2022 PhilRice R&D Highlights

PhilRice Los Baños

Philippine Rice Research Institute
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BRANCH STATION

PHILRICE LOS BANOS

Branch Director:

EXECUTIVE SUMMARY

DA-PhilRice Los Baños continues to live up to its mandate by implementing 13 research and development (R&D) projects aimed at increasing the rice productivity and profitability of farmers and educating the general public on rice science technologies and conservation, especially in its regions of responsibility, CALABARZON (Cavite, Laguna, Batangas, Rizal, and Quezon) and MIMAROPA (Mindoro Occidental and Oriental, Marinduque, Romblon, and Palawan). This, in turn, helps in the improvement and sustenance of rice quality and availability for consumers. In 2022, DA-PhilRice Los Baños implemented three station-based projects, four division-based projects, one program-based project, four extra-core projects, and one RCEF (Rice Competitiveness Enhancement Fund) funded project.

Station-based projects

Major accomplishments of the Rice Technology and Innovations Promotion (RiceTIP) in Regions IV-A and IV-B include technology scaling of nutrient decision support tools in Quezon province, seed multiplication and distribution of climate-smart varieties to farmers in affected areas of CALABARZON and MIMAROPA, webinars, exhibits, technology demonstrations, *Lakbay Palay*, National Rice Awareness Month (NRAM) campaign activities, technical assistance, station tours, social media management and engagement, and capacity enhancement on inbred rice production and other technologies.

The Research Innovations for Sustained Improvement of Research for Development (RISe of R4D), through the Conservation and Management of Rice Genetic Resources in PhilRice Los Baños study, maintained 3,580 rice accessions with over 85% seed viability. Moreover, 366 traditional rice varieties were seed-multiplied and characterized based on their agronomic and morphological traits. Its study on Development of a Rapid Method for the Genetic Purity Assessment of Hybrid Rice Parental Lines packaged a rapid method for assessing the genetic purity of hybrid parental lines using an alkali digestibility test. Five parental lines of public released hybrids—Mestizo 1 (IR58025A, IR58025B, and IR34686R) and Mestiso 20 (PRUP TG102 and

TG102M)—were tested. Meanwhile, its study on Packaging of Site Specific and Cost Effective Nutrient Management for Irrigated Lowland Hybrid and Inbred Rice Varieties in Regions IV-A and IV-B showed that, for 2022 dry season (DS) and wet season (WS), the differences in yield and production cost between inbred varieties NSIC Rc 216 and NSIC Rc 218 and hybrid varieties M73 and M20 were not significant. However, hybrid varieties had a comparative yield advantage of 1 to 2t/ha over the inbred varieties.

The Agricultural and Biosystem Engineering (ABE) Unit, officially started in 2022, inspected agricultural facilities and recommended repairs and constructions of key agricultural facilities with Detailed Engineering Design and Program of Works. The unit also conducted field testing of the riding-type boat tiller, with results submitted to the Rice Engineering and Mechanization Division (REMD) project team for further machine modifications.

Division-based projects

The Development of Thermo-sensitive Genetic Male Sterile (TGMS)-based Two-line Hybrid Rice and the Screening of TGMS Parentals, Breeding Lines, and Promising Hybrids for Grain Quality and Resistance to Major Insects and Diseases projects completed assessments on field performance, pest and disease resistance, and grain quality performance for AYT 205 (PRUP 15).

On the other hand, the Hybrid Nucleus and Breeder Seed Production (NBSP) research and maintenance increased seeds for Mestizo 1 component parent lines IR 58025A and IR 34686R, resulting in the production of 530 and 120kg breeder seeds, respectively, equivalent to 35 bags for A line and 24 bags for R line. For the female parent, a total of 614kg breeder seeds were produced, while 241kg were generated for the male parent line, equivalent to 40 and 48 bags of S and P line.

The Philippine Rice Information System (PRiSM) project maintained 197 monitoring fields and collected 239 and 218 rice and non-rice area validation points in the first and second Semester. Results show that the overall accuracy of the rice map and rice area produced were computed to be 96% and 94%, respectively. The average weekly *palay* price survey collected across the regions ranged from P14.42 to 17.94/kg and P16.53 to 19.34/kg for fresh and dry *palay*, respectively.

Program-based project

In Phase I of the Rice Business Innovations System (RiceBIS) Community in Sariaya, Quezon, 70 rice farmers (42 male, 28 female) from three farmer associations, covering 75.5ha were reached. The Samahan ng mga Magsasaka

sa Brgy. Antipolo (SAMBA) and Manggalang Agrarian Reform Beneficiaries Cooperative (MARBENCO) both served as input supplier, service provider, traders and distributors for its members in 2022. MARBENCO sustained its enterprises inputs trading, milled, and pigmented rice production—and scaled out its enterprise with the help of financial service providers. Meanwhile, the Morong-Antipolo Rice Farmers Association (MORAN RFA) will re-establish its organizational structure and identify their chosen enterprise for 2023.

Extra-core projects

The RiceBIS Community in Tiaong, Quezon supported a total of 408 rice farmers (270 male, 138 female) from 12 farmer organizations covering 344.56ha rice area. Two business enterprises were developed including milled and pigmented rice. Milled rice was marketed in Tiaong and Laguna, and through the KADIWA ni Ani at Kita. Three farmers' associations were engaged in the marketing of black and red rice, collecting approximately 1,100kg of fresh and dried *palay,* of which 59% was marketed until December 2022.

In the Deployment of Genetic Resistance in the Management of rice black bug (RBB) or *Scotinophara coarctata (F.)*, 88 crosses were generated and evaluated. These crosses combined confirmed to have RBB-resistant lines with high performing/elite lines as parent. Rearing techniques for RBB were also established. A total of 1,344 assembled entries were characterized agro-morphologically and evaluated for phenotypic acceptability for screening and evaluation using an induced and natural field infestation. RBB reaction data of 242 entries (2022 DS) and 359 (2022 WS) upon assembly of genotypes for searching RBB resistance were screened and evaluated using induced methods. Confirmatory evaluation was also conducted in 48 resistant/susceptible entries that were previously screened using higher insect populations using an induced method.

The Performance Evaluation of Public Hybrid Rice Varieties for Commercialization successfully develop F1 seed production protocols for Mestiso 73 (M73) and Mestiso 99 (M99), using characterization of their potential lines as reference. The protocols were completed during the WS under Los Baños conditions.

The Enhanced Decision Support System and Enabling Policies (EDGE) project conducted activities and generated information in line with its four component studies: (1) sources of rice production growth with an emphasis on the regional and macro level; (2) provincial competitiveness; (3) price formation; and (4) farmers' perception of and adaptation to climate change.

RCEF-funded project

The Physical Attributes Determination (grain quality) of National Cooperative Test (NCT) entries analyzed 371 varieties (205 from 2021 WS and 166 from 2022 DS NCT trial) across 12 ecosystems for physical attributes using the standard NCT method for grain quality evaluation. Results showed that 15 entries (4.0%) met the standard requirement for chalky grains, while 184 entries (50%) passed the standard for immature grains. In terms of size and shape, majority (53.10%) of the entries had long and slender grains. Only five entries were classified with G1 to PR % chalkiness levels while also having long, slender grains.

CORE PROJECT (STATION-BASED):

Rice Tip: Rice Technology and Innovation Promotion in Region IV-A and IV-B

Michelle C. Quimbo, Virginia D. Ompad, Kristina S. Labita, Maria Sofia Canilao, Jolita Carandang, John Paul A. Palillo, Marie Shiela M. Muros, Nicanor C. Yadan, Kathleen Aldama, Anne Betina C. De Guzman, Carl Matthew Q. Pangilinan, Lea E. Licong, and Kei J. Asagi

In 2022, the Branch Development Initiative (BDI) of the station titled, "Rice Technology and Innovations Promotion in Regions IV-A and IV-B," continued the implementation of its four major components: RicePATROL, RiceSHARE, Technology Scaling of Nutrient Management, and Monitoring and Evaluation, through online and face-to-face learning activities for the target rice stakeholders. Among the major accomplishments was technology scaling of nutrient decision support tools in Quezon province, seed multiplication and distribution of climate-smart varieties to farmers in affected areas of CALABARZON and MIMAROPA, webinars, exhibits, technology demonstrations or techno-demos (inbred and hybrid varieties, intergrated farming through the *Palayamanan* set-up, rice-based urban gardening set-up through the Rice Garden at Luneta Park), *Lakbay Palay*, NRAM campaign activities, technical assistance, station tours, social media management and engagement, and capacity enhancement on inbred rice production and other technologies.

Through the techno-scaling activities conducted in nine major rice-growing municipalities of Quezon province, the use of minus-one-element technique -leaf color chart (MOET-LCC) and rice crop manager (RCM) increased yields in the techno-demo sites by 0.3 to 3t/ha from the farmers' practice/baseline yields, reaching 5-7t/ha with 20 to 70% increase in net income. A total of 420 farmers participated in capacity enhancement trainings and *Lakbay Palay*, and 51 out of 199 farmers trained (25.6%) adopted at least one of the nutrient decision support tools. Moreover, 36 participants composed of municipal agriculturists,

extension workers from Sariaya and Tiaong, Quezon, farm school partners, and representatives from National Irrigation Administration-Quezon (NIA-Quezon) and Office of Provincial Agriculturist-Quezon (OPA-Quezon) were presented with nutrient techno-demo and training results and trained on the biophysical characterization and interpretation of rice crop suitability maps to further scale up the Technology Scaling of Nutrient Decision Support Tools.

A total of 5,990 rice stakeholders (farmers, extension workers, policymakers, general public) were reached through the conduct of knowledge-sharing and learning (KSL) activities such as technical assistance, NRAM activities, techno-demos, on- and off-station *Lakbay Palay*, station visits, capacity enhancement trainings, webinars, exhibits among others.

These were further supported by the distribution of 8,400 copies of information, education, and communication (IEC) materials in CALABARZON and MIMAROPA in collaboration with the RCEF Seed and Extension team. Nineteen collaborations were established with local governement units (LGUs), DA-attached agencies, farm schools, RCEF, and RiceBIS, which strengthened the implementation of the KSL activities.

A total of 345 farmers across CALABARZON and MIMAROPA were provided with 5kg seed packets of climate-smart varieties, which are adapted to rainfed and saline conditions.

Through the active social media postings to expand the reach for rice science and technologies (S&T) and activities, 155 original stories/content were produced and 51 posts from partner agencies and other rice stakeholders were shared through the Facebook page in collaboration with the RCEF team. A total of 11 original stories were published in various platforms including the quarterly magazine, newsletter, E-newsletter, and corporate website.

Rice Innovation for Sustained Improvement of R4D (Rice of R4D)

Edelweiss E. Sajise, Mel Anthony T. Talavera, Lowel V. Guittap, Wendy B. Abonitalla, Abigael A. Danao, Michelle C. Quimbo, and Kristina S. Labita

Guided by the DA-PhilRice Strategic Plan (2017-2022), the Institute mandated the station to address location-specific problems in rice research and development and to undertake adaptive research suited to Regions IV-A and IV-B. The Los Baños Station also conducts research that cuts across regions or is of national interest. For this year, the Rice of R4D focused on nitrogen management for inbred and hybrid rice, exploratory research on the use of grain quality traits to identify possible genetic mixtures, and germplasm maintenance at the station.

Conservation and Management of Rice Genetic Resources in PhilRice Los Baños

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

Rice germplasm conservation has been an integral activity of DA-PhilRice and University of the Philippines Los Baños (UPLB), as it preserves all genetically diverse resources in a population. Thorough characterization and evaluation are conducted to ensure full utilization of materials. This study maintains and conserves rice genetic resources for variety development and research-related purposes, with important desirable traits often sought by plant breeders and researchers.

PhilRice Genebank, in collaboration with UPLB, currently maintains 3,580 rice accessions that include traditional rice varieties (TRVs), selections, breeding, and elite lines; wide-hybridization derived and TGMS lines, promising hybrid pollen parents, and highly selected national cooperative test (NCT) lines. For the period, 200 accessions of TRVs were manually cleaned, processed, packed in aluminum foil, and stored for short-term conservation. These accessions were also tested for viability before storage. Notably, the seed viability of the accessions remained above 85%, indicating proper conservation and management of the germplasm. Moreover, 366 TRVs were seed-multiplied and characterized based on their agronomic and morphological traits. Fifty-eight quantitative and qualitative traits, based on Bioversity International (2007) were used for the characterization. Postharvest data gathering for 60 entries from the 2020 wet season and encoding were completed. The database is being maintained for monitoring and tracking the rice germplasm. Conservation and maintenance of the genebank are done at temperatures ranging from 16-18°C and relative humidity between 40% to 60%.

For this year, seven accessions were requested for research purposes. These included traditional varieties, improved varieties, and hybrid parent lines with 10g each. The seed requests covered four improved varieties and three traditional varieties.

Development of a Rapid Method for the Genetic Purity Assessment of Hybrid Rice Parental Lines

Wendy B. Abonitalla, Lowel V. Guittap, Abigael A. Danao, Asha Kamille Bagunu, Edelweiss E. Sajise, and Arvin Paul P. Tuaño

The main objective of this study is to package a rapid method for assessing the genetic purity of hybrid parental lines using an alkali digestibility test. Five parental lines of the publicly released hybrids Mestizo 1 (IR58025A, IR58025B, and IR34686R) and Mestiso 20 (PRUP TG102 and TG102M) were tested. Concentrations that produced sharp, consistent results and could potentially discriminate genotypes from others were selected to test the parentals at a larger sample size. Several findings have emerged since its implementation in 2020. For a comprehensive result, evaluation of the alkali response of parental lines subjected to different sample sizes and levels of purity on selected concentrations and seed lots for alkali reaction and correlating its relationship with the result of the grow-out purity test were continued in 2022.

In 2022 DS, the response of parental lines soaked in selected concentrations and subjected to varying levels of purity (80%, 85%, 90%, 95%, 100%) and sample sizes (50, 100, 200, 400, 600, 800, 1000 grains) was determined. Samples from each line were collected and mixed with other lines (checks) and soaked in their respective concentrations for different sample sizes. The discriminatory scores of the genotypes soaked in the chosen concentrations based on the previous experiments were used to compute the purity of the entries. A correlation was observed between the computed purity and actual purity for each genotype. Moreover, the response of seed lot samples for alkali reaction was determined and correlated with the result of the grow-out test in the succeeding season.

Packaging of Site-Specific and Cost Effective Nutrient Management for Irrigated Lowland Hybrid and Inbred Rice Varieties in Regions IV-A and IV-B

Michelle C. Quimbo and Kristina S. Labita

This study aims to generate site-specific and cost-effective nutrient recommendations for public-released hybrid and inbred varieties suitable in Region IV to obtain maximum economic yield and profit. A varietal x fertilizer experiment was conducted during the DS and WS in Brgy. Concepcion, Pila, Laguna for inbred (NSIC Rc 218, NSIC Rc 216) and hybrid (M73, M20) varieties. Two seasons of varietal x fertilizer experiments using inbred and hybrid varieties were established in Marikina silty clay loam at the same location. The soil had a high organice matter (OM) content (5.4%), however, the MOET test indicated macro- and micro-nutrient deficiencies, including nitrogen (N), phophorus (P), potassium (K), sulfur (S), zinc (Zn), and copper (Cu).

The results of the 2022 DS and WS showed no siginificant differences in yield and production cost between the two inbred varieties (NSIC Rc 216 vs. NSIC Rc 218) and two hybrid varieties (M73 vs. M20) varieties. However, hybrid varieties exhibited a comparative yield advantage over inbred varieties by 1 to 2t/ha. In 2022 DS, M73 and M20 yielded 6.5 and 6.0t/ha, respectively, while NSIC Rc 216 and NSIC Rc 218 produced 4.9 and 5.2t/ha, respectively. In 2022 WS, M73 and M20 yielded 5.1t/ha and 4.1t/ha, while the inbred varieties had 3.4t/ha (NSIC Rc 216) and 3.2t/ha (NSIC Rc 218).

Due to higher yields, hybrid varieties had a lower production cost by P0.50 to 7.00/kg compared to the inbred varieties. In 2022 DS, the cost of production for M73 and M20 were P13.00/kg and P13.70/kg, respectively, while NSIC Rc 216 and Rc 218 had costs of P15/kg and P14.2/kg, respectively. In 2022 WS, the production cost for M73 and M20 were P16.77/kg and P19.95/kg, respectively, compared to NSIC Rc 216 and Rc 218 with P21.89/kg and P23.21/kg, respectively.

In terms of the effect of fertilizer rates, 2022 DS data showed that inbred varieties treated with 120-40-40 (NPK) kg/ha produced the highest yield at 5.9t/ha. This was comparable to other fertilizer treatments, which ranged from 5.1 to 5.5t/ha, except for 40-0-0 (NPK) kg/ha (4.8t/ha), 0-40-40 (NPK) kg/ha (4.3t/ha), and control (4.3t/ha) treatments, which had significantly lower yields. Treatment 4 (40-0-40 NPK kg/ha) was the most cost-efficient at P12.6/kg, with production costs for other treatments ranging from P14.1 to P15.1/kg, except for 0-40-40 with P16.1/kg. For the 40-0-40 (NPK) kg/ha, the recommendation for fertilizer application and timing are as follows: 1st fertilizer application at 15 days after

transplanting (DAT): 0.4 bag urea + 0.7 bag muriate of potash (MOP); 2nd application at 32 DAT: 0.9 bag urea; 3rd application at 55 DAT: 0.4 bag urea + 0.7 bag MOP. The relatively higher yields even with low-N treatments, may be partly attributed to the high soil organic matter content of the area.

In terms of disease incidence, sheath blight (SHB) disease caused by *Rhizoctonia solani*, was observed in all varieties tested. SHB was not observed in plots with 0-0-0 (control) fertilizer treatment. SHB incidence was highest in Mestiso 20 (13.2%) and NSIC Rc 216 (13.9%), significantly higher than in Mestiso 73 (1.39%) and NSIC Rc 218 (4.63%). Maximum SHB infection of Mestiso 20 varies significantly among fertilizer levels at 95% level of confidence. The highest disease infection rating of 5.7 was observed at 160 and 240kg N/ha. This suggests that higher N application rates may increase the risk of disease infection.

Agricultural and Biosystem Engineering Unit

Virginia D. Ompad, Gabrel Flancia, Nicanor C. Yadan, John Paul A. Palillo, Marc Gene Lapitan, Samuel Tapia

The Agricultural and Biosystems Engineering (ABE) Unit in DA-PhilRice Los Baños officially was operationalized in 2022 through the initiative of the Rice Engineering and Mechanization Division (REMD). This aligns with Administrative Order No. 2020-008, "Establishment of Agricultural and Biosystems Engineering (ABE) Unit at PhilRice Branch Stations," issued by the executive director in compliance to the spirit of AFMech Law (Article III, Section 9, Rule 9.1.3) "Establishment of Agricultural and Fishery Machinery Service Centers" and Department of Agriculture - Office of the Secretary (DA-OSEC) Memo Order No. 49 Series of 2017. It aims to provide agricultural engineering services through research and development, training and extension, and consultancy services on facilities/services, systems, and technologies.

In support of research for development (R4D) operations, the unit evaluated and inspected structures such as the greenhouse, flatbed dryer, and brown rice mill. As a result, the flatbed dryer and greenhouse were recommended for general repair, while the construction of a room with appropriate exhaust and dust collector at the rice mill was also proposed. The Detailed Engineering Design and Program of Works of these proposals were prepared and are awaiting funding.

Field operation testing of the riding-type boat tiller was conducted at the production area of DA-PhilRice Los Baños, with participation from field machine operators and AB engineers. The collected data was submitted to the project team for further modifications.

Finally, the AB engineers served as resource persons during the training activities conducted by the station including Walk your Talk (WOKTOK): the PalayCheck challenge, technical briefing on PalayCheck for RiceBIS farmer beneficiaries, and refresher course on Inbred Rice Seed Production and Farm Mechanization for the Key Checks related to machines.

CORE PROJECT (DIVISION-BASED)

Development of Thermo-Sensitive Genetic Male Sterile (TGMS)-Based Two-Line Hybrid Rice and Screening of TGMS Parentals, Breeding Lines, and Promising Hybrids for Grain Quality and Resistance to Major Insect Pests and Diseases

Mel Anthony T. Talavera, Edelweiss E. Sajise, Kathleen P. Gonzales, and Mary Jane P. Vasquez (Breeding)
Edelweiss E. Sajise, Abigael A. Danao, Mikkaela Andrea Vitalista, Krisna Concepcion (January-June), Renelaine Limosinero (January-June), Jose Villa (UPLB), and Ester Magsino (UPLB) (Screening)

The two projects work hand in hand to develop and evaluate thousands of experimental hybrids with the objective of identifying two-line hybrids with at least 15% yield advantage over NSIC Rc 222 or a 5% over the currently commercialized hybrid varieties (Mestiso 99 or M99), with resistance to pests, and excellent grain and eating qualities.

Under the environment of Los Baños as testing site in 2022, advance yield trial (AYT) 205 (PRUP 15) completed the necessary assessment for field, pest and disease resistance, and grain quality performance. For agronomic traits, PRUP 15 had 119 maturity days, this is about two days earlier than M99 and five days difference compared to NSIC Rc 222. In terms of plant height, PRUP 15 measured 123cm, about 5cm taller than M99 and 16cm taller than NSIC Rc 222. For grain yield, data on actual and potential grain yield were taken. Actual grain yield was measured by harvesting plant samples from the 10m² field, excluding border rows. For PRUP 15, average grain yield obtained is 5,342kg/ha, while M99 and NSIC Rc 222 yielded 5,184 and 4,236kg/ha, respectively, or 3.75 and 26.10% yield advantage over M99 and NSIC Rc 222, respectively. Potential yield derived from counting all grain types (field, unfilled, and half-filled) and transforming them to all filled grains, showed that PRUP 15 averaged of 10,666kg/ha, with a maximum yield of 12,012kg/ha. M99 and NSIC Rc 222 recorded 9,785kg/ha and 10,375kg/ha, respectively.

Comparing the biomass and yield components of PRUP 15 and hybrid check M99, this promising two-line hybrid has about 24 more grains per panicle than M99, while the 1,000 grain weight and harvest index were similar. This is the reason why PRUP 15 has a higher grain yield than M99. For disease resistance screening, PRUP 15 showed intermediate resistance to sheath blight and resistant to bacterial leaf blight, and sheath rot. For insect pests screening under natural pest pressure, no significant pest damage was recorded. For grain quality, PRUP 15 had intermediate amylose content and gelatinization temperature, comparable with the grain and eating quality of M20 and M99. Finally, the characterization of the parent lines of PRUP 15 has been completed. Agronomic characteristics of the parents of the new hybrid showed a 30 and 34cm height advantage for culm length and plant height, respectively, of P line over S line even without gibberellic acid (GA3) application.

Nucleus and Breeder Seed Production

Lowel V. Guittap, Wendy B. Abonitalla, Mel Anthony T. Talavera, and Ysabel Aurora R. Alcachupas

In support of DA-PhilRice's initiative to promote the utilization of locally produced hybrids, the Nucleus and Breeder Seed Production project at DA-PhilRice Los Baños aims to generate basic seeds of all public hybrids currently promoted and commercialized in the Philippines. Its main objective is to supply the required amount of breeder seeds for public hybrid parental lines of Mestizo 1 (NSIC 1997 Rc72H) and Mestiso 20 (NSIC 2009 Rc204H) through purification and seed production to meet national hybrid targets.

In 2022, public hybrids Mestizo 1 and Mestiso 20 were seed-produced in accordance to the target set by the Public Hybrid Rice Commercialization team. For Mestizo 1, component parent lines IR 58025A and IR 34686R were seed increased, resulting in the production of 530 and 120kg of breeder seeds, respectively, equivalent to 35 and 24 bags of A and R lines, respectively. For Mestiso 20, the female parent (PRUP TG 102) seed multiplication was conducted in Benguet, while the male parent (TG 102M) was produced in Los Baños, Laguna. For the female parent, a total of 614kg breeder seeds was produced, while for the male parent line, 241kg breeder seeds were generated. Converting it to bags, 40 and 48 bags of S and P line were produced for the year.

Philippine Rice Information System (PRiSM)

Gabriel Flancia

The station is also actively involved in the Philippine Rice Information System (PRiSM), an operational system for rice monitoring that supports decision-making toward increased rice production in the country. In 2022, PRiSM activities were implemented in Regions IV-A and IV-B.

DA-PhilRice Los Baños, in partnership with DA-Regional Field Offices (RFOs) and local government units (LGUs), maintained 197 monitoring fields (MFs) across both regions. Data were collected on field profile, cultural management, crop/yield status, production, fertilizer usage, and crop-cut for the first and second semesters of 2022. Rice and non-rice area validation points were collected across based on the target land use. The data collected were used to assess the accuracy of the rice map produced via remote sensing technology. For the first and second semesters, a total 239 and 218 validation points were collected, respectively. Based on the results, the overall accuracy of the rice maps and rice area produced was computed at 96% and 94%, respectively. PRiSM also collects weekly *palay* price survey across the region. The selection of target areas is based on the actual area planted with rice for each season. Respondents included farmers, millers, traders, and LGU technicians. Based on the results, the average weekly *palay* price ranged from P14.42 to 17.94/kg and P16.53 to 19.34/kg for fresh and dry *palay*, respectively.

CORE PROJECT (PROGRAM-BASED)

Rice Business Innovations System (RiceBis) Community in Sariaya, Quezon

Michelle C. Quimbo, Kristina S. Labita, Anne Betina C. De Guzman, Kei J. Asagi, and Karl Matthew Pangilinan

Phase I of the RiceBIS project was implemented in Sariaya, Quezon. The major studies packaged to respond to the five components of the project include: "Communication Strategies in Promoting Better Mindsets, Attitudes, and Behaviors of Rice Farmers and Other Stakeholders in the RiceBIS Community," "Development of Rice and Rice-based Enterprise in Sariaya, Quezon," and "Socioeconomic Indicators of RiceBIS Community in Sariaya, Quezon". The five component activities are: 1) Strategic Communication, 2) Organizational Building, 3) Capacity Enhancement, 4) Enterprise Development, and 5) Monitoring and Evaluation.

The pilot phase was established in the 2017 WS with two barangays in Sariaya, Quezon—Antipolo, and Morong. It was expanded to Brgy. Manggalang in 2018 WS. Seventy rice farmers (42 male, 28 female) from three farmer associations (FAs), covering 75.5ha, were reached by the project for production and group marketing. Among the 2022 major outputs were the development of a package of technologies (POT) on inbred rice production particularly on transplanting as a method of crop establishment for both the dry and wet seasons, organizational building, and agroenterprise development for the RiceBIS communities including information needs assessment, site working group, and agroenterprise training. Other knowledge-sharing and learning (KSL) activities conducted for the farmers include *PasyalAralan*, gender-neutral localized communication plans (PhilRice Text Center, use of social media such as Facebook, *Palaytalakayan* and face-to-face KSL activities), School-on-Air, and techno-demonstrations of yield-enhancing and cost-reducing technologies.

The two organized groups in RiceBIS Sariaya namely: *Samahan ng mga Magsasaka sa* Brgy. Antipolo (SAMBA) and Manggalang Agrarian Reform Beneficiaries Cooperative (MARBENCO) both served as input suppliers, service providers, traders, and distributors for its members in 2022. MARBENCO was able to sustain the three enterprises, which include inputs trading, milled, and pigmented rice production. It was also able to scale out its enterprise because of access to financial service providers. Meanwhile, the Morong-Antipolo Rice Farmers Association (MORAN RFA) will re-establish their organizational structure, which will identify their chosen enterprise for 2023.

Decreased adoption rate of technologies such as proper timing of fertilizer application and water management was observed due to water insufficiency and/or irrigation problems. Farmers adopted technologies that were easily accessible and available for them (i.e., increased adoption rate for the use of high-quality seeds, as this were provided for free by the Rice Competitiveness Enhancement Fund Seed Program). When it comes to recommended technologies that may affect their cost of production such as the timing of fertilizer application and water management, adoption became difficult. An increase in the adoption of cost-reducing technologies such as the proper seeding rate, integrated pest management, and use of farm machinery was observed. The acquisition of farm machinery including mechanical transplanter and combine harvester through a grant by the DA-RFO CALABARZON and Philippine Center for Postharvest Development and Mechanization, with the assistance of LGU-Sariaya and RiceBIS project, resulted in the increased adoption of these technologies for crop establishment and harvesting.

EXTRA-CORE PROJECTS

Rice Business Innovations System (RiceBis) Community In Tiaong, Quezon

Michelle C. Quimbo, Kristina S. Labita, Anne Betina C. De Guzman, Kei J. Asagi, and Carl Matthew Q. Pangilinan

Phase II of RiceBIS project was implemented in Tiaong, Quezon. In 2022, 408 rice farmers (270 male, 138 female) from 12 farmer organizations in Tiaong, Quezon were reached. It comprised 12 farm clusters and covered 344.56ha rice area. One of the major outputs includes the development of four IEC materials, specifically one Agripreneurship Module and three one-pager package of technologies on inbred rice production focusing on methods of crop establishment. Moreover, one gender-neutral motivational video on adopting recommended management practices for rice towards agroenterprising was also produced. Other KSL activities to improve the capability, skills, and technology adoption of the farmers include capacity enhancement training through School-on-the-Air and technical briefings, social media postings, *PalayGalingan*, *PalayAralan*, *Lakbay Palay*, technology demostration of yield-enhancing and cost-reducing technologies, organizational building and management, needs assessment, and agroenterprise training.

Two business enterprises were developed, including milled and pigmented rice. Milled rice was marketed in Tiaong and Laguna and through the KADIWA ni Ani at Kita in Lipa, Batangas (Lipa Agricultural Research and Experiment Station). Three farmers' associations (FAs) engaged in black and red rice marketing where around 1,100kg of fresh and dried *palay* were gathered and 59% of it was marketed until December 2022. In addition, two market linkages are still under negotiation with Mayani PH and UPLB Alumni Association (through the UPLB techno hub and one stop shop in UPLB) to market black, brown, and red rice.

The 2022 DS end-season result showed 0.31t/ha yield increase in the irrigated areas (from 3.50t/ha to 3.81t/ha) and 1.17t/ha increase in the rainfed areas (from 3.31t/ha to 4.48t/ha). Some of the technologies associated with increases in yield are the use of high-quality seeds, water management, and proper timing of fertilizer application. The generally low yields obtained or small yield increments, however, are due to constraints in water insufficiency during the dry season, harsh weather conditions, and pest problems during the wet season. The production cost and *palay* cost per kg both increased from the baseline values due to various factors including low yields obtained and high cost of agricultural inputs, hired labor, fuel, and land rent, among others. Some farmers also tend to increase the seeding rates and rely on manual operations, contributing to increased production costs.

The target of increasing net income by 25% is yet to be met because only a few farmers from Bula Farmers' Association shared a part of their harvest for group marketing. Moreover, other FAs in Tiaong have yet to have a complete milling facility to support and sustain their enterprise for milled and pigmented rice production. The pandemic, increased cost of fertilizers, financial issues, lack of drying and milling facilities, among others, have slowed down agroenterprise development and commitment of the farmers in Tiaong. However, the project will continue to monitor and provide assistance to ensure that initial undertakings—especially on the enterprise development, marketing opportunities/linkages, and related concerns on rice production—will be improved and sustained.

Development of Genetic Resistance in the Management of Rice Black Bug

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Source nurseries for the generation of crosses have been assembled for the development of rice black bug (RBB) resistant lines through hybridization and selection. A total of 88 crosses were generated and evaluated for developing lines by using parents confirmed to have resistance to RBB paired with the high performing/elite lines.

Rearing techniques for rice black bug was established by the RBB UPLB team using potted rice plants of susceptible variety TN1, okra fruits, and *gabi* stalks.

Preliminary screening methodology was done using Heinrich's (2007) protocol, with modifications. Seed box technique was used as a screening method by DA-PhilRice Central Experiment Station (CES) to evaluate/screen rice lines against RBB.

A total of 1,344 assembled entries were characterized agro-morphologically and evaluated for phenotypic acceptability. These entries will be used in screening and evaluation for RBB resistance using an induced method (artificial infestation) and natural field infestation at DA-PhilRice Midsayap.

RBB reaction data of 242 entries (2022 DS) and 359 (2022 WS), upon assembly of genotypes for searching RBB resistance were screened and evaluated using induced methods (artificial infestation). Confirmatory evaluation was also conducted on 48 resistant/susceptible entries previously screened using higher insect populations using an induced method.

Performance Evaluation of Public Hybrid Rice Varieties for Commercialization

Mel Anthony T. Talavera, Lowel V. Guittap, Ysabel Aurora R. Alcachupas, and Susan R. Brena

The project supported the hybrid commercialization group by assisting in evaluating the parent lines of promising hybrids for seed reproducibility and stability, generating passport data, and developng F1 seed production protocol.

Using the Standard Evaluation System (SES) for rice, the F1 seed production protocol was formulated based on the characterization of the parent lines of Mestiso 73 (M73) and Mestiso 99 (M99). Key characteristics gathered included plant height and days to 50% flowering. Results showed that the pollen parent lines of both M73 and M99 were taller by 25cm and 29cm, respectively, compared to their female parent lines. Moreover, a growth-promoting hormone called gibberellic acid (GA3) was employed in order to enhance panicle exsertion of both the male and female lines of M73 and M99, which further increased the height advantage of the pollen parent over the female parent. The morphological characteristics and the asterisked characters from the Test Guidelines for Rice of The International Union for the Protection of New Varieties of Plants (UPOV) for distinctness, uniformity, and stability test (DUST) were collected. These data will be used for seed accreditation process and as a reference in seed production.

The F1 seed production protocol for M73 and M99 was completed during WS under Los Baños conditions. Using a 3:10 male-to-female ratio, the female parent of M73 is needed to be seeded in synchrony with the first set of the pollen parent. For M99, the female parent was seeded a day after the second set of the male parent was seeded.

Enhanced Decision Support System and Enabling Policies (EDGE)

Lea E. Licong and Rhemilyn Z. Relado-Sevilla

The Department of Agriculture–Bureau of Agricultural Research (DA-BAR)-funded joint research project between DA-PhilRice and International Rice Research Institute (IRRI) implemented in 2021 and 2022, generated empirical findings to aid policymakers in addressing major challenges in the rice sector, including low farm yields and incomes, competitiveness issues in certain provinces, and the effects of climate change. The project consisted of four component studies in order to achieve the target outcomes: (1) sources

of rice production growth at the regional and macro level; (2) provincial competitiveness; (3) price formation; and (4) farmers' perception of and adaptation to climate change. The project employed several methods such as rice-based farming household survey (RBFHS) analysis, Delphi expert survey, and farmers survey. As of December 2022, conducted activities based on this and generated information are as follows:

Sources of rice production growth: data on rice yield, patterns in farmers' crop management, technology adoption, and input use at farm household level using RBFHS data; and quantitative and qualitative information on sources of production growth using two rounds of Delphi expert survey.

Assessment of provincial competitiveness: data on rice yield, input use, and cost of production and marketing at the provincial level and other quantitative information using RBFHS data.

Factors affecting price formation: data on contributions of the factors that influence rice prices, challenges, and qualitative information using the RBFHS data and two rounds of Delphi expert survey.

Farmers' perception of and adaptation to climate change: data on farmers' climate event experiences, impacts, and adaptation. Surveys were conducted in selected provinces across the country.

RCEF-FUNDED PROJECT

Physical Attributes Determination (Grain Quality) of NCT Entries

Edelweiss E. Sajise and Abigail A. Danao

To support the National Cooperative Testing (NCT), the Rice Chemistry and Quality Laboratory of DA-PhilRice Los Baños conducted evaluation of grain (i.e. physical attributes, including % chalkiness, % immature grains, and grain size and shape) for NCT rice selections;

In 2022, a total of 371 entries (205 from the 2021 WS and 166 from the 2022 DS NCT trial) from 12 different ecosystems were analyzed for physical attributes using the standard NCT method for grain quality evaluation. Results showed that 15 entries (4.0%) met the standard requirement for % chalky grains, while 184 entries (50%) for % immature grains. In terms of size and shape, majority (53.10%) of the entries had long and slender grains. Among all evaluated entries, only five had G1 to PR % chalky classification and had long, slender grains.