types of inorganic fertilizers provided by the government since 2022.

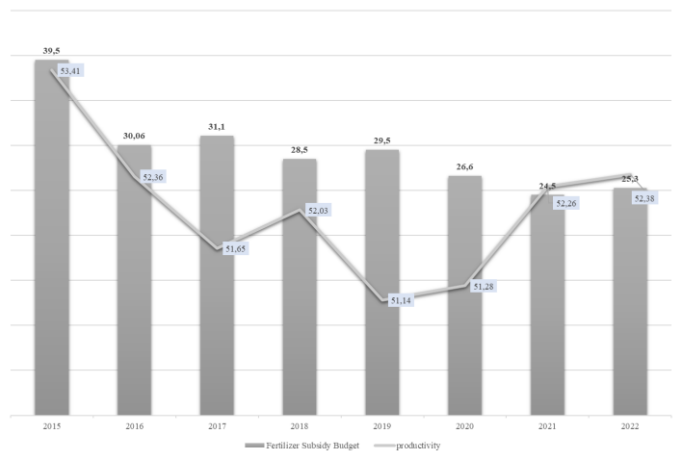

Figure 1. The correlation between the fertilizer subsidy budget and rice productivity (Source: BPS dan Ministry of Finance (2015-2022))

The government's policy of spending a budget to subsidize fertilizer prices has not been able to boost the productivity of agricultural products. This is shown in the rate of Indonesian rice productivity, which has fluctuated in recent years. **Figure 1** shows that the highest rice productivity over the last eight years occurred in 2015. This condition aligns with the government budget for subsidized fertilizer in 2015, IDR 39.5 trillion. In 2018, there was a decrease in the subsidized fertilizer budget, which increased rice productivity. This indicates that the efforts made by the government in the form of input price subsidies need to be more effective in stabilizing rice productivity in terms of the subsidized fertilizer policy expenditure budget. The assessment of the

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effectiveness of the subsidized fertilizer policy can be measured using six appropriate indicators, namely the exact type, exact quantity, exact price, exact place, exact time, and exact quality.

Table 1. Productivity and the number of farmers receiving subsidized fertilizer

District	Harvest area (Ha)	Production (Tons)	Productivity (Tons.Ha^{-1})	Recipient of subsidized fertilizer (farmer groups)
Bandung	47,538	289,205.70	6.08	53,211
Kuningan	48,250	277,583.76	5.75	37,804
Majalengka	100,951	566,087.34	5.61	43,287
Indramayu	245,329	1,482,255.86	6.04	40,596
Subang	177,986	1,038,780.58	5.84	42,302
Purwakarta	34,397	188,731.69	5.49	14,591
Karawang	204,326	1,226,880.08	6.00	38,276

Source: Ministry of Agriculture (2022)

Majalengka Regency is one of the largest rice producers in West Java Province, with rice productivity of 5.61 Tons.Ha^{-1} in 2022. Based on data from the Ministry of Agriculture (2022), Majalengka Regency has the second largest number of farmer groups receiving fertilizer, namely 42,302 farmer groups. **Table 1** shows productivity data and the number of farmers receiving subsidized fertilizer in more detail. Regarding rice productivity, the Majalengka Regency's productivity is still lower than the Karawang Regency's, with as many as 38,276 farmer groups receiving subsidized fertilizer. Therefore, this research aims to examine the effectiveness of subsidized fertilizer policies and the influence of their use in the Majalengka Regency.

METHODS

The research was conducted in April-June 2024. Primary data was collected in Kertajati District and Majalengka District, Majalengka Regency. The consideration for determining the research location in Majalengka Regency was because the area had the second largest number of subsidized fertilizer recipients in West Java Province, amounting to 43,287 farmer groups in 2022. The selection of the sub-district was based on information from the Agriculture and Fisheries Service of Majalengka Regency, which stated that the two sub-districts were areas with the most significant number of farmers receiving subsidized fertilizer for rice commodities.

Method of collecting data

The types of data used in this research are primary and secondary. Primary data was obtained by directly interviewing respondent farmers in Kertajati District and Majalengka District. Secondary data was obtained from the Ministry of Agriculture, the Ministry of Trade, the Central Statistics Agency, and the Majalengka Regency Food Security, Agriculture and Fisheries Service to support the analysis.

The sampling technique for analyzing distribution effectiveness and the influence of subsidized fertilizers was intentionally carried out (Purposive Sampling). The determination of the number of samples in the study refers to the Slovin formula with a 10% error rate; a minimum sample size of 100 people was obtained with Equation 1.

$$n = \frac{N}{1+N(e)^2} = \frac{43.287}{1+43.287(0,1)^2} = 99,76 \approx 100 \text{ respondents} \quad \ldots 1)$$

where; n = number of samples, N = number of population, e = critical value/error Actual information acquisition in the field was conducted on 100 respondent farmers, namely 50 farmers who only use subsidized fertilizers and 50 farmers who mix subsidized fertilizers with non-subsidized fertilizers.

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Data Analysis Methods

Analysis of the effectiveness and influence of using urea and NPK fertilizers is divided into two stages of work. The effectiveness of the subsidized fertilizer policy is measured based on six indicators called the six correct principles, namely the exact type, quantity, price, place, time, and quality. The indicators used in this research focus on four indicators, namely, exact price, exact place, exact time, and exact quantity, because these four indicators can be quantified and interpreted. The effectiveness of the subsidized fertilizer policy can be calculated using the effectiveness formula in **Table 2**.

Table 2 Formulation of Effectiveness of Urea and NPK Fertilizer Distribution

Exact Price	**Exact Place**
Exact Price = $\frac{Nh}{N}$ x 100% note; Nh = Number of sample farmers who obtained fertilizer according to HET (people) N = Total number of sample farmers (people)	Exact Place = $\frac{Nt}{N}$ x 100% note; Nt = Number of sample farmers who buy fertilizer at authorized retailers (people) N = Total number of sample farmers (people)
Timely	**Exact Quantity**
Timely = $\frac{Nw}{N}$ x 100% note; Nh = Number of sample farmers who think fertilizer is available when needed (people) N = Total number of sample farmers (people)	Exact Quantity = $\frac{Nj}{N}$ x 100% note; Nt = Number of sample farmers who do the fertilization according to the allocation fertilizer subsidy (people) N = Total number of sample farmers (people)

Effectiveness Assessment Criteria are divided into five classifications, namely very ineffective ($k \leq 40\%$), ineffective ($40\% \leq k \leq 60\%$), quite effective ($60\% \leq k \leq 80\%$), practical ($80\% \leq k \leq 90\%$), very effective ($90\% \leq k \leq 100\%$).
Source: Arisandi et al. (2016) in Mulyadiana et al. (2018)

Analysis of the effect of using urea and NPK fertilizers on farmers receiving subsidized fertilizer assistance was carried out using the Cobb-Douglas production function. The multiple linear regression model built to answer this aim is presented in Equation 2.

$$\ln Y = \alpha_0+\beta_1 \ln X1 +\beta_2 \ln X2 + \beta_3 \ln X3 + \beta_4 \ln X4 + \beta_5 X5 + \varepsilon \quad (2)$$

Note:
E = *error term*, Y = Rice production (kg), X1 = Use of seed (kg), X2 = Use of urea fertilizer (kg), X3 = Use of NPK fertilizer (kg), X4 = Use of labor (HKO), X5 = *dummy* use of subsidized fertilizer, 0 : Only use subsidized fertilizer, 1: use subsidized + non subsidized fertilizer.

This study conducted a classical assumption test to achieve the Best Linear Unbiased Estimator (BLUE) estimator, fulfilling certain assumptions in the linear regression model. The tests carried out include normality tests, multicollinearity tests, heteroscedasticity tests, and autocorrelation tests.

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RESULT AND DISCUSSION

Analysis of the effectiveness of subsidized fertilizer policies

Effectiveness is an approach used to assess the success and achievement of program objectives implemented. The subsidized fertilizer policy is considered successful if farmers can receive benefits through the ease of providing fertilizer as a production input. The research focused only on four principles that can be measured and interpreted: exact price, time, place, and quantity. The research was conducted using direct interviews with farmers who received subsidized fertilizer in 2023 so that the effectiveness of the subsidized fertilizer policy was measured from the farmers' perspective as beneficiaries. In more detail, **Table 3** will describe the characteristics of the respondent farmers in this study.

Table 3 Characteristics of farmers

Characteristics	Information	Amount (people)	Percentage (%)
Age (years)	≤30	4	4.0
	31-50	37	37.0
	51-63	32	32.0
	≥64	27	27.0
	Sum	100	100.0
	Minimum		28
	Maximum		78
Level of Education	S2	1	1.0
	S1	3	3.0
	SMA	18	18.0
	SMP	13	13.0
	SD	65	65.0
	Total	100	100.0
Farming experience (years)	≤10	19	19.0
	11-30	49	49.0
	31-40	15	15.0
	41-50	14	14.0
	51-60	3	3.0
	Total	100	100.0
Land ownership	profit sharing	9	9.0
	owned land	53	53.0
	rent	38	38.0
	Total	100	100.0

Source: primary data (2024)

Exact price

Price accuracy at the farm level refers to the highest retail price set by the Ministry of Agriculture for subsidized fertilizer. The Decree of the Minister of Agriculture (Kepmentan) Number 734 of 2022 sets the highest retail price (HET) for subsidized fertilizer for 2023 at IDR 2,250/kg for urea fertilizer and IDR 2,300/kg for NPK fertilizer. Based on the results of filling out the questionnaire by 100 respondent farmers, 61 people bought urea fertilizer according to the HET, and 63 people bought NPK fertilizer according to the HET. Therefore, it can be said that the appropriate level of effectiveness of subsidized fertilizer prices in Kertajati

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District and Majalengka District is in the "quite effective" category. This is indicated by the effectiveness level value of 61.0% for urea fertilizer and 63.0% for NPK fertilizer.

Findings in the field show that there are sales of subsidized fertilizer above the HET, with the highest price paid by farmers receiving subsidized fertilizer for urea fertilizer of IDR 2,700/kg and for NPK fertilizer of IDR 2,800/kg. The farmer's purchase price above the HET is caused by transaction costs from the retail kiosk to the recipient farmer's location, which the farmer bears. Apart from that, the subsidized fertilizer received by the kiosk is in 50 kg packaging, while the redemption is made by farmers in retail form. This also causes kiosks to apply prices above HET for repackaging and shrinkage costs. Adnyana and Mohktar (2019) stated that the difference in the price of subsidized fertilizer received by farmers was because there was a reasonably long distribution chain distributing subsidized fertilizer, causing prices to be higher and potentially reducing the availability of subsidized fertilizer.

Timely

Timeliness regarding the availability of subsidized fertilizer at retail kiosks when farmers need it. The indicators used in this research were obtained based on information from respondent farmers regarding the availability of subsidized fertilizer when needed by respondent farmers. Delays in the distribution of subsidized fertilizer can cause fertilizer shortages at the farmer level. In this regard, subsidized fertilizer producers and distributors have a critical role in ensuring the availability of subsidized fertilizer.

The results of interviews with respondent farmers stated that 61 respondents assessed that subsidized fertilizer was available on time before the planting season, while 39 respondent farmers stated the opposite. So, the effectiveness of the timely distribution of subsidized fertilizer in Majalengka Regency is included in the "quite effective" category with a percentage value of 61.0% in the range of 60%≤ k ≤80%. Based on farmer information, respondents found that the delay was no more than 2 to 3 days, so farmers usually wait for the availability of subsidized fertilizer. The anticipation carried out by several respondent farmers was to immediately make redemptions at the beginning when the subsidized fertilizer was available at retail kiosks, so that it would not interfere with fertilization activities. The role of producers and distributors is the primary determinant in reducing delays in providing subsidized fertilizer to farmers.

According to Dacholfany (2023) , PT. Pupuk Indonesia, as a producer and distributor of subsidized fertilizer, has made special efforts so that the distribution of urea fertilizer is smooth and timely. This effort is to impose fines on transportation service providers if they need to arrive on time to pick up/load commodities at the original warehouse or are late in making deliveries, so that the warehouse receives the urea fertilizer late. The fine imposed on transportation service providers is 2% per day, with a maximum of 5% of the number of commodities sent from the origin warehouse, but delayed delivery at the destination warehouse.

Exact Place

The exact place in the distribution of subsidized fertilizer means how producers can distribute subsidized fertilizer to designated areas (Zulaiha et al., 2018). From the perspective of the recipient farmer, the exact place means that the subsidized fertilizer retail kiosk is available near the farmer's house or land so that the redemption process can be carried out quickly. PT Pupuk Indonesia, as a subsidized fertilizer producer, includes requirements for prospective distributors, namely having a distribution network, which is demonstrated by having at least 2 (two) retail kiosks in each sub-district and village in its area of responsibility. This is done to ensure that the appropriate indicators for the distribution of subsidized fertilizer can be met.

The interviews with farmers showed that 86 farmer respondents thought that the

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subsidized fertilizer kiosk was in the correct location. In comparison, fourteen farmer respondents thought the subsidized fertilizer kiosk was too far away, so farmers receiving subsidized fertilizer needed more time to get to the retail kiosk. The indicator of the level of effectiveness in Majalengka Regency is in the 'effective' category. This is shown by the percentage of recipients of subsidized fertilizer at the exact location at a distance of 80% ≤ k ≤ 90, namely 90% of the total respondents.

Exact Quantity

The exact quantity of subsidized fertilizer distributed is related to the fulfillment of subsidized fertilizer allocation by PT. Indonesian fertilizer that the Ministry of Agriculture has determined. The dose of NPK and Urea compound fertilizer for rice commodities in Majalengka Regency, as stated in Minister of Agriculture Regulation Number 13 of 2022 concerning the Use of NPK Fertilizer Doses for Rice, Corn, and Soybeans on Rice Fields, is 250 kg.ha^{-1} for NPK 15 fertilizer-10-12 and 275 kg.ha^{-1} for urea fertilizer (Kementerian Pertanian, 2022). The government's subsidized fertilizer must fully meet the required dosage. Kertajati District allocates subsidized fertilizer for rice plants, amounting to 212 kg.ha^{-1} for urea fertilizer and 62 kg.ha^{-1} for NPK fertilizer. In comparison, Majalengka District allocates subsidized fertilizer for rice plants, amounting to 239 kg.ha^{-1} for urea fertilizer and 65 kg.ha^{-1} for NPK fertilizer.

Respondent farmers in Kertajati District and Majalengka District all stated that the amount of subsidized fertilizer redeemed was based on what was stated in the determined allocation. This indicates that the level of effectiveness of subsidized fertilizer in the "very effective" category is indicated by the percentage of recipients of subsidized fertilizer in the exact place in the range 90%≤ k ≤100%, namely 100% of the total respondents. However, the subsidized fertilizer allocation determined does not meet the dosage recommended by the government. To overcome this problem, respondent farmers were divided into groups of farmers who only used subsidized fertilizer with government allocations and those who bought non-subsidized fertilizer at higher prices.

Effectiveness of Subsidized Fertilizer Policy

The approach to assessing the effectiveness of the subsidized fertilizer policy in terms of benefits for farmers in this research shows that Majalengka Regency has a percentage level of effectiveness of 75,32% (quite effective) for the effectiveness of the exact price, exact place, exact time, and exact quantity. This detail can be shown in **Table 4** below.

Table 4 Percentage level of effectiveness of subsidized fertilizer policy

Effectiveness	Exact (%)	Not Exact (%)
Price (urea)	61.0	39.0
Price (NPK)	63.0	37.0
Place	86.0	14.0
Time	61.0	39.0
Quantity	100.0	0.00
Average	74.2	

Source: Primary data (2024)

Problems that arise in the distribution of subsidized fertilizer in Majalengka Regency include selling prices above the HET, scarcity of subsidized fertilizer during the planting season, retail kiosks that are far from farmers' locations, and the amount of allocation given does not meet the government's recommended fertilizer dosage. Therefore, the government needs to increase supervision of the distribution of subsidized fertilizer by involving regional governments and extension workers at the sub-district level. Apart from the farmers' side as beneficiaries, Zulaiha et al. (2018) researched the effectiveness of subsidized fertilizer policies from the producer and distributor side. The results of this research provide suggestions for the government to establish a mechanism for achieving the six appropriate indicators to evaluate the success of subsidized fertilizer distribution assigned to PT Pupuk Indonesia. Assessment and evaluation should be carried

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out by an independent third party so that the assessment becomes more objective.

The Effect of Urea and NPK Fertilizer Usage on Farmers Receiving Fertilizer Subsidies

This research aims to analyze the effect of urea and NPK fertilizers on rice production among farmers who receive subsidized fertilizers. The analysis was carried out using the Cobb-Douglas production function model and estimated using the OLS (Ordinary Least Squares) method. The software used in this analysis is EViews 12. The independent variables in this analysis are the number of seeds used, the number of uses of urea and NPK fertilizers, and the number of workers, with a dummy variable divided into farmers who only use subsidized fertilizers and farmers who mix the use of subsidized fertilizers with fertilizers. Non-subsidized. This study uses a cross-sectional data type, namely data collected from many respondents at a certain point in time, namely in 2023. This is a limitation of the research conducted, considering that policies related to subsidized fertilizer types, namely urea and NPK fertilizers, began to be implemented that year.

R-squared (R^2) from the regression model equation is 0.79. This value illustrates that 79% of the dependent variation in rice production is caused by the combined influence of independent variables: seeds, urea, NPK, labor, and dummy use of subsidized and non-subsidized fertilizers. In comparison, other factors outside the model influence the remaining 21%. The results of the production function estimation show that the coefficients of the independent variables in the rice production function have a positive sign, namely seeds, urea fertilizer, labor, and the dummy for the use of subsidized fertilizer. The negative sign is found in the coefficient of the independent variable using NPK fertilizer. In more detail, the results of the production function estimation can be seen in **Table 5**. This condition does not follow the assumption of the Cobb-Douglas production function, where all variable coefficients used in the model should have a positive sign. However, this may occur under certain conditions, showing that using NPK fertilizer causes a decrease in rice production.

Table 5 Estimated results of the rice production function in Majalengka Regency in 2023

Variabel	Coefficient	Standard-error	T-Calculation	Prob.
Constanta	1.468	0.147	9.987	0.000
Seed	0.791***	0.115	6.901	0.000
Urea Fertilizer	0.273**	0.120	2.273	0.025
NPK Fertilizer	-0.098	0.081	-1.212	0.228
Labor	0.335***	0.079	4.264	0.000
Dummy	0.069	0.045	1.529	0.129
R-squared	0.790			
Adj R-squared	0.779			

Note: *** : significant on α 1%, ** : significant on α 5%

Seed input has a positive variable coefficient sign, meaning that its use can increase production and is significant at the α=1 percent level. The coefficient value of the seed variable is 0.791, which indicates that every 1% increase in seeds can increase rice production by 0.791%, assuming the use of other inputs is constant (ceteris paribus). These results align with research by Sularso & Sutanto (2020), which states that seed variables have a natural effect on rice production at a 90% confidence level. Seeds are very influential in determining the success of the production of a farming business. The higher the quality of the seeds used, the

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higher the production quality will be (Fadillah, 2022).

Using fertilizer is an essential part of meeting the nutrient needs of plants. The input for urea fertilizer in the estimation results has a positive coefficient sign. This means urea fertilizer can increase production significantly at the α=5 percent level. The coefficient value of the urea fertilizer variable is 0.273, which indicates that every 1% increase in urea fertilizer use can increase rice production by 0.273%, assuming the use of other inputs is constant (ceteris paribus). These results align with research by Ani et al. (2024), which states that the use of urea fertilizer significantly affects rice productivity. This is supported by research by Sukmawati et al. (2021), which states that urea fertilizer effectively increases the production of 1000 rice grains by 27.25 in the 200 kg.ha^{-1} treatment. The nitrogen content in urea fertilizer is helpful as a source of nutrition for plants to produce protein and chlorophyll, and can increase plant dry weight and yield.

The NPK fertilizer input in the estimation results has a negative coefficient sign, that is, it is considered to have the effect of reducing rice production, but has no natural effect. This is indicated by the significance value exceeding the α = 10 percent level. The coefficient value of the NPK fertilizer input variable is 0.098, which indicates that every 1% increase in NPK fertilizer use can reduce rice production by 0.098%, assuming the use of other inputs is constant (ceteris paribus). As stated previously, this is not based on the assumption of the Cobb-Douglas production function, which states that all independent variables in the model positively correlate with the dependent variable, rice production. In line with research in Sidera Village, Sigi Biromaru District, Sigi Regency, and research by Walis et al. (2021) in Pamotan Village, Kalipucang District, Pangandaran Regency. Both studies also stated that NPK fertilizer had no natural effect on rice production. This allegedly happened because the dosage of NPK fertilizer used by farmers in Sidera Village did not match the recommendations, so it needed to be increased. On the other hand, adding too much NPK fertilizer or insufficient NPK fertilizer can disturb plant growth and make it suboptimal. Widyastutik et al. (2022) stated that the NPK fertilization carried out by farmers is not only influenced by the combination of NPK formulas used, but also by how farmers apply the fertilizer will also greatly influence plant productivity. The field survey results found that farmers often fertilize excessively due to farmers' need to understand the nutrient conditions in the soil and the nutritional needs of rice plants. This is considered to trigger agricultural cultivation activities to become ineffective and optimal, thereby affecting crop production.

The labor variable has a positive coefficient sign, which means that labor can increase production and is significant at the α=1 percent level. The coefficient value of the labor input variable is 0.335, which indicates that every 1% increase in labor can increase rice production by 0.335%, assuming the use of other inputs is constant (ceteris paribus). This is in line with research by Sukmayanto et al. (2022) and Apriani et al. (2018), which states that increasing the workforce involved in farming will increase rice production through more intensive management. Canon et al. (2018) stated that labor outside the family used in farming significantly influences production, while labor within the family does not have a significant effect. Workers outside the family are agricultural workers who are given wages to help in the farming process, so they are thought to have more commitment to carrying out their work. Therefore, increasing the number of workers outside the family will significantly affect production.

The allocation of subsidized fertilizer in 2023 cannot meet the needs of rice commodity farmers in the Majalengka Regency. As stated in the Regulation of the Minister of Agriculture, Number 13 of 2022,

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concerning the Use of N, P, K Fertilizer Doses for Rice, Corn, and Soybeans on Rice Fields for rice commodities in Majalengka Regency is 250 kg.ha^{-1} for NPK 15-10-12 fertilizer and equal to 275 kg.ha^{-1} for urea fertilizer. The dummy variable for the use of subsidized fertilizer has a positive coefficient sign with a regression coefficient value of 0.069. The estimation results show that farmers who mix the use of subsidized and non-subsidized fertilizers have a production level that is 0.069 times higher than farmers who only use subsidized fertilizers, with the assumption that the use of other inputs is constant (ceteris paribus). However, because the significance value exceeds the α = 10 percent level, the dummy variable for subsidized fertilizer has no natural effect in this research.

The results of direct interviews with respondent farmers in Majalengka District and Kertajati District provide information that farmers in these two Districts are accustomed to fertilizing at a dose of 600 kg.ha^{-1} for all types of fertilizer used. The fertilizer dosage is based on the rice farming production experience that the respondent farmers have carried out. This dose is higher than the fertilizer dose recommended by the government through Minister of Agriculture Regulation Number 13 of 2022. The exciting thing is that groups of farmers who only use subsidized fertilizer can use fertilizer at doses above the government's recommendation. In contrast, the allocation given by the government needs to be increased. Based on the interviews with respondent farmers, information was obtained that respondent farmers with these conditions purchased subsidized fertilizer quotas from relatives or other farmers.

Respondent farmers still use chemical pesticides to control pests and diseases during the crop growth period. Based on the results of the interviews, it is known that the reason for using chemical pesticides is that farmers can quickly obtain chemical pesticides at the nearest kiosk. It is just that farmers still need a more robust understanding of the active substances contained in chemical pesticides. This is by Situmorang et al., (2021), who stated that farmers are more focused on the risk of crop failure compared to the negative impacts that will arise from the use of chemical pesticides. Research by Sutarni & Fitri, (2023) states that farming without chemical pesticides is more feasible, profitable, and environmentally friendly. In line with Linda et al., (2018) Implementing non-chemical inputs can reduce ecological damage to farming, which is one of the efforts to increase rice production through good management of rice farming. Therefore, it is necessary to increase supervision regarding subsidized fertilizers up to the realization of their use by recipient farmers.

The current implementation of a subsidized fertilizer policy does not consider the condition and characteristics of the land. This condition can cause anomalies, such as using fertilizers that do not affect crop production. This is supported by research results showing that the use of NPK fertilizers by farmers receiving subsidized fertilizers is insignificant for rice production. It is hoped that the subsidized fertilizer policy will consider land conditions so that the subsidized fertilizer assistance provided by the government is needed.

CONCLUSION

The analysis of the effectiveness of subsidized fertilizer distribution in Majalengka Regency has an effectiveness level of 74.2% (quite effective) for the right price, place, time, and amount. However, the government needs to improve supervision related to the distribution of subsidized fertilizer by compiling a mechanism for achieving the six appropriate indicators in more detail. It is necessary to increase the involvement of local governments and extension workers in supervising subsidized fertilizers, especially regarding the realization of their use by farmers. The results of the Cobb-Douglas production function estimation using the Ordinary Least Squares method state that the independent variables of

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seeds, use of urea fertilizer, and labor have a real and significant effect on rice production for farmers receiving fertilizer subsidies in Majalengka Regency. The use of NPK fertilizer has no real and significant effect on rice production. This is thought to occur because NPK fertilizer has caused soil saturation, disrupting growth. An analysis of land conditions in Indonesia is needed, so that the use of subsidized fertilizer is based on the needs of the land.

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