EFFICACY TEST OF QUANTUM-TOTAL ON THE GROWTH AND YIELD OF LOWLAND IRRIGATED RICE (*Oryza sativa L.*)

EVALUATION TRIAL REPORT

INAVET NUTRITION TECHNOLOGY INC.
Unit 413, Corporate 101 Building, 101 Mother Ignacia Ave,
Diliman, Quezon City, 1103 Metro Manila

ROSE ANN R. MANLUSOC
FPA Accredited Researcher, PNT 327

November 2024 to April 2025

EFFICACY TEST OF QUANTUM-TOTAL ON THE GROWTH AND YIELD OF LOWLAND IRRIGATED RICE (*Oryza sativa L.*)

ROSE ANN R. MANLUSOC

ABSTRACT

Rice production in the Philippines continues to face persistent challenges, including declining soil fertility, erratic weather conditions, and stagnating yields. This study investigated the bioefficacy of Quantum-Total, a microbial inoculant designed to improve nutrient uptake and plant health, thereby enhancing crop productivity. Field trials were conducted at two locations—San Jose City, Nueva Ecija, and San Nicolas, Pangasinan—using two application rates of Quantum-Total (1 and 2 quarts per hectare), applied alone or in combination with full and half rates of inorganic fertilizer.

Results revealed that the application of 2-quart per hectare of Quantum-Total combined with the full rate of inorganic fertilizer (T9) consistently produced the highest values across all agronomic parameters, including plant height, tiller and panicle counts, straw biomass, and grain yield. T9 achieved grain yields of 8.43 t/ha in Nueva Ecija and 7.26 t/ha in Pangasinan. The 1-quart treatment (T6) also significantly improved outcomes compared to inorganic fertilizer alone. Treatments involving Quantum-Total alone demonstrated moderate benefits over the control.

The study confirms that Quantum-Total, particularly at the 2-quart rate, is a promising input for enhancing rice growth, yield, and nutrient use efficiency, supporting its registration with the Fertilizer and Pesticide Authority (FPA) as a viable tool for sustainable rice intensification.

INTRODUCTION

Rice farming is a cornerstone of the Philippine agriculture sector, providing a livelihood for millions of farmers and serving as a staple food for the country's population. However, despite its critical importance, rice farming in the Philippines faces numerous challenges, including declining soil fertility, pest infestations, and unpredictable weather patterns due to climate change. These issues not only threaten the productivity and sustainability of rice farms but also impact the nation's food security.

To address these challenges, innovative solutions like **Quantum-Total** microbial inoculant offer promising benefits. **Quantum-Total** enhances soil health by restoring and boosting soil biology, improving nutrient uptake, and fortifying plants' natural defenses. By incorporating this advanced microbial technology into rice farming practices, Filipino farmers can not only overcome some of the most pressing issues they face but also significantly increase rice production, resulting in healthier crops and higher yields.

To ensure its effectiveness and safety, **Quantum-Total** will undergo an evaluation trial specifically focused on rice growth and yield. This trial aims to generate crucial data on its impact on rice farming while also providing the necessary information to support its product registration with the Fertilizer and Pesticide Authority (FPA). This step is essential for ensuring that **Quantum-Total** can be widely adopted by Filipino farmers, contributing to more sustainable and productive rice farming practices in the country.

OBJECTIVES

1. To assess the effectiveness of Quantum-Total in enhancing the growth and yield of lowland rice.
2. To determine the optimal application rate of Quantum-Total for both soil and foliar treatments.
3. To generate data supporting the product registration of Quantum-Total with the Fertilizer and Pesticide Authority (FPA).

METHODOLOGY

Field Characterization

Field trials were conducted in Barangay Sto. Tomas, San Jose City, Nueva Ecija, and Barangay San Isidro, San Nicolas, Pangasinan. Both sites lie within Agro-Climatic Zone 12 and are classified under the Type I climate of the Philippines, characterized by distinct wet and dry seasons. The terrain is nearly level, with slopes ranging from 0% to 3%, favorable for uniform water management and mechanized

farming. Soils in the area range from clay to loam and clay loam, which provide good water retention and nutrient-holding capacity—ideal for lowland rice cultivation.

Both locations are fully irrigated and benefit from established irrigation infrastructure, allowing for continuous rice production. Average monthly rainfall is about 15 mm at 75% probability, while total annual precipitation exceeds 2,100 mm (Moya, 2005), ensuring adequate moisture during the cropping period. These conditions make the sites highly suitable for field experimentation on rice growth and yield performance.

Experimental Design

The field trial followed a Randomized Complete Block Design (RCBD) to account for variability across the experimental area and ensure reliable comparison of treatments. The site (Figure 1) was divided into three blocks, each serving as a replication. Within each block, nine plots were laid out and treatments were randomly assigned to reduce bias.

Each plot measured 4 m × 5 m and was surrounded by a 0.3-meter bund to prevent water and nutrient runoff. A 1-meter buffer was maintained between blocks and 0.5 meters between plots to minimize treatment interference and edge effects, ensuring accurate assessment of treatment performance under field conditions.

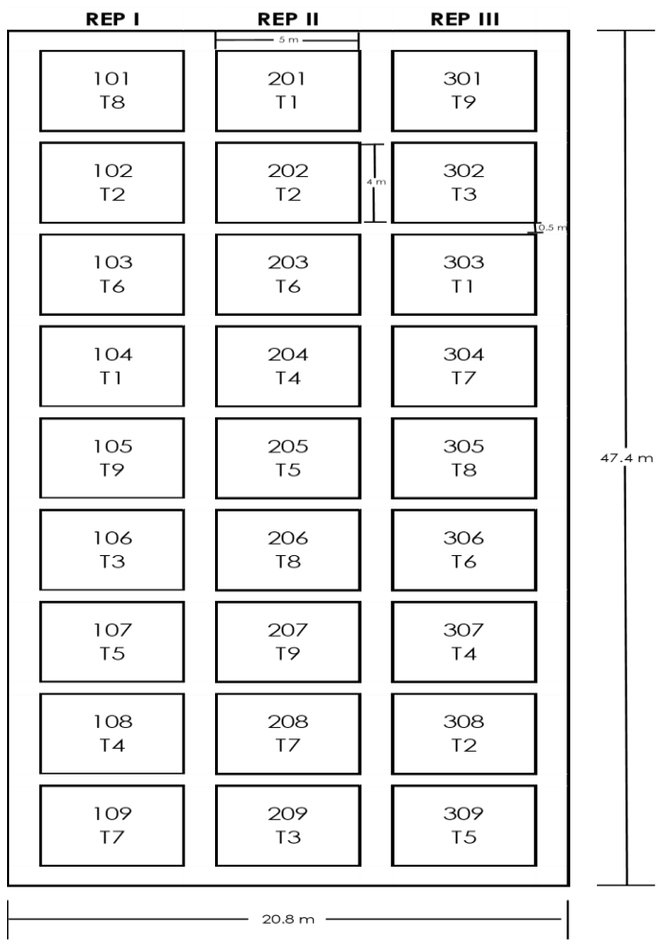


Figure 1. Field layout and randomization. 985.92 sqm.

Test Variety

The test crop used was NSIC Rc 222, a certified inbred rice variety known for its high yield potential and adaptability. With a seeding rate of 40 kg/ha, it has an average yield of 6.1 t/ha and a maximum yield of 10 t/ha, according to the Pinoy Rice Knowledge Bank (pinoyrice.com). The variety exhibits moderate resistance to brown planthopper and green leafhopper, and intermediate resistance to blast, bacterial leaf blight, and tungro.

Land preparation

A conventional land preparation method was employed over a four-week period, consisting of one plowing followed by three harrowings at 5–7-day intervals. Leveling was done after the final harrowing to ensure uniform water distribution. The trial was conducted during the 2025 Dry Season (November 2024 to April 2025) over a total area of 985.92 m².

Seed and Seedling Management

NSIC Rc 222 seeds were soaked for 24 hours, incubated for another 24 hours, and raised using the dapog method, which promotes uniform and vigorous seedlings for transplanting.

Crop Establishment

Twenty-one-day-old seedlings were manually transplanted at 20 × 20 cm spacing, with one to two seedlings per hill. Replanting was done 2–3 days after transplanting (DAT) to ensure full stand establishment.

Nutrient management

The recommended rate of inorganic fertilizer base on the MOET set-up (Table 1, Appendix Figure 1 & 2) were 123.44-14-42.6 and 179.66-14-42.6-4.32 kg of NPKS per hectare in Nueva Ecija and Pangasinan, respectively. The trial included nine treatments, as shown in Tables 2 and 3. Treatment 1 served as the control (no application), while Treatment 2 involved the full recommended rate of inorganic fertilizer. Treatment 3 consisted of a 50% reduction in N, P_2O_5, and K_2O rates. Treatments 4 to 6 incorporated QUANTUM TOTAL with either no, half, or full rates of inorganic fertilizer per hectare. The inorganic fertilizers used were urea (46–0–0), ammonium phosphate (16-20-0), muriate of potash (0–0–60) and zinc sulfate.

For treatment 4-6, in a one-hectare field, with QUANTUM TOTAL, seeds soaked in water with the said biofertilizer at the rate of 100ml per 40kg of seeds. For soil treatment, 0.5 quart of QUANTUM TOTAL per hectare was applied right after transplanting. After 30 days, foliar application of Quantum Total was

done at a rate of 0.5 quart per hectare. Treatment 4 treated with quantum alone, Treatment 5 with half rate of inorganic fertilizer while Treatment 6 with full rate of inorganic fertilizer.

For treatment 7-9, in a one-hectare field, with QUANTUM TOTAL, seeds soaked in water with the said biofertilizer at the rate of 100ml per 40kg of seeds. For soil treatment, 1 quart of QUANTUM TOTAL per hectare was applied right after transplanting. After 30 days, foliar application of Quantum Total was done at a rate of 1 quart per hectare. Treatment 7 treated with quantum alone, Treatment 8 with half rate of inorganic fertilizer while Treatment 9 with full rate of inorganic fertilizer.

Table 1. Inorganic fertilizer rates derived from MOET biomass data and indigenous nutrient supply

MOET App biomass data						
Location	Minus N	Minus P	Minus K	Minus S	Minus Cu	Minus Zn
Nueva Ecija	14.5	37.0	35.4	32.5	17.6	17.6
Pangasinan	14.0	29.5	32.0	29.8	6.5	3.3
MOET App computed indigenous nutrient supply						
	INS_N	INS_P	INS_K	INS_S		
Nueva Ecija	47.1	24.04	132.56	18.68		
Pangasinan	45.52	19.15	120.02	17.14		
MOET App recommended rate of NPKS/ha						
	N	P	K	S		
Nueva Ecija	123.44	14	42.6			
Pangasinan	179.66	14	42.6	4.32		

Table 2. Fertilizer treatments and the recommended fertilizer rate used in the field trial. 2025 Dry Season.

Fertilizer Treatments (T)	**Recommended Fertilizer Rate**	
	Nueva Ecija	**Pangasinan**
T1: Control	No application	
T2: RRIF	123.44-14-42.6 kg NPK/ha	179.66-14-42.6-4.32 kg NPKS/ha
T3: ½ RRIF	61.72-7-21.3 kg NPK/ha	89.83-7-21.3-2.16 kg NPKS/ha
T4: QUANTUM TOTAL	1 quart QUANTUM TOTAL	1 quart QUANTUM TOTAL
T5: ½ RRIF + 1 quart QUANTUM TOTAL	61.72-7-21.3 kg NPK/ha + 1 quart QUANTUM TOTAL	89.83-7-21.3-2.16 kg NPKS/ha + 1 quart QUANTUM TOTAL
T6: RRIF + 1 quart QUANTUM TOTAL	123.44-14-42.6 kg NPK/ha + 1 quart QUANTUM TOTAL	179.66-14-42.6-4.32 kg NPKS/ha + 1 quart QUANTUM TOTAL
T7: 2 quart QUANTUM TOTAL	2 quart QUANTUM TOTAL	2 quart QUANTUM TOTAL
T8: ½ RRIF + 2 quart QUANTUM TOTAL	61.72-7-21.3 kg NPK/ha + 2 quart QUANTUM TOTAL	89.83-7-21.3-2.16 kg NPKS /ha + 2 quart QUANTUM TOTAL
T9: RRIF + 2 quart QUANTUM TOTAL	123.44-14-42.6 kg NPK/ha + 2 quart QUANTUM TOTAL	179.66-14-42.6-4.32 kg NPKS/ha + 2 quart QUANTUM TOTAL

RRIF-recommended rate of inorganic fertilizer based on MOET App

Table 3. Time and amount of fertilizer application used in the field trial.

Treatment	Timing of application/Recommended application per hectare		
	Inorganic fertilizer		QUANTUM TOTAL
	Nueva Ecija	Pangasinan	
T1: Control	-----	-----	-----
T2: RRIF	14 DAT: 0.88 bag 46-0-0 (20.24 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.3 bag zinc sulfate 25 DAT: 1.14 bag 46-0-0 (26.22 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 1.88 bag 46-0-0 (43.24 kg N/ha) 45 DAT: 0.98 bag 46-0-0 (22.54 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	14 DAT: 1.28 bag 46-0-0 (29.44 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.24 bag zinc sulfate 25 DAT: 1.68 bag 46-0-0 (38.64 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 2.74 bag 46-0-0 (63.02 kg N/ha) 45 DAT: 1.46 bag 46-0-0 (33.58 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	-----
T3: ½ RRIF	14 DAT: 0.44 bag 46-0-0 (10.12 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.15 bag zinc sulfate 25 DAT: 0.57 bag 46-0-0 (13.11 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 0.94 bag 46-0-0 (21.62 kg N/ha) 45 DAT: 0.49 bag 46-0-0 (11.27 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	14 DAT: 0.64 bag 46-0-0 (14.72 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.12 bag zinc sulfate 25 DAT: 0.84 bag 46-0-0 (19.32 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 1.37 bag 46-0-0 (31.51 kg N/ha) 45 DAT: 0.73 bag 46-0-0 (16.79 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	-----
T4: 1 quart QUANTUM TOTAL	-----	-----	Seed soaking treatment: 100 ml QUANTUM TOTAL for 40kg seeds; Soil treatment**:** 0.5-quart QUANTUM TOTAL applied after transplanting with 160L water per hectare; 30 DAT: 0.5-quart QUANTUM TOTAL applied thru foliar spray with 160L water per hectare
T5: ½ RRIF + 1 quart QUANTUM TOTAL	14 DAT: 0.44 bag 46-0-0 (10.12 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.15 bag zinc sulfate 25 DAT: 0.57 bag 46-0-0 (13.11 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 0.94 bag 46-0-0 (21.62 kg N/ha) 45 DAT: 0.49 bag 46-0-0 (11.27 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	14 DAT: 0.64 bag 46-0-0 (14.72 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.12 bag zinc sulfate 25 DAT: 0.84 bag 46-0-0 (19.32 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 1.37 bag 46-0-0 (31.51 kg N/ha) 45 DAT: 0.73 bag 46-0-0 (16.79 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	
T6: RRIF + 1 quart QUANTUM TOTAL	14 DAT: 0.88 bag 46-0-0 (20.24 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.3 bag zinc sulfate 25 DAT: 1.14 bag 46-0-0 (26.22 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 1.88 bag 46-0-0 (43.24 kg N/ha) 45 DAT: 0.98 bag 46-0-0 (22.54 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	14 DAT: 1.28 bag 46-0-0 (29.44 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.24 bag zinc sulfate 25 DAT: 1.68 bag 46-0-0 (38.64 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 2.74 bag 46-0-0 (63.02 kg N/ha) 45 DAT: 1.46 bag 46-0-0 (33.58 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	

T7: 2 quart QUANTUM TOTAL	-----	-----	Seed soaking treatment: 100 ml QUANTUM TOTAL for 40kg seeds; Soil treatment**:** 0.5-quart QUANTUM TOTAL applied after transplanting with 160L water per hectare; 30 DAT: 0.5-quart QUANTUM TOTAL applied thru foliar spray with 160L water per hectare
T8: ½ RRIF + 2 quart QUANTUM TOTAL	14 DAT: 0.44 bag 46-0-0 (10.12 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.15 bag zinc sulfate 25 DAT: 0.57 bag 46-0-0 (13.11 kg N/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 0.94 bag 46-0-0 (21.62 kg N/ha) 45 DAT: 0.49 bag 46-0-0 (11.27 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	14 DAT: 0.64 bag 46-0-0 (14.72 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) + 0.12 bag zinc sulfate 25 DAT: 0.84 bag 46-0-0 (19.32 kg N/ha) + 0.09 bag 21-0-0-24S (0.945-1.08 NS/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha) 35 DAT: 1.37 bag 46-0-0 (31.51 kg N/ha) 45 DAT: 0.73 bag 46-0-0 (16.79 kg N/ha) + 0.71 bag 0-0-60 (21.3 kg K/ha) + 0.14 bag 16-20-0 (1.12-1.4 kg NP/ha)	
T9: RRIF + 2 quart QUANTUM TOTAL	14 DAT: 0.88 bag 46-0-0 (20.24 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.3 bag zinc sulfate 25 DAT: 1.14 bag 46-0-0 (26.22 kg N/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 1.88 bag 46-0-0 (43.24 kg N/ha) 45 DAT: 0.98 bag 46-0-0 (22.54 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	14 DAT: 1.28 bag 46-0-0 (29.44 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) + 0.24 bag zinc sulfate 25 DAT: 1.68 bag 46-0-0 (38.64 kg N/ha) + 0.18 bag 21-0-0-24S (1.89-2.16 NS/ha) + 0.56 bag 16-20-0 (4.48-5.6 kg NP/ha) 35 DAT: 2.74 bag 46-0-0 (63.02 kg N/ha) 45 DAT: 1.46 bag 46-0-0 (33.58 kg N/ha) + 1.42 bag 0-0-60 (42.6 kg K/ha) + 0.28 bag 16-20-0 (2.24-2.8 kg NP/ha)	

Note: 123.44-14-42.6 kg NPK/ha and 179.66-14-42.6-4.32 kg NPKS/ha full recommended rate of inorganic fertilizers for Nueva Ecija and Pangasinan, respectively.
DAT- days after transplanting

Water Management

Irrigation water was provided by the National Irrigation Administration (NIA). Water depth was maintained at ~3 cm during land preparation, saturated at transplanting, and then regulated at 2–5 cm from 7 DAT until 7 days before harvest to support optimal crop growth and minimize water stress.

Pest Management

Molluscicide was applied 7 days before transplanting to control apple snails. Hand weeding was done at 15, 21, 37, and 40 DAT. To manage stemborers, chlorpyrifos was sprayed at 20 and 45 DAT following IPM guidelines.

Harvest Management

Sampling and harvesting were conducted on April 19 and 20, 2025 in Nueva Ecija and Pangasinan, respectively. The crop was 114/113 days old after sowing and 93/92 days old after transplanting.

Data Gathered

Sixteen hills were tagged, and data on both plant height and tiller count were recorded at 30 DAT and at maturity. The tagged hills were harvested and analyzed for productive and unproductive tillers, as well as panicle density (panicles per unit area). Additionally, an 8 m² area was harvested, and grain yield was calculated in tons per hectare at an adjusted 14% moisture content. Straw weight (kg) from the harvested area was recorded as well.

Data Analysis

Data on plant height and tiller count (both productive and unproductive) per square meter at 30 DAT and at maturity, panicle count per square meter, straw weight (kg) from an 8 m² area, and yield (t/ha) were statistically analyzed using analysis of variance (ANOVA). Mean differences were analyzed using Tukey's Honest Significant Difference (HSD) test at a 5% significance level.

RESULTS AND DISCUSSION

Plant height at 30 DAT and at maturity

The influence of fertilizer management on the plant height of NSIC Rc 222 at 30 days after transplanting (DAT) and at physiological maturity across two locations—Nueva Ecija and Pangasinan—is presented in Tables 4 and 5. Significant differences in plant height were observed at both growth stages in both sites.

In Nueva Ecija, the tallest plants at 30 DAT were recorded in plots treated with the full recommended rate of inorganic fertilizer (RRIF) combined with 2-quart of QUANTUM TOTAL (T9), with an average height of 49.11 cm. This was closely followed by the full RRIF plus 1 quart of QUANTUM TOTAL (T6) at 48.94 cm. Plant heights in treatments receiving the half-rate RRIF combined with either 1 or 2 quarts of QUANTUM TOTAL (T5 and T8) were comparable to those treated with the full RRIF alone (T2). Similarly, plant heights in treatments with QUANTUM TOTAL alone (T4 and T7) were comparable to the half-rate RRIF alone (T3). The shortest plants were observed in the control treatment (T1), which did not receive any fertilizer, with a mean height of 44.38 cm.

In Pangasinan, the tallest plants at 30 DAT were observed in plots treated with the half-rate RRIF plus 2-quart of QUANTUM TOTAL (T8), with a mean height of 43.10 cm. This was statistically comparable to the full RRIF plus 2-quart of QUANTUM TOTAL (T9) at 42.46 cm, and to 2-quart of QUANTUM TOTAL alone (T7) at 41.30 cm. The shortest plants were found in the control treatment (T1), with a height of 35.71 cm.

At physiological maturity, plant height differences among treatments were also significant. In Nueva Ecija, plant height ranged from 78.46 cm to 102.96 cm. The tallest plants were recorded in the treatment with the full RRIF plus 2-quart of QUANTUM TOTAL (T9), followed by the full RRIF plus 1 quart of QUANTUM TOTAL (T6), with heights of 102.96 cm and 94.27 cm, respectively. The shortest plants were observed in the control (T1), similar to those treated with QUANTUM TOTAL alone (T4 and T7).

In Pangasinan, significant differences were also evident. The tallest plants were recorded in plots treated with the full RRIF plus 2-quart of QUANTUM TOTAL (T9) at 104.52 cm, followed closely by T6 (103.79 cm) and T2 (102.08 cm). In general, treatments that included QUANTUM TOTAL, either alone or in combination with inorganic fertilizer, produced taller plants than those with inorganic fertilizer alone. Again, the control (T1) had the shortest plants (80.52 cm).

Notably, the 2-quart rate of QUANTUM TOTAL (T9) consistently produced the tallest plants at both sites and growth stages—102.96 cm in Nueva Ecija and 104.52 cm in Pangasinan. This was followed by the 1-quart rate (T6), which recorded 94.27 cm and 103.79 cm, respectively. These results suggest that increasing the application rate of QUANTUM TOTAL enhances vegetative growth, likely due to improved microbial activity and nutrient solubilization.

When compared to inorganic fertilizer alone (T2 and T3), the combination treatments (T6 and T9) yielded taller plants, whereas treatments with QUANTUM TOTAL alone (T4 and T7) showed only modest

improvements over the control (T1). The consistent underperformance of the control highlights the critical role of nutrient supplementation in rice growth and development.

Overall, these findings demonstrate that combining inorganic fertilizer with QUANTUM TOTAL enhances plant height significantly at both 30 DAT and maturity, with the highest performance observed at the higher application rate of the biofertilizer.

Table 4. Effect of fertilizer management on plant height at 30 days after transplanting and at physiological maturity. San Jose City, Nueva Ecija.

TREATMENTS	Plant height (cm) at	
	30 DAT	**Maturity**
T1: Control	44.38 ^{d}	78.46 ^{e}
T2: RRIF	47.79 ^{abc}	91.87 ^{bc}
T3: ½ RRIF	46.67 ^{abcd}	85.94 ^{d}
T4: 1 quart of QUANTUM TOTAL	45.04 ^{cd}	78.59 ^{e}
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	47.36 ^{abc}	87.96 ^{cd}
T6: RRIF + 1 quart of QUANTUM TOTAL	48.94 ^{ab}	94.27 ^{b}
T7: 2 quart of QUANTUM TOTAL	46.00 ^{bcd}	79.69 ^{e}
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	47.61 ^{abc}	87.71 ^{cd}
T9: RRIF + 2 quart of QUANTUM TOTAL	49.11 ^{a}	102.96 ^{a}

Note: Means followed by a different letter in a column are considered significant at $p \leq 0.05$ by Tukey's HSD (honest significant difference) test.

Table 5. Effect of fertilizer management on plant height at 30 days after transplanting and at physiological maturity. San Nicolas, Pangasinan.

TREATMENTS	Plant height (cm) at	
	30 DAT	**Maturity**
T1: Control	35.71 ^{d}	80.52 ^{d}
T2: RRIF	38.97 ^{bcd}	102.08 ^{a}
T3: ½ RRIF	36.55 ^{d}	91.84 ^{b}
T4: 1 quart of QUANTUM TOTAL	37.02 ^{cd}	81.33 ^{cd}
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	38.71 ^{bcd}	94.63 ^{b}
T6: RRIF + 1 quart of QUANTUM TOTAL	40.55 ^{abc}	103.79 ^{a}
T7: 2 quart of QUANTUM TOTAL	41.30 ^{ab}	84.42 ^{c}
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	43.10 ^{a}	94.71 ^{b}
T9: RRIF + 2 quart of QUANTUM TOTAL	42.46 ^{ab}	104.52 ^{a}

Note: Means followed by a different letter in a column are considered significant at $p \leq 0.05$ by Tukey's HSD (honest significant difference) test.

Tiller count at 30 DAT and at maturity

The analysis of tiller count per square meter of NSIC Rc 222 at 30 DAT and at maturity reveals notable trends across both experimental sites—Nueva Ecija and Pangasinan (Tables 6 & 7). Significant differences in tiller counts among treatments were observed at both growth stages in each location.

In Nueva Ecija, tiller counts at 30 DAT ranged from 359.9 to 522.92 tillers per square meter. The highest tiller count was recorded in the treatment receiving the full RRIF combined with 2-quart of QUANTUM TOTAL (T9), followed by the full RRIF + 1-quart of QUANTUM TOTAL (T6) with 458.86 tillers. A comparable tiller count was also observed in the treatment with the half-rate RRIF plus 2-quart of

QUANTUM TOTAL (T8). The lowest tiller count was recorded in the control treatment (T1), which received no fertilizer input.

At maturity, the trend persisted, with treatments combining both full and half rates of inorganic fertilizer and QUANTUM TOTAL producing significantly higher tiller counts. The highest count at this stage was again recorded in T9 (411.46 tillers/m²), while other treatments ranged between 211.46 and 396.88 tillers/m².

In Pangasinan, similar patterns emerged. At 30 DAT, the highest tiller count was observed in the T9 treatment (553.65 tillers/m²), followed by T6 and T8. Treatments that included QUANTUM TOTAL, whether alone or in combination with inorganic fertilizer, consistently outperformed those treated with inorganic fertilizer alone. By maturity, T9 maintained the highest tiller count at 440.10 tillers/m², reinforcing its superior performance in promoting tiller development.

Overall, tiller count was significantly influenced by the application rate of QUANTUM TOTAL. The 2-quart rate (T9) consistently resulted in the highest number of tillers at both 30 DAT and maturity in both locations. The 1-quart rate (T6) also showed strong performance, affirming a dose-dependent enhancement in tillering. Compared to the sole inorganic fertilizer treatments (T2 and T3), the combination treatments (especially T6 and T9) showed markedly superior tiller development. While QUANTUM TOTAL alone (T4 and T7) improved tiller counts over the control, the effect was more pronounced when combined with inorganic inputs. The control plots (T1) consistently recorded the lowest tiller numbers, underscoring the critical role of nutrient supplementation.

Significant differences were also observed in the number of unproductive tillers across treatments. Plots treated with full or half rates of inorganic fertilizer alone (T2 and T3) tended to have the highest number of unproductive tillers, indicating that inorganic fertilizer alone may promote excessive vegetative growth without proportional yield benefits.

In contrast, plots treated with QUANTUM TOTAL—either alone or in combination with inorganic fertilizer—generally exhibited the lowest unproductive tiller counts across both sites. Notably, T9 recorded the lowest unproductive tiller counts, with only 8.85 tillers in Nueva Ecija and 11.98 in Pangasinan. This suggests that the higher application rate of QUANTUM TOTAL not only increases total tillers but also enhances their productivity.

Interestingly, although T6 was effective in producing high total tiller counts, it had relatively higher unproductive tiller counts (31.77 in Nueva Ecija and 35.94 in Pangasinan) compared to T9. This implies that while both rates of QUANTUM TOTAL promote tillering, the 2-quart rate leads to a more efficient conversion of tillers into productive ones.

These findings collectively demonstrate that the integration of QUANTUM TOTAL, particularly at the 2-quart rate, significantly improves both tiller quantity and quality, reducing unproductive tillering and enhancing crop stand establishment and potential yield.

Table 6. Effect of fertilizer management on tiller count at 30 days after transplanting and at physiological maturity. San Jose City, Nueva Ecija.

TREATMENTS	Tiller count/sqm at		Unproductive tiller/sqm at Harvest
	30 DAT	Maturity	
T1: Control	359.90 c	211.46 e	4.69 c
T2: RRIF	443.75 abc	376.56 ab	38.54 a
T3: ½ RRIF	368.23 bc	312.50 c	26.04 ab
T4: 1 quart of QUANTUM TOTAL	396.88 bc	248.44 d	8.86 c
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	408.86 bc	343.23 bc	6.25 c
T6: RRIF + 1 quart of QUANTUM TOTAL	458.86 ab	396.88 a	31.77 a
T7: 2 quart of QUANTUM TOTAL	385.94 bc	266.15 d	7.29 c
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	439.58 abc	343.75 bc	16.67 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	522.92a	411.46 a	8.85 c

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test.

Table 7. Effect of fertilizer management on tiller count at 30 days after transplanting and at physiological maturity. San Nicolas, Pangasinan.

TREATMENTS	Tiller count/sqm at		Unproductive tiller/sqm at Harvest
	30 DAT	Maturity	
T1: Control	332.29 c	232.29 c	5.21 d
T2: RRIF	459.90 abc	371.36 b	38.54 ab
T3: ½ RRIF	421.36 abc	349.48 b	54.17 a
T4: 1 quart of QUANTUM TOTAL	358.85 bc	242.19 c	8.86 cd
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	430.21 abc	354.17 b	23.44 bcd
T6: RRIF + 1 quart of QUANTUM TOTAL	483.85 ab	376.56 b	35.94 ab
T7: 2 quart of QUANTUM TOTAL	420.31 abc	264.59 c	12.71 cd
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	462.50 abc	355.21 b	27.60 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	553.65 a	440.10 a	11.98 cd

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test.

Panicle per square meter

Panicle count per square meter showed significant variation across treatments in both locations, with values ranging from 206.77 to 402.61 in Nueva Ecija and 227.08 to 428.13 in Pangasinan (Tables 8 & 9). Significant differences were observed among treatments at both sites.

The highest panicle counts were consistently recorded in plots treated with QUANTUM TOTAL, either alone or in combination with inorganic fertilizer. Specifically, the treatment with the full RRIF plus 2-quart of QUANTUM TOTAL (T9) achieved the highest counts: 402.61 panicles/m² in Nueva Ecija and 428.13 panicles/m² in Pangasinan. This was followed by T6 (full RRIF + 1 quart QUANTUM TOTAL), also showing strong performance in both locations.

Conversely, the control plots (T1), which received no fertilizer, recorded the lowest panicle counts in both sites. This further underscore the necessity of nutrient input for optimal reproductive growth.

Interestingly, plots treated with the half rate of inorganic fertilizer plus either 1 or 2 quart of QUANTUM TOTAL (T5 and T8) produced panicle counts that were statistically comparable to those treated with the full RRIF alone (T2). This finding suggests that combining QUANTUM TOTAL with reduced levels of inorganic fertilizer can maintain or even improve reproductive development, offering a potential strategy for reducing chemical inputs without sacrificing yield.

Overall, the use of QUANTUM TOTAL—either alone or in combination with inorganic fertilizer—led to a panicle count increase of 8.0% to 25.2% in Nueva Ecija and 2.3% to 28.6% in Pangasinan, compared to inorganic fertilizer alone. These results highlight the positive impact of microbial activity and nutrient solubilization provided by QUANTUM TOTAL on panicle formation and development.

Panicle Production Trends and Relationship to Tiller Count

Panicle production closely mirrored the trends observed in tiller count. Treatments that produced more tillers at early growth stages (especially T9 and T6) also produced the highest panicle numbers at maturity. This consistency emphasizes the role of early vegetative vigor in supporting reproductive success.

In particular, T9 consistently outperformed all other treatments in both sites, suggesting that the 2-quart application rate of QUANTUM TOTAL, when paired with the full rate of inorganic fertilizer, is most effective in enhancing reproductive growth. This demonstrates that QUANTUM TOTAL not only boosts vegetative parameters such as plant height and tiller count but also significantly contributes to improved reproductive output, ultimately enhancing the plant's yield potential.

In contrast, inorganic fertilizer alone (T2 and T3) resulted in lower panicle counts (338.02 and 286.46 in Nueva Ecija; 332.82 and 295.32 in Pangasinan), suggesting that chemical nutrients alone may not be sufficient to maximize reproductive development. Meanwhile, treatments with QUANTUM TOTAL alone (T4 and T7) provided moderate improvements over the control, reinforcing the additive benefit of microbial enhancement even without synthetic fertilizer input.

These findings suggest that the synergistic effect of QUANTUM TOTAL and inorganic fertilizer supports better overall plant performance from early growth to reproductive maturity. The enhanced panicle formation observed in treatments with QUANTUM TOTAL is likely due to improved nutrient uptake and plant physiological responses stimulated by beneficial microbial activity, further validating its value as a sustainable biofertilizer input.

Straw weight per 8 square meters

The analysis revealed significant differences in straw weight per 8 square meters across treatments at both sites, reflecting the influence of fertilizer management on vegetative biomass production. Straw weight ranged from 8.99 to 19.87 kg in Nueva Ecija and from 8.22 to 21.73 kg in Pangasinan (Tables 8 & 9).

The highest straw weights were recorded in plots treated with the full rate of inorganic fertilizer in combination with QUANTUM TOTAL, particularly in T9 (full RRIF + 2-quart QUANTUM TOTAL), which produced 19.87 kg and 21.73 kg in Nueva Ecija and Pangasinan, respectively. This was followed by T6 (full

RRIF + 1-quart QUANTUM TOTAL) and T2 (full RRIF alone), which also showed high biomass accumulation but were still outperformed by T9.

In contrast, the lowest straw weights were consistently recorded in the control plots (T1), with only 8.99 kg in Nueva Ecija and 8.22 kg in Pangasinan. These results highlight the essential role of nutrient supplementation, particularly through the combined application of inorganic fertilizer and biofertilizer, in promoting biomass production.

Biomass Trends Relative to Growth Parameters

Straw biomass trends were consistent with those observed for plant height, tiller count, and panicle number. Treatments that supported vigorous early growth and tillering (e.g., T9 and T6) also resulted in greater biomass at maturity. The 2-quart rate of QUANTUM TOTAL (T9) proved most effective, significantly enhancing vegetative growth and resulting in the heaviest straw biomass. This suggests that QUANTUM TOTAL stimulates robust plant development through improved nutrient uptake and microbial activity, which translates into increased biomass accumulation.

While T2 (inorganic fertilizer alone) produced relatively high straw weights (18.75 kg in Nueva Ecija and 19.30 kg in Pangasinan), it was consistently outperformed by treatments involving QUANTUM TOTAL, particularly T9. This further reinforces the additive effect of combining synthetic fertilizers with microbial inoculants.

Treatments with half RRIF or QUANTUM TOTAL alone (T3, T4, and T7) resulted in moderate improvements in straw weight over the control, but were notably less effective than combinations involving the full rate of inorganic fertilizer and QUANTUM TOTAL. This trend suggests that although QUANTUM TOTAL alone can enhance vegetative biomass, its full potential is best realized when used alongside inorganic inputs.

Overall, these findings affirm that integrated fertilization strategies, especially those involving QUANTUM TOTAL at the 2-quart rate, substantially increase straw biomass production. The data not only align with trends in other agronomic parameters but also support the broader conclusion that biofertilizer and inorganic fertilizer synergy enhances overall plant performance. This has important implications for sustainable nutrient management in rice production systems.

Grain Yield at 14% Moisture Content

Grain yield, the most critical agronomic parameter, exhibited significant variation across treatments in both sites (Tables 8 & 9). The yield of NSIC Rc 222 ranged from 4.20 to 8.43 tons/ha in Nueva Ecija and 3.42 to 7.26 tons/ha in Pangasinan. These differences reflect the clear impact of nutrient management, particularly the use of QUANTUM TOTAL, on crop productivity.

The highest yields were obtained from plots treated with the full RRIF combined with 2-quart of QUANTUM TOTAL (T9), reaching 8.43 tons/ha in Nueva Ecija and 7.26 tons/ha in Pangasinan. Following closely was T6 (full RRIF + 1-quart QUANTUM TOTAL), with yields of 7.73 and 6.98 tons/ha, respectively.

These results highlight the dose-responsive performance of Quantum-Total, where higher application rates consistently resulted in greater productivity.

In comparison, plots treated with the full rate of inorganic fertilizer alone (T2) yielded 7.05 and 6.33 tons/ha, while the half-rate inorganic fertilizer alone (T3) resulted in lower yields of 5.58 and 4.63 tons/ha. Notably, treatments that combined half-rate inorganic fertilizer with 1 or 2 quarts of QUANTUM TOTAL produced yields comparable to or exceeding those of T2, indicating that the microbial inoculant compensated for reduced chemical fertilizer input.

Treatments with QUANTUM TOTAL alone (T4 and T7) achieved moderate yield improvements over the control but were still inferior to combination treatments. Yield gains over the control or full or half RRIF ranged from 9.6% to 32.9% in Nueva Ecija and 10.3% to 39.7% in Pangasinan, depending on treatment. These results underscore the importance of integrating microbial and chemical fertilizers for maximizing rice yield.

Integration with Other Growth Parameters

Grain yield performance closely mirrored trends observed in other parameters such as plant height, tiller count, panicle number, and straw biomass. Treatments that promoted strong vegetative growth and reproductive development—particularly T9 and T6—also produced the highest grain yields. This reinforces the effectiveness of Quantum-Total, especially at 2-quart rates, in enhancing overall crop vigor and yield components.

Furthermore, the superior performance of T9 across all parameters confirms the synergy between inorganic nutrient supply and microbial activity. This synergy not only improves nutrient uptake and utilization but also enhances the efficiency of resource use, especially when reducing chemical inputs.

In summary, the integration of Quantum-Total, particularly at the 2-quart application rate, into conventional fertilizer regimes significantly improves rice yield and agronomic performance. Its consistent superiority across all measured parameters demonstrates its potential as a complementary biofertilizer in lowland rice systems. These results provide strong evidence that integrated nutrient management—combining microbial inoculants with inorganic fertilizers—is a practical and sustainable approach to maximize productivity and improve input use efficiency.

Table 8. Effect of fertilizer management on the yield and other parameters of rice. San Jose City, Nueva Ecija.

Treatment	Tiller/ sqm	Panicle/ sqm	Straw Weight/ 8sqm	Grain Yield (t/ha)
T1: Control	211.46 e	206.77 f	8.99 d	4.20 e
T2: RRIF	376.56 ab	338.02 bc	18.75 b	7.05 c
T3: ½ RRIF	312.50 c	286.46 d	12.62 c	5.58 d
T4: 1 quart of QUANTUM TOTAL	248.44 d	239.58 ef	9.88 d	5.40 d
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	343.23 bc	336.98 bc	13.24 c	7.26 bc
T6: RRIF + 1 quart of QUANTUM TOTAL	396.88 a	365.11 b	18.12 b	7.73 b
T7: 2 quart of QUANTUM TOTAL	266.15 d	258.85 de	9.87 d	5.58 d
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	343.75 bc	327.08 c	13.17 c	7.00 c
T9: RRIF + 2 quart of QUANTUM TOTAL	411.46 a	402.61 a	19.87 a	8.43 a

Note: Means followed by a different letter in a column are considered significant at $p \leq 0.05$ by Tukey's HSD (honest significant difference) test.

Table 9. Effect of fertilizer management on the yield and other parameters of rice. Pangasinan.

Treatment	Tiller/ sqm	Panicle/ sqm	Straw Weight/ 8sqm	Grain Yield (t/ha)
T1: Control	232.29 c	227.08 d	8.22 f	3.42 e
T2: RRIF	371.36 b	332.82 b	19.30 b	6.33 bc
T3: ½ RRIF	349.48 b	295.32 bc	14.01 d	4.63 d
T4: 1 quart of QUANTUM TOTAL	242.19 c	233.33 d	9.59 ef	4.15 de
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	354.17 b	330.73 b	14.76 cd	6.05 c
T6: RRIF + 1 quart of QUANTUM TOTAL	376.56 b	340.63 b	20.86 a	6.98ab
T7: 2 quart of QUANTUM TOTAL	264.59 c	251.88 cd	10.85 e	4.67 d
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	355.21 b	327.60 b	16.09 c	6.47 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	440.10 a	428.13 a	21.73 a	7.26 a

Note: Means followed by a different letter in a column are considered significant at $p \leq 0.05$ by Tukey's HSD (honest significant difference) test.

SUMMARY

This study evaluated the agronomic effectiveness of Quantum-Total, a microbial inoculant, on lowland irrigated rice (NSIC Rc 222) across two locations in the Philippines. The primary objectives were to assess its bioefficacy, identify the optimal application rate, and generate supporting data for product registration with the FPA.

Treatments included 1- and 2-quart per hectare application rates of Quantum-Total, applied alone or in combination with half and full rates of inorganic fertilizer. Across both sites, the 2-quart treatment combined with the recommended inorganic fertilizer rate (T9) consistently outperformed all other treatments. This combination resulted in the highest values for all agronomic parameters measured—plant height, number of tillers and panicles, straw biomass, and grain yield.

The 1-quart rate (T6) also enhanced performance compared to inorganic fertilizer treatments alone (T2 and T3), although it was consistently less effective than T9. Quantum-Total applied alone (T4 and T7) provided moderate yield improvements over the control (T1), which recorded the lowest performance across all metrics.

These findings affirm the effectiveness of Quantum-Total, particularly at the 2-quart rate, in boosting crop performance and promoting nutrient efficiency, making it a valuable supplement to current fertilizer practices in lowland rice farming.

CONCLUSION

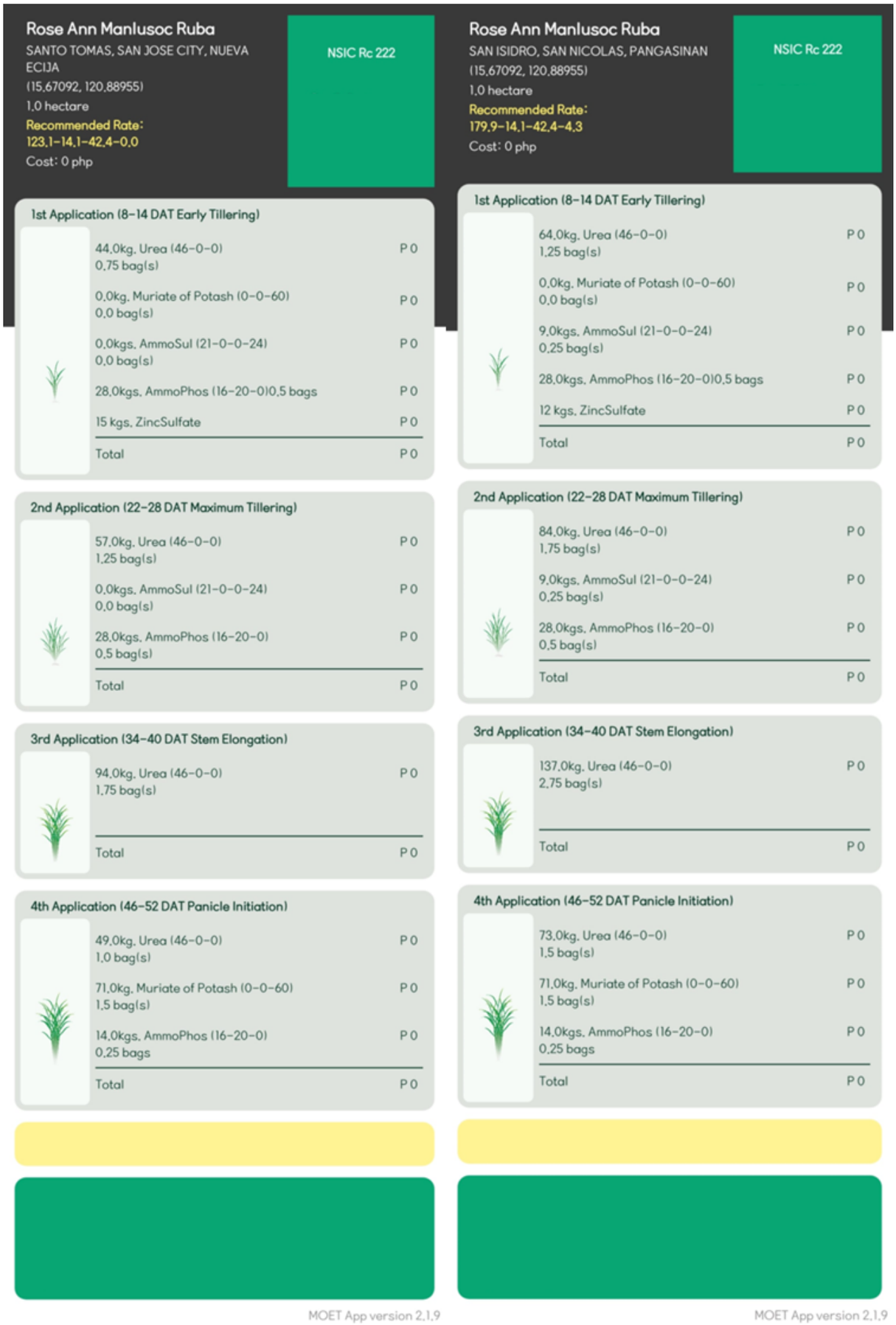
The field trials clearly demonstrated that Quantum-Total significantly enhances the growth and yield of lowland rice, especially when applied at 2-quart per hectare in combination with the recommended rate of inorganic fertilizer. This treatment (T9) consistently produced the highest grain yields and superior

agronomic traits in both Nueva Ecija and Pangasinan, outperforming all other combinations and single treatments.

While the 1-quart rate (T6) also improved crop performance when integrated with inorganic fertilizer, the 2-quart rate offered the most consistent and substantial benefits. Quantum-Total alone provided moderate improvements, indicating that its best use lies in synergy with traditional nutrient inputs.

These results strongly support the use of Quantum-Total as an effective biofertilizer that can enhance nutrient uptake, reduce chemical input dependency, and promote sustainable rice production. The 2-quart application rate is recommended as optimal, and the study findings provide robust evidence to support the registration of Quantum-Total with the Fertilizer and Pesticide Authority (FPA) for broader adoption in Philippine rice farming systems.

APPENDICES



Appendix Figure 1 & 2. MOET fertilizer recommendation in Nueva Ecija and Pangasinan.

Appendix Table 1. Average plant height (cm) at 30 days after transplanting. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	44.56	44.13	44.44	44.38 [d]
T2: RRIF	46.38	48.06	48.94	47.79 [abc]
T3: ½ RRIF	46.50	46.94	46.56	46.67 [abcd]
T4: 1 quart of QUANTUM TOTAL	45.50	45.25	44.38	45.04 [cd]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	48.63	46.75	46.69	47.36 [abc]
T6: RRIF + 1 quart of QUANTUM TOTAL	48.44	48.88	49.50	48.94 [ab]
T7: 2 quart of QUANTUM TOTAL	47.88	46.44	43.69	46.00 [bcd]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	47.63	48.63	46.56	47.61 [abc]
T9: RRIF + 2 quart of QUANTUM TOTAL	49.25	49.44	48.63	49.11 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=2.18%

Appendix Table 2. Average plant height (cm) at 30 days after transplanting. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	33.81	36.69	36.63	35.71 [d]
T2: RRIF	39.97	39.44	37.50	38.97 [bcd]
T3: ½ RRIF	34.53	37.25	37.87	36.55 [d]
T4: 1 quart of QUANTUM TOTAL	38.25	36.56	36.25	37.02 [cd]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	37.66	40.63	37.84	38.71 [bcd]
T6: RRIF + 1 quart of QUANTUM TOTAL	39.09	40.41	42.16	40.55 [abc]
T7: 2 quart of QUANTUM TOTAL	40.25	41.75	41.91	41.30 [ab]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	40.94	43.63	44.75	43.10 [a]
T9: RRIF + 2 quart of QUANTUM TOTAL	41.09	43.63	42.66	42.46 [ab]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=3.31%

Appendix Table 3. Average plant height (cm) at physiological maturity. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	77.50	80.81	77.06	78.46 [e]
T2: RRIF	92.56	91.25	91.81	91.87 [bc]
T3: ½ RRIF	86.56	85.25	86.00	85.94 [d]
T4: 1 quart of QUANTUM TOTAL	81.25	78.38	76.13	78.59 [e]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	89.00	87.13	87.75	87.96 [cd]
T6: RRIF + 1 quart of QUANTUM TOTAL	92.13	95.00	95.69	94.27 [b]
T7: 2 quart of QUANTUM TOTAL	82.56	80.81	75.69	79.69 [e]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	88.81	87.13	87.19	87.71 [cd]
T9: RRIF + 2 quart of QUANTUM TOTAL	103.81	102.75	102.31	102.96 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=2.00%

Appendix Table 4. Average plant height (cm) at physiological maturity. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	79.88	81.13	80.56	80.52 [d]
T2: RRIF	102.69	102.06	101.50	102.08 [a]
T3: ½ RRIF	93.63	88.94	92.94	91.84 [b]
T4: 1 quart of QUANTUM TOTAL	82.00	82.00	80.00	81.33 [cd]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	94.69	94.75	94.44	94.63 [b]
T6: RRIF + 1 quart of QUANTUM TOTAL	103.00	104.19	104.19	103.79 [a]
T7: 2 quart of QUANTUM TOTAL	83.25	84.81	85.19	84.42 [c]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	93.50	94.00	96.63	94.71 [b]
T9: RRIF + 2 quart of QUANTUM TOTAL	105.88	103.56	104.13	104.52 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=1.41%

Appendix Table 5. Average tiller count per square meter at 30 days after transplanting. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	379.69	326.56	373.44	359.90 c
T2: RRIF	456.25	435.94	439.06	443.75 abc
T3: ½ RRIF	376.56	348.44	379.69	368.23 bc
T4: 1 quart of QUANTUM TOTAL	451.56	396.88	342.19	396.88 bc
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	446.88	381.25	398.44	408.86 bc
T6: RRIF + 1 quart of QUANTUM TOTAL	498.44	481.25	396.88	458.86 ab
T7: 2 quart of QUANTUM TOTAL	371.88	440.63	345.31	385.94 bc
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	456.25	423.44	439.06	439.58 abc
T9: RRIF + 2 quart of QUANTUM TOTAL	521.88	514.06	532.81	522.92 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=7.67%

Appendix Table 6. Average tiller count per square meter at 30 days after transplanting. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	259.38	364.06	373.44	332.29 c
T2: RRIF	490.63	439.06	450.00	459.90 abc
T3: ½ RRIF	273.44	492.19	498.44	421.36 abc
T4: 1 quart of QUANTUM TOTAL	339.06	350.00	387.50	358.85 bc
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	395.31	414.06	481.25	430.21 abc
T6: RRIF + 1 quart of QUANTUM TOTAL	485.94	489.06	476.56	483.85 ab
T7: 2 quart of QUANTUM TOTAL	350.00	448.44	462.50	420.31 abc
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	450.00	412.50	525.00	462.50 abc
T9: RRIF + 2 quart of QUANTUM TOTAL	568.75	528.13	564.06	553.65 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=11.81%

Appendix Table 7. Average tiller count per square meter at physiological maturity. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	228.13	226.56	179.69	211.46 e
T2: RRIF	385.94	370.31	373.44	376.56 ab
T3: ½ RRIF	320.31	317.19	300.00	312.50 c
T4: 1 quart of QUANTUM TOTAL	232.81	264.06	248.44	248.44 d
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	343.75	334.38	351.56	343.23 bc
T6: RRIF + 1 quart of QUANTUM TOTAL	403.13	396.88	390.63	396.88 a
T7: 2 quart of QUANTUM TOTAL	254.69	276.56	267.19	266.15 d
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	342.19	350.00	339.06	343.75 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	403.13	417.19	414.06	411.46 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=3.92%

Appendix Table 8. Average tiller count per square meter at physiological maturity. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	228.13	239.06	229.69	232.29 c
T2: RRIF	379.69	373.44	360.94	371.36 b
T3: ½ RRIF	354.69	337.50	356.25	349.48 b
T4: 1 quart of QUANTUM TOTAL	243.75	248.44	234.38	242.19 c
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	342.19	351.56	368.75	354.17 b
T6: RRIF + 1 quart of QUANTUM TOTAL	342.19	362.50	425.00	376.56 b
T7: 2 quart of QUANTUM TOTAL	259.38	268.75	265.63	264.59 c
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	348.44	378.13	339.06	355.21 b
T9: RRIF + 2 quart of QUANTUM TOTAL	423.44	432.81	464.06	440.10 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=5.64%

Appendix Table 9. Average unproductive tiller count per square meter. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	4.69	6.25	3.13	4.69 c
T2: RRIF	48.44	29.69	37.50	38.54 a
T3: ½ RRIF	31.25	17.19	29.69	26.04 ab
T4: 1 quart of QUANTUM TOTAL	12.50	3.13	10.94	8.86 c
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	6.25	7.81	4.69	6.25 c
T6: RRIF + 1 quart of QUANTUM TOTAL	34.38	31.25	29.69	31.77 a
T7: 2 quart of QUANTUM TOTAL	4.69	1.56	15.63	7.29 c
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	15.63	15.63	18.75	16.67 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	6.25	12.50	7.81	8.85 c

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=30.46%

Appendix Table 10. Average unproductive tiller count per square meter. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	4.69	1.56	9.38	5.21 d
T2: RRIF	45.31	37.50	32.81	38.54 ab
T3: ½ RRIF	51.56	51.56	59.38	54.17 a
T4: 1 quart of QUANTUM TOTAL	12.50	9.38	4.69	8.86 cd
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	17.19	20.31	32.81	23.44 bcd
T6: RRIF + 1 quart of QUANTUM TOTAL	43.75	42.19	21.88	35.94 ab
T7: 2 quart of QUANTUM TOTAL	19.38	14.06	4.69	12.71 cd
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	31.25	32.81	18.75	27.60 bc
T9: RRIF + 2 quart of QUANTUM TOTAL	7.81	9.38	18.75	11.98 cd

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=30.30%

Appendix Table 11. Average panicle per square meter. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	223.44	220.31	176.56	206.77 f
T2: RRIF	337.50	340.63	335.94	338.02 bc
T3: ½ RRIF	289.06	300.00	270.31	286.46 d
T4: 1 quart of QUANTUM TOTAL	220.31	260.94	237.50	239.58 ef
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	337.50	326.56	346.88	336.98 bc
T6: RRIF + 1 quart of QUANTUM TOTAL	368.75	365.63	360.94	365.11 b
T7: 2 quart of QUANTUM TOTAL	250.00	275.00	251.56	258.85 de
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	326.56	334.38	320.31	327.08 c
T9: RRIF + 2 quart of QUANTUM TOTAL	396.88	404.69	406.25	402.61 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV= 4.16%

Appendix Table 12. Average panicle per square meter. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	223.44	237.50	220.31	227.08 d
T2: RRIF	334.38	335.94	328.13	332.82 b
T3: ½ RRIF	303.13	285.94	296.88	295.32 bc
T4: 1 quart of QUANTUM TOTAL	231.25	239.06	229.69	233.33 d
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	325.00	331.25	335.94	330.73 b
T6: RRIF + 1 quart of QUANTUM TOTAL	298.44	320.31	403.13	340.63 b
T7: 2 quart of QUANTUM TOTAL	240.00	254.69	260.94	251.88 cd
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	317.19	345.31	320.31	327.60 b
T9: RRIF + 2 quart of QUANTUM TOTAL	415.63	423.44	445.31	428.13 a

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV= 6.53%

Appendix Table 13. Average weight of straw per 8 square meters. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	9.06	8.93	8.98	8.99 [d]
T2: RRIF	18.68	18.64	18.93	18.75 [b]
T3: ½ RRIF	12.50	12.60	12.77	12.62 [c]
T4: 1 quart of QUANTUM TOTAL	10.40	9.90	9.33	9.88 [d]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	13.42	13.73	12.57	13.24 [c]
T6: RRIF + 1 quart of QUANTUM TOTAL	18.20	18.16	18.01	18.12 [b]
T7: 2 quart of QUANTUM TOTAL	10.72	9.53	9.36	9.87 [d]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	13.14	13.01	13.35	13.17 [c]
T9: RRIF + 2 quart of QUANTUM TOTAL	19.89	19.56	20.16	19.87 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=2.77%

Appendix Table 14. Average weight of straw per 8 square meters. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	8.31	7.66	8.70	8.22 [f]
T2: RRIF	18.64	19.50	19.77	19.30 [b]
T3: ½ RRIF	14.28	13.66	14.10	14.01 [d]
T4: 1 quart of QUANTUM TOTAL	9.01	9.55	10.21	9.59 [ef]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	14.59	15.12	14.57	14.76 [cd]
T6: RRIF + 1 quart of QUANTUM TOTAL	20.36	20.30	21.91	20.86 [a]
T7: 2 quart of QUANTUM TOTAL	10.77	10.99	10.79	10.85 [e]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	15.75	15.26	17.25	16.09 [c]
T9: RRIF + 2 quart of QUANTUM TOTAL	21.35	21.85	21.99	21.73 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=3.28%

Appendix Table 15. grain yield (t/ha) at 14% moisture. Nueva Ecija.

Treatment	Replication			Mean
	I	II	III	
T1: Control	4.30	4.27	4.03	4.20 [e]
T2: RRIF	7.16	7.04	6.96	7.05 [c]
T3: ½ RRIF	5.94	5.44	5.35	5.58 [d]
T4: 1 quart of QUANTUM TOTAL	5.22	5.45	5.52	5.40 [d]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	7.58	7.27	6.93	7.26 [bc]
T6: RRIF + 1 quart of QUANTUM TOTAL	7.71	7.72	7.75	7.73 [b]
T7: 2 quart of QUANTUM TOTAL	5.67	5.50	5.57	5.58 [d]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	6.91	7.14	6.94	7.00 [c]
T9: RRIF + 2 quart of QUANTUM TOTAL	8.34	8.42	8.53	8.43 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=2.75%

Appendix Table 16. grain yield (t/ha) at 14% moisture. Pangasinan.

Treatment	Replication			Mean
	I	II	III	
T1: Control	3.23	3.65	3.38	3.42 [e]
T2: RRIF	6.68	6.25	6.07	6.33 [bc]
T3: ½ RRIF	4.63	4.68	4.58	4.63 [d]
T4: 1 quart of QUANTUM TOTAL	4.08	4.29	4.09	4.15 [de]
T5: ½ RRIF + 1 quart of QUANTUM TOTAL	5.81	6.38	5.95	6.05 [c]
T6: RRIF + 1 quart of QUANTUM TOTAL	6.98	6.83	7.14	6.98 [ab]
T7: 2 quart of QUANTUM TOTAL	4.66	4.60	4.74	4.67 [d]
T8: ½ RRIF + 2 quart of QUANTUM TOTAL	6.03	6.31	7.07	6.47 [bc]
T9: RRIF + 2 quart of QUANTUM TOTAL	7.03	7.15	7.61	7.26 [a]

Note: Means followed by a different letter in a column are considered significant at p ≤ 0.05 by Tukey's HSD (honest significant difference) test. CV=4.91%

PHOTO DOCUMENTATION

Soil Collection in Nueva Ecija and Pangasinan for MOET Set-up

Soil Preparation for MOET Set-up

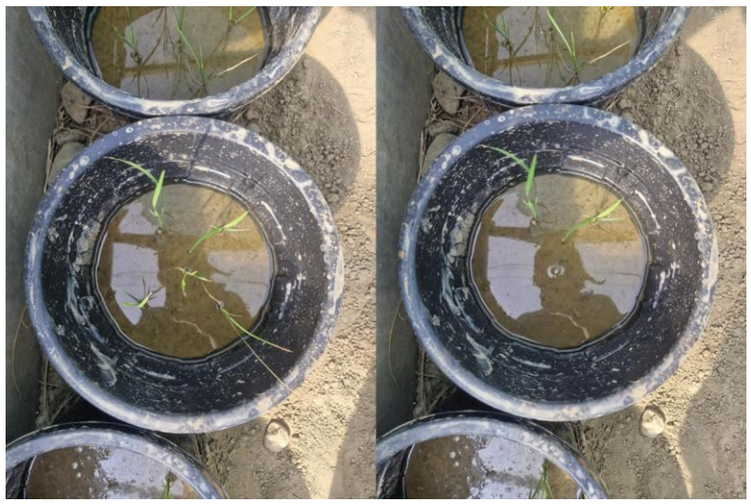
MOET Set-up

Seed management for Nueva Ecija site

Seed management for Pangasinan site

Seed sowing for Nueva Ecija site

Seed sowing for Pangasinan site



MOET- retaining 2-hills per plot at 10 days after transplanting.

Seedling at 20 days after sowing (with (right) and without (left) quantum total)

Seed pulling

Seedling distribution (Nueva Ecija).

Transplanting with 21-day old seedling (January 16, 2025, Nueva Ecija).

Application of Quantum Total right after transplanting (Nueva Ecija).

Seedling distribution (Pangasinan).

Transplanting with 21-day old seedling (January 18, 2025, Pangasinan).

Application of Quantum Total right after transplanting (Pangasinan).

MOET Set-up at 45 days after transplanting (Nueva Ecija).

MOET Set-up at 45 days after transplanting (Pangasinan).

Processing of MOET sample.

1st Fertilizer Application in Nueva Ecija 14 days after transplanting (January 30, 2025)

1st Fertilizer Application in Pangasinan 14 days after transplanting (February 1, 2025)

2nd Fertilizer Application in Nueva Ecija 25 days after transplanting (February 10, 2025)

2nd Fertilizer Application in Pangasinan 25 days after transplanting (February 12, 2025)

Quantum Total Foliar Application in Nueva Ecija 30 days after transplanting (February 15, 2025)

Plant height and tiller count data gathering in Nueva Ecija 30 days after transplanting (February 15, 2025)

Quantum Total Foliar Application in Pangasinan 30 days after transplanting (February 17, 2025)

Plant height and tiller count data gathering in Pangasinan 30 days after transplanting (February 17, 2025)

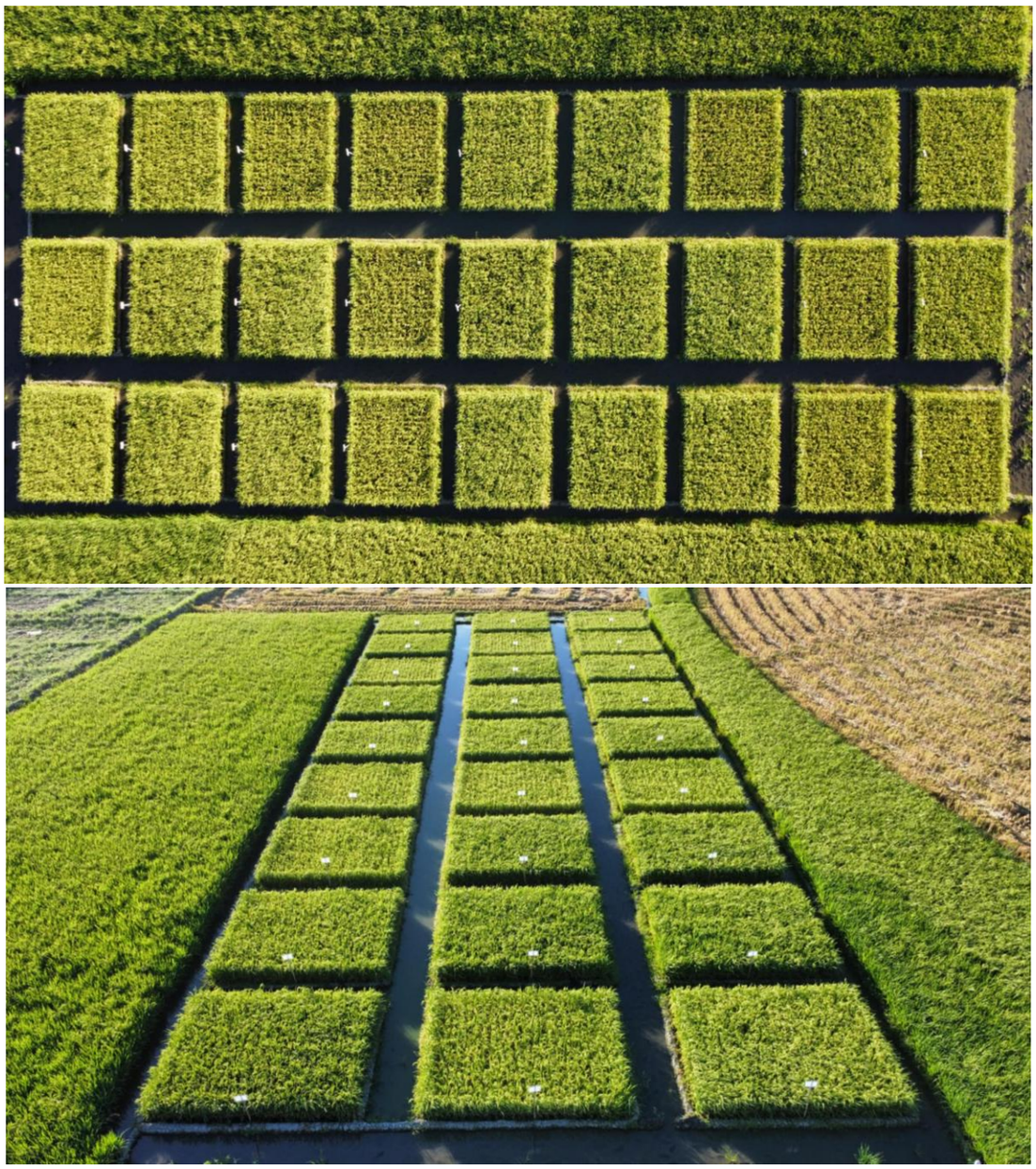
3rd Fertilizer Application in Nueva Ecija 35 days after transplanting (February 20, 2025)

3rd Fertilizer Application in Pangasinan 35 days after transplanting (February 22, 2025)

4th Fertilizer Application at 45 days after transplanting in Nueva Ecija (March 2, 2025).

4th Fertilizer Application at 45 days after transplanting in Pangasinan (March 4, 2025).

Pangasinan Field Status at 62 days after transplanting (March 21, 2025).



Nueva Ecija Field Status at 69 days after transplanting (March 26, 2025).

Plant height data gathering in Nueva Ecija 108 days after transplanting (April 12, 2025)

Nueva Ecija Field Status at 112 days after transplanting (April 17, 2025).

Plant height data gathering in Pangasinan 107 days after transplanting (April 13, 2025)

Pangasinan Field Status at 105 days after transplanting (April 12, 2025).

Sampling and harvesting at 114 days old after transplanting (April 19, 2025, Nueva Ecija)

Processing of Nueva Ecija Samples.

Nueva Ecija crop cut and yield component samples

Sampling and harvesting at 113 days old after transplanting(April 20, 2025, Pangasinan)

Processing of Pangasinan Samples.

Pangasinan crop cut and yield component samples