2022 PhilRice R&D Highlights

PhilRice Agusan



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BRANCH STATION PHILRICE AGUSAN

Branch Director: GERARDO F. ESTOY JR.

EXECUTIVE SUMMARY

As one of the branch stations in Mindanao, PhilRice Agusan is mandated to develop, adapt, and promote location-specific technologies suitable to the unique agro-climatic conditions in Northeastern Mindanao with our partners towards profitable, resilient, and sustainable rice industry.

Covering the three regions (10, 11, and 13), the station is working to help farmers access advanced technologies that will help them increase their yield and reduce production costs and postharvest losses. These were done through various research initiatives, and development activities that promote matured technologies through technology demonstrations, field walks, trainings, seminars and various knowledge-sharing and learning (KSL) activities. Implementation is conducted in partnership with Regional Field Offices (RFOs), Provincial/Local Government Units (PLGUs), farmer organizations, cooperatives, and other attached agencies.

From CY 2021 to 2022, the station implemented four projects: two branch research initiatives (BRI), one branch development initiative (BDI), and the Rice Business Innovations System (RiceBIS) along with nine studies funded under core/PhilRice budget. These projects and studies are focused on the development of rice crop management options for high productivity and profitability of direct-seeded irrigated lowland rice in CARAGA, improvement of information systems for improved crop management decisions, and the promotion of area-based rice technologies.

Additionally, twelve externally funded projects and trainings were implemented at the station. These included screening of hybrid and inbred varieties focusing on yield, pests and diseases resistance; rice crop manager (RCM) trials; performance of FDA-approved fertilizers, the Philippine Rice Information System (PRISM); and the capacity enhancement and knowledge-sharing and learning.

Outputs from these activities aim to address outcomes: 1-increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner, 2-improved rice trade through efficient postproduction, better product quality, and reliable supply and distribution system; 3-enhanced value, availability, and utilization of rice, diversified rice-based farming products, and by-products

for better quality, safety, health, nutrition, and income; 4-science-based and supportive rice policy; 5-advanced rice science and technology as continuing sources of growth; and 6-enhanced partnership and knowledge management for rice research for development.

CORE-FUNDED PROJECT 1:

Crop Management Options for Higher Productivity and Profitability of Direct-Seeded Irrigated Lowland Rice in Caraga

JC Magahud, BM Tabudlong, and DB Bastasta

Farming in the direct-seeded rice areas of Caraga is a low-profit enterprise, partly due to high costs and below-optimum yields when producing rice. Hence, this project aims to package yield-enhancing and cost-reducing crop management technologies for direct-seeded irrigated lowland rice in CARAGA. Specifically, the project (1) tests the integration of existing yield-enhancing and cost-reducing inbred crop management component technologies under a highly-mechanized platform; (2) analyzes the economic advantage of using *Beauveria bassiana* and *Metarhizium anisopliae* to manage insect pests in the field; (3) tests the integration of existing yield-enhancing and cost-reducing hybrid crop management component technologies under a highly-mechanized platform; (4) recommends a new location-specific rice variety suitable to CARAGA environment; and (5) confirms yield increase and cost reduction of the identified inbred package of technology (POT) in another test site with similar characteristics.

Side-by-side comparisons between farmers' and PhilRice POT were conducted in Cabadbaran City, Agusan del Norte. The yield increase and cost reduction of the identified inbred rice POT were confirmed in two rice farms of Brgy. Sanghan for the December 2021-April 2022 and June-October 2022 cropping seasons. The testing of the integration of existing yield-enhancing and cost-reducing hybrid crop management component technologies was done in two rice farms of Brgy. San Antonio Luna for the June-October 2022 cropping seasons. Each farmers' and PhilRice POT was tested in a 1,000-1,500 m² area.

In the December 2021-April 2022 and June-October 2022 cropping seasons, the PhilRice inbred POT had 4.53-5.85t/ha yields. Relative to those of farmers, such yields were higher by 0.81-2.31t/ha in three farms, but lower by 0.09 and 0.42t/ha in one farm. Differences in yields were due to the main and/or interaction effects of factors such as crop establishment including seeding rate,

fertilizer management, weed management, and/or proper land leveling. The PhilRice inbred POT had P9.88-13.11/kg production costs. Compared with those of farmers, the production costs in three farms were lower by 16.3-29.9% due to the use of a cheaper brand of herbicides, lower seed cost, and zero insecticide cost. However, cost was higher by 3.5% in one farm.

In the June-October 2022 cropping season, the PhilRice hybrid POT recorded yields of 6.35-6.43t/ha yields. Relative with those of farmers, such yields were higher by 1.28 and 1.72t/ha in two farms. Differences in yields were due to the main and/or interaction effects of factors such as hybrid vigor, crop establishment (including seeding rate), fertilizer management, weed management, and proper land leveling. The PhilRice hybrid POT had P8.14 and P9.22/kg production costs. Compared with those of farmers, these production costs were lower by 11% and 25.8% in two farms due to cheaper brand of herbicides used.

An on-farm evaluation of two entomopathogenic fungi; *Beauveria bassiana* and *Metarhizium anisopliae* was conducted to evaluate their efficacy of fungal application in managing major rice insect pests compared to the insecticide applications in farmers' practices. Occurrence of key insect pests in PhilRice-managed crops and farmers' fields was monitored and recorded. Among the major rice pests, rice bug (RB) had the highest population count observed both in cropping seasons.

The fungus, *Beauveria bassiana* was highly pathogenic to RB population causing more than 55% mortality based on 10 RB collected per sampling after 14 days of post treatment, compared to the farmers practice using chemical spray with less than 30% mortality. Prolonged observation showed mortality rates of 80-90% mortality at 21 days after fungal application. Insects sprayed with insecticide in farmers' practice were also contaminated with *Beauveria bassiana* resulting in 26.67%-93.33% infection based on 10 RB sampled in the field whereas visual counts only detected 2.37%-18.37% infection. Application of *Metarhizium anisopliae* showed 16.67%-86.67% mortality of RB while 13.33%-50.00% in insecticide application based on collected sample populations.

The use of golden apple snail (GAS) attractant before the spraying of fungal suspensions can be integrated in the management of RB. The use of *Beauveria bassiana* and *Metarhizium anisopliae* were 59.1%-68.9% cost-advantage over chemicals for RB population in the field. Thus, these fungi have the potential for managing RB and can be adopted by rice-based farmers.

The new location-specific rice variety will be selected from the National Rice Cooperative Testing (NCT) Project field trials in PhilRice Agusan. Promising rice lines were evaluated for yield performance in both transplanted and direct wet-seeded planting methods. A total of 19 high-yielding rice lines outyield the check varieties in 2022. Among these, one medium-maturing direct-seeded rice line (PR51293ILR-B-44-1-B-1) and nine transplanted rice lines (PR43282-B-3-1, PR51316ILR-B-74-B-1, IR18A1167, PR47356-19-1-B-1, PR43966-A-B-17-1-1, PRT1-1-2-3-4, PR39502-13-7-99, PR47201-A102A-29-132-B-B, C10460-5-3-1-1-2-1) surpassed the yield of the best check variety by at least 5%, with average yields of 5.6t/ha and 4.9-6.1t/ha, respectively.

CORE-FUNDED PROJECT 2:

PhilRice Agusan Information System for Improved Crop Management Decisions

CU Seville, AMM Rojo, JA Peligro, and BP Gepiga

The project aims to improve farmer's decision-making on rice crop management and weather-related risk management through a data-driven information system of PhilRice Agusan. It includes three studies implemented from 2021-2022: Study 1, Population-based Insect Pests Advisory (PIPA): The Key to Improved Decision-Making which aims to enhance the timing of insect pests management/control based on pest population levels and crop growth stages; Study 2, Local Weather-based Advisory (LoWA) for Informed Crop and Risk Management Decisions which aims to improve crop and weather-related risk management decisions of farmers and stakeholders through an up-to-date weather-based advisories; and Study 3, Development of Local Rice Information System and Interface (RISI) which aims to establish a rice information system with an interactive rice social community (RSC) and an accessible, user-friendly database.

A total of 11 advisories in local language were generated, providing recommended management options based on pest population and crop growth stage. These advisories addressed strategies managing common for insect pests including white stemborer (WSB), rice bug (RB), rice black bug (RBB), green leafhopper (GLH), brown planthopper (BPH), and leaf folder (LF). It was disseminated to the RiceBIS farmers in Antonio Luna, Cabadbaran City, Agusan Del Norte.

In addition, five localized weather advisories and management options during critical crop stages (flowering to mature stage and seedling to tillering stage) were generated and shared in the local language through the DA-PhilRice Agusan Facebook page.

An interactive, Excel-based dashboard was also developed, maintained, and enhanced to host rice-related information, including a database of relevant research and development (R&D) data and information.

Area-based Rice Technology Promotion and Strategic Partnerships in Caraga Region

CJM Tado, CU Seville, SDT Lincuna, AMM Rojo, MB Villaruben, CMT Necesito, KO Kuizon, and RO Cortez

The project aims to develop area-based rice technology promotion, modernized extension modalities and strengthened partnerships to forge enabling mechanisms for improved access to extension services and income opportunities by rural farmers and farming households. It specifically aims to (1) establish rice and rice-based technology learning platforms; (2) increase adoption of rice technologies and production in irrigated lowland areas in Surigao del Norte and Agusan del Sur; and (3) develop a rice-based agri-enterprise and sustain community partnership for improved extension services to farming households in Agusan.

The knowledge-sharing and learning (KSL) component led and conducted various activities to enhance rice and rice-based knowledge among to target participants. The official Facebook page of the station was maintained with 7,710 followers, 150,106 people reached, and 19,108 people engaged. A total of 49 rice-related information posts from the R&D activities were shared. The last batch of Woktok activity was conducted during the first semester and was attended by 52 staff (30 males and 22 females), with 37% gain in knowledge (GIK). Eleven PhilRice corners were also installed in Region 10 provinces and state university. The One-Stop Information Shop (OSIS) in the station was maintained to cater to the needs of walk-in farmers, students, and other rice stakeholders.

The Lakbay Palay with the theme "Bukid Tipid Tips, Subukan", received a very satisfactory (VS) rating and was conducted on October 21, 2022. It was attended by 531 participants (47% male and 53% female) including farmers, agricultural Extension workers (AEWs) and local government unit (LGU) representatives. It include exhibits, and field tour showing various technologies such as rice varieties, machines, nutrient and pest management practices, and value adding strategies. "Bukid Tipid" tips to lessen input costs were discussed during the forum. The farmer cooperator's motivational talk on his farming experiences also graced the activity.

The National Rice Awareness Month (NRAM) was celebrated in November with activities including a kick-off program, *Sabayang Tanghalian*, and a feeding program at Pupotsan Elementary School, Magallanes, Agusan del Norte participated by more than 100 students. The culmination program featured a cooking competition held on November 29, 2022.

Four technology demonstration in Agusan del Sur and Surigao del Norte showcased the use of high-quality seeds (HQS), walk-behind mechanical transplanter for establishment, rice crop manager (RCM), and alternate wetting and drying (AWD) were established. Field days and Participatory Varietal Selections (PVS) were conducted in four sites. While farmers' awareness on some production technologies were low, most were willing to adopt them. However, actual adoption was hindered by the limited availability of implements such as mechanical transplanters.

Eight knowledge products—including two brochures and six leaflets—were localized. Subjects were selected based on the problems identified by farmer-respondents in the study.

The Palayaman Plus component was maintained with four agro-enterprises, namely mushroom, vegetable, vermicast/compost and rice productions. The total gross sales of all components are P428,843.00, with mushroom production being the most profitable earning a gross income and profit of P311,590.00 and P124,768.36, respectively for the 2022 operations. Mushroom production training was also conducted with members of the Cacea Guihao-an Irrigators' Association, Inc. (CGIA) members in Agon-ong, Buenavista, Agusan del Norte with 23 participants (nine male and 14 female).

PROGRAM-BASED PROJECT 1:

Rice Business Innovations System (RiceBIS) Phase I, II, and Expansion Site

ST Rivas, EA Rapil, PR Guindang, SJ Acosta, AE Lincuna, ES Moñeva and RM Ballenas

The project aims to transform rice-based farming communities into an inclusive, competitive, and sustainable agroenterprise community model with a targeted income increase of 25%. Specifically, RiceBIS aims to: (1) establish partnerships with farmers' organizations for production and agroenterprise development; (2) enhance farmers' capacities in production and processing, organizational building and management, and agripreneurship; (3) increase yield by 1t/ha in irrigated and 0.5t/ha in rainfed through the application of yield-enhancing technologies; (4) reduce cost of production by 30% (P8/kg) and postharvest losses to 12% through applying cost-reducing technologies; and (5) engage farmers in profitable rice and rice-based enterprises.

To achieve these objectives, RiceBIS will utilize key strategies such as partnershipbuilding, cluster formation, mind-setting, and capacity enhancement through PalayCheck Farmer Fields School (PFFS), technology demonstration, Farm Business School (FBS), and organizing farm production, collective marketing, and sustaining enterprise through agro-enterprise development meetings.

On gender and development (GAD) integration, the project is heavily gender inclusive. Implementers are capacitated to integrate concepts and principles in all aspects of implementation. A balanced ratio of men and women implementers has been maintained, and a large percentage of women beneficiaries were reached. In doing so, more women farmers are capacitated and enabled in PalayCheck System and agro-enterprise development.

Phase 1: Under the capacity enhancement component, 33 men and 24 women farmers were engaged in agroenterprise in Esperanza, Agusan del Sur. The agroenterprise development component sustained two agroenterprises, the seed production and milled rice. Monitoring and evaluation results for the 2022 dry season (DS) showed 4.49t/ha yield, a statistically significant from the 2017 DS baseline yield of 3.01t/ha. The yield increase was attributed to the adoption of technologies such as the use of location-specific and recommended varieties, proper seeding rates, correct planting distance, RCM-based fertilizer application, proper fertilizer timing and elements, synchronous planting, controlled irrigation for water management, proper application of pesticides, and the use of combine harvesters. The agroenterprise seed production recorded an average return of investment (ROI) of 74% in 2022 and had a combined net income of P7,035,320.00 throughout the year.

Phase 2: In the capacity enhancement component, 99 farmer (men and women) engaged in four PalayCheck Farmer Fields School and agroenterprise development training in strategic barangays of Magallanes, Kitcharao, and Cabadbaran City, Agusan Del Norte. Three learning sites were established including one 6.0-ha upland rice seed multiplication demonstration site to showcase yield-enhancing and cost-reducing technologies appropriate for the agroclimatic and socio economic conditions of the barangay.

The agroenterprise development component sustained four milled rice agroenterprises and one internal saving and lending (ISL) agroenterprise. The results of the monitoring and evaluation of 2022 DS showed a 4.40t/ha yield, a statistically insignificant decline from the baseline yield of 2020 DS which is 4.59t/ha. The decline can be attributed to the decrease in fertilizer use due to the sudden increase in fertilizer prices. Furthermore, the cost of rice production increased in 2022 DS by 15.65% primarily due to the higher fertilizer and fuel costs. The aforementioned resulted in a reduction in total net income to 31.31%. Despite this, the agroenterprise development posted an average ROI of 18.98% and generated a combined net income of P221,018.00. On average, the agroenterprises contributed P1,270.22, or 4.07% of the baseline net income from rice production.

Expansion Site: In the capacity enhancement component, 32 men and 68 women farmers were engaged in three PalayCheck FFS and agroenterprise development training in strategic barangays of Buenavista, Agusan Del Norte. One learning site was established to showcase yield-enhancing and costreducing technologies suitable to the local agroclimatic and socio economic conditions. The agroenterprise development component sustained four milled rice agroenterprises. Monitoring and evaluation results for the 2022 DS for Site 1 (Remedios T. Romualdez) showed 4.43t/ha yield, a statistically insignificant increase from the 2020 DS baseline yield of 4.41t/ha. At Site 2 (Buenavista), a yield of showed 4.6t/ha was recorded, a statistically insignificant increase from the baseline yield of 2020 DS which is 4.25t/ha. These marginal increases were affected by challenges such as insect pests, reduced fertilizer use and lower unit prices per kilogram. Furthermore, production costs decreased in 2022 DS by 73.38% for Site 1 (RTR), while they increased in 2022 DS by 77.43% for Site 2 (Buenavista), due to the rising cost of fertilizer and fuel. As a result, the net income rose by 71.18% for Site 1 but declined by 68.68%. Fortunately, the agroenterprise development posted a 14.57% ROI average among agroenterprises and had a combined net income of P42,287.00. On gender and development (GAD) integration of the project, the project is heavily involved with women in its implementation.

DIVISION-BASED PROJECT 1:

Philippine Rice Information System (PRiSM)

Station implementers: BP Gepiga and JA Peligro

Philippine Rice Information System (PRiSM) is a satellite-based rice monitoring system that provides data products that can be used as references for the country's decision-makers and policymakers. It supported the analysis and interpretation of satellite images for rice detection. For 2022 it has the following accomplishments:

A total of 180 farmers' fields were monitored across three regions during the 2022 cropping season. Data collectors in the DA-RFO and LGUs were regularly coordinated to ensure the on-time gathering and submission of data on field profile, cultural management, monitoring, nutrient management, crop-cutting, and production, using a smartphone-based survey. These data were validated in the PRiSM analytics and checked for timeliness, quality and accuracy.

A total of 355 rice and 252 non-rice field validation points were collected by regional partners (Region 10, 11, and 13) during the 2022 cropping season.

Overall rice and non-rice accuracy results were 99% for both Region 10 and 11, while Region 13 got 92%. These were validated and verified and used as rice map accuracy assessment by PRiSM mapping team in producing the PRiSM data products such as rice area and planting season.

Palay price was surveyed weekly during harvesting season in the three Regions; Region 10, 11, and 13 (March and April) for the 1st semester, and (September, October, and November) for the 2nd semester in 2022.

DIVISION-BASED PROJECT 2:

Field Evaluation of FPA-approved Fertilizers for Irrigated Lowland Rice Ecosystem for the Packaging of Best Nutrient Management Technology

Station implementers: CS Agting, JC Magahud, and JPC Gasta

The project addresses the low adoption of recommended nutrient management recommendation, low fertilizer efficiency, environment pollution due to improper nutrient application, and inadequate documentation of field performance of fertilizer products. It is expected to showcase the performance of Fertilizer and Pesticide Authority (FPA)-approved fertilizer materials, generate information of their effects on rice growth and yield, compare economic performance of different fertilizer materials, and generate the best package of nutrient management technologies for irrigated lowland rice.

The goal of the project is to increase productivity and cost effectiveness of rice farming in a sustainable manner through the provision of the best package of nutrient management technology. PhilRice Agusan Station had seven companies, including farmer's practice and PhilRice participated in the project during the 2022 DS and eight during 2022 WS. PhilRice and farmer's practice used soil-based fertilizer and served as control treatments.

Performance of NSIC Rc 402 for 2022 DS and NSIC Rc 534 for 2022 WS applied with FPA-approved fertilizer materials/products were evaluated with nutrient management technologies of seven participating companies namely: Atlas Fertilizer Corporation, Enviro Scope Synergy Inc., Allied Botanical Corp., Bacphil Planters Fertilizer Corp., VVZ Corporation Inc., PhilRice, and farmers' practice for 2022 DS; and the nutrient management technology of eight participating companies namely: Allied Botanical Corp., Bacphil Planters Fertilizer Corp., Allied Botanical Corp., Bacphil Planters Fertilizer Corp., Allied Botanical Corp., Bacphil Planters Fertilizer Corp., Bacphil Planters Fertili

Inavet Nutrition Technologies Inc., VVZ Corporation Inc., Enviro Scope Synergy Inc. (new product), Agrigrowth International Corp., PhilRice, and farmers' practice for 2022 WS.

In 2022 DS PhilRice practice had the highest potential and actual yield of 5.09t/ha and 4.54t/ha, respectively. While in partial budget analysis showed that in 2022 DS, PhilRice practice has the lowest production cost at P10.86/kg.

In 2022 WS, the participant that got the highest potential yield was PhilRice with 6.07t/ha and in terms of actual yield, Inavet Nutrition Technologies Inc. got the highest actual yield with 4.91t/ha. Bacphil Planter Fertilizer Corp. achieved the lowest production cost at P9.72/kg with an actual yield of 4.46 t/ha.

DIVISION-BASED PROJECT 3:

Nutritionally Enhanced Rice-Finishing and Delivering Golden Rice and High Iron and High Zinc Rice Varieties

JD Tangog, DC Noja, and CJM Tado, PhD

Golden Rice (GR) is a type of rice that contains beta carotene (a source of vitamin A), which gives the grain its golden/yellowish color. It was developed using genetic modification, with genes from corn and a common soil microorganism that together produce beta carotene in the rice grain. The beta carotene in GR is the same as the beta carotene found in green leafy and yellow-colored fruits and vegetables. One cup of cooked GR can provide up to 30-50% of the estimated average requirement (EAR) of vitamin A for preschool-age children, and two cups for pregnant or lactating mothers.

Field walk and harvesting of GR at Bayugan, Agusan del Sur was conducted on October 26, 2022. Crop monitoring activity in the GR fields at Lala and Kapatagan, Lanao del Norte done on October 12-14, 2022.

DIVISION-BASED PROJECT 4:

National Rice Cooperative Testing Project (Irrigated Lowland, Inbred, and Hybrid)

KDL Sepulveda, JB Culiao and DB Bastasa

PhilRice Agusan Experiment Station is one of the sites of the National Rice Cooperative Testing (NCT) Project, which is led by the Rice Varietal Improvement Group. This is the final phase in the variety development process in the Philippines wherein the performances of promising rice lines are assessed in strategic locations across the country. The national rice breeding program continues to develop new inbred and hybrid rice varieties to address different needs (e.g., high-yielding, climate-resilient, early-maturing, resistant to pests and diseases, better eating quality, high adaptability), thus providing better options and helping the Filipino rice farmers increase their yield and income.

A total of 19 high-yielding inbred rice lines were identified in 2022. Among these, six transplanted rice (TR) lines, namely: PR43282-B-3-1, PR51316ILR-B-74-B-1, IR18A1167, PR47356-19-1-B-1, PR43966-A-B-17-1-1, and PRT1-1-2-3-4, and one medium-maturing direct-seeded rice (DSR) line (PR51293ILR-B-44-1-B-1), surpassed the best check variety by at least 5%, with average yields of 4.9-6.1t/ ha (TR lines) and 5.6t/ha (DSR line). In addition, six hybrid rice lines yielded higher than the check with an average of 6.47-7.74t/ha. Of these, two Philippine-Sino Center for Agricultural Technology (PhilSCAT)-bred lines, P10 and P20, obtained at least 15% yield advantage compared with the best hybrid check variety. The recommendation to the National Seed Industry Council (NSIC) of a promising inbred or hybrid rice for variety release and registration shall be considered after satisfying the minimum testing duration in the NCT.