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Analysis Of The Effectiveness Of Fertilizer Subsidies On The Success Of Maize Farming In Dutohe Village, Kabila District, Bone Bolango Regency

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Abstract

This study analyzes the effectiveness of subsidized fertilizer distribution based on the "6R" principles and its impact on the success of maize farming in Dutohe Village, Bone Bolango Regency. A descriptive quantitative method was employed, utilizing multiple linear regression analysis on a saturated sample of 55 farmers. The results indicate that both fertilizer distribution (91.47%) and farming success (91.54%) were classified as "highly effective," with the 6T principles collectively contributing 84% to farming success ($F = 48.148$; $p < 0.05$; Adjusted $R^2 = 0.840$). Individually, the variables of Right Quality ($\beta = 0.383$), Right Location ($\beta = 0.233$), Right Quantity ($\beta = 0.144$), Right Type ($\beta = 0.121$), and Right Price ($\beta = 0.116$) had a positive and significant influence, whereas the Right Time variable had a negative influence ($\beta = -0.427$); this confirms that distribution delays extending beyond the initial growth phase can reduce crop yields, making scheduling precision and fertilizer quality the primary keys to farming success.

Keywords: Subsidy effectiveness, subsidized fertilizer, farming success, maize.

INTRODUCTION

The agricultural sector is a cornerstone of Indonesia's economy, serving not only as a provider of food but also as a source of livelihood for the majority of the rural population. Among various food commodities, maize holds the second most strategic position after rice, owing to its role as both a staple food and a primary raw material for the animal feed industry (Sulardi., 2021).

Under Law Number 18 of 2012, the national food system establishes food sovereignty and self-sufficiency as the guiding spirit and foundation for national food development. Improving the agricultural sector's performance is inextricably linked to the factors of production such as fertilizer that influence it. Fertilizer plays a significant role in replenishing soil nutrients essential for optimal plant growth. Regulation of the Minister of

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Trade No. 15/M-DAG/PER/4/2013, which governs the procurement and distribution of subsidized fertilizer for the agricultural sector, is highly relevant when discussing the effectiveness of fertilizer distribution.

Fertilizer is a key input for increasing food crop productivity. Fertilizer subsidy policies aim to enhance the performance of the agricultural sector, particularly the food crop sub-sector. This aligns with the Regulation of the Minister of Agriculture regarding the implementing regulations for Presidential Regulation Number 6 of 2025 (Article 1, Paragraph 2), which defines "Subsidized Fertilizer" as fertilizer whose procurement and distribution are subsidized by the Government to meet the needs of farmers and fish cultivators, carried out under Government programs in the agriculture and fisheries sectors".

The implementation of subsidized fertilizer distribution must meet six criteria to ensure the program's success; right location, right price, right type, right time, right quantity, and right quality (Nuryanti et al., 2023). Dutohe Village, an area with significant potential for maize cultivation, is included in the subsidized fertilizer program for Kabila District, Bone Bolango Regency. The following data outlines farmers' use of subsidized fertilizer over the three-year period from 2023 to 2025:

Table 1. Subsidized Fertilizer Usage Data

Year	Subsidized Fertilizer		Land (Ha)
	UREA	NPK	
2023	18,723 Ton	14,994 Ton	74,97 Ha
2024	10,095 Ton	7,938 Ton	77,25 Ha
2025	20,850 Ton	29,181 Ton	83,31 Ha

Source: Kabila Agricultural Extension Center

The use of subsidized fertilizers (Urea and NPK) in the study area has fluctuated significantly. In 2024, usage plummeted from 33,717 tons to 18,033 tons due to allocation restrictions and stricter recipient criteria implemented via the e-RDKK system. However, 2025 saw a dramatic surge to 50,031 tons as the cultivated land area expanded to 83.31 hectares, driven by a policy to increase the national subsidy quota for the recovery of the food sector.

Given the background outlined above, this research is necessary; the instability of fertilizer supply and uptake occurring amidst an expansion of cultivated land creates an urgent need to examine the extent of its impact on farmers' yields. Consequently, this study focuses on "Analysis of the Effectiveness of Fertilizer Subsidies on the Success of Maize Farming in Dutohe Village, Kabila District, Bone Bolango Regency".

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RESEARCH METHOD

This study employs a quantitative approach grounded in the philosophy of positivism. This method is used to test hypotheses regarding a specific population or sample through data collection using research instruments and statistical analysis (Borg & Gall, 1989, as cited in (Sugiyono, 2023)).

This study combines primary data (obtained directly from farmers) and secondary data (official documents) sourced via the Kabila Agricultural Extension Center to ensure the validity of the information. Employing a quantitative descriptive method, the study not only captures actual field conditions but also provides precise figures regarding achieved productivity. Data collection was conducted using three methods: questionnaires, observation, and documentation.

The study population consists of farmers in Dutohe Village, Kabila District, Bone Bolango Regency. There are 55 farmers who have been active from 2025 to the present; consequently, this entire group constitutes the study population.

Descriptive statistical analysis using actual and ideal scores aims to determine the extent of a variable's achievement specifically, subsidy effectiveness and farming success relative to the established maximum standard. Determine the achievement level (percentage) using the following formula; Achievement Percentage = (Total Actual Score / Total Ideal Score) × 100%. Based on the achievement percentage, determine the success category using score interpretation criteria:

Table 2. Score interpretation criteria

Percentage of achievement	Effectiveness Category
81% – 100%	Very High / Highly Effective
61% – 80%	High / Effective
41% – 60%	Moderate / Moderately Effective
21% – 40%	Low / Less Effective
0% – 20%	Very Low / Ineffective

RESULTS AND DISCUSSION

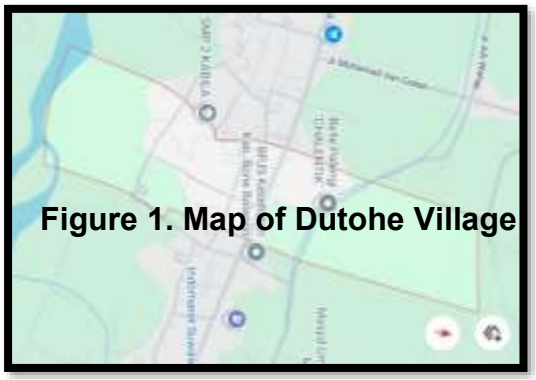


Figure 1. Map of Dutohe Village

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Dutohe Village is located in the Kabila District of Bone Bolango Regency, Gorontalo Province. Geographically, the village is situated in a strategic lowland area with good transportation accessibility, linking local agricultural hubs to trade centers at both the district and regency levels. The administrative boundaries of Dutohe Village are as follows:

- North: Borders Iloheluma Village
- South: Borders Panggulo Village
- East: Borders Tinelo Village
- West: Borders Dutohe Barat Village

The Effectiveness of Fertilizer Subsidy Distribution for Corn Farmers in Dutohe Village

The average 6R (Right Quantity, Type, Quality, Price, Place, and Time) is as follows:

Table 3. Average 6R

Number	Indicator	Percentage (%)	Criteria
1.	Right Quantity	93,21%	Highly Effective
2.	Right Type	91,15%	Highly Effective
3.	Right Quality	91,03%	Highly Effective
4.	Right Price	90,18%	Highly Effective
5.	Right Place	91,03%	Highly Effective
6.	Right Time	92,24%	Highly Effective

Source: Processed primary data (2026)

The table above indicates that the provision of fertilizer to farmers in Dutohe Village is effective in terms of 6R ; the average is calculated as follows:

Effectiveness = Total average / 6 × 100%
Effectiveness = 548.84 / 6 × 100%
Effectiveness = 91.47%

Based on calculations, the average effectiveness of subsidized fertilizer in Dutohe Village is 91.47%, placing it in the "highly effective" category. This aligns with research by (Ramlayana et al, 2020), which indicates that the fertilizer subsidy policy is a fiscal measure aimed at boosting agricultural production particularly of food crops to ensure the population's food needs are met.

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Success Rate of Corn Farming in Dutohe Village

The respondent data showing the impact of subsidized fertilizer on corn farmers' yield, productivity, and income in Dutohe Village is presented below:

Table 4. Results of Analysis of Respondent Responses to Farming Business Success Variables

Statement Score									
Number	**F1**	**F2**	**F3**	**F4**	**F5**	**Actual**	**Ideal**	**%**	**Criteria**
Statement 1	0	0	0	10	45	265	275	96,36%	Highly Effective
Statement 2	0	0	0	27	28	248	275	90,18%	Highly Effective
Statement 3	0	0	0	35	20	240	275	87,27%	Highly Effective
Statement 4	0	0	0	21	34	254	275	92,36%	Highly Effective
Statement 5	0	0	0	16	39	259	275	94,18%	Highly Effective
Statement 6	0	0	0	21	34	254	275	92,36%	Highly Effective
Statement 7	0	0	0	21	34	254	275	92,36%	Highly Effective
Statement 8	0	0	0	24	31	251	275	91,27%	Highly Effective
Statement 9	0	0	0	26	29	249	275	90,54%	Highly Effective
Statement 10	0	0	0	26	29	249	275	90,54%	Highly Effective
Statement 11	0	0	0	21	34	254	275	92,36%	Highly Effective
Statement 12	0	0	0	31	24	244	275	88,72%	Highly Effective
Total	**0**	**0**	**0**	**279**	**381**	**3.021**	**3.300**	**91,54%**	Highly Effective

Source: Processed primary data (2026)

Based on the table, maize farming success in Dutohe Village falls within the "Very Effective" category, achieving 91.54% (total score 3,021 out of 3,300). Across all 12 items, Statement 1 scored the highest at 96.36% and Statement 3 the lowest at 87.27%

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both remaining "Very Effective." With responses concentrated on scales F4 and F5, maize farming implementation in Dutohe Village is highly optimal.

Validity and Reliability Testing

A validity test is conducted to measure the accuracy and precision of a research instrument in performing its measurement function. The validity decision is determined by comparing the calculated r-value (r-calculated) with the table r-value (r-table) based on the degrees of freedom (df). With a sample size of 30 respondents (n=30), the degrees of freedom used is df=28 (30-2). At a significance level of 5% (α=0.05), the r_table value is 0.361. The decision-making criteria for the validity test are as follows: if r-calculated > r-table, the statement item is considered valid; if r-calculated ≤ r-table, the statement item is considered invalid. A summary of the validity test results for all research variables is presented in the following table:

Table 5. Validity Test

VARIABLE	Items	Calculated R	R Table	Desc
Right Quantity (X1)	X1. 1	0,705	0,361	Valid
	X1. 2	0,782	0,361	Valid
	X1. 3	0,793	0,361	Valid
Right Type (X2)	X2. 1	0,852	0,361	Valid
	X2. 2	0,622	0,361	Valid
	X2. 3	0,722	0,361	Valid
Right Quality (X3)	X3. 1	0,816	0,361	Valid
	X3. 2	0,797	0,361	Valid
	X3. 3	0,674	0,361	Valid
Right Price (X4)	X4. 1	0,826	0,361	Valid
	X4. 2	0,746	0,361	Valid
	X4. 3	0,685	0,361	Valid
Right Place (X5)	X5. 1	0,857	0,361	Valid
	X5. 2	0,783	0,361	Valid
	X5. 3	0,607	0,361	Valid
Right Time (X6)	X6. 1	0,807	0,361	Valid
	X6. 2	0,797	0,361	Valid
	X6. 3	0,656	0,361	Valid
Farming Success (Y)	Y1	0,607	0,361	Valid
	Y2	0,429	0,361	Valid
	Y3	0,691	0,361	Valid

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	Y4	0,541	0,361	Valid
	Y5	0,611	0,361	Valid
	Y6	0,416	0,361	Valid
	Y7	0,524	0,361	Valid
	Y8	0,503	0,361	Valid
	Y9	0,484	0,361	Valid
	Y10	0,483	0,361	Valid
	Y11	0,501	0,361	Valid
	Y12	0,407	0,361	Valid

Source: Processed primary data (2026)

All statement items for variables X1 through X6 and Y are valid r-value (0.361) and suitable for data collection. Furthermore, the questionnaire is reliable and consistent, as all variables achieved a Cronbach's Alpha above the 0,60 threshold.

Table 6. Reliability Test

Variable	Items	*Cronbach's Alpha*	Standard Reability	Desc
Right Quantity (X1)	3	0,624	0,60	Reliable
Right Type (X2)	3	0,619	0,60	Reliable
Right Quality (X3)	3	0,631	0,60	Reliable
Right Price (X4)	3	0,616	0,60	Reliable
Right Place (X5)	3	0,619	0,60	Reliable
Right Time (X6)	3	0,623	0,60	Reliable
Farming Success (Y)	12	0,732	0,60	Reliable

Source: Processed primary data (2026)

All research variables including the independent variables (the six "Right" indicators, X1 through X6) and the dependent variable (Farming Success, Y) exhibit Cronbach's Alpha values exceeding the standard reliability threshold of 0.60. Thus, the research instrument is proven to be consistent and reliable for data collection purposes.

The Impact of Fertilizer Subsidy Effectiveness on the Success of Maize Farming in Dutohe Village

The success of maize farming in Dutohe Village relies heavily on the optimization of production inputs, particularly the availability of subsidized fertilizer. Therefore, examining the impact of fertilizer subsidy effectiveness on farming success is crucial to determining whether the accuracy of fertilizer allocation and distribution actually correlates with increased crop yields and the economic well-being of farmers.

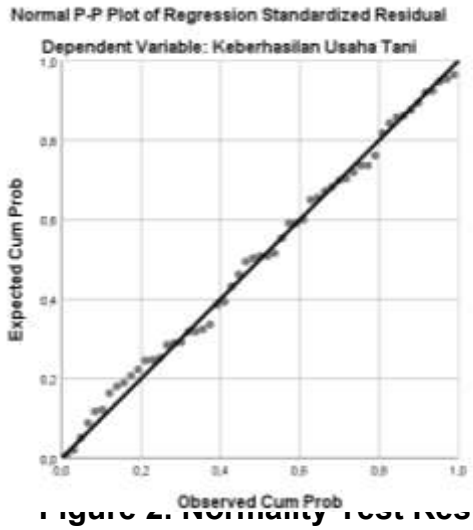
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1. Classical Assumption Test

a) Normality Test

A normality test was conducted using the "Normal P-P Plot of Regression Standardized Residual" for the regression model examining the effect of fertilizer subsidy effectiveness on the success of maize farming in Dutohe Village, Kabila District, Bone Bolango Regency. This test was performed to ensure that the disturbance variables or residuals within the regression model are normally distributed; this is a key requirement (or classical assumption) for ensuring the validity and reliability of the linear regression analysis results.



Source: Processed Primary Data (2026)

Based on the Normal P-P Plot, the residual data points are consistently distributed and clustered along the diagonal line. This indicates that the regression model satisfies the normality assumption, making it suitable and valid for subsequent statistical analysis and hypothesis testing.

b) Multicollinearity Test

The multicollinearity test aims to ensure the absence of a very strong linear relationship among independent variables (the 6R principle), thereby allowing each variable to independently explain farming success. A regression model is considered free from multicollinearity if it meets the criteria of a Tolerance value > 0.10 and a VIF < 10.

Table 7. Multicollinearity Test Results

Number	Model	Collinearity Statistics	
		Tolerance	VIF
	(Constant)		
1.	Right Quantity	,836 > 0,1	1,196 < 10
2.	Right Type	,808 > 0,1	1,238 < 10

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3.	Right Quality	,877 > 0,1	1,140 < 10
4.	Right Price	,729 > 0,1	1,371 < 10
5.	Right Place	,713 > 0,1	1,402 < 10
6.	Right Time	,830 > 0,1	1,205 < 10

Source: Processed Primary Data (2026)

Overall, all tested independent variables exhibited Tolerance values well above 0.1 and VIF values well below the maximum threshold of 10. This demonstrates the absence of multicollinearity issues among the independent variables in the regression model.

c) Heteroskedasticity test

The heteroscedasticity test aims to determine whether the residual variance (the difference between actual and predicted values) in a regression model is non constant. This test is a requirement under classical assumptions to ensure the regression model exhibits homoscedasticity (constant variance), thereby yielding accurate, reliable, and unbiased estimation results.

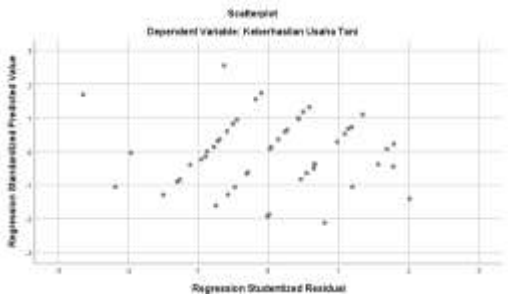


Figure 3. Heteroskedasticity Test Results

Source: Processed Primary Data (2026)

The data points on the scatterplot are distributed randomly and evenly above and below the zero mark on the Y-axis, without forming any discernible pattern. This indicates the absence of heteroscedasticity; thus, the regression model analyzing the effect of fertilizer subsidy effectiveness on the success of maize farming in Dutohe Village satisfies the assumption of homoscedasticity.

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2. Hypothesis Test

Table 8. Hypothesis Test Results

Number	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	47,288	1,411		33,515	,000
1.	Right Quantity	,144	,051	,168	2,820	,007
2.	Right Type	,121	,035	,213	3,514	,001
3.	Right Quality	,383	,039	,570	9,797	,000
4.	Right Price	,116	,029	,252	3,944	,000
5.	Right Place	,233	,033	,452	7,009	,000
6.	Right Time	-,427	,053	-,481	-8,043	,000

Source: Processed Primary Data (2026)

The t-test analysis yielded the regression equation $\hat{Y}$ = 47.288 + 0.144X1 + 0.121X2 + 0.383X3 + 0.116X4 + 0.233X5 - 0.427X6 + ε, where the constant value of 47.288 represents the baseline level of maize farming success in Dutohe Village when all independent variables are zero. The indicators of Right Quantity, Right Type, Right Quality, Right Price, and Right Place contributed positively, whereas Right Timing had a negative effect on farming success. Since the significance values (Sig.) for variables X1 through X6 were all below 0.05, each dimension of subsidized fertilizer distribution effectiveness had a significant partial effect on maize farming success; the extent to which the variation in success could be explained by the independent variables was measured using the coefficient of determination (R^2).

Table 9. Coefficient of Determination (R^2)

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,926[a]	,858	,840	,22419	1,914

Source: Processed Primary Data (2026)

The correlation coefficient (R^2) of 0.926 indicates a very strong, positive relationship between the collective indicators of subsidized fertilizer effectiveness and

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farming success. The Adjusted R-squared value of 0.840 (84%) indicates that 84% of the variation in maize farming success in Dutohe Village is explained by the six indicators of subsidized fertilizer distribution effectiveness, while the remaining 16% is influenced by factors outside the regression model, such as weather, land preparation, pest control, and seed quality.

3. F-test (Simultaneous)

The F-test was conducted to determine whether all indicators of fertilizer subsidy distribution effectiveness considered simultaneously had a significant impact on the success of maize farming in Dutohe Village, as well as to verify the validity of the constructed regression model.

Table 10. Hasil Uji F

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14,520	6	2,420	48,148	,000[b]
	Residual	2,413	48	,050		
	Total	16,932	54			

Source: Processed Primary Data (2026)

Based on the table, the calculated F-value is 48.148 with a significance level of 0.000 ($p < 0.05$); consequently, H_0 is rejected and H_a is accepted. This indicates that all indicators of subsidized fertilizer distribution effectiveness simultaneously exert a significant influence on the success of maize farming in Dutohe Village; the more effective the fertilizer distribution, the greater the success of the farmers' operations.

4. T-test (Partial)

a) The Effect of Quantity Accuracy (X1) on Farming Success

The "quantity accuracy" variable has a positive and significant effect on the success of maize farming in Dutohe Village (β = 0.144; t-statistic = 2.820; sig. = 0.007 < 0.05). The positive coefficient indicates that meeting subsidized fertilizer volume requirements based on land needs enables farmers to implement balanced fertilization patterns during both the vegetative and generative phases. This aligns with the findings of (Karsidi et al, 2023), which state that the accuracy of fertilizer quantity directly impacts the optimization of crop yields and farmer profits.

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b) The Effect of Fertilizer Type Appropriateness (X2) on Farming Success

The variable representing the appropriateness of the fertilizer type has a positive and significant effect on farming success (β = 0.121; t-statistic = 3.514; sig = 0.001 < 0.05). Matching the type of fertilizer (such as Urea and NPK) to the specific nutrient requirements of maize plants minimizes the risk of fertilization failure. Furthermore, the receipt of the appropriate type of fertilizer prevents farmers from incurring additional costs to purchase expensive substitute fertilizers on the open market Ramlayana et al, 2020).

c) The Influence of Quality Accuracy (X3) on Farming Success

The Quality Accuracy variable exerts a positive and significant influence acting as the dominant factor on farming success (β=0.383; t-statistic=9.797; sig = 0.000 < 0.05). Fertilizer quality is the strongest driving factor (highest β). Stable physical and nutritional quality (free from adulteration and degradation) ensures maximum nutrient uptake, thereby increasing the tonnage and market value of maize kernels (Karsidi et al, 2023).

d) The Effect of Price Accuracy (X4) on Farming Success

The Price Accuracy variable has a positive and significant effect on farming success (β = 0.116; t-statistic = 3.944; sig = 0.000 < 0.05). Ensuring fertilizer prices align with the Highest Retail Price (HET) reduces production costs. This efficiency in input costs allows for greater capital allocation toward other cultivation activities while simultaneously increasing farmers' profit margins (Amelia at al, 2022).

e) The Effect of Place Accuracy (X5) on Farming Success

The Place Accuracy variable has a positive and significant effect on farming success (β = 0.233; t-statistic = 7.009; sig = 0.000 < 0.05). The presence of official kiosks in strategic, easily accessible locations cuts down on farmers' transportation costs and time. This smooth geographic accessibility ensures that logistics distribution hubs operate effectively without disrupting the local supply chain (Kholis & Setiaji, 2020).

f) The Effect of Timeliness (X6) on Farming Success

The timeliness variable has a significant but negative effect on farming success (β = -0.427; t-statistic = -8.043; sig. = 0.000 < 0.05). This negative value indicates the high sensitivity of the distribution schedule. Delays in fertilizer supply that extend beyond the critical growth phase (early vegetative stage) can disrupt the fertilization schedule and drastically reduce potential crop yields (Karsidi et al, 2023).

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CONCLUSION

Based on the research findings in Dutohe Village, it can be concluded that the distribution of subsidized fertilizer is highly effective overall (91.47%) and has a significant simultaneous impact on the success of maize farming, contributing 84% to the outcome. Individually, all five indicators—Right Quality (β=0.383), Right Place (β=0.233), Right Quantity (β=0.144), Right Type (β=0.121), and Right Price (β=0.116)—exert a positive and significant influence, with Right Quality serving as the primary driver for increased crop yields. Conversely, the Right Time indicator shows a significant but negative effect (β=-0.427), highlighting the high sensitivity of the distribution schedule; specifically, distribution delays occurring after the initial growth phase can drastically reduce farming productivity.

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