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# Effectiveness of NPK 20-20-10 Fertilizer on Growth, Yield, and Economic Performance of Potato in Tropical Conditions

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***Abstract***. *As a high-value crop, potatoes necessitate balanced nutrient management for optimal growth and yield. This research aimed to assess how varying applications of NPK 20-20-10 fertilizer influenced potato growth, yield, tuber quality, agronomic efficiency, and economic viability within tropical climates. The experimental setup involved a randomized complete block design, incorporating four replications across seven distinct treatments: a control, a standard inorganic fertilization regimen, and NPK 20-20-10 applied at 0.50, 0.75, 1.00, 1.25, and 1.50 times the suggested dosage. The findings indicated that applying NPK 20-20-10 significantly enhanced several parameters, including plant height, branch count, tuber count, tuber weight, and overall yield components, when contrasted with the control group. Notably, the 1.25 times recommended dose demonstrated superior performance, leading to a 34.9% increase in tuber number and a 68.6% rise in tuber weight compared to the control. Agronomic effectiveness scores surpassed 100 for dosages ranging from 0.75 to 1.50, with the 1.25 dose registering the peak value. Economic evaluations confirmed the profitability of all NPK treatments, and the 1.25 dose yielded the most favorable R/C ratio and a net profit of IDR 29,053,400. Consequently, the recommended application for potato cultivation is 675 kg/ha of NPK 20-20-10, distributed in three equal parts at planting, four weeks post-planting, and six weeks post-planting. Thus, these results underscore that NPK 20-20-10, when applied at 1.25 times the recommended rate, presents an agronomically effective and economically sound strategy for sustainable potato farming in tropical settings.*

***Keywords***: *Agronomic Effectiveness; Economic Analysis; Fertilizer Dosage; NPK 20-20-10; Potato*

## 1. INTRODUCTION

Potatoes are a global dietary staple, providing essential carbohydrates, vitamins, and minerals to people worldwide (Koch et al., 2019; Petrar et al., 2024). In Indonesia, these versatile tubers are especially vital, helping to diversify food options and bolster national food security (Gunadi & Pronk, 2023; Ham et al., 2022). However, for farmers to achieve the best possible harvest, careful nutrient management is crucial, as potatoes are nutrient-intensive plants, particularly regarding nitrogen, phosphorus, and potassium (Li et al., 2024; Naumann et al., 2019; Wang et al., 2024).

Fertilization profoundly influences potato growth, yield, and the overall quality of its tubers (Wang et al., 2024). Among the diverse range of available formulations, compound NPK fertilizers are notable for delivering a balanced supply of crucial macronutrients in a single application. This approach can notably enhance nutrient use efficiency and help reduce labor expenditure (Ali et al., 2021). The NPK 20-20-10 blend, specifically composed of 20% nitrogen, 20% phosphorus, and 10% potassium, sees widespread application in intensive agricultural systems. Despite its common use, however, the effectiveness of this particular formulation in potato cultivation under tropical conditions has not been thoroughly investigated (Soratto et al., 2023; Xue et al., 2024).

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Numerous studies have consistently shown that applying appropriate NPK fertilization is key to boosting potato plant growth, improving factors such as plant height, branching, and leaf area (Chabani et al., 2024; Manolov & Neshev, 2021; Nizamuddin et al., 2003; Sai & Paswan, 2024; Wang et al., 2024). These benefits extend to yield, where optimal fertilization increases both the number and weight of tubers. Nevertheless, pinpointing the exact optimal dosage is critical. Miscalculating can lead to nutrient imbalances, create environmental hazards, and inflate production expenses unnecessarily. Beyond the purely agricultural benefits, farmers also heavily weigh the economic feasibility of any new fertilizer technology before adopting it.

The objective of this study is to determine how varying applications of NPK 20-20-10 fertilizer influence potato growth, yield, and tuber quality in tropical environments. Additionally, the research seeks to gauge the agronomic and economic benefits of using NPK 20-20-10, with the goal of offering practical recommendations for sustainable and profitable potato farming.

## 2. LITERATURE REVIEW

Potatoes, as a tuber crop, thrive when they receive a sufficient and well-balanced supply of nutrients, which is crucial for optimal growth and high yields (Haider et al., 2024; Petrar et al., 2024; Wang et al., 2024). These three main macronutrients nitrogen, phosphorus, and potassium each contribute uniquely and synergistically to the plant's physiological processes (Otieno & Mageto, 2021; Singh & Maiti, 2022; Wang et al., 2024). Nitrogen, for instance, is vital for leafy, vegetative growth; it's a key ingredient in amino acids, proteins, and chlorophyll, all of which directly impact photosynthesis and the plant's overall biomass accumulation (Kumar et al., 2021; Ye et al., 2022). Phosphorus, on the other hand, is crucial for energy transfer via ATP, robust root development, and the initial formation of tubers (Hawkesford et al., 2011). Potassium then steps in to manage osmotic balance, activate enzymes, and facilitate carbohydrate movement, all essential processes for proper tuber bulking and achieving good quality (Sardans & Peñuelas, 2021; Shah et al., 2024).

Using compound fertilizers like NPK formulations offers a balanced delivery of these macronutrients, which can significantly enhance the plant's nutrient uptake efficiency when compared to applying single-nutrient fertilizers (Koch et al., 2019; Wang et al., 2024). Specifically, the NPK 20-20-10 blend containing 20% nitrogen, 20% phosphorus, and 10% potassium is particularly well-suited for crops with intensive nutrient requirements, such as

potatoes. Therefore, applying the correct dosage at the right time is paramount for NPK fertilizers to be most effective. This careful management maximizes nutrient absorption by the plants and helps prevent losses due to leaching or volatilization, a concern amplified in tropical regions where high rainfall and temperatures can rapidly alter nutrient availability (Blecharczyk et al., 2023; Wang et al., 2024; Yang et al., 2024; Zotarelli et al., 2021).

Numerous studies have consistently shown that NPK fertilization significantly impacts various growth indicators, such as plant height, the number of branches, and leaf area (Blecharczyk et al., 2023; Chabani et al., 2024; Lawrence & Melgar, 2018; Munthali et al., 2022; Su et al., 2024). These benefits also extend to yield components, influencing the total number of tubers, their size distribution, and the overall yield. However, too much nitrogen can cause abundant leafy growth but at the cost of tuber development, whereas a lack of potassium might result in smaller tubers and compromised storage quality (Ali et al., 2021; Zapadiya et al., 2025). This highlights why pinpointing the optimal NPK dosage is critical: it ensures high yields and quality while maintaining economic viability and environmental responsibility.

Beyond simply looking at how well a fertilizer performs agronomically, its effectiveness can also be measured using relative agronomic effectiveness. This method involves comparing the yield increase achieved with a new fertilizer against the yield from a standard, established fertilizer (Barłóg, 2023; Lyons et al., 2024). Farmers also need to consider the economic side, often assessing profitability through metrics like overall profit and the revenue-to-cost ratio, which directly indicate how financially beneficial a fertilizer application is for their operations (Harmel et al., 2008; Medici & Canavari, 2022). These theoretical frameworks collectively provide the foundation for thoroughly assessing how NPK 20-20-10 impacts potato growth, yield, tuber quality, and the financial returns for farmers.

## 3. RESEARCH METHOD

### Materials and Equipment

For this experiment, the primary materials utilized were G3 potato seed tubers of the Granola variety, NPK fertilizer (whose effectiveness was specifically assessed), urea, SP-36, and KCl. The equipment employed in the study included cultivation tools, sample stakes, a measuring tape, and a digital scale. Statistical data processing was performed using SAS software installed on a computer. The precise nutrient content and composition of the NPK 20-20-10 fertilizer can be found in Table 1.

**Table 1.** Nutrient Content and Composition of NPK 20-20-10 Fertilizer

| Parameter | Unit | Result |
|---|---|---|
| N-Total | % | 20.10 |
| Total $P_2O_5$ | % | 21.04 |
| $K_2O$ | % | 10.00 |
| Pb | ppm | Ttd |
| Cd | ppm | 1 |
| As | ppm | 0.4 |
| Hg | ppm | 0.03 |
| Kadar Air | % | 2.99 |

Note: ttd = not detected

**Experimental Design**

The experiment was structured as a randomized complete block design, incorporating four replications. Seven distinct treatment levels were applied: a control group, a standard inorganic fertilization regimen, and five varying doses of NPK 20-20-10 fertilizer (0.5, 0.75, 1.0, 1.25, and 1.5 times the full dose). This arrangement resulted in a total of 28 experimental units, with each unit comprising a 25 m² plot. Comprehensive details regarding these treatments are presented in Table 2.

**Table 2.** Details of NPK 20-20-10 Fertilizer Dosage Treatments

| Treatment | Fertilizer Dosage (kg/ha) | | | |
|---|---|---|---|---|
| | NPK 20-20-10 | Urea | SP-36 | KCl |
| Control | - | - | - | - |
| Reference | - | 350 | 300 | 350 |
| 0.50 dose of NPK 20-20-10 | 270 | 55 | - | 130 |
| 0.75 dose of NPK 20-20-10 | 405 | 83 | - | 195 |
| 1.00 dose of NPK 20-20-10 | 540 | 110 | - | 260 |
| 1.25 dose of NPK 20-20-10 | 675 | 138 | - | 325 |
| 1.50 dose of NPK 20-20-10 | 810 | 165 | - | 390 |

**Implementation Method**

Prior to their placement in the soil, the chosen seed tubers for cultivation exhibited sprouts measuring approximately 2 cm. Land preparation involved comprehensive double tillage, subsequently leading to the formation of raised beds, each measuring one meter in width. A dressing of organic manure was incorporated into the soil at a concentration of 10 tons per hectare. Potato seed tubers were set with an inter-row spacing of 70 cm and an in-row spacing of 30 cm, ensuring a single tuber occupied each designated planting site. To preempt subterranean pest issues, Furadan 3G was administered into every planting hole at a rate of 20 kg per hectare. The application of urea and NPK 20-20-10 fertilizers occurred in three distinct stages: one-third during planting, another third at four weeks post-planting, and the final third at six WAP. Harvesting operations commenced around 13–14 WAP, corresponding to the initial signs of foliage senescence. Weed management interventions took place at three and six

WAP, with pest and disease control measures implemented as dictated by the severity of infestations.

**Observations**

The study focused on evaluating several key parameters, including plant development, yield characteristics, and the overall quality of the tubers. To quantify plant growth, researchers measured the height and the count of branches on 10 plants chosen randomly from each plot between 3 and 6 weeks post-planting. Yield-related parameters measured were the number of tubers per plant, the total weight of tubers per plant, the tuber yield obtained per plot, and the projected yield per hectare. This estimation for yield per hectare was derived from the plot yield data, utilizing the same plant samples used for growth observations. Tuber quality was determined by categorizing the tubers into three distinct size grades Grade A (>300 g), Grade B (100–300 g), and Grade C (50–100 g) and calculating the percentage of tubers falling into each category.

**Data Analysis**

The collected data underwent statistical evaluation through analysis of variance, followed by Duncan's Multiple Range Test, with significance established at the 5% level. All statistical computations were executed using SAS software.

## 4. RESULTS AND DISCUSSION

### Effect of NPK 20-20-10 Fertilizer Application on Potato Plant Growth

The application of NPK 20-20-10 fertilizer significantly impacted the height of potato plants (Table 3). At three weeks post-planting, the greatest plant height was observed in treatments receiving 1.25 to 1.50 times the recommended dose, outperforming the control group. In the subsequent weeks, specifically from four to six WAP, doses ranging from 0.75 to 1.50 consistently led to taller plants compared to the control. By the end of the observation period, plant heights in the treated groups ranged from 50.3 to 54.7 cm, notably surpassing the control treatment's height of 46.9 cm. These findings highlight a strong positive relationship between NPK 20-20-10 application and vegetative growth, echoing other studies where custom NPK fertilizers enhanced potato plant height (Mandal et al., 2020). This improved growth is likely due to the balanced nutrient provision from NPK 20-20-10, which promotes cell division and elongation (Wang et al., 2024).

**Table 3.** Potato Plant Height under NPK 20-20-10 Fertilizer Treatments

| Treatment | Plant Height (cm) | | | |
|---|---|---|---|---|
| | 3 WAP | 4 WAP | 5 WAP | 6 WAP |
| Control | 15.0b | 21.7b | 32.4b | 46.9b |
| Reference | 15.4ab | 24.0a | 35.0a | 51.6a |
| 0.50 dose of NPK 20-20-10 | 14.8b | 22.0ab | 33.9ab | 48.7ab |
| 0.75 dose of NPK 20-20-10 | 15.4ab | 23.9a | 35.8a | 50.3a |
| 1.00 dose of NPK 20-20-10 | 15.3ab | 24.1a | 35.2a | 53.8a |
| 1.25 dose of NPK 20-20-10 | 16.5a | 24.4a | 56.3a | 54.7a |
| 1.50 dose of NPK 20-20-10 | 16.6a | 24.3a | 36.4a | 50.6a |

Note: Numbers in the same column followed by the same letter are not significantly different.

The application of NPK 20-20-10 fertilizer notably influenced the branching of potato plants (Table 4). Specifically, at four weeks post-planting, treatments involving 1.00 to 1.50 times the recommended dose led to the greatest number of branches when contrasted with the control group. Subsequently, during weeks five and six WAP, dosages ranging from 0.50 to 1.50 consistently yielded a higher branch count compared to the control. Ultimately, by the conclusion of the study, the average plant displayed between four and five branches. These findings indicate that NPK 20-20-10, especially at moderate to elevated levels, encourages vigorous lateral development, thereby fostering a more compact canopy. Such enhanced branching, coupled with the observed increases in plant height, collectively implies that NPK 20-20-10 fertilization effectively supports the vegetative growth of potato plants, which is crucial for maximizing photosynthetic efficiency and subsequent tuber formation (Sai & Paswan, 2024).

**Table 4.** Number of Branches under NPK 20-20-10 Fertilizer Treatments

| Treatment | Number of Branches | | | |
|---|---|---|---|---|
| | 3 WAP | 4 WAP | 5 WAP | 6 WAP |
| Control | 1.2a | 2.3b | 2.9b | 4.0b |
| Reference | 1.3a | 2.5ab | 3.5a | 4.5a |
| 0.50 dose of NPK 20-20-10 | 1.5a | 2.6ab | 3.7a | 4.6a |
| 0.75 dose of NPK 20-20-10 | 1.3a | 2.5ab | 3.5a | 4.6a |
| 1.00 dose of NPK 20-20-10 | 1.5a | 2.7a | 3.9a | 4.7a |
| 1.25 dose of NPK 20-20-10 | 1.3a | 2.7a | 3.6a | 4.8a |
| 1.50 dose of NPK 20-20-10 | 1.4a | 2.8a | 3.8a | 4.6a |

Note: Numbers in the same column followed by the same letter are not significantly different.

**Effect of NPK 20-20-10 Fertilizer Application on Potato Yield**

The application of NPK 20-20-10 fertilizer exerted a considerable influence on the quantity of tubers produced per plant (Table 5). Specifically, treatments administered at doses ranging from 0.50 to 1.50 times the recommended rate resulted in a greater number of tubers per plant when compared to the control group. Among these, the 1.50 dose proved most effective, producing the highest tuber count and exceeding both the control and the designated

comparison treatment. Quantitatively, this particular treatment led to an increase in tuber number per plant of 34.9% relative to the control and 18.4% compared to the comparison treatment. Such outcomes are consistent with prior studies that have demonstrated the capacity of appropriate NPK fertilization to foster improved tuberization and elevate the overall tuber yield (Alimkhanov et al., 2021; Mandal et al., 2020).

**Table 5.** Number of Tubers and Tuber Weight under NPK 20-20-10 Fertilizer Treatments

| Treatment | Tuber Number/ Plant | Weight of 10 Tubers (g) |
|---|---|---|
| Control | 8.6c | 986.7d |
| Reference | 9.8bc | 1173.3c |
| 0.50 dose of NPK 20-20-10 | 10.5ab | 14000.0b |
| 0.75 dose of NPK 20-20-10 | 10.9ab | 1260.0c |
| 1.00 dose of NPK 20-20-10 | 10.7ab | 1430.0b |
| 1.25 dose of NPK 20-20-10 | 11.2ab | 1450.0b |
| 1.50 dose of NPK 20-20-10 | 11.6a | 1663.3a |

Note: Numbers in the same column followed by the same letter are not significantly different.

The application of NPK 20-20-10 fertilizer also significantly influenced the weight of ten tubers (Table 5). Treatments utilizing doses of 0.50 and 1.00–1.50 times the recommended rate yielded greater tuber weights when compared to the control and comparison groups. The 0.75 dose specifically led to a better tuber weight than the control, while the 1.50 dose achieved the highest weight among all applied treatments. This particular treatment boosted the weight of ten tubers by 68.6% relative to the control and by 41.8% when compared to the comparison treatment. This observed increase in tuber weight directly corresponds to enhanced tuber bulking and development, which is a crucial factor in determining the overall potato yield. These results underscore the significance of balanced NPK ratios in fostering the optimal allocation of assimilates towards tuber formation rather than excessive vegetative growth (Chabani et al., 2024).

The application of NPK 20-20-10 fertilizer significantly impacted potato yield across various metrics, including yield per plant, per plot, and estimated yield per hectare (Table 6). Treatments with doses ranging from 0.75 to 1.50 times the recommended rate notably increased yield per plant compared to the control, while doses between 0.50 and 1.50 times the recommended rate led to higher yields per plot and estimated yields per hectare. Quantitatively, yield per plant saw an increase of 10.3–29.5% relative to the control, and both yield per plot and estimated yield per hectare rose by 47.8–83.2% and 47.1–82.4%, respectively. These substantial improvements highlight the effectiveness of NPK 20-20-10 in boosting potato productivity, a finding consistent with research indicating that optimized nutrient management can significantly enhance tuber yields (Abato & Zebire, 2024; Shi et al., 2023).

**Table 6.** Potato Yield under NPK 20-20-10 Fertilizer Treatments

| Treatment | Yield/Plant (g) | Yield/Plot (kg) | Estimated Yield/ha (kg/ha) |
|---|---|---|---|
| Control | 1300.0c | 11.3c | 4533.3c |
| Reference | 1488.3b | 17.0ab | 6800.0ab |
| 0.50 dose of NPK 20-20-10 | 1396.7c | 16.7ab | 6666.7ab |
| 0.75 dose of NPK 20-20-10 | 1433.3b | 18.2ab | 7266.7ab |
| 1.00 dose of NPK 20-20-10 | 1630.0a | 18.7ab | 7466.7ab |
| 1.25 dose of NPK 20-20-10 | 1590.0a | 20.7a | 8266.7a |
| 1.50 dose of NPK 20-20-10 | 1683.3a | 20.0a | 8000.0a |

Note: Numbers in the same column followed by the same letter are not significantly different.

**Effect of NPK 20-20-10 Fertilizer Application on Potato Tuber Quality**

The quality of potato tubers was significantly enhanced by the application of NPK 20-20-10 fertilizer (Table 7). Specifically, treatments within the 0.50 to 1.50 dose range consistently led to an increased proportion of Grade A tubers when compared to the control group. Overall, the use of NPK 20-20-10 resulted in a higher percentage of Grade A tubers and a simultaneous reduction in Grade B and C tubers relative to the control, thus indicating an improvement in tuber quality. This betterment can be attributed to the balanced nutrient provision, which fosters consistent tuber development a crucial factor for both marketability and processing suitability. The higher incidence of Grade A tubers also suggests a more effective allocation of photosynthates and nutrient resources towards optimal tuber formation and growth (Saifullah et al., 2024). Furthermore, the elevated concentrations of nitrogen (N), phosphorus (P), and potassium (K) supplied by the fertilizer stimulate cellular division and elongation, contributing to the production of larger and more uniformly shaped tubers (Alimkhanov et al., 2021; Mirdad, 2010). This phenomenon is additionally supported by evidence indicating that potassium, a critical constituent of NPK fertilizers, aids in cell division and photosynthesis, ultimately leading to increased tuber size and overall yield (Yousef et al., 2023).

**Table 7.** Tuber Quality of Potato under NPK 20-20-10 Fertilizer Treatments

| Treatment | Grade (%) | | |
|---|---|---|---|
| | A | B | C |
| Control | 41.6d | 34.6a | 23.8ab |
| Reference | 52.5b | 26.9b | 20.6bcd |
| 0.50 dose of NPK 20-20-10 | 47.8c | 26.2b | 26.0a |
| 0.75 dose of NPK 20-20-10 | 49.1bc | 27.8b | 23.1abc |
| 1.00 dose of NPK 20-20-10 | 52.4b | 25.2bc | 22.3abcd |
| 1.25 dose of NPK 20-20-10 | 59.0a | 21.7cd | 19.3cd |
| 1.50 dose of NPK 20-20-10 | 62.4a | 19.3d | 18.3d |

Note: Numbers in the same column followed by the same letter are not significantly different.

**Relative Agronomic Effectiveness**

The efficiency of a fertilizer is commonly evaluated using the Relative Agronomic Effectiveness indicator. A fertilizer is considered agronomically effective if its RAE value surpasses 100. An RAE value above this threshold signifies that the fertilizer generates a superior yield increase compared to the enhancement provided by a designated reference fertilizer over a control group. Table 8 presents a comprehensive overview of the RAE values.

**Table 8.** Relative Agronomic Effectiveness of Different NPK 20-20-10 Fertilizer Doses

| Treatment | RAE (%) |
|---|---|
| Control | - |
| Reference | - |
| 0.50 dose of NPK 20-20-10 | 94 |
| 0.75 dose of NPK 20-20-10 | 121 |
| 1.00 dose of NPK 20-20-10 | 129 |
| 1.25 dose of NPK 20-20-10 | 165 |
| 1.50 dose of NPK 20-20-10 | 153 |

NPK 20-20-10 treatments administered at doses between 0.75 and 1.50 times the recommended rate proved to be agronomically effective, as indicated by their Relative Agronomic Effectiveness values surpassing 100. The 1.25 dose displayed the highest agronomic effectiveness, elevating the yield by 1.65 times when compared to the yield improvement achieved by the standard fertilization treatment. This considerable efficacy underscores NPK 20-20-10's capacity to significantly improve potato cultivation results beyond conventional methods, a finding consistent with research suggesting that optimized NPK rates can boost potato yields from 32% to 93%. These substantial increases are additionally supported by studies demonstrating that a balanced NPK application, particularly at a 2:1:1 ratio, can lead to optimal yield increases, specifically translating to average potato yield enhancements of 12.8 c/ha from nitrogen, 8.3 c/ha from phosphorus, and 9.8 c/ha from potassium fertilizers (Shoykin et al., 2024).

**Farm Business Analysis**

The economic performance of NPK 20-20-10 fertilizer was assessed through indicators of farm profitability, specifically profit and the revenue-to-cost (R/C) ratio. Table 9 presents the results of the farm business analysis for various treatments. All NPK 20-20-10 treatments demonstrated economic viability, as evidenced by R/C ratios exceeding 1. The 1.25 dose exhibited the highest R/C ratio of 1.54, generating a profit of IDR 29,053,400. This implies that for every unit of cost incurred, 1.54 units of revenue were generated, highlighting the significant profitability of NPK 20-20-10 fertilizer in potato production. This economic viability and superior profitability observed with the 1.25 dose suggest its strong potential for widespread adoption by potato farmers, thereby contributing to improved agricultural

sustainability and farmer livelihoods. This aligns with other research indicating that the highest relative agronomic effectiveness and profitability often result from optimized fertilizer doses rather than the highest application rates, reflecting efficient nutrient utilization (Aisyawati et al., 2020; Kasno et al., 2022).

**Table 9.** Farm Business Analysis of Various NPK 20-20-10 Fertilizer Treatments

| Treatment | Cost (Rp) | Revenue (Rp) | Benefit (Rp) | R/C |
|---|---|---|---|---|
| Control | 44,010,000 | 45,333,000 | 1,323,000 | 1.03 |
| Reference | 49,730,000 | 68,000,000 | 18,270,000 | 1.37 |
| 0.50 dose of NPK 20-20-10 | 47,851,000 | 66,667,000 | 18,816,000 | 1.39 |
| 0.75 dose of NPK 20-20-10 | 49,772,600 | 72,667,000 | 22,894,400 | 1.46 |
| 1.00 dose of NPK 20-20-10 | 51,692,000 | 74,667,000 | 22,975,000 | 1.44 |
| 1.25 dose of NPK 20-20-10 | 53,613,600 | 82,667,000 | 29,053,400 | 1.54 |
| 1.50 dose of NPK 20-20-10 | 55,533,000 | 80,000,000 | 24,467,000 | 1.44 |

## 5. CONCLUSION AND SUGGESTIONS

Experimental findings revealed that applying NPK 20-20-10 fertilizer at 1.25 times the recommended rate substantially enhanced various potato growth and yield parameters, including plant height, leaf count, tuber number, 10-tuber weight, and yields per plant, plot, and hectare, in comparison to the control group. This specific application rate of NPK 20-20-10 was also found to be both agronomically effective and more economically profitable than the control. Consequently, the recommended dosage for potato cultivation is set at 675 kg/ha of NPK 20-20-10, to be applied in three equal splits: one-third at planting, one-third at four weeks after planting, and the final one-third at six weeks after planting.

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