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# Potential Beneficial Effect of Granule Organic Fertilizer (GOF) to Enhance the Growth and Productivities of Sweet Corn (*Zea Mays* L.)

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**ABSTRACT**: Inorganic fertilizers have played a vital role in increasing crop production. However, its application in high doses caused adverse impacts on soil and plant production, as well as human health. The study aims to evaluate the beneficial effects of organic fertilizer in supporting sustainable plant growth and production and increasing economic value. The study was conducted from July to October 2022 in Poncokusumo, Kabupaten Malang. This study used a randomized block design (RBD) consisting of ten combination treatments with three times replication. The fertilizer combination includes GOF (250, 500, 750, and 1000 kg ha$^{-1}$), Phonska (250 and 300 kg ha$^{-1}$), and Urea 300 kg ha$^{-1}$. Our results showed that application of GOF at a dose of 750-1000 kg ha$^{-1}$ GOF + 250/300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea plays a role in increasing growth (height, number of leaves and stem diameter) and yields ha-$^{1}$ sweet corn. The treatment of 1000 kg ha$^{-1}$ GOF + 300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea (T8) gave the highest yield reaching 21.70 tons ha$^{-1}$. The combination of GOF treatment with inorganic fertilizer (T2-T9) produces RAE values that meet the criteria for cultivation effectiveness, ranging from 128-163%. Meanwhile, the combination of 1000 kg ha$^{-1}$ GOF with 300 kg ha$^{-1}$ Phonska fertilizer and 300 kg ha$^{-1}$ Urea (T8) fertilizer showed the highest R/C and B/C ratio values, 1.65 and 0.65. Reducing the Phonska dose by 50 kg ha$^{-1}$, followed by increasing the GOF dose, can increase income. Overall, the GOF application can help increase productivity and economic benefits in sweet corn cultivation.

**Keywords:** Sweet corn, organic fertilizer, plant growth, RAE, R/C, B/C

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## INTRODUCTION

Sweet corn (*Zea mays sacharata*) is a type of corn that is highly nutritious and contains high sugar. This plant is also called the queen of cereals and Indian gold. Corn is one of the important commodities cultivated worldwide (Baranowska, 2023). Sweet corn is a good source of food nutrients such as vitamins, minerals, and fiber so it is important to consume for a balanced diet yield (Rao & Annadana, 2017). Sweet corn is widely cultivated. Due to high demand, Indonesian farmers cultivate corn in almost all provinces (Ariyanto et al., 2023). During plant production, the utilization of inorganic fertilizers has increased and enhanced. Inorganic fertilizer is a source of macro and micronutrient availability that plant roots can absorb immediately and quickly. Susanto and Amirta (2020) reported that applying NPK chemical fertilizer could meet the macronutrient needs of plants in a short time to influence growth rate. However, the continuous application of high doses of inorganic fertilizer harms environmental and human health (Hossain et al., 2022). In the long term, high doses of inorganic fertilizer can degrade the soil by affecting the soil's physical, chemical and biological properties (Pahalvi et al., 2021). Ahmed et al. (2020) state that excessive nitrogen fertiliser application causes high nitrate accumulation in the soil and plant cells. Singh (2018) explained that the application of high doses of inorganic fertilizer causes a decrease in soil organic matter and beneficial soil microbes. Inorganic fertilizers also cause a reduction in pH and organic matter, which impacts environmental pollution (Hammat et al., 2019).

A decrease in soil pH due to inorganic fertilizer will indirectly result in an increase in natural heavy metals in the soil, such as lead (Pb), cadmium (Cd), and zinc (Zn) (Wei et al., 2020). One type of inorganic N fertilizer, urea, can release nutrients in large quantities and quickly, thus stimulating rapid plant growth (Barlog et al., 2022). Furthermore, Zhang et al. (2021) reported that adding inorganic N fertilizer reduced the complexity and connectivity of soil microbes, decreasing the diversity and stability of the microbial ecosystem in the soil. This condition is very likely influenced by changes in the form of ammonia nitrogen ($NH^{4+}$-N) and a decrease in pH due to chemical fertilizers (Wu et al., 2021)

Combining inorganic fertilizer treatment with organic fertilizer can significantly improve soil health by increasing organic matter and catalase activity (Ning et al., 2017). According to Lin et al. (2019), applying organic fertilizer can significantly increase the diversity and mass of soil microbes, which are essential in degrading organic matter and providing plant nutrients. In the long term, using organic-inorganic fertilizers simultaneously is an alternative to partially or replace inorganic fertilizers (Karmakar et al., 2020). Furthermore, Annaheim et al. (2015) explained that applying organic fertilizer will slightly affect the soil's nutrient element phosphorus (P) availability. Moreover, organic fertilizer can also increase the nitrifying and denitrifying bacterial community to improve soil health (Lazcano et al., 2021).

Organic fertilizer is essential in increasing soil organic matter and the availability of N and P elements to stimulate plant growth (Zhang et al., 2021). Application of granule organic fertilizer of 8% can increase the rate of inorganic N and increase the productivity of bean plants (Ali & Ali, 2019). Interestingly, the research results also reported that organic fertilizer increased rice production by 4-7.4 t ha$^{-1}$ (Ilahude et al., 2023). In addition, granular organic fertilizer increases the biodiversity of beneficial bacteria, which play a role in reducing the rate of N mineralization in the soil (Yang et al., 2020). Organic granule fertilizer is one of the efforts to realize food security and organic farming (Soni et al., 2022). Thus, this research aims to evaluate the beneficial effects of organic fertilizer in supporting sustainable plant growth and production and increasing economic value.

## MATERIALS AND METHODS

The research was conducted from July to October 2022 in Poncokusumo, Malang. The location has an Andosol soil type, an average temperature of 26 – 27°C, an average rainfall of 2,000 – 3,000 mm year$^{-1}$, an altitude of 625 m above sea level, dusty clay soil texture and flat topography. The soil properties in the research study are presented in Table 1.

**Table 1.** Soil chemical properties in the research area

| Nutrients | Value | Criteria |
|---|---|---|
| Nitrogen (N) | 0,12 | Low |
| Phosphor (P) | 57,6 | High |
| Potassium (K) | 0,23 | Low |
| pH | 5,49 | Acid |
| C/N ratio | 8,93 | Low |

*)Soil samples were taken and analyzed collectively from the study area

### Experimental design

The research was conducted using a Randomized Block Design consisting of 10 treatments, each repeated three times. The treatment groups tested were four dose levels of "Petrokimia Gresik" granular organic fertilizer, namely 250, 500, 750 and 1000 kg ha-1 combined with 300 and 250 kg phonska fertilizer ha$^{-1}$ and 300 kg ha$^{-1}$ urea fertilizer. For comparison, there is a standard fertilizer application treatment, namely T1 (0 kg ha$^{-1}$ + 300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea) and without application of organic or inorganic fertilizer (T2) used as a control. The following are the treatment combinations in the study:

T0 = Control (without fertilizer)
T1 = Standard (0 GOF + 300 Phonska + 300 Urea)
T2 = (250 GOF + 300 Phonska + 300 Urea)
T3 = (250 GOF + 250 Phonska + 300 Urea)
T4 = (500 GOF + 300 Phonska + 300 Urea)
T5 = (500 GOF + 250 Phonska + 300 Urea)
T6 = (750 GOF + 300 Phonska + 300 Urea)
T7 = (750 GOF + 250 Phonska + 300 Urea)
T8 = (1000 GOF + 300 Phonska + 300 Urea)
T9 = (1000 GOF + 250 Phonska + 300 Urea)

**Plant growth analysis**

Growth observations were performed thrice at 14, 28 and 42 days after planting (DAP). The variables observed include plant height, number of leaves, and stem diameter. Plant height is measured from the base of the stem (soil surface) to the plant's growing point. The number of leaves on plant$^{-1}$ is calculated as all leaves that have fully opened on each plant. Meanwhile, the stem diameter was observed at a height of 5 cm from the ground surface.

**Yield observation**

The yield of sweet corn plants was observed at 83 DAP. The variables observed included the fresh weight of ears plot$^{-1}$ and ha$^{-1}$. The ears weight plot$^{-1}$ is calculated by adding up all the harvests in a plot area of 20 m$^{-2}$. Meanwhile, the ears' fresh weight ha$^{-1}$ was obtained by converting harvest ears in each experimental plot to the effective area in 1 ha.

**Data analysis**

The data were evaluated with one-way ANOVA using DSAASTAT ver.1.101 by Andrea Onofri. The comparison test was carried out using LSD, and the significant differences ($p < 0.05$) between treatments were determined.

**Analysis of Relativity Agronomic Effectiveness (RAE)**

Each organic fertiliser's effectiveness was compared to standard fertilizer using RAE (Relative Agronomic Effectiveness). The RAE value corresponds to the yield increase by fertilizer treatment with the results obtained in standard fertilizer treatment, and then the result is multiplied by 100. The RAE value of standard treatment (T2) is 100%, so the RAE value for each treatment is said to be effective if the RAE for each fertilizer treatment has a value ≥ 100%. RAE value was calculated using the following formula:

$$\textbf{RAE}=\frac{\text{yield of tested fertilizer-yield of control plants}}{\text{Yield of standard fertilizer-yield of control plants}} \times 100\ \%$$

**Analysis of R/C and B/C ratio**

The economic effectiveness of fertilizer was determined using the R/C and B/C ratio equations.

$$\textbf{R/C ratio} = \frac{\text{Total revenue}}{\text{Production cost}}$$

$$\textbf{B/C ratio} = \frac{\text{Netto income}}{\text{Production cost}}$$

## RESULTS AND DISCUSSION

**Plant vegetative growth**

Application of granular organic fertilizer (GOF) significantly affected plant height at 28 and 42 DAP. At 28 DAP, the application of various doses of GOF resulted in higher plant height compared to unfertilized (T0) or fertilized with inorganic fertilizer (T1) only. Our results show that the application of the highest doses of GOF fertilizer (T8 and T9) significantly increased the height of sweet corn plants compared to plants without fertilizer (T0) or without GOF (T1). The highest increase in plant height was obtained at 28 HST when sweet corn plants were applied with a combination of fertilizers at a dose of 750-1000 kg ha$^{-1}$ GOF + 250/300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea. Moreover, the same results were also obtained at 42 HST, namely on plants treated with 500-1000 kg ha$^{-1}$ GOF + 250 / 300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea (Table 2).

Combining inorganic fertilizer treatment with organic fertilizer can significantly improve soil health by increasing organic matter and catalase activity (Ning et al., 2017). Organic fertilizer is essential in increasing soil organic matter and expanding the availability of N and P elements to stimulate plant growth (Zhang et al., 2021). Moreover, the study conducted by Muktamar et al. (2023) exhibited that applying organic fertilizer enhances soil nitrogen availability, increasing the height of sweet corn. Granular organic fertilizer decreases the potential risk of nitrogen loss during the crop seedling stage. It improves soil nitrogen availability during the fast-growing periods of most crops by delaying nitrogen release for about a month (Yang et al., 2020).

**Table 2.** A combination of GOF and inorganic fertilizer increased the plant height (cm) of sweet corn

| Treatments | Days after planting (DAP) | | |
|---|---|---|---|
| | 14 | 28 | 42 |
| T0: Control (without fertilizer) | 23.66 | 61.43 a | 114.63 a |
| T1: Standard (0 GOF + 300 Phonska + 300 Urea) | 24.64 | 72.28 b | 134.51 b |
| T2: (250 GOF + 300 Phonska + 300 Urea) | 25.23 | 73.35 bc | 138.38 bc |
| T3: (250 GOF + 250 Phonska + 300 Urea) | 24.89 | 72.49 b | 135.95 bc |
| T4: (500 GOF + 300 Phonska + 300 Urea) | 25.46 | 77.47 bcd | 146.21 bcd |
| T5: (5000 GOF + 250 Phonska + 300 Urea) | 25.33 | 74.68 bcd | 148.68 bcd |
| T6: (750 GOF + 300 Phonska + 300 Urea) | 26.14 | 83.23 cde | 150.74 bcd |
| T7: (750 GOF + 250 Phonska + 300 Urea) | 26.03 | 80.53 bcde | 149.32 bcd |
| T8: (1000 GOF + 300 Phonska + 300 Urea) | 27.11 | 88.07 e | 157.21 d |
| T9: (1000 GOF + 250 Phonska + 300 Urea) | 26.44 | 84.55 de | 152.62 cd |
| **LSD 5%** | **ns** | **10.25** | **16.77** |

Note: Values followed by different letters indicate significant differences in the LSD test at $P = 0.05$. ns: no significant different

Furthermore, applying various GOF + Phonska + Urea doses significantly increased the number of corn leaves at 28 and 42 DAP. At 28 DAP, fertilizer combination treatment with a dose of 1000 kg ha$^{-1}$ GOF with 250 kg ha$^{-1}$ phonska + 300 kg ha$^{-1}$ urea (T8) or 1000 kg ha-1 GOF with 250 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea (T9) obtained a higher leaf number compared to the control (T0) and standard (T1) treatments. Meanwhile, at 42 DAP, the application of a combination of various doses of granular organic fertilizer at a dose of 750-1000 kg ha$^{-1}$ combined with 250 or 300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ urea significantly increased the number of sweet corn leaves compared to treatments T0 and T1 (Table 3).

Granular organic fertilizer increases the biodiversity of beneficial bacteria, which play a role in reducing the rate of N mineralization in the soil (Yang et al., 2020). Applying organic fertilizer significantly affects the growth of sweet corn by increasing the plant height, leaf area, root fresh weight, and weight ears$^{-1}$(Fahrurrozi et al., 2016). According to Lin et al. (2019), applying organic fertilizer can significantly increase the diversity and mass of soil microbes, which are essential in degrading organic matter and providing nutrients for plants. Moreover, the growth promotion effects were also induced by inorganic fertilizers. Susanto and Amirta (2020) reported that applying NPK chemical fertilizer could provide the macronutrient needs of plants in a short time to influence growth rate.

**Table 3.** The combination of GOF and inorganic fertilizer increased the leaf number of sweet corn

| Treatments | Day after planting (DAP) | | |
|---|---|---|---|
| | 14 | 28 | 42 |
| T0: Control (without fertilizer) | 6.67 | 8.25 a | 10.50 a |
| T1: Standard (0 GOF + 300 Phonska + 300 Urea) | 6.83 | 9.17 b | 11.75 b |
| T2: (250 GOF + 300 Phonska + 300 Urea) | 6.92 | 9.42 b | 11.92 bc |
| T3: (250 GOF + 250 Phonska + 300 Urea) | 6.83 | 9.33 b | 11.75 b |
| T4: (500 GOF + 300 Phonska + 300 Urea) | 7.08 | 9.58 bc | 12.00 bc |
| T5: (500 GOF + 250 Phonska + 300 Urea) | 6.92 | 9.50 bc | 11.83 bc |
| T6: (750 GOF + 300 Phonska + 300 Urea) | 7.17 | 9.83 bc | 12.61 c |
| T7: (750 GOF + 250 Phonska + 300 Urea) | 7.08 | 9.58 bc | 12.61 c |
| T8: (1000 GOF + 300 Phonska + 300 Urea) | 7.25 | 10.17 c | 12.70 d |
| T9: (1000 GOF + 250 Phonska + 300 Urea) | 7.17 | 9.75 bc | 12.72 d |
| **LSD 5%** | **ns** | **0.72** | **0.85** |

Note: Values followed by different letters indicate significant differences in the LSD test at $P = 0.05$. ns: no significant different

Additionally, our results showed that applying various doses of GOF and inorganic fertilizer significantly increased stem diameter compared to the control (T0) and standard (T1). At 28 DAP, a more significant increase in stem diameter was obtained in the treatment combination of 1000 kg $ha^{-1}$ GOF with 250 or 300 kg $ha^{-1}$ Phonska + 300 kg $ha^{-1}$ Urea (T8 and T9). The highest increase in stem diameter was obtained in the T8 but did not significantly differ from the T9 treatment. Furthermore, at 42 DAP, the results showed that the combination treatment of 750 and 1000 kg $ha^{-1}$ GOF with 250 or 300 kg $ha^{-1}$ Phonska + 300 kg $ha^{-1}$ Urea (T6, T7, T8, and T9) also significantly increased the stem diameter compared to (T)) and T1 (Table 4).

Organic fertilizer can also increase the nitrifying and denitrifying bacterial community to improve soil nutrients and properties (Lazcano et al., 2021). In addition, Al-Budaheri & Al-Shami, 2021) explain that the concentrations of nitrogen, phosphorus, and potassium and the protein content of maize are significantly increased by adding mineral, organic, and biofertilizers. Annaheim et al., (2015) explained that applying organic fertilizer will slightly affect soil nutrient element phosphorus (P) availability. Organic fertilizers increase nutrient uptake and potentially promote plant growth under different environmental conditions (Zhang et al., 2021).

**Table 4.** A combination of GOF and inorganic fertilizer increased the stem diameter (cm) of sweet corn

| **Treatments** | **Day after planting (DAP)** | | |
|---|---|---|---|
| | **14** | **28** | **42** |
| T0: Control (without fertilizer) | 6.03 | 14.48 a | 23.16 a |
| T1: Standard (0 GOF + 300 Phonska + 300 Urea) | 6.03 | 17.42 b | 25.24 b |
| T2: (250 GOF + 300 Phonska + 300 Urea) | 6.11 | 18.49 bc | 25.59 bc |
| T3: (250 GOF + 250 Phonska + 300 Urea) | 6.08 | 17.78 bc | 25.28 bc |
| T4: (500 GOF + 300 Phonska + 300 Urea) | 6.20 | 18.99 bc | 26.11 bcd |
| T5: (5000 GOF + 250 Phonska + 300 Urea) | 6.15 | 19.09 bc | 25.65 bcd |
| T6: (750 GOF + 300 Phonska + 300 Urea) | 6.58 | 19.47 bc | 26.58 cd |
| T7: (750 GOF + 250 Phonska + 300 Urea) | 6.46 | 19.22 bc | 26.41 cd |
| T8: (1000 GOF + 300 Phonska + 300 Urea) | 6.68 | 20.03 c | 26.95 d |
| T9: (1000 GOF + 250 Phonska + 300 Urea) | 6.64 | 19.88 c | 26.58 cd |
| **LSD 5%** | **ns** | **2.31** | **1.34** |

Note: Values followed by different letters indicate significant differences in the LSD test at $P$ = 0.05. ns: no significant different

## Plant generative growth (crop yield)

The results showed that the combination of GOF with various doses of inorganic fertilizer produced higher ear fresh weight $plot^{-1}$ and $ha^{-1}$ compared to plants fertilized with 100% inorganic fertilizer (T1) or without fertilizers (control (T0)). Plants fertilized with 100% organic fertilizer obtained an ear weight $plot^{-1}$ by 38.69 kg 20 $m^{-1}$ or 16.93 tons $ha^{-1}$. Interestingly, in the treatment of various doses of GOF (500, 750 and 1000 kg $ha^{-1}$ combined with 250 or 300 kg $ha^{-1}$ phonska + 300 kg $ha^{-1}$ Urea) significantly obtained ear weights ranging from 19.73 - 21.70 tons $ha^{-1}$.

These results suggest that GOF treatment and inorganic fertilizer (T4-T9) have a significant effect on increasing sweet corn yields compared to the control (T0) and standard (T1). The highest yield was obtained in treating with 1000 kg $ha^{-1}$ GOF + 300 kg $ha^{-1}$ phonska + 300 kg $ha^{-1}$ Urea (T8) (Table 5). Furthermore, our results show that the results of the analysis of RAE values obtained in each combination of GOF treatment (250, 500, 750, and 1000 kg $ha^{-1}$ ) with 250 or 300 kg $ha^{-1}$ phonska + 300 kg $ha^{-1}$ Urea (T2-T9) meet the feasibility of cultivation effectiveness because the RAE value obtained ranges from 128-163%. These results show that GOF application can increase sweet corn yields by 1.28 – 1.63 times compared to standard treatment (T1) (Table 5).

According to Widyanto et al. (2013), applying organic fertilizer causes an increase in soil nitrogen uptake, leading to improved plant growth and sweet corn yield. Macronutrients are incredibly supported by phonska fertilizer, which contains nitrogen, phosphorous, and potassium, which can increase sweet corn production by 17.28 t ha$^{-1}$ (Hawayant et al., 2021). Application of granule organic fertilizer of 8% can increase the rate of inorganic N and increase the productivity of bean plants (Ali & Ali, 2019). In addition, granular organic fertilizer increases the biodiversity of beneficial bacteria, which play a role in reducing the rate of N mineralization in the soil (Yang et al., 2020). Soil organic amendment efficiently accelerates the growth and productivity of sweet corn; the most significant production, at 22.35 t ha$^{-1}$, is obtained when integrating NPK, ZA, and urea fertilizers (Aisyawati et al., 2022). Relative Agronomy Effectiveness (RAE) values of >100% can be obtained through the use of granular organic fertilizers (GOF) at doses of 200–400 kg/ha, which can enhance soil chemical characteristics and boost sweet corn production by 345% (Intansari & Subiksa, 2022).

**Table 5.** The combination of GOF and inorganic fertilizer increased the yield and RAE of sweet corn

| **Treatments** | **Ear Fresh weight** | | **RAE value (100%)** |
|---|---|---|---|
| | **kg plot$^{-1}$** | **ton ha$^{-1}$** | |
| T0: Control (without fertilizer) | 21.52 a | 9.42 a | 0 |
| T1: Standard (0 GOF + 300 Phonska + 300 Urea) | 38.69 b | 16.93 b | 100.00 |
| T2: (250 GOF + 300 Phonska + 300 Urea) | 43.58 cd | 19.07 cd | 128.50 |
| T3: (250 GOF + 250 Phonska + 300 Urea) | 42.38 bc | 18.54 bc | 121.50 |
| T4: (500 GOF + 300 Phonska + 300 Urea) | 45.49 cde | 19.90 cde | 139.60 |
| T5: (5000 GOF + 250 Phonska + 300 Urea) | 45.11 cde | 19.73 cde | 137.38 |
| T6: (750 GOF + 300 Phonska + 300 Urea) | 47.07 de | 20.59 de | 148.82 |
| T7: (750 GOF + 250 Phonska + 300 Urea) | 45.60 cde | 19.95 cde | 140.22 |
| T8: (1000 GOF + 300 Phonska + 300 Urea) | 49.61 e | 21.70 e | 163.59 |
| T9: (1000 GOF + 250 Phonska + 300 Urea) | 47.42 de | 20.74 de | 150.83 |
| **LSD 5%** | **4.53** | **1.98** | **-** |

Note: Values followed by different letters indicate significant differences in the LSD test at $P$ = 0.05. ns: no significant different

## Farming feasibility analysis

Our results show that the combined application of GOF with 250 or 300 kg ha$^{-1}$ phonska + 300 kg ha$^{-1}$ Urea obtained a higher income than standard (T1) and control (T0) fertilizers. The income received through the GOF application with doses of 250, 500, 750 and 1000 kg ha$^{-1}$ with 300 kg ha$^{-1}$ phonska + 300 kg ha$^{-1}$ urea is IDR 20,404,000; IDR 22,310,000; IDR 23,832,000 and IDR 25,539,000, respectively. A reduction in phonska dosage followed by an increase in GOF dosage may increase revenue. Reducing the phonska dose by 50 kg ha$^{-1}$ caused a decrease in income of IDR 19,056,000, IDR 22,012,000, IDR 22,124,000, and IDR 23,955,000, respectively. Meanwhile, the control (T0) resulted in lower income by IDR 21,188,250.

Furthermore, the results of the economic analysis show that the application of GOF combined with (300 kg ha$^{-1}$ Phonska fertilizer and 300 kg ha$^{-1}$ Urea fertilizer) produces higher R/C and B/C ratio values, namely 1.65 and 0, respectively. 65. This value is higher than standard fertilizer (T1), with an R/C ratio of only 1.49 and a B/C ratio of 0.49. Higher R/C and B/C ratio values indicate that the combination of 1000 kg ha$^{-1}$ GOF with 300 kg ha$^{-1}$ Phonska fertilizer and 300 kg ha$^{-1}$ Urea fertilizer increases economic profits compared to without adding GOF fertilizer (Table 6).

According to Baghdadi et al. (2018), combining organic and inorganic fertilizers leads to the yield of corn, which is similar to 100% Inorganic fertilizer. This result indicates that reducing the dose of inorganic fertilizer can reduce production costs. Sugiardi (2021) explained that the highest R/C and B/C ratios suggest that farming is feasible and will enhance financial aspects.

**Table 6.** Farming feasibility of sweet corn by addition of GOF

| Treatments | Yield (kg ha$^{-1}$) | Total revenue (IDR) | Production cost (IDR) | Total income (IDR) | Economic value | |
|---|---|---|---|---|---|---|
| | | | | | R/C | B/C |
| T0 | 9,417 | 21,188,250 | 30,990,000 | -10,221,750 | 0,67 | -0,33 |
| T1 | 16,927 | 50,781,000 | 33,990,000 | 16,791,000 | 1,49 | 0,49 |
| T2 | 19,068 | 57,204,000 | 36,800,000 | 20,404,000 | 1,55 | 0,55 |
| T3 | 18,542 | 55,626,000 | 36,570,000 | 19,056,000 | 1,52 | 0,52 |
| T4 | 19,901 | 59,700,000 | 37,390,000 | 22,310,000 | 1,60 | 0,60 |
| T5 | 19,734 | 59,202,000 | 37,190,000 | 22,012,000 | 1,59 | 0,59 |
| T6 | 20,594 | 61,782,000 | 37,950,000 | 23,832,000 | 1,63 | 0,63 |
| T7 | 19,948 | 59,844,000 | 37,720,000 | 22,124,000 | 1,59 | 0,59 |
| T8 | 21,703 | 65,109,000 | 39,570,000 | 25,539,000 | 1,65 | 0,65 |
| T9 | 20,745 | 62,235,000 | 38,280,000 | 23,955,000 | 1,63 | 0,63 |

Note :

- Production costs are the cumulative costs of the price of fertilizer and the cost of all components for cultivation.
- Fertilizer prices: Urea = IDR 3500, Phonska = IDR 4000, GOF "Petrokimia Gresik" = IDR 2,000 kg$^{-1}$ and the price of sweet corn is IDR 3000 kg$^{-1}$
- Profit: profit calculated from the income value minus production costs.

## CONCLUSION

Application of GOF at a dose of 750-1000 kg ha$^{-1}$ GOF + 250/300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea increases growth (height, number of leaves, and stem diameter) and yields ha$^{-1}$ sweet corn plants. The treatment of 1000 kg ha$^{-1}$ GOF + 300 kg ha$^{-1}$ Phonska + 300 kg ha$^{-1}$ Urea (T8) gave the highest yield reaching 21.70 tons ha$^{-1}$. The combination of GOF treatment with inorganic fertilizer (T2-T9) produces RAE values that meet the criteria for cultivation effectiveness, ranging from 128-163%. Meanwhile, the combination of 1000 kg ha$^{-1}$ GOF with 300 kg ha$^{-1}$ Phonska fertilizer and 300 kg ha$^{-1}$ Urea (T8) fertilizer showed the highest R/C and B/C ratio values, 1.65 and 0.65. Reducing the Phonska dose by 50 kg ha$^{-1}$, followed by increasing the GOF dose, can increase income. Overall, the GOF application can help increase productivity and economic benefits in sweet corn cultivation.

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