2022
PhilRice R&D Highlights

Agronomy, Soils and Plant Physiology Division

Philippine Rice Research Institute
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DIVISION

Agronomy, Soils, and Plant Physiology Division

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EXECUTIVE SUMMARY

The Agronomy, Soils, and Plant Physiology Division (ASPPD) contributes to modernizing rice and rice-based agriculture by developing diagnostic tools and technologies for crops, fertilizers, soils, and water management to help increase rice production. Because of varying conditions among regions and production systems, rice yields and yield gaps may also vary. This suggests that interventions to close the yield gaps must be geography- and season-specific. Further, technology should be matched with local conditions and environmental profiles. Consequently, ASPPD has executed interrelated projects all aiming to increase farm productivity and yield.

The division has generated information from long and short-term field experiments on soil, water, and fertilizer, using varieties involving all DA-PhilRice branch stations and some private fertilizer formulators. Findings were integrated into a tool, technology package, farm practices, or information. Soil nutrient diagnostic and fertilizer recommendation tools such as the rice crop manager (RCM), leaf color chart (LCC) App, and minus-one-element technique (MOET) App were refined and promoted. The Philippine Rice Information System (PRiSM) that monitors rice production situations nationwide in a near-real time, helps to formulate strategic decisions and plan interventions at any level of decision-making process operated by the division.

The division's operational framework is anchored on the DA-PhilRice outcomes as defined in the 2017-2022 strategic plan. The mainstream research activities aimed at cost-reducing and yield-enhancing rice and rice-based production technologies for sustainable production.

CORE-FUNDED PROJECT 1

DA-PhilRice Soil Information System: A Tool for Effective Crop Management

Sandro D. Cañete and Mary Rose O. Mabalay

The PhilRice Soil Information System (PSIS) is a comprehensive, accessible, and user-friendly soil information system and a tool for effective crop management designed to help decision-makers and planners in the selection of suitable crops with appropriate management strategies to enhance agricultural production (https://dbmp.philrice.gov.ph/dbmp_main/services/services). The PSIS soil series gallery contains validated soil series profiles with physical and soil fertility description, datasets for taxonomic classification, management recommendations on rice and other crops, soil limitations, soil productivity indicators for lowland rice production, and crop suitability analysis for major Philippine crops. It includes the method of soil series identification by province and a web-based information portal. Soil series field guides were developed, with International Standard Book Number (ISBN) registered in the National Library.

Fifteen soil series from Ifugao, Laguna, Agusan Del Norte/Sur, and Quezon were validated this year, two of which are no longer agriculturally relevant due to land-use shift and accessibility. Most of the land units covered by the Carmona series in Laguna have been converted into industrial and commercial uses; the area coverage of Guinaoang series in Hungduan, Ifugao is very small. Castilla series of Patnanungan Island in Quezon is an example of inaccurate soil map data from existing sources due to its scale of 1:250,000, which is not detailed enough for validation, and shares its classification nearby islands (e.g., Polillo Island).

The soil series map was integrated with the Philippine Rice Information System (PRiSM) rice area map to validate the extent of rice area with respect to rice suitability level. Suitability maps of rice under irrigated lowland and rainfed upland and lowland were generated using the soil series map, rice area map, and the provincial/municipal political boundary map of the eight target provinces. Discrepancies were seen between the rice area maps and results of crop suitability analysis. Rice suitability level in some Agusan-areas is marginally to moderately suitable but no rice cultivation was observed in the rice area map. This will help Department of Agriculture-Local Government Unit (DA-LGU) in the province to identify areas or target areas for their rice expansion program. Rice areas shown in the map are grown in hydrosol (riverbanks), undifferentiated mountain soil, and rubble lands in Agusan, Quezon, Bukidnon, and Laguna.

Technology interventions and research are therefore needed to develop management recommendations that will cater to the needs of farmers across the growing environments. Furthermore, the available soil series distribution-based map needs updating to include newly identified soil series and remove soil series that are no longer existing due to natural changes and land-use shifts.

CORE-FUNDED PROJECT 2

Assessment and Management of Soil Fertility and Soil Health

Jayvee C. Kitma

One study focused on the long-term effects of nutrient management on changes in soil fertility, sustainability of crop productivity, soil microbial diversity, and on closing the yield gap between the potential and the maximum attainable yields of irrigated lowland rice. After four decades of double rice cropping, the soil has maintained its indigenous nutrient-supplying capacity in achieving yields close to the maximum attainable under good management practices. An average indigenous nutrient supply (INS) per hectare of 62.18kg Nirogen (N), 16kg Phosphorus (P), and 96.28kg Potassium (K) for dry season (DS), and 77.08kg N, 11.82kg P, and 73.88kg K for wet season (WS) over the six-year cropping period were recorded.

In the DS, significantly higher yields than control were obtained in plots applied with fertilizer combinations such as NK with 6.74t/ha and NPK-SSNM with 5.83t/ha. Yields obtained from treatments NP, NPK, and PK were 4.30 to 5.37t/ha. In the WS, the same trend was observed where control treatment had the lowest yield. Yield gap analysis showed an average difference of 1.06t/ha between the simulated potential yield and measured yield of a variety. This indicates that full NPK application combines with LCC-based mid-season N application can achieve yields closer to the maximum attainable yield under favorable growing conditions and good management practices. The second study assessed the current soil fertility of the PhilRice CES rice paddy fields, which generally have exhibit medium soil fertility status.

CORE-FUNDED PROJECT 3

Philippine Rice Information System (PRiSM)

Eduardo Jimmy P. Quilang and Jovino L. de Dios

PRiSM uses earth observation satellite data and simulation models, complemented by ground observations and other information sources to generate more accurate and timely information on planted rice area, planting time, growth, yield, production, and potential rice areas that can be affected by extreme weather events.

The rice area planted in the first semester (January-June) was 2,089,207 hectare (ha), which was 1% higher than the first semester of 2021 (2,064,881ha). The percentage contributions of rice area planted in Luzon, Visayas, and Mindanao for the first semester were 57% (1,191,067ha), 21% (433,786ha), and 22% (464,354ha), respectively. The seven regions with large rice areas were: Central Luzon (367,641ha); Cagayan Valley (314,860ha); Western Visayas (247,948ha); Bicol Region (168,159ha); SOCCSKSARGEN (139,771ha); MIMAROPA (134,965ha); and Ilocos Region (107,086ha). Majority of the rice areas were planted in December (733,766ha) and January (471,146ha) while the peak of harvesting was in March (582,973ha) and April (594,921ha).

There were 2,428,814ha planted to rice for the second semester (July-December) cropping, 1% lower than 2021. The regions with the largest rice areas were: Central Luzon (420,664ha); Cagayan Valley (312,774ha); Ilocos Region (301,651ha); Western Visayas (282,483ha); and MIMAROPA (185,376ha). Majority were planted in June (787,664ha), July (611,759ha), and August (590,417ha) while the peak of harvesting was recorded in September (795,257ha), October (629,593ha), and November (603,163ha).

The estimated national average rice yield for the first semester was 3.90 metric tons per hectare (t/ha), or around 7.9% lower than 2021. The top five highest-yielding regions are Central Luzon (5.66t/ha), Ilocos (4.92t/ha), Cagayan Valley (4.30t/ha), CAR (4.12t/ha), and Davao (4.12t/ha). The top five lowest-yielding regions are Central Visayas (2.31t/ha), Western Visayas (2.68t/ha), Eastern Visayas (2.76t/ha), Caraga (2.88t/ha), and BARMM (2.88t/ha). The provincial average rice yields ranged from 1.83t/ha (Basilan) to 7.13t/ha (Nueva Ecija). The estimated national average rice yield for the second semester was 4.15t/ha or around 4% lower than 2021. Northern Mindanao (5.11t/ha), Davao (4.87t/ha), Central Luzon (4.72t/ha), Ilocos (4.45t/ha), and Cagayan Valley (4.42t/ha) surpassed the national average yield. The top five lowest-yielding regions are Caraga, Central Visayas, CALABARZON, Western Visayas, and Cordillera.

The country's total rice production in the 2022 first semester was 8,153,057mt or about 6.8% lower than 2021. The top five highest-producing regions are Central

Luzon, Cagayan Valley, Western Visayas, Bicol, and Ilocos. Their opposites are Central Visayas, BARMM, CAR, CALABARZON, and Davao. The reduction in rice yields can be attributed to increased costs of farm inputs and negative effects of extreme weather conditions. Total production in the second semester was 10,085,384, some 4.7% lower than 2021. The top producers were Central Luzon, Ilocos, Cagayan Valley, Western Visayas, and MIMAROPA contributing around 64% of the total. Their opposites were Central Visayas, CALABARZON, CAR, BARMM, and Caraga.

From September 2021 to April 2022, eight tropical cyclones (TC) entered the Philippine Area of Responsibility (PAR). Based on available satellite images, the total flooded-standing rice crops were 34,862ha; majority of these were in vegetative phase (21,789ha) and in the reproductive (6,887ha). For the second semester, rice areas in Luzon were hard hit with heavy rains, floods, and strong winds brought about by tropical cyclones. From April to November 1, 2022, seventeen tropical cyclones entered the PAR. Based on available satellite images, the total flooded-standing rice crops were 21,122ha; the majority of these were in the ripening (8,645ha), and reproductive phases (8,269ha).

For the first semester, 816 PRiSM monitoring fields (MFs) were covered; field activities were facilitated and also assisted by the PRiSM teams from all stations. The top five varieties planted were NSIC Rc 222, Rc 216, Rc 160, Rc 480, and Rc 402. The majority of the farmers interviewed practiced the transplanting method (64%). Average crop cut and actual yields were 4.54t/ha and 4.21t/ha, respectively. For the second semester, 922 MFs were monitored. Planting peaked in June; majority used certified seeds (69%). Average crop cut and actual yields were 5.46t/ha and 4.81t/ha.

Developed were: online visualization and analysis of weather data with nationwide coverage; a module for saving data through an API used in the feedback survey of PRiSM; a *palay* price dashboard covering the national, regional, and provincial levels; and a dashboard for collecting users' feedback on PRiSM data product requests. A total of 194 requests for data products through PRiSM Infolib (prism.philrice.gov.ph/infolib) were received and granted.

PRiSM helps farmers and policymakers to make informed decisions about rice crop and production management, and resource allocation, which can help increase rice productivity and ensure food security. The system also supports disaster response efforts by providing timely information on crop damage caused by natural disasters.

CORE-FUNDED PROJECT 4

Enhancement of Palayamanan Components

Myrna D. Malabayabas

The *Palayamanan* demo farm serves as a training venue for students, extension workers, farmers, researchers, government and private sector employees, entrepreneurs, and other farming enthusiasts. Thus, production components such as rice, rice-duck-vegetable integration, and continuous vegetable production are being maintained and enhanced to showcase the benefits of the system.

The rice-duck-vegetable production component grossed P12,562; vegetables grossed P19,847. The whole component grossed P32,274 and earned P18.54 per square meter. Nutraceutical herbal crops were continuously collected and cultivated in a 32m^2 greenhouse. Vermicompost from 70% SMS + 30% BM was the best substrate combination in terms of yield, and had the better physical appearance with more friable texture.

The *Palayamanan* map was produced using drone images. ArcGIS was used to georeference the drone image and then digitized to generate the sections, including sorjan, rice-duck, and mushroom production areas.

CORE-FUNDED PROJECT 5

Development of Appropriate Nutrient Management for Newly Released Irrigated Lowland Rice Varieties

Myrna D. Malabayabas

Yields of five 500-series varieties did not significantly differ across fertilizer treatments (4.92 to 7.68t/ha in DS and 4.44 to 6.04t/ha WS). Nitrogen, Phosphorus, and Potassium (NPK) uptake of the test varieties was higher under continuous flooding than alternate wetting and drying (AWD). A higher K fertilizer rate than the usual or current recommendation of 30-60 kg/ha is advised. The optimum rates for NPK during DS were 109kg N/ha, 23-41kg P/ha and 82-149kg K/ha; in WS, 28-90kg N/ha, 6-60kg P/ha, and 60-149kg K/ha.

Across water management treatments, higher agronomic efficiency of NPK (AENPK) was obtained with half the recommended NPK rate in most varieties, except for NSIC Rc 508, which had higher AENK at the full NPK rate. In most fertilizer treatments, AENPK values were higher under AWD than CF, which also explains the insignificant differences in yields between CF and AWD.

RCEF-FUNDED PROJECT 1

Agro-Specific Profiling of Popular and Newly Released Varieties for the Development of Genotype-Specific Nutrient Package of Technologies (POTs)

Ailon Oliver V. Capistrano

This project aimed to develop POTs that are specific to a rice genotype; establish the foundations for an integrated research project with other divisions; and later collaborate with other stations in fine-tuning these POTs thru validation trials of crop simulation outputs via WeRise.

For nutrient uptake analysis, established were nutrient omission plots for six varieties and NPK uptake in bothe dry season(DS) and wet season (WS). Results of the omission plot trial in the DS highlighted the exceptional yielding ability of NSIC Rc 436 over the other test varieties as it yielded more than 7t/ha and 6t/ha even without N or NPK applied. It was also the only variety that had more than 9t/ha under full NPK, minus P and minus K plots. Plant tissue analysis revealed that N uptake was much lower than the 2021 trial. Across varieties, the 2022 WS omission plot trial did not show much yield difference between those plots applied with NPK, minus N, and zero NPK, as expected. NSIC Rc 580 even yielded better in both minus N and zero NPK plots than its full NPK counterpart.

Work Package 3 (WP3) on nutrient-pest interaction was implemented in both seasons using WP1 outputs as the basis for NPK treatments across the first set of varieties (NSIC Rc 506, Rc 508, Rc 510, Rc 512, and Rc 514). It was established in three planting schedules-early, regular, and late-to deliberately expose the varieties to available pest pressures. Pest damages were from stem borer (StB), rice black bug (RBB), rats, bacterial leaf streak (BLS), and bacterial leaf blight (BLB). Analyis showed that early planting suffered the most. Pests in alternate plant hosts from undisturbed fields (weeds, stubbles from previous cropping) indeed transfer/re-establish in an early-planted field. Hence, synchronized planting with the rest of the community remains the best strategy to minimize pest damage, as it helps distribute pest risks across many rice fields.

During the 2022 DS, StB and RBB damages were significant in NSIC Rc 512 at vegetative and reproductive stages across all fertilized treatments. In the WS 2022, BLS in late planting was observed across all varieties, with the maximum NPK rate showing more significant damage than the other fertilizer treatments. NSIC Rc 514 also suffered StB damage during the reproductive stage, but was not correlated with fertilizer treatment levels.

EXTRA-CORE PROJECT 1

Lowland Rice Ecosystem for the Packaging of Best Nutrient Management Technologies

Wilfredo B. Collado, Leylani M. Juliano, Jovino L. De Dios, Ailon Oliver V. Capistrano, Myrna D. Malabayabas, Rose Ann R. Manlusoc, Jan Pauline A. Jove, Jesusa C. Beltran, Marco Antonio M. Baltazar, Eduardo Jimmy P. Quilang, and John C. de Leon

The project successfully achieved its objectives of evaluating various FPA-approved fertilizers and related products from different companies across the six PhilRice stations. In the DS, 56 entries from 19 companies including four new ones participated in the evaluation; 11 companies have completed the four-season trial. Fifty participants were evaluated in the WS.

Across seasons, the fertilizers and related products, including application time by each participant in each station varied. The majority used soil-applied products, supplemented by foliar-applied fertilizers in several splits. The companies, including PhilRice, applied different nutrient management technologies; PhilRice and the farmers' practice used soil-based inorganic fertilizers. Other entries used a combination of soil-applied fertilizer (single elements or combined elements), and foliar-applied fertilizers (single or combined elements such as calcium, copper, magnesium, manganese, zinc, sulfur, boron, iron, molybdenum, and zinc). Some related products applied included growth promoters such as microorganisms, biostimulants, fulvic acid, humic acid, organic matter, and vitamin B complex, among others. The application rate and times were also variable depending on the location.

In the DS at CES, the actual yield and production cost per unit ranged from 6.57t/ha (at P5.50/kg cost) to 8.66t/ha (P6.75/kg), with farmers' practice achieving the highest yield (8.66t/ha at P6.75/kg cost), followed closely by Xanadu (8.42t/ha at P7.88/kg), PhilAsia (8.23t/ha at P8.01/kg), and AllTech (8.21/ha at P8.85/kg).

In Isabela, the yield range was 6.69-9.39t/ha (at P6.52-P9.51/kg input cost), with PhilVin obtaining the highest yield at 9.39t/ha (at P6.9/kg cost). In Batac, yields were 4.43-6.82t/ha (at P10.64-P15.32/kg input cost), with Enviro producing the highest at 6.82t/ha (P10.64/kg cost).

In Negros, yields were 6.55t/ha-7.63t/ha (at P6.83-P9.08/kg cost), with ThaiPhil yielding the highest at 7.63t/ha (P7.10/kg). In Agusan, the yield range was 3.90-4.54t/ha (P10.86-P14.57/kg cost), with PhilRice getting the highest yield at 4.54t/ha at P10.86/kg cost. In Midsayap, yields were 4.07-6.02t/ha (P7.35-12.83/kg cost), with Cebu Agbio Innovations Inc. achieving the highest at 6.02t/ha (P7.35/kg cost).

During the WS, all participants at CES yielded high at 5-7t/ha (P8-10/kg input cost), with Society Agri-Venture yielding the highest at 7t/ha (P8.24/kg). Global Green (6.38t/ha) and farmers' practice (6.34t/ha) followed. Isabela participants yielded 6.14-7.93t/ha (P6.86-9.56/kg input cost), with the farmers' yielding the highest, followed by Inavet Nutrition (7.69t/ha at P8.14/kg), and VVZ Corp (7.6t/ha at P6.86/kg cost).

Batac yielded 4.01-6.84t/ha with higher production costs (P14.19-21.20/kg) due to supplemental irrigation. Allied Botanical yielded the highest. Negros harvested 4.73-6.04t/ha (P9.05-12.29/kg cost), with farmers' practice as highest at 6.04t/ha; the rest yielded less than 6t/ha. Agusan reaped 3.8-4.91t/ha (P10.63-12.39/kg cost), with Inavet Nutrition yielding highest; followed by Allied Botanical (4.8t/ha). In Midsayap, all participants yielded above 6t/ha, with PhilRice achieving the highest at 8.02t/ha (P7.63/kg cost), followed by VVZ Corp (7.15t/ha at P8.41/kg cost).

Evaluation of BioPrime 5-5-5 on the Growth and Yield of Irrigated Lowland Rice

Roel R. Suralta, Jayvee A. Cruz-Kitma, Daisyree G. Agustin, Wilfredo B. Collado, Rodolfo V. Bermudez, and Sandro D. Cañete

Plant height and tiller count

The highest average number of tillers per square meter was achieved using 50% reduced rate of inorganic fertilizer combined with 25g/ha BioPrime 5-5-5, with an average tiller advantage of 5.26% compared to the full rice crop manager (RCM) recommendation (Table 1). During the DS, RCM + 15g BioPrime produced the highest number of tillers, while the rest of the treatments produced, a statistically similar number of tillers per unit area. Plant height (cm) was measured at 30 DAT, 60 DAT, and during the crop's physiological maturity (at harvest). At 30 and 60 DAT, all treatments had statistically the same height, except for the plots with no fertilizer, that were the shortest. At harvest, the tallest plants were in the RCM plot (T1) and in plots applied with 50% inorganic fertilizer combined with 15 grams/ha of BioPrime applied as a soil treatment and foliar spray (T4); and 15g BioPrime applied at seed sowing, seedling stage, and 30DAT (T2). The other combination treatments produced shorter plants but were still significantly taller than the plots with no fertilizer (T6).

Table 1

Effects of fertilizer management on plant height and tiller production, 2021-2022 DS, PhilRice CES, Maligaya, Science City of Muñoz, Nueva Ecija.

Treatments	Plant height at 30 DAT (cm)	Plant height at 60 DAT (cm)	Plant height at harvest (cm)	Tillers per sqm
T1. RCM	34.99a	71.97a	83.81a	379.69b
T2. RCM + 15g BioPrime 5-5-5 (applied 3x)	33.73b	71.09a	84.27a	433.85a
T3. 50% RCM + 15g BioPrime (applied 3x)	32.16cd	62.62b	73.64b	344.27b
T4. 50% RCM + 25g BioPrime (applied 4x)	31.36d	62.38b	75.45b	365.11b
T5. 50% RCM	33.14bc	63.38b	76.81b	331.25b

Note: Means with the same letter are not significantly different from each other at 5% level of probability according to the Tukey's Honest Significant Difference (HSD) Test.

ns = not significant

Table 2

Effects of fertilizer management on plant height and tiller production, 2022 WS, PhilRice CES, Maligaya, Science City of Muñoz, Nueva Ecija.

Treatments	Plant height at 30 DAT (cm)	Plant height at 60 DAT (cm)	Plant height at harvest (cm)	Tillers per sqm	Tillers at 30DAT	Tillers at 60 DAT
T1. RCM	67.74a	106.50a	117.09a	279.86ab	569.44a	354.17a
T2. 50% RCM + 15g BioPrime (applied 3x)	64.38a	100.73a	114.51ab	285.94ab	517.19a	335.42a
T3. 50% RCM + 15g BioPrime (applied 2x) during seed soaking and soil treatment a day before transplanting	64.93a	101.11a	112.62b	273.96ab	523.96a	322.40a
T4. 50% RCM + 15g BioPrime (applied 2x) during soil treatment a day before transplanting, 30 DAT	65.48a	102.12a	115.31a	278.65ab	509.89ab	319.27a
T5. 50% RCM + 20g BioPrime (applied 3x)	65.52a	101.66a	112.48b	288.19a	495.14ab	327.08a
T6. No fertilizer	58.44b	90.98b	106.18c	252.60b	427.61b	258.33b
CV (%)	3.57%	2.51%	0.9978%	5.25%	7.15%	7.93%

Grain yield and yield components

In the DS, the highest yields were observed in the RCM and RCM + 15g BioPrime 5-5-5 combined treatments; the combination of 50% RCM and BioPrime produced significantly lower yields than the full-dosed treatments, although still significantly higher than the 50% reduced RCM recommendation. Notably, the target grain yield of 7t/ha was not achieved among the treatments (Table 3). During 2022 WS, the targeted grain yield (7t/ha) based on the RCM recommendation was not achieved due to lodging caused by typhoons particularly in the full-dosed inorganic fertilizer treatment. Grain yield data showed no significant differences among the RCM and BioPrime treatments with a 50% reduced RCM rate. Moreover, in untreated plots were statistically comparable to the use of 50% reduced inorganic fertilizer rate combined with 15g and 20g BioPrime 5-5-5 applied twice and thrice, respectively (Table 4). Higher yields in untreated plots were attributed to the soil's high indigenous nutrient-supplying capacity.

Table 3

Effects of fertilizer management on the yield and yield components of rice, 2021-2022 DS, PhilRice CES, Maligaya, Science City of Muñoz, Nueva Ecija.

Treatments	Grain yield (t/ha)	Panicles per m^2	1,000-grain weight (g)	Filled grains per Panicle (%)	Spikelets per panicle
T1. RCM	6.14a	368.75b	22.85	77.51a	91.99a
T2. RCM + 15g BioPrime (applied 3x)	5.95a	425.00a	21.94	72.28b	86.98ab
T3. 50% RCM + 15g BioPrime (applied 3x)	5.44b	339.58b	22.40	81.26a	78.06c
T4. 50% RCM + 25g BioPrime (applied 4x)	5.36b	360.41b	22.54	77.54a	78.44c
T5. 50% RCM	4.92c	326.56b	22.86	80.22a	80.32bc
CV (%)	3.98	8.73	2.69	4.03	5.96

Note: Means with the same letter are not significantly different from each other at 5% level of probabil-ity according to the Tukey's Honest Significant Difference (HSD) Test.

ns = not significant.

Table 4

Effects of fertilizer management on the yield and yield components of rice, 2022 WS, PhilRice CES, Maligaya, Science City of Muñoz, Nueva Ecija.

Treatments	Grain yield (t/ha)	Panicle per m^2	1,000-grain weight (g)	Filled grains per panicle (%)	Spikelets per panicle
T1. RCM	6.87a	268.75	23.89	71.61b	137.67
T2. 50% RCM + 15g BioPrime (applied 3x)	6.62a	278.65	24.48	79.64a	129.89
T3. 50% RCM + 15g BioPrime (applied 2x)	6.44ab	265.10	24.71	77.58ab	132.67
T4. 50% RCM + 15g BioPrime (applied 2x)	6.36ab	270.83	24.34	78.86a	138.23
T5. 50% RCM + 20g BioPrime (applied 3x)	6.27ab	279.17	24.54	80.06a	131.35
T6. No fertilizer	5.91b	247.92	24.71	83.78a	124.76
CV (%)	4.27	5.23	1.72	3.69	5.43

Soil Microbial Functional Diversity

Population of bacterial colony was counted after a 24-hour incubation. The highest of bacterial colony count ($4.65x10^6$cfu/ml) was observed in the plots with RCM recommendation (T1). The lowest bacterial population was recorded in plots with no fertilizer treatment ($8.9 x10^5$). On the other hand, treatments 2-5 showed populations of $1.26 x10^6$, $1.21 x10^6$, $4.15 x10^6$, and $1.07 x10^6$, respectively.

The result indicate that following the RCM recommendation impacts the microbial community present in the soil. This influences different biogeochemical processes that react to sudden physical and chemical changes in the soil, which may translate into higher yield in the area.

Table 5 details grain yields in the 2022 WS. It shows that RCM recommendation achieved the highest while plots with no fertilizer, and those with 50% recommended fertilizer combined with 15g and 20g BioPrime applied twice and thrice, respectively, produced the lowest yields.

Table 5

Bacterial populations in plots with RCM and BioPrime application.

Treatments	Colony-forming unit (CFU/0.1 ml soil solution)
T1- RCM	$4.65 x10^6$
T2- 50% RCM + 15g BP (3x)	$1.26 x10^6$
T3- 50% RCM + 15g BP (2x) during seed soaking and soil treatment a day before transplanting	$1.21 x10^6$
T4- 50% RCM + 15g BP (2x) during soil treatment a day before transplanting, 30 DAT	$4.15 x10^6$
T5- 50% RCM + 20g BP (3x)	$1.07 x10^6$
T6- No fertilizer	$8.9 x10^5$