2023 PhilRice R&D Highlights

LOS BANOS BRANCH STATION

Philippine Rice Research Institute
Central Experiment Station
Maligaya, Science City of Muñoz, 3119 Nueva Ecija

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STATION

PhilRice Los Baños

Branch Director: **RHEMILYN Z. RELADO-SEVILLA**

EXECUTIVE SUMMARY

PhilRice Los Baños loaded itself with 14 projects to help execute the PhilRice Strategic Plan 2023-2028, fulfilling its commitment to advancing science and technology for rice-farming communities. The Station also catered to the specific needs of rice stakeholders in CALABARZON and MIMAROPA.

Implemented were four program-based projects: Scaling out Rice ICM technologies for increased yield and reduced production cost (SMART-ICM); Rice Business Innovations System (RiceBIS) 2.0; Seed Production for Food Sufficiency; and Malusog Rice; four division-based projects: Philippine Rice Information System (PRISM); Promotion of Hybrid Rice in CALABARZON and MIMAROPA; Evaluation of TGMS-based hybrid PRUP 15 in the National Cooperative Testing ,and PreCom Los Banos; four station-based projects: Rice Technology and Innovations Project (RiceTIP); Increasing rice productivity and reducing methane emissions in CALABARZON and MIMAROPA; Conservation and management of rice genetic resources in PhilRice Los Banos; and Operationalization of Agricultural and Biosystems Engineering (ABE) Unit; one extra core project [Deployment of genetic resistance in the management of rice black bug Scotinophara coarctata (F.)-PhilRice Component]; and one RCEF-funded project [Physical Attributes Determination (Grain Quality) at Rice Chemistry and Grain Quality Laboratory, PhilRice- LB].

CORE-FUNDED PROJECT 1:

RiceTIP: Rice Technology and Innovations Promotion in CALABARZON and MIMAROPA

Michelle C. Quimbo, Virginia D. Ompad, Maria Sofia M. Canilao, Mel Anthony T. Talavera, Jolita B. Carandang, Imelda DG. Olvida, Jeremiah S. Orellano, Gabrel P. Flancia, Lea E. Licong, John Hernan Trinidad, Cherry F. Piñon, Nicanor C. Yadan, Kei J. Asagi, and Andra Ly J. Morales

This Branch Development Initiative (BDI) titled, "Rice Technology and Innovations Promotion in Regions 4A and 4B" worked on four major components: (1) RicePATROL, (2) RiceSHARE, (3) Technology-Scaling of Nutrient Management, and (4) Monitoring and Evaluation through face-to-face learning activities with the rice stakeholders.

Among the major accomplishments of the project include: technical assistance; technology-scaling of nutrient decision support tools in Quezon; seed multiplication and distribution of climate-smart varieties to farmers of Quezon and Ilocos provinces; varietal demonstrations of newly released inbred, climate-smart, and public hybrid varieties; seminars/webinars, exhibits, on and off-station techno-demonstrations; Lakbay Palay; National Rice Awareness Month (NRAM) and Be RICEponsible campaign activities; Women's month and VAWC activities; social media management and engagement; and capacity enhancement on inbred rice production and other technologies.

In detail, the following itemize the major accomplishments:

- Forty-two technical dispatches including representations to serve as resource persons on rice S&T technologies to government and private sector-led undertakings;
- Some 300 consultations (i.e., seeds, machinery, MOET, brown rice, pest, and disease) attended to through the PalayKonsulta;
- Four poster papers at the 2023 Ugnay Palay Conference, and six booklets each characterizing with suitability maps six municipalities in Quezon;
- Nutrient management training, techno-demo, Lakbay Palay in Magsaysay, Occidental Mindoro;
- Region-wide WS Lakbay Palay with 1,108 (623 men and 485 ladies) farmers, ATs, partner-agencies, and students from CALABARZON and MIMAROPA;
- Two batches of training on High-Quality Inbred Rice Production for 60 AEWs across CALABARZON in partnership with DA-ATI;

- Two seminars on Women Empowerment during Women's Month and during the VAWC campaign;
- Accommodated 260 station visitors made up of farmers, agricultural technicians, students, researchers, public and private officials, dignitaries;
- Two on-station and 12 off-station inbred and hybrid techno-demos with 10 Lakbay Palay conducted in Laguna and Occidental Mindoro;
- Palayamanan setup with vegetables, herbs, vermicomposting, and livestock maintained year-round;
- NRAM Activities: 21st Ceremonial Rice Harvesting at Luneta Park with 200+ students and teachers of Salawag National High School in Dasmariñas City, Cavite in partnership with KIWANIS International; Be RICEponsible and Agri-Careers Campaigns conducted in Padre Garcia Integrated National High School in Batangas, attended by 200 senior highschool students and their advisers; and Los Banos Bayog Science High School with 200 students and their advisers;
- Farmers' market in partnership with DA-RFO 4A, KADIWA, UPLB-BAO, DA-ATI, invited farmers' cooperatives and entrepreneurs (November 25, 2023) held at Freedom Park, UP Los Baños; and
- Social media management and articles published (in collaboration with RCEF Strat Comm): 14,585 followers as of January 2023; 17,810 followers as of December 15, 2023 (22% increase); 34 original Facebook posts

CORE-FUNDED PROJECT 2:

Increasing rice productivity and reducing methane emissions in CALABARZON and MIMAROPA

Noriel M. Angeles, Gabrel P. Flancia, and John Paul A. Palillo

The initiative identified low methane-emitting rice varieties and assessed their suitability to AWD. Trials across diverse sites evaluated five rice varieties under different irrigation systems, revealing variations in methane emissions (ME) and yields.

Greenhouse gas emissions, mainly methane, were monitored at various growth stages using the closed-chamber method. ME and yields varied across locations, with PhilRice Los Baños itself recording the highest levels under CF; Lopez, Quezon, had the lowest ME. NSIC Rc222 consistently emitted high methane

across multiple sites, despite variations in yields. Insufficient irrigation and pest infestations pulled down yields in Sablayan, Pila, and Infanta, with AWD yielding less than continuous flooding (CF). The 2023 trials unlocked these results:

Yield and methane emissions under CF:

- In Sablayan, Occidental Mindoro, NSIC Rc 216 yielded highest at 3,917kg/ha; Rc 508 emitted the most methane at 55.16kg CH4/ha. In Infanta, Quezon, Rc 218 yielded the most at 3,955kg/ha, but Rc 222 emitted the highest methane at 70.20kg CH4/ha. Pila, Laguna saw NSIC Rc 222 as the top yielder at 4,530kg/ha, also emitting the most methane at 23.51kg CH4/ha. At PhilRice Los Baños Rc 222 yielded highest at 6,703kg/ha, and emitted methane at 80.25kg CH4/ha. In Lopez, Quezon, Rc508 yielded highest at 6,369kg/ha; Rc216 emitted the most methane but at only 15.32kg CH4/ha.
- Highest global warming potential was reckoned from Rc 222 at PhilRice Los Banos with 2246.98kg CO2-eq/ha; lowest was from Rc 508 in Lopez with 259.79kg CO2-eq/ha.
- PhilRice Los Banos had the highest yields and methane emissions; lowest in Lopez. Methane emission ranking was: PhilRice Los Baños > Infanta > Sablayan > Pila > Lopez. On average, Rc 222 had the highest emissions; next were Rc 216, Rc 218, Rc 508, and Rc 402.

AWD Irrigation technique evaluation:

- In Sablayan, NSIC Rc508 yielded highest at 4,119kg/ha; Rc 216 had the lowest at 3,077. In Infanta, Rc 216 yielded highest at 4,683kg/ha; Rc 222 the lowest at 2,977 owing to rice bug infestation. Rc 222 yielded highest in Pila at 5,083kg/ha; Rc 216 the lowest at 3,255. In Lopez, Rc 508 had the highest at 5,880kg/ha; Rc 218 had the lowest yield at 2,720kg/ha.

CORE-FUNDED PROJECT 3:

Philippine Rice Information System (PRiSM)

Ronel G. Discaya

The PRiSM project provides reliable and timely information on rice area planted, planting dates, yield and production estimates in support of the DA's policy formulation tasks. The station partners with several DA- RFOsand local government units (LGUs) in pursuing the project.

Established, monitored and data-collected were 247 PRiSM monitoring fields (MFs) (112 in 1st semester and 135 in 2nd) across the regions. Field profile,

cultural and nutrient management, production data, and monitoring visits (based on satellite pass schedule) were put together, processed, and submitted to the PRiSM mapping team.

Gathered across the regions were 480 validation points within rice and non-rice, , meeting the target of 120 points per region per semester. These data points were utilized to evaluate the precision of the rice maps generated through remote sensing technology. Overall accuracy of the rice maps and rice areas for Region 4A over two semesters was 95%; for the MIMAROPA region it was 94%.

CORE-FUNDED PROJECT 4:

Scaling out Rice ICM technologies for increased yield and reduced production cost (SMART-ICM)

Michelle C. Quimbo, Jolita B. Carandang, and Jeremiah S. Orellano

The project is the first under the SMART Farm Program, which aimed to increase farmers' adoption of mature rice production technologies through deployment to a 100-ha farm cluster. Established was a 103.9-ha cluster in Brgy Mayao Castillo, Lucena City, Quezon, in collaboration with OPA-Quezon and the City Agriculture Office. Key accomplishments include collaborative meetings, focus group discussions, establishment of the RCEF PalaySikatan demo farm, field demonstrations of mechanical transplanter and agricultural drone, site characterization, and GIS mapping of the farm cluster. The following are the highlights:

SMART-ICM cluster of three Irrigators' Associations was organized with 97-ha rice area.

Adoption of mature technologies advocated through RCEF PalaySikatan showcasing six varieties, demonstration of mechanical transplanting and drone-seeding, and conduct of FGDs.

Eleven government agencies formed the site working group for SMART-ICM implementation.

CORE-FUNDED PROJECT 5:

Rice Business Innovations System (RiceBIS) 2.0

Michelle C. Quimbo, Kei J. Asagi, Lea E. Licong, Maria Shiela M. Muros, and Andra Ly J. Morales

The project rejuvenated rice-based farming communities by enhancing agroenterprise models and value chain efficiency. Comprising three projects - Process Innovations, Product Innovations, and Marketing Innovations - the program thrust expanded from the RiceBIS 1.0 pilot site in Sariaya and Tiaong, Quezon. Achievements include business capacity assessments for 14 farmer clusters, formation of a Site Working Group with 13 partner-agencies, training on Good Agricultural Practices (GAP), market linkage with institutional buyers, facilitation of machinery requests, and policy consultations with Local Government Units.

Process innovations:

- Fourteen Business Capacity Assessments were conducted across Tiaong and Sariaya, Quezon, and a site Working Group of 13 partner public/private agencies was established;
- Business plans for MARBENCO and Sintorisan-Behia SWISA FA were developed.

Product innovations:

- GAP Certification and Product Standards Training with 34 participants was conducted.
- Eight farms in Tiaong for PhilGAP assessment and potential certification were identified.

Marketing innovations:

- Link between Manggalang Agrarian Reform Beneficiaries Cooperative (MARBENCO) and LBB Sariaya Agri Trading Inc. for collective marketing was established.
- Products of Sintorisan-Behia SWISA FA at the Cashless Expo 2023 were showcased, resulting in two potential partnerships.
- Partnerships for MARBENCO with LBB Sariaya and the National Food Authority were established, and for Sintorisan-Behia SWISA FA with various potential partners including the LGU of Tiaong, National Cooperative Marketing Federation, and individual stakeholders.

CORE-FUNDED PROJECT 6:

Seed production for food sufficiency: production of nucleus and breeder seeds of hybrid parental lines

Mel Anthony T. Talavera, Wendy B. Abonitalla, Kathleen P. Gonzales, Edelweiss E. Sajise, Susan R. Brena

The project, anchored in Los Baños, produced, maintained, and distributed high-genetic purity seeds of public hybrids to support hybrid rice commercialization. It involved seed selection, evaluation, and multiplication to produce basic seeds, with foundation seeds generated by branch stations in Negros, Isabela, and Midsayap. F1 seed production is handled by F1 seed cooperatives, with the seeds procured by DA-RFO for farmer distribution. Hybrid parentals (Mestizo 1, 20, 73, 99, 103) were stored at PhilRice Los Baños' facility.

In Tublay, Benguet, 2,200 plants were selected and shuttled to Los Baños for evaluation of sterility trueness, uniformity, pollen sterility, and agro-morphological characteristics, 1,960 of which met the criteria and were bulked for nucleus seed production

Produced were over 555kg of breeder seeds for Mestiso 20's female parent and 35 kg of P-line, enough to plant 37 hectares of S-line foundation seed production.

Seeds of parental lines of Mestizo 1 and Mestiso 20 were distributed to PhilRice Isabela and CES for foundation seed production

Quarterly monitoring with the PhilRice GRD-Seed Technology Unit saw germination rates between 86% and 99% for stored parental lines at PhilRice Los Baños cold storage

CORE-FUNDED PROJECT 7:

Promotion of hybrid rice in CALABARZON and MIMAROPA

Mel Anthony T. Talavera, Mary Jane P. Vasquez, and Jolita B. Carandang

Breeding institutions IRRI, PhilRice, and UPLB have collaborated to develop a wide range of rice cultivars suited to various environments. Through the NCT Plans from 2011 to 2019, 75 hybrids and 105 inbreds were introduced to accelerate the adoption of superior rice varieties. This initiative involves researcher-managed Participatory Performance Testing and Validation (PPTV) studies across 16 regions,

bolstered by partnerships with DA-RFOs and other entities. In CALABARZON, PhilRice-Los Baños and Lipa Agricultural Research and Extension Center (LARES) conducted PPTV to identify adaptable rice varieties across different setups, including irrigated lowlands and rainfed areas. Mestiso 99 (M99) and Mestiso 73 (M73) provided promising results in irrigated lowlands during the 2023 dry season.

- Included M73 and M99 in the experimental setup of irrigated inbred lowland varieties across four locations: Sta. Maria, Laguna; Morong, Rizal; Maragondon, Cavite; and Nasugbu, Batangas, using farmers' varieties as checks
- Farmers recognized the high-yielding performance of M73, particularly in Sta. Maria and Maragondon where it yielded 8.93 and 6.89t/ha, respectively, defeating other inbreds and hybrids varieties
- Morong emerged as the highest-yielding area

CORE-FUNDED PROJECT 8:

Germplasm maintenance and conservation

Wendy B. Abonitalla, Edelweiss E. Sajise, Teresita H. Borromeo, Sancho G. Bon, and Mark Ian C. Calayugan

This PhilRice-UPLB program safeguards rice diversity and supports breeding programs at Los Baños.

- The PhilRice-UPLB Genebank maintains 3,580 rice materials with 200 traditional rice variety (TRV) accessions processed, cleaned, and stored for short-term conservation, achieving at least 85% seed viability. TRV seeds are available upon request. Population samples of Philippine wild rice are managed in pots for live plant collections, with DNA harvesting efforts ongoing. Harvested mature grains are stored for future seed sources, and a field sampling mission for O. meyeriana from Palawan was conducted. UPLB personnel primarily undertook DNA extraction and collection activities.
- Twenty-nine rice accessions at 10kg seeds each, primarily elite breeding lines, were requested for research and breeding purposes
- 218 TRV entries were planted for seed multiplication with seeds harvested, manually threshed, and air-dried to maintain seed quality and prevent deterioration
- Two hundred sixteen entries planted for DS and WS and characterized for quantitative and qualitative traits based on Bioversity International (2007) guidelines. Field and grain characterization were completed for 137 DS

entries and 81 WS entries. Post-harvest processing, drying, and packaging of harvested seed lots were also completed, with initial data analysis showing morphotype proportions.

- Evaluation of germplasm materials for resistance to insect pests and diseases was not completed due to seed availability and budget constraints.
- The physical seed inventory was updated and encoded, detailing storage locations and seed weights.

CORE-FUNDED PROJECT 9:

PhilRice LB PreCom

Mel Anthony T. Talavera, Kathleen P. Gonzales, and Mary Jane P. Vasquez

The project characterized the pollen parent lines of M73 and M99, established F1 seed production protocols, and evaluated the performance of pre-commercialization public hybrid rice. Using the Standard Evaluation System (SES) for rice, the study developed an F1 seed production protocol that identifies key traits such as plant height and flowering time. Trial seed kits of both hybrids were distributed to DOSEPCO and S2R cooperative.

- Seed growers in Region 11 were trained on F1 seed production using the protocols of M73 and M99. M73 averaged 1,076kg (fresh weight) and 762kg (dry); M99 had 1,456kg (fresh) and 1,164kg (dry). The next season will optimize the production protocol

CORE-FUNDED PROJECT 10:

Operationalization of the Agricultural and Biosystems Engineering (ABE) Unit in PhilRice Los Baños

Virginia D. Ompad, Nicanor C. Yadan, Gabrel P. Flancia, John Paul A. Palillo, Marc Gene T. Lapitan, and Silvestre A. Andales

Several ABE outputs were achieved based on the project objectives and the collaborative efforts of the team:

- **Machine inventory and maintenance.** Machine lists for PhilRice Los Baños and the Mindoro Satellite Station were reported. Maintenance

was performed by the assigned AB Engineer, machine field operator, and mechanic. Malfunctioning machines often required external service due to lack of repair equipment or replacement parts. The ABE Unit recommended purchasing consumable machine parts and repair equipment quarterly to ensure operational efficiency and as part of austerity measures.

- **Training and custom service provision.** The ABE Unit, in partnership with the Laser-guided Land Leveling Project, trained on machine operation five AB Engineers and 13 Farm Machinery operators at the Satellite Station. Co-funded by the Province of Occidental Mindoro, 13 personnel from its various departments underwent training. AB Engineers served as resource persons for station-conducted training and responded to requests from partner agencies.
- **Support for R4D Operations.** The ABE Unit evaluated agricultural structures such as greenhouses, flatbed dryers, and brown rice mills. Recommendations included general repairs of the flatbed dryer and greenhouse, and the construction of a room with appropriate exhaust and dust collector for the rice mill.

CORE-FUNDED PROJECT 11:

Evaluation of TGMS-based hybrid PRUP 15 in the National Cooperative Testing

Mel Anthony T. Talavera, Wendy B. Abonitalla, Kathleen P. Gonzales, Edelweiss E. Sajise, and Susan R. Brena

PhilRice and UPLB have developed high-yielding and pest-resistant hybrids. Following the success of five nationally recommended hybrids, PhilRice is introducing PRUP15, a new TGMS-based hybrid, expected to further enhance F1 performance and seed yield of TGMS products. The project characterizes hybrid parentals, ensures F1 seed reproducibility, and collects agronomic and morphological data for the male and female parents of PRUP15. Utilizing the UPOV Distinctness, Uniformity, and Stability Test (DUST) further aids in seed accreditation.

- Basic characteristics of the parent lines of PRUP15 were pinpointed using the Standard Evaluation System (SES) for rice. The response of the plants to GA3 was also assessed to determine parent line receptivity. The ideal parent combination for hybrid rice production is when the pollen parent has a height advantage over the female parent and a maturity difference not exceeding ten days for easier synchronization.

- The pollen parent line, RPP6 251, exhibited a 34-cm height advantage over the female parent line, TGMS 31. With the application of GA3, this height difference increased to 28.8 cm and 36.7 cm, respectively. Additionally, TGMS 131 flowered more than three days later than RPP6 251.

EXTRA CORE PROJECT 1:

Malusog Rice (MR)

Rhemilyn Z. Relado-Sevilla, Wilfredo B. Collado, and Jeff Lloyd G. Francisco

Malusog Rice offers the opportunity to address nutritional needs in conjunction with other interventions, as fruits and vegetables are not commonly consumed by young children in VAD-known areas. We are the first country in the world to approve this genetically engineered rice with nutritional benefits for commercial propagation pilot-scale deployment.

To ensure availability and accessibility of MR both as seeds and milled rice, the project established 1.4ha of seed production and half-hectare of commercial production in Los Baños, Laguna in DS; and 1.9ha of commercial production in Nasugbu, Batangas in WS. To raise product awareness, promote public acceptance and desirable behaviors for uptake, the project conducted six MR Briefings to farmers, LGUs, and SUCs. The project also participated in six exhibits based on planned activity and by invitation. Some 464kg of milled MR were distributed as part of the pilot-scale deployment and promotions through Feeding Programs, Tokens, and other activities

EXTRA CORE PROJECT 2:

Deployment of genetic resistance in the management of rice black bug Scotinophara coarctata (F.)-PhilRice Component

Edelweiss E. Sajise, Genaro S. Rillon, Ester A. Magsino, Dara Faye R. Rivera, Sophia Karla S. Vergara, Gina D. Balleras, Oliver E. Manangkil, and Juliet P. Rillon

A key objective of the project is to refine the screening methodology for rice black bug (RBB) resistance. This involves developing a sensitive evaluation procedure to identify resistant parent lines for breeding and to gauge the resistance of elite lines. To achieve this, genotypes, resistant parent lines, elite lines, and released varieties were evaluated using both natural and artificial infestations. Sixteen entries were identified as resistant, including two NSIC varieties and several elite

lines and known resistant genotypes. Their resistance was confirmed under caged conditions with high insect pressure (60 adult RBB per hill), with data collected at 20, 40, and 60 days after infestation (DAI).

The traditional "seed box technique" and screenhouse evaluation were tested for screening rice against RBB using five rice entries with known resistance or susceptibility and common checks. The resistant entry, RBB 001, was rated moderately resistant 7 DAI, but all entries from 14 to 21 DAI turned either moderately susceptible or susceptible. For both techniques, further study is needed.

Seeds of 1,675 germplasm materials were assembled, 1,605 of which have been successfully multiplied and are now regularly scheduled for RBB resistance screening. Evaluated at PhilRice Midsayap were 1,560 entries for their reaction to RBB. From the first batch of 177 entries, 16 RBB-resistant lines were identified using artificial infestation in 2021. A subset of 48 entries were tested in Los Baños, where eight lines confirmed resistance under higher infestation rates. Consistently resistant lines include RBB 11, RBB 12, and RBB 112. Four entries were highly resistant, three were moderately resistant, and 139 showed intermediate reactions from Batch 3 and 4 field screenings.

Germplasm materials (1,344) planted in the seed increase nursery were continuously characterized and evaluated for important agro-morphological traits. The 920 entries (68%) were considered as elite lines while 424 (32%) have plant type not suitable for use as stop-gap variety thus may be considered as potential donor lines if found with resistance to RBB.

Breeding efforts in 2022 focused on eight resistant lines, from which 134 crosses were made. Thirty-five F1s were selected to form the F2 populations. Due to the lack of RBB pressure, the breeding method shifted from pedigree to bulk breeding. The F3 populations were established in Midsayap to expose them to RBB. Eight F2 populations with confirmed resistant parents, along with 15 others, were advanced to F3, and resistant plants were selected. The F3 and F2 populations were bulk-harvested and progressed. To address pandemic-related delays, rapid generation advance (RGA) was used, advancing 21 F1s to the F5 generation. Development of two composite populations began, with eight of ten crosses generated.

RCEF-FUNDED PROJECT 1:

Physical Attributes Determination (Grain Quality) at Rice Chemistry and Grain Quality Laboratory, PhilRice- LB

Mary Joy A. Manalo and Edelweiss E. Sajise

Physical attributes of 214 (DS) and 199 (WS) rice grain samples from 11 (WS) and 13 (DS) ecosystems were tested as part of the GQ evaluation that involved percent chalkiness and immature grains, grain size, and shape. Duplicate samples were assessed visually.

Evaluation of physical attributes:

- Four hundred twelve breeding lines for chalkiness, immature grains, and size and shape were evaluated
- Two hundred thirteen samples (52%) from 2022 wet season and 199 samples (48%) from 2023 dry season coming from GQ-Plot, Albay, and Agusan were assessed

Identification of breeding lines with acceptable grain quality:

- In 2022 wet season, 168 samples (79%) had elongated and long grain dimensions, while only 7 samples (3%) passed Grade 1 to Premium for chalkiness
- In 2023 dry season, 123 samples (62%) had long grain dimensions.

Photo Documentation

(Insert relevant pictures)