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PHILRICE R&D HIGHLIGHTS

DA-PHILRICE ISABELA

Content

BRANCH STATION

DA-PhilRice ISABELA BRANCH STATION

Joy Bartolome A. Duldulao

EXECUTIVE SUMMARY

PhilRice Isabela, an experiment station established in 1992, continues to address production constraints of Region II and Cordillera Administrative Region (CAR) by developing rice and rice-based technologies and promoting them using appropriate and relevant media channels to next and end-users. Together with various partners, PhilRice Isabela achieves this objective through the conduct of technology demonstrations, field walks, training programs, seminars, and Knowledge-Sharing and Learning (KSL) activities.

With 10 permanent research and development (R&D) staff and 21 service contractors, the Hybrid Rice Center of DA-PhilRice implemented five development and 14 research projects and studies in 2021 that helped attain outcomes 1, 4, 5, and 6 of the 2017-2022 PhilRice Strategic Plan.

RiceBIS, the station's banner development project, continued to engage its established communities of 928 smallholder-farmers with 28 production clusters in San Mateo, Isabela; Diffun, Quirino; and Alfonso Lista, Ifugao. Through this project, farmers' harvests in all sites increased with rice growers in San Mateo attaining the target yield increase of 1t/ha; averaging 1.35t/ha in the dry season. This initiative also strived to reduce the production cost at PhP8/kg of palay and increase farmers' income by 25% by establishing and operating agro-enterprises in their areas. One of its established clusters is the MarDag Association in San Mateo, Isabela, which showed promising agro-enterprises that scaled-up farmers' produce and helped them generate additional income

To further capacitate the farmer-partners and strengthen community-level partnerships, trainings were also conducted through Rice Development Initiative for Cagayan Valley and CAR Environments (RICCE) project. The station's Branch Development Initiative engages these clusters on improving hybrid rice production and enhancing entrepreneurial skills. A season-long training on F1 Hybrid Rice Commercialization was completed involving 36 men and

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women farmers in Luna, Apayao. Training recorded a knowledge gain of 51%. Moreover, 11 inbred and hybrid rice technology demonstrations were established in the station's area of coverage with PSB Rc72H as top yielder among the hybrid rice varieties averaging 7.44t/ha and NSIC Rc 512 for inbred with 7.30t/ha average yield. The station has also conducted Lakbay Palay and rice campaigns, established rice information corners, and used social media, which resulted in 156,056 total reach.

The station also hosted a fertilizer derby showcasing 11 companies. Bioprime Agri Industries, Inc. (8.66t/ha), Enviro Scope Synergy (8.42t/ha), and PhilVin Trading (6.50t/ha) were declared top yielders. Meanwhile, ThaiPhil Advance AgriTech Company and Brioprine Agri Industries, Inc recorded the lowest production cost of PhP7.34/kg and PhP6.68/kg, respectively.

Among the station's research projects included development of varieties through testing of promising lines. There were 204 lines (85 entries for 2021 DS and 119 for 2021 WS) tested for agronomic and yield performance while 1,001 lines (429 for 2021 DS and 572 for 2021 WS) were evaluated for insect and disease resistance under the National Cooperative Test and screening of CMS/TGMS parental lines and hybrid rice elite lines. Six and 23 entries out yielded the hybrid and inbred varieties, respectively. Study results also found that 122 lines were resistant to blast, 76 lines to bacterial leaf blight, and 81 lines to sheath blight.

From the NCT, 400 lines have advanced for further testing under the Multi-environment Advance Yield Trial (MAYT), where 30 entries achieved higher yield (8.04-9.58t/ha) than the check entries (5.75-7.40t/ha). Lower yields were recorded from the rest of the entries, which can be attributed to their susceptibility to blast, BLB, and stem borer.

As the hybrid rice center, the station continues to implement research projects and studies that contribute to the existing knowledge in hybrid rice production. One of these is the "Multi-environment Field Performance Evaluation of Elite F1 Hybrids and Parents." Six rice genotypes responded differently to specific fertilizer recommendations. In its initiative to mechanize AxR seed production at the station, a seeding rate of 10kg/ha of A-line was found to be feasible for PSB Rc72H.

The station also served as technical auxiliary in implementing the Rice Crop Manager (RCM) in Regions I, II, and CAR. Results

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showed that across the DA-RFO managed sites, the standard RCM recommendation (RCM1) produced higher yield than RCM2, which used a fertilizer rate of one bag urea per hectare less from the RCM1 treatment. During the wet season, RCM with PRISM integration produced the highest average yield over RCM and farmer's practice. In the NOPT trial across sites, the plot with complete fertilizer attained the highest yield compared with the –N, -P, -K, -Zn, and –S plots.

The PRISM project monitored and assisted partners in collecting field datasets and validation points that generated maps with 96-99% accuracy in 348,794ha during the dry season, and 367,800ha in the wet season for Region II and CAR.

In the RFO2-funded project, "On-farm Validation and Analysis of High-Yielding Technology Package for Increased Production and Competitiveness," four technology packages were evaluated in Isabela, Cagayan, Quirino, and Nueva Vizcaya during 2021 dry and wet season. During the 2021 dry season, package of technology 1 with 150-35-35 NPK rate attained the highest average yield of 10.19t/ha in Isabela, while the PalayCheck plot with 111-42-72 NPK rate attained the highest yield in Quirino with 7.92t/ha. Production cost ranged from PhP8.58 to PhP9.94/kg. During the wet season, the PalayCheck plot obtained the highest average yield of 7.88t/ha across provinces and the lowest production cost of PhP8.10/kg.

With guidance from the Philippine Commission on Women (PCW), the station adhered to a set of guidelines to further improve and support the inclusive and culture-sensitivity as well as culture- and gender-responsiveness of its projects. Two of this year's research and development projects were GAD-tagged indicating that these projects have ensured equal opportunities for men, women, senior citizens, and persons with disabilities. These interventions include Lakbay Palay, agro-enterprise engagements, and Be Riceponsible campaign. Specifically, 489 men, 439 female, 200 senior citizens, and 3 persons with disabilities benefited from the RiceBIS project, 78 men and 53 women were reached through training, and 156,056 through the RICCE project.

PROJECT 1

Rice Business Innovations System (RICEBIS) Community Project in San Mateo, ISABELA

Ofelia C. Malonzo

The Rice Business Innovation System (RiceBIS) Community Project in San Mateo, Isabela aimed to increase yield, reduce production cost and losses, and link farmers to the market. Two studies were implemented to engage and sustain RiceBIS farmers' engagement in agro-enterprises. The enabling component, which is composed of capacity building activities related to rice production, organizational building and management, and enterprise development, were completed in two years of implementation. It served as the preparatory stage for the second component, in which the farmers were engaged in their chosen agro-enterprises. In this stage, farmers were guided to prepare and implement their agro-enterprise plans. Farmers' engagement will also be sustained through various strategic communication activities.

In its fifth year of implementation, RiceBIS engaged smallholder farmers in agro-enterprise. Thus, the second study aimed to: (a) engage farmers who were trained on agroenterprise development in agroenterprise and (b) develop and operationalize two profitable agro-enterprise. Through the study, individual farmers were guided on collectively producing for a properly selected market to maximize their profit. It gave smallholder farmers the opportunity to engage themselves in business and profit more from their produce.

- Increase in yield by 1.37t/ha in 2021 DS from 5.72t/ha in 2017. Production cost was also reduced to PhP7.77/kg from PhP10.95/kg for fresh palay and PhP8.63/kg from PhP12.12/kg dry palay.
- Four profitable agro-enterprise were operationalized and sustained: milled rice, brown rice, custom service provision, and KADIWA ni Ani at Kita outlet, which recorded a total income of PhP538,333.74 since 2018 wet season.

PROJECT 2

Fine tuning the Integrated Crop Management (ICM) for Dry Direct-seeded Rice in Favorable Rainfed Ecosystem

Anielyn Y. Alibuyog and Ahlfie James G. Galanza

Rice Development Initiatives for Cagayan Valley and CAR Environments, the Branch Development Initiative project, aimed to promote rice and rice-based technologies in Cagayan Valley and Cordillera Administrative Region (CAR). Specifically, it aimed to: (1) showcase existing rice and rice-based innovations for adoption and scaling by the farmers in strategically-located communities; (2) develop a sustainable public hybrid rice seed system to make F1 seeds accessible, affordable, and available at all times to men and women stakeholders; and (3) connect the station to a network of partners in implementing rice-related initiatives particularly in sharing gender-friendly rice and rice-based technologies. Four components were developed: component 1 improved the station's learning farm on PalayCheck System, Palayamanan Plus, and Good Agricultural Practices (GAP); component 2 organized hybrid rice farming and marketing communities; component 3 scaled out rice and rice-based production technologies; and component 4 delivered rice information and services in the coverage area.

- One batch of season-long training on F1 Hybrid Rice Commercialization was completed involving 36 men and women farmers in Luna, Apayao, which resulted in a knowledge gain of 50.72%. The graduates were technically honed to be the core group of farmers that will organize hybrid rice production and marketing initiatives in their communities.
- Eleven inbred and hybrid rice technology demonstrations were established in which PSB Rc 72H yielded the highest among the hybrid rice varieties (7.44t/ha) while NSIC Rc 512 among the inbred (7.30t/ha).
- Three scaling sites of 100ha per site were identified where PalayCheck with Rice Crop Manager-based fertilizer recommendation were scaled up in the 2022 dry season. On the other hand, Lakbay Palay, rice campaigns, rice information corners, and social media particularly the branch's facebook page registered a 156,056 total reach.

PROJECT 3

Optimizing Hybrid Rice Seed Yield Through Mechanized Hybrid Rice Seed Production System

Fernando D. Garcia, Gracia B. Amar, Nymfa S. Sosa, Zarah Faith T. Lunag

Mechanizing hybrid rice seed production can address concerns on high production cost. Mechanization has been proven to reduce the production cost and farm losses due to increased efficiency. Mechanization also addresses labor scarcity during transplanting. Mechanizing hybrid rice seed production would result in a new scheme of producing hybrid rice. The current protocol requires 15kg/ha of A line and 5kg/ha of R line. Costs of these seeds are higher than inbred seeds at PhP750/kg of A line and PhP100/kg of R line. The optimum seed rate per seedling tray should be ascertained to reduce seed rates. Seed rate is very important to avoid high missing hill rates in transplanting.

This project was conducted in 2021 dry season and 2021 wet season at the experimental field of PhilRice Isabela. There are two components of the project:

1. Evaluation of seeding rate and timing of NPK application on seed production of PSB Rc72H under mechanized production system and
2. Assessment of major rice pests on mechanized hybrid rice seed production of PSB Rc72H.

In 2021 DS, seeding rates (main plot) of 15kg/ha, 13kg/ha, and 10kg/ha A line using walk behind mechanical transplanter were used while in 2021 WS, manual transplanting using 15kg/ha was added as treatment in the main plot. This was done to compare mechanized transplanting and manual method of transplanting. The experiments in Component 1 were laid out in split plot design with three replications measuring 70sqm each main plot. Component 2 was superimposed in Component 1; thus, there was no need to establish an experiment to study arthropod population and disease levels in hybrid rice seed production.

In 2021 DS, results showed that increasing seeding rates correspond to increased seedling emergence per tray. Upon transplanting, the number of hills per unit area as well as the number of seedlings per hill did not vary among seeding rates. Plant height did not vary among NPK application at 30 DAT and 60 DAT across seeding rates as well as the number of tillers per hill of A line. However, it can be noted that lower seeding rate (10kg/ha)has higher number of tillers compared

with 15 and 13kg/ha. No significant differences were observed across fertilizer treatments and seeding rates. However, higher outcrossing rate was observed on the use of 10kg/ha A line fertilized with additional 0-0-60 at 50 DAT in addition to regular fertilizer application of NPK. There were no differences observed on grain weight among NPK treatments across different seeding rates. The highest grain yield was obtained from seeding rate of 10kg/ha (1.28t/ha) applied with 16-20-0 at early crop stage using the recommended fertilizer rate, but this was statistically comparable with the yield obtained from seeding rate of 15kg/ha (1.06t/ha) applied with NPK fertilizers at four splits.

Populations of the insect pests BPH, GLH, and WBPH were not significantly different across fertilizer rates and seeding rates. At 35 DAT, natural enemies were still the highest on T2 (120-90-60kg NPK) applied at 5 DAT of A line with mean of 66.25 at seeding rate of 13kg/ha. However, this is not significantly different with the number of natural enemies across seeding rates and fertilizer rates. Number of seedlings per tray and number of seedlings dispensed by mechanized transplanter were similar during the wet and dry season. Data on yield and yield components such as productive tillers, % filled spikelets, % unfilled spikelets, 1000-grain weight, and grain yield were not significant across seeding rate, fertilizer, and crop establishment. For Component 2, sampling was conducted from August to November 2021 in the experimental set up in Component 1. Arthropods were sampled using sweep net and visual counts per hill on each plot at 30 DAT and 60 DAT. Visual counts were done on five hills per plot to compare the pest population and damages in different seeding rates and fertilizer levels in mechanized and conventional seed production of PSB Rc 72H. The data were encoded and analyzed using the STAR software.

Interactive effects of seeding rate x fertilizer on deadheart and whitehead damages of stemborer were insignificant among all treatments. The dominant insect pest observed were planthoppers (brown planthoppers + whitebacked planthoppers) ranging from 13.37 plant hoppers per hill. The dominant species of natural enemies were wasps, spiders, mirid bug, damsel fly, and lady beetle. Populations of insect pests BPH, whorl maggot, GLH, WBPH, stemborer, zigzag plant hopper, and leaf folder were not significantly different across fertilizer rates and seeding rates.

At 30 DAT, natural enemies with 25.97 populations were highest on 10kg/ha seeding rate with a fertilizer rate of 134-42-102kg NPK/ha. Bacterial leaf blight was noted in treatments 120-90-60kg NPK/ha in the seeding rate 15kg/ha with 56.67%. At 60 DAT, the interactive effects

of seeding rate x fertilizer on whitehead damage by stemborer were significant among all treatments. The highest percent whitehead damage (20.83%) was noted at 15kg/ha with fertilizer rate 120-90-60kg NPK/ha. The percent WH damage on 13kg/ha, 10kg/ha, and manual method were not significantly different at 13.21 - 7.83% .

PROJECT 4

Philippine Rice Information System (PRISM) – Field Monitoring of Rice Areas In the Region II & CAR

Darlynne Kaye B. Matias, Ederlina I. Cariño

PRISM estimates data on rice area, seasonality/planting dates, seasonal yield, and flood- or drought-affected area by using satellite data, remote sensing, geographical information system (GIS), and crop modeling. This generated information is validated through field monitoring, which is conducted by using standardized field protocols and smartphone-based data collection forms and applications. A set of field protocols and forms was developed for seasonal field data collection on monitoring field locations, farmer and field profile, photos, field status, crop growth stages, crop management practices, production, and crop damages due to flood or drought.

In 2021, PRISM monitored four locations in Region II and CAR. Eighty-nine field profile data, 80 cultural management data, 381 crop status, 59 production data, 52 fertilizer usage, 54 crop cut data and 354 rice and non-rice validation points were collected. Thirteen typhoons were monitored and field damage was assessed during the onslaught of TD Jolina, Kiko, and Maring in Region II and CAR. All available and validated field data were used for analysis and interpretation of satellite imagery, calibration of the thresholds used for rice classification, and accuracy assessment of rice area, yield, and flooded/drought-affected rice maps. Due to pandemic, data collection and implementation in these regions were affected, which resulted in low data turn-out. Moreover, PhilRice facilitators assisted regional partners in gathering data where they were restricted. PRISM also collected weekly data on prevailing palay price from key informants from January to December (845 data sets as of November). Data were submitted to the Field Operations Head for consolidation and basic analysis. Weekly reports were also submitted to the PhilRice Management. PRISM facilitators also obtained monthly rice standing crop data from regional partners for comparison analys

Capturing of the actual status of monitoring field in San Mateo, Isabela February 20, 2021

Capturing of actual field during rice and non-rice validation last Aug. 25, 2021

PROJECT 5

Evaluation of CMS & TGMS Parentals, Breeding Lines & Promising Hybrids for Grain Quality & Resistance to MajorPests

Gracia B. Amar, Zarah Faith T. Lunag

The use of resistant variety is the most economical way of combating pests. To date only few hybrids possessed moderate resistance to specific pests. This is because the hybrid rice parent lines used in hybrid rice production are susceptible to pests which includes insect pest and diseases. Therefore, it is important that the CMS and the TGMS parent lines be screened against major rice disease and insect pests to come up with desirable parents for F1 production. This study was conducted at PhilRice Isabela Experiment Station, San Mateo, Isabela during the 2021 Dry and Wet seasons. In dry season, there were 258 entries screened to major rice diseases and stemborer. Similarly, there were 259 entries screened in WS 2021.

These entries were screened against bacterial leaf blight, sheath blight and rice blast, and in any case that there is tungro infection, the same lines were to be evaluated however since tungro was not observe in the experimental area, evaluation for reactions to tungro was not done. Two Hundred Fifty-eight (258) entries showed resistance to stemborer during the vegetative and reproductive phases as indicated by the low infestation rating.

For dry season, reactions to major diseases showed that 48 entries were resistant to rice blast, 91 were resistant to sheath blight, and 85 were resistant to bacterial leaf blight. In WS 2021, screening of hybrid parental and hybrid elite lines showed that 85 entries were resistant to sheath blight, 113 were resistant to bacterial leaf blight and 97 were resistant to rice blast. No data on stemborer infestation was gathered because the plants were damage by continuous rain that lodged the plants.

Direct seeding of entries for blast screening under nursery condition

Inoculation of entries with sheath blight through insertion of substrate per hill with 2 hills per entry

PROJECT 6

Modernized Rice Production Technologies for Irrigated Lowland Ecosystem

Jerry D. Batcagan, Quehly Jade Agpalza

The Smarter Rice project aims to validate, integrate and test the adaptability of the best POTs under irrigated environment that could help farmers increase their yield, optimize farming costs, and increase their profit.

For 2021, ten study trial set-ups were established in Delfin Albano, Isabela comparing existing farmers practice with recommended technologies. In dry season of 2021, farmer-manage plots yielded higher at an average of 7.08 tons/ha while the researcher-managed results at 5.28 ton/ha. However, due to additional cost in the method of transplanting, fuel, and chemicals, the farmer-managed plots incurred an average total production cost per hectare of PhP56,508.63, higher than the researcher-managed expense at PhP45,314.29. The average production cost per kilogram of palay for DS 2021 was computed at PhP 8.23 and PhP 8.58 for farmer-managed and researcher-managed plots (Table 12).

Yield data generated for the WS 2021 are summarized in Tables 11 and 13. Unlike the previous season, the average actual yield of the researcher-managed for WS 2021 was higher at 5.33t/ha than the farmer-managed set-ups at 5.03t/ha. The average total production cost was computed to be PhP54,865.07/ha and at PhP11.34/kg (palay) for FP plots, while the RM set-ups of PhP45,314.29 and PhP9.29/kg (palay).

The wet season yield results reflected more accurately the differences between the farmer-managed and researcher-managed set-ups since data gathering was better supervised by the researchers unlike during the DS as mentioned. Contributory factors for yield increase were proper nutrient management (right kind, timing, and amount), good pest and disease management (rice bug, blast, bacterial leaf blight), and water management during critical stages. Savings in the production cost were attributed to the use of the mechanical transplanter which was cheaper than manual transplanting, lesser chemical application as compared to the farmers' practice, and lesser fuel consumption for irrigation.

Crop establishment using walk-behind transplanter.

Crop stand, wet season 2021

Extracore Project 1

Rice Business Innovations System (RICEBIS) Community Project in Diffun, Quirino

Ofelia C. Malonzo

The shift in the development paradigm from merely focusing on crop production to linking farmers to market has helped increase yield, reduce production cost and postharvest losses and more importantly, linked farmers to the market through engagement in profitable agro-enterprises.

The RiceBIS Phase II project aimed to (a) increase palay yield by 1t/ha in irrigated and 0.5t/ha in rainfed areas; (b) reduce palay production cost to PhP8/kg; (c) reduce PH losses to 12%; and (d) engage farmers in two profitable rice and rice-based enterprises. To compete with the market, smallholder farmers were encouraged to view farming as an "enterprise" and to become "entrepreneurs". The goal is to enhance farm profitability by engaging groups of farmers in agro-enterprises.

Thus, creating and sustaining the entrepreneurial behavior of smallholder farmers through training activities prepared them for a competitive market, helping them understand and enabling them to move forward in the value chain. The organized smallholder farmers were introduced to the market by enhancing their technical, organizational, and agro-entrepreneurial capacities through (a) establishing RiceBIS communities and forming production clusters and (b) enhancing the technical capacity of smallholder farmers, which was implemented during the starting phase of the project last year. This year, training activities focused on enhancing the values, interpersonal, and organizational skills of farmers and their agro-entrepreneurial capacity.

- Ten farmer organizations (FOs) were established with 416 (265 male and 151 female) farmer participants covering 441.27ha of rice area
- Five trainings on improved rice production and processing based on the *PalayCheck* system were conducted, which were attended by 196 smallholder farmers who gained 57.50% average in knowledge
- One training on agro-enterprise development was conducted with 20 (10 men; 10 women) participants who gained 61.46% in knowledge

- One training on organizational building was conducted with 20 (10 men and 10 women) participants who gained 63.3% in knowledge
- Six *Lakbay Palay* were conducted with 108 (82 men; 26 women) farmer participants
- Yield was increased by 0.48t/ha in DS 2021 from 4.93t/ha in 2020 to 5.41t/ha in 2021. Production cost was also reduced to PhP9.1/kg from PhP10.79/kg for fresh *palay* and PhP10.1/kg from PhP11.97/kg dry *palay*.

Extracore Project 2

Rice Business Innovations System (RICEBIS) Community Project in Alfonso Lista, Ifugao

Ofelia C. Malonzo

RiceBIS was expanded in Alfonso Lista for RiceBIS Phase II. The RiceBIS Community Project generally aimed to transform rice-based farming communities into an inclusive, competitive, and sustainable agro-enterprise model. Specifically, it is geared to increase the yield, reduce the production cost, enhance farmers' capacity, and engage farmers in profitable rice and rice-based enterprises. On its second year of implementation, RiceBIS collaborated with DA RFO-CAR, ATI-CAR, TESDA, IFSU, DTI, LGU Alfonso Lista, and 10 farmer-associations from the rainfed/upland and irrigated areas of Alfonso Lista, Ifugao.

Initially, only five farmer-associations with a total membership of 209 farmers participated in the project. At present, 10 farmer-associations comprised of 412 farmers (178 male; 234 female) are active members in the RiceBIS expansion site. The participants are from barangay Namillangan, Sto. Domingo, Namnama, Caragasan, Pinto, San Quintin, Bangar, and San Juan covering 342.67ha.

- Ten FOs were established with 412 (178 male; 234 female) farmer-participants covering 441.27ha
- Eight training activities on improved rice production and processing based on the PalayCheck system were attended by 331 farmers who gained an average of 52.52% in knowledge
- One training on financial literacy was participated in by 28 (18 men and 10 women) participants and recorded 51% knowledge gain

- One training on agro-enterprise development was conducted to 20 (11 men and 9 women) farmers who gained 49% in knowledge
- Five Lakbay Palay were conducted with 104 (45 men; 59 women) farmer-participants

Extracore Project 3

National Cooperative Test for Hybrid Rice Selections

Angelita B. Obaña, Jim Allen T. Tabirao

The study determined the yield potential, range of adaptability, and other striking features of hybrid rice entries to evaluate the performance of hybrid rice selections that will be recommended as national, location-specific, and season specific varieties and to compare hybrid rice entries with check varieties performance. The National Cooperative Test (NCT) conducts the final evaluation before a promising hybrid can be recommended for release as a commercial variety. This is a multi-location trial where promising entries from the Advance Yield Trial are evaluated for yield performance, agronomic characteristics, resistance to pest and diseases, and grain quality, in comparison with extensively used hybrid and inbred varieties. The study was conducted at PhilRice Isabela during 2021 wet season, in which 24 entries were cultivated in 10m2 plots, arranged in randomized complete block design (RCBD), and replicated three times. From the NCT hybrid rice selections, indices 7, 15, 10, 3, 9, and 21 obtained higher yield than the highest check variety. These entries will be further evaluated to ensure their yielding potential stability and other features.

Gathering of agronomic data during maturity stage

Extracore Project 4

National Cooperative Test for Special Purpose Rice Selections

Angelita B. Obaña, Jim Allen T. Tabirao

The demand for special-purpose rice has dramatically increased over the years. Efforts have been devoted to developing special-purpose rice varieties to meet the high-value needs in the market. Recommending new rice varieties, including special-purpose varieties, to the National Seed Industry Council of the Philippines depends on the results of the National Cooperative Test, the multi-location yield trials being coordinated by PhilRice. Conducted at PhilRice Isabela during the 2021 dry and wet seasons, this trial evaluated yield performance, eating quality and aroma, and insect pest resistance. An area of 12m2 per plot was planted, arranged in a randomized complete block design (RCBD), and replicated three times. During the dry season, the best elite line was index 8 with an average yield of 10,046.8kg/ha. This is significantly higher than the best check PSB Rc 82 (index 1), which yielded 8,878.3kg/ha, resulting in 13.2%. For the wet season, results showed that for the micronutrient-dense group, the highest yield was obtained by index 6 (7,268.3kg/ha) with a yield advantage of 9% over the best check variety, NSIC Rc222 (6,437.0kg/ha). Under the pigmented group, the highest yield was obtained by index 25 (7,134.3kg/ha) with a yield advantage of 5.4% over the check variety NSIC Rc19 (6,770kg/ha). This entry produced 17 productive tillers/hill, 26.67 grams (1,000 grain weight), 175 number of filled grains/panicle, and 80.33% seed set fertility.

Hauling of the harvested crop cut entries for threshing

Extracore Project 5

Screening of Irrigated Lowland Rice Selections to Major Insect Pest

Nymfa S. Sosa, Gracia B. Amar, Zarah Faith T. Lunag

One of the several ways to minimize crop losses is through the development of improved varieties with resistance to specific insect pests. The use of resistant varieties is the most economical and practical way of controlling insect pests. It can be combined with other control methods with minimal detrimental impact on the environment. The use of resistant varieties also agrees with the concept of sustainable agriculture, which include economic viability, ecologically sound, socially just and humane, culturally accepted, and based on integrative and holistic science (Mc Rae, et al, 1989; Fernandez, 1992).

The study screened and evaluated promising lines for their resistance to major insect pests such as stem borer. Conducted from January to May 2021 and from July to December 2021, the experiment was composed of NCT I, NCT hybrid, MAT, special purpose (SPRS), and heat tolerance (HT) rice selections for the dry season and NCT I, NCT Hybrid, MAT, SPRS, upland, rainfed lowland dry seeded, and submergence rice selections for the wet season.

Eighty-two test entries were evaluated in the dry season and 158 entries in the wet season. The test entries were planted a month after the regular planting season to coincide with the peak of insect pests populations. Test entries were screened under natural field conditions while insects were studied following the protocol stipulated on the NCT Manual. Rating entry resistance was based on Standard Evaluation System (SES) for rice.

Stemborer damage (deadheart) 35-50 DAT

Stemborer damage (whitehead) 2 weeks before harvest

Extracore Project 6

Screening of NCT Lines for Resistance to Major Rice Diseases

Gracia B. Amar, Zarah Faith T. Lunag

Diseases are one of the major factors contributing to decrease in rice yield. About 5 – 30% decrease in yield can be attributed to bacterial diseases while 10 – 80% can be attributed to fungal diseases. Viral diseases such as tungro can cause about 100% decrease in yield when they attack at younger growth stage of rice. With this phenomenon, it is therefore important to develop varieties with resistance to diseases to maximize yield potential. The National Cooperative Test (NCT) is a program designed to evaluate advanced breeding lines for resistance to major diseases and insect pests, yield potential, and grain quality.

The project determined reactions of the NCT lines to bacterial leaf blight, sheath blight, and rice blast. Reactions of entries infested with tungro disease were also evaluated.

This study was conducted in 2021 dry season and wet season at PhilRice Isabela. In the dry season, 89 entries were screened for major rice diseases. These entries were composed of special purpose rice, inbred lines from the Multi-adaptation Trial (MAT), NCT Phase 1, and heat tolerant lines. In WS 2021, 155 NCT lines from MAT, NCT Phase 1, special purpose rice, hybrid, submergence, upland, and rainfed lowland dry seeded (RLDS) composed the entries.

Results showed that in DS 2021, most of the entries were intermediate to susceptible to sheath blight. One entry in the special purpose rice showed a resistant reaction to the disease. Reactions to bacterial leaf blight showed that 18 entries from the different ecosystems were resistant to the disease, while 42 entries were resistant to rice blast. For wet season, 58 of the 155 entries were found to be resistant to BLB, 80 were resistant to rice blast, and 80 were resistant to sheath blight.

Inoculation of entries with bacterial leaf blight through leaf clipping of 5 hills per entry

Extracore Project 7

National Cooperative Test for Irrigated Lowland (PHASE I) Under Direct Seeded & Transplanted Rice Culture

Joy Bartolome A. Duldulao, Jim Allen T. Tabirao

Promising lines developed by breeding institutions such as PhilRice, IRRI, UPLB and private breeding companies are advanced to the National Cooperative Test (NCT) for nationwide testing. PhilRice Isabela is one of the testing sites of promising irrigated lowland rice selections under direct seeded rice culture to evaluate their agronomic characteristics and yield performances. The different test entries were arranged in randomized complete block design (RCBD), replicated three times.

Eighty (80) test entries under direct seeded and transplanted rice culture were evaluated for their agronomic and yield performances. For dry season of DSR, in group I, indices 1, 6 and 9 showed the highest yield range from 6.7 to 6.9t/ha. In group II, index 14 showed the highest yield with 6.8t/ha. For dry season of TPR, in group I, indices 6 and 9 were the best entries with 7.7t/ha. In group II, index 15 outperformed all the test entries with 8.0t/ha. For wet season of DSR, in group I, index 1 showed the highest yield with 6.2t/ha. In group II, index 20 showed the highest yield with 5.1t/ha. For wet season of TPR, in group I, index 5 outperformed all the test entries with 6.7t/ha. In group II, index 16 showed the highest yield with 6.6t/ha.

Row seeding and broadcasting of seeds of NCT Phase I DSR

Transplanting of NCT Phase I

Extracore Project 8

NCT-Multi Location Adaptation Trial Under Direct Seeded & Transplanted Rice Culture

Joy Bartolome A. Duldulao, Jim Allen T. Tabirao

The decision to recommend new varieties to the National Seed Industry Council of the Philippines for release to the farmers depends on the results of the National Cooperative Test. In multi-location trials being coordinated by PhilRice, entries were evaluated for agronomic and yield performances during the dry season of 2021. Index 7 showed the highest yield with 8.1t/ha under direct seeded rice culture. For transplanted rice culture, the best entry is index 4 with 7.3t/ha. Indices 4, 8, and 6 performed best among the test entries under direct seeded rice culture with yields of 5.1, 5.4, and 5.6t/ha, respectively. For the transplanted rice culture, index 6 and index 10 showed the highest yields with 7.3 and 7.6t/ha.

Broadcasting of seeds of MAT DSR

Transplanting of MAT TPR

Extracore Project 9

On-Farm Validation & Analysis of High-Yielding Technology Packages for Increased Production & Competitiveness Development

Joy Bartolome A. Duldulao, Jim Allen T. Tabirao

Development of Package of Technologies (POTs) from the farmers' best practices and from an identified POT like the "Palayabangan" may give practical and farmer-friendly management for a specific location. These farmers' best practices can be integrated with the documented interventions from the competition to develop integrated management practices. However, these developed POTs must also be tested and validated at the on-farm level and be managed by farmers themselves so that the resulted recommendations can be said feasible at the on-farm level. Best farming practices per management area will also be developed to make it more flexible based on farmers condition, resources and cropping season.

Four POTs were evaluated on-farm in Roxas, Isabela; Sta. Teresita, Cagayan; Bambang, Nueva Vizcaya and Aglipay, Quirino during DS and WS 2021.

During DS 2021, POT 1 had the highest yield with 10.19t/ha in Isabela; 8.91t/ha in Cagayan; and 7.34t/ha in Nueva, Vizcaya. While PalayCheck technology had the highest yield in Quirino with 7.92t/ha. Cost of production of the four POTs ranges PhP8.58 –9.94/kg. POT 1 had the lowest cost of production per kilogram of palay in Isabela, Cagayan and Quirino; while Farmer practice had the lowest cost per kilogram with PhP9.10/kg.

In WS 2021, PalayCheck technology plot obtained highest yield in four provinces. Cost of production of the four POTs ranges PhP7.51 – 10.20 /kg. Also, PalayCheck System had the lowest cost of production per kilogram of palay in four provinces. Price increase of agricultural inputs especially inorganic fertilizer and pesticides significantly affect the cost of production. And PalayCheck Technology increases profit to 33.59% average in four province sites compared to Farmer practice.

Although the yield and cost of the two POTs did not attain the 10t/ha and PhP5/kg, the resulting yield and cost is still practical for promotion since they are still better than the current regional and national yield and cost levels.

Extracore Project 10

Selection & Dissemination of Elite Salt-Tolerant Rice Varieties to Afacimember Countries

Andres L. Dela Cruz, Jr., Delbert A. Santos

The Philippines had an estimated agricultural area under coastal-saline-prone of 500-600,000ha, of which 200,000ha is considered seriously salt-affected soils (IRRI knowledgbank). The saline-prone areas are geographically distributed in the country with 180,000ha in Luzon, 220,000ha in Visayas and 160,000ha in Mindanao. These areas are small compared to other countries in Asia, but they are potentially important resource for rice and other staple food production. The salt-affected coastal areas are generally associated with tidal flats and flood-prone alluvial plains. Rice yield in these areas is marginal ranging from 1.5-2.5t/ha-1, or total crop failure in severe cases of salinity. Farmers in these areas rely on the rice varieties that are tolerant to salinity to get a good harvest. Although there were many released saline rice varieties in the Philippines, adoption is still low due to lack of seeds, promotion, and production guides. The objectives of the project were 1) to disseminate suitable rice varieties relevant to the targeted saline ecosystem in the Philippines, 2) to provide technical support for the crop production technology to researchers, extension specialists, and farmers through the development of the manual for salt-affected soils in Tagalog, 3) to solve the common challenges of AFACI member countries by adopting superior salt-tolerant rice genotypes suitable to their coastal saline soils to minimize the salt damage. In this way, during the duration of the experiments, farmers can select varieties suited to their local conditions and preferred by them. Since, some of the test materials (i.e., PhilRice entries) are already released varieties, farmers can multiply the seeds and plant them in the next cropping season. Other breeding lines in the test

Saline set-up at 5 days after transplanting during 2021 DS

Experimental Set-up under normal condition in Sta. Teresita, Cagayan during 2021 DS

will be evaluated for further screening and yield trials in saline-prone locations. A production and management guide will be published at the end of the project for farmers' and researchers' use.

For 2021 implementation of the project in Cagayan, saline-tolerant varieties were identified and seed produced and distributed to the farmers and collaborative farmers in the province. The other genotypes or breeding lines tested performed well in saline-prone areas as indicated in the results in saline areas in Buguey, Cagayan during 2021 wet season. Further screening and yield evaluation were required for better results. These genotypes can be good candidates for the National Cooperative Test (NCT) for national evaluation and later for recommendation for variety release. The manual writing is on-going, incorporating the current technologies for saline-prone rice production that farmers can adopt and guide them in field management. Researchers were active in collaborating with the farmers and collaborators and helping whatever can do to assist them despite limitations due to pandemic and community quarantine situations.

Extracore Project 11

The Water-Efficient & Risk Mitigation Technologies for Enhancing Rice Production in Irrigated & Rainfed Environments (WATERICE)

Jerry D. Batcagan, Quehly Jade J. Agpalza

The study under WP3 of WateRice project aimed to improve production efficiency through improved water management, mechanization, and integrated weed management for rice under irrigated environments.

For 2021, 15 study trial set-ups were established including demonstrations of mechanical transplanters and laser guided land leveling throughout DS and WS. The study highlighted performance comparison between current farmers' practices in the area and the integration of recommended managements on water, nutrient, and weeds coupled with the use of cost reducing technology like mechanical transplanter. WS 2021 results showed an average yield difference of 638kg/ha between the integration plot at 6.31t/ha and farmers' practice plot at 5.67t/ha. Average net returns per hectare were computed at PhP49,210 and PhP55,683 for the farmer-managed and researcher-managed plots, respectively. The yield increase and

production cost were attributed to improved nutrient management, lesser chemical usage through integrated pest management, use of mechanical transplanter as cost reducing technology, and efficient water management.

The packaging of these technologies involved the promotion of mechanical transplanter for crop establishment and laser guided land leveling technology. Two commercially available mechanical transplanter units were used during the establishment. The VST Shakti transplanter had a minimum actual capacity of 0.8 ha/day while the Kubota SPW 48c at 1.04ha/day. Mechanical transplanting hastened crop establishment and is cheaper than hiring a platoon of labor. On the other hand, the laser-guided land leveling technology is ideal in combining small paddies into wider and leveled field. This contributed in attaining uniform crop growth, better weed control, and increased efficiency of nutrient and water use.

Laser-guided land leveling demonstration with farmers in Victoria, San Mateo, Isabela

Walk-behind mechanical transplanter demonstration

Extracore Project 12

Multi Environment Field Performance Evaluation of Elite F1 Hybrids & Parents

Jerome V. Galapon, Andres L. Dela Cruz, Jr., Delbert A. Santos

Multi-location yield trial (MYT) is part of the breeding program to further evaluate promising/elite lines, F1 hybrids and parents for NCT nomination. In line with the Department of Agriculture's mandate to increase the utilization of hybrid rice, screening and evaluation of promising lines/genotypes was implemented. This study evaluated the performance of the elite F1 hybrids and parents that perform well in high-yielding environment like Isabela and eventually to advance to the next generations of the breeding program.

According to the Bureau of Agriculture and Fishery Product Standards (BAFPS), the average yield in Isabela ranges from 5.5t/ha to 6.2t/ha. Based on the yield result in DS 2021 of the elite F1 hybrids and parents, SN758 with 6.81t/ha have higher yield than the average yield data from BAFPS with only 6.2t/ha. The yield data of the test entries ranged from 4.06t/ha to 6.81t/ha during the DS 2021 and 2.22t/ha to 4.84t/ha during WS 2021. High yield during DS 2021 was observed as solar radiation is abundantly available for plant growth and development. In WS 2021, Mestiso 73 and NSIC Rc222 obtained the highest average yield with 4.84t/ha followed by IR34686 with 4.03t/ha. The rest of the test entries yielded from 2.22t/ha to 3.85/ha. Low yield was observed in the test entries during WS 2021 due to late crop establishment and onslaught of the typhoon "Maring" and "Nando" that resulted in 75-85% lodging during reproductive phase and ripening phase. In nutrient management recommendation study, the highest yielder among rice genotypes per treatment were SN758 (113-41-49 NPK/ha) with 2.63t/ha, SN758 (80-41-90 NPK/ha) with 2.85t/ha, and Mestiso 20 (no fertilizer) with 3.14t/ha. Using ANOVA: two-factor without replication, yield (t/ha) data of each rice genotypes within treatments showed significantly different with each other which means each rice genotypes responds differently in specific fertilizer recommendations.

Experimental area of Multi-location Yield Trial, PhilRice Isabela (DS 2021)

Extracore Project 13

RCM- Field Evaluation & Monitoring of Diverse Rice-Growing Area for Sustainable Upgrading of RCM of REGION 1, 2 AND CAR

Macario Jr. Q. Agustin, Irene B. Laureano, and Ofelia C. Malonzo

Rice Crop Manager aimed to provide farmers with dynamic and timely field-specific rice management recommendations to increase rice yields and profitability. The RCM project involved four work packages. The work package on "Field Evaluation and monitoring of Diverse Rice Growing Area for sustainable upgrading of RCM in Regions 1, 2, and CAR was handled by PhilRice Isabela. This work package sought to refine RCM recommendations for diverse rice growing environments and to validate and enhance the site-specific nutrient management work packages in the said regions.

During the dry season, RCM recommendations were tested in 12 sites in Region II under abiotic stresses while RCM and PRISM were integrated in 18 sites during the wet season under rice and non-rice condition and abiotic stress. In CAR, RCM with high fertility and standard fertility treatments were tested in three sites. These trials were managed by DA-Regional Field Units with technical assistance from PhilRice Isabela. Results showed that the use of standard RCM recommendation produced higher yield than the use of one bag urea less from the standard RCM rate. Moreover, RCM with PRISM integration produced higher yield than h the standard RCM recommendation and farmers' practice.

To hasten RCM adoption in the region, its recommendations were tested in Bagabag and Dupax del Sur, Nueva Vizcaya during the wet season. Results showed that in Bagabag, Nueva Vizcaya, the domain specific RCM recommendation did not meet the target yield while the treatment that allows nutrient adjustment during panicle initiation based on PRISM current yield prediction consistently got the highest yield of 8.07t/ha. Low yield was recorded in Dupax del Sur due to early infestation of insect pests, which later advanced to tungro disease.

Technical briefing at Brgy. Paraiso, Cabatuan, Isabela

PhilRice Isabela staff assisted the DA-RFO2 in data data gathering in Wacal, Solano on Aug. 30, 2021

Extracore Project 14

Multi-Environment Advanced Yield Trial (Under Nextgen Plus)

April Joy A. Bernardo

The multi-environment advance yield trial (MAYT) is a collaborative project of International Rice Research Institute and Philippine Rice Research Institute. Multi-location testing in crop improvement is crucial in advancing elite lines into the National Cooperative Trials. MAYT is conducted for breeding materials selected from breeding panel based on genomic estimated breeding values (GEBV-based selection strategy). Conducted in the dry season, this trial evaluated 400 lines with two replications in terms of yield and reactions to pests and diseases. These were planted at 2 x 2m planting distance. Each column measures 88m and each line at 2.2m where there were 44 entries per column. The fertilizer recommended rate was 150-60-60 (NPK).

Results showed that most of the entries have a good crop stand. Three entries achieved at least 9t/ha followed by 27 entries that yielded at least 8t/ha. Moreover, most of the entries yielded 6-7t/ha. Only 11 entries yielded at least 3t/ha and below (Table 1). Most of these entries were affected by rice blast and bacterial leaf blight. Comparing the average yield performance of check entries with the top most performing entries of MAYT, the latter achieved higher yield with 8.04 to 9.58t/ha while check entries only yielded 5.75-7.40t/ha.

MAYT entries at flowering stage, PhilRice Isabela DS 2021

Extracore Project 15

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

Fernando D. Garcia, Aileen Joy S. Mateo, Macario Q. Agustin Jr.

This project addressed 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 showcased the performance of FPA-approved fertilizer materials, generated information of the effect of their materials as growth and yield of rice, compared economic performance of the different fertilizer materials, and generated the best package of nutrient management technology for irrigated lowland rice. It aimed to increase productivity and cost effectiveness of rice farming in a sustainable manner through the provision of the best package of nutrient management technology. Twelve companies including PhilRice participated in the project during DS 2021 and 11 in WS 2021. PhilRice used soil-based fertilizer and served as control in its set-up. Two companies used nano-based technology in addition to soil-based fertilizer, eight companies used foliar-based nutrient supplement/growth promotants in combination with soil-applied fertilizer and one company used soil-based fertilizer. BioPrime Agri Industries Incorporated attained highest potential yield of 8.66t/ha in DS 2021 while Atlas Fertilizer Corporation recorded the highest actual yield of 6.75t/ha. Partial budget analysis showed that ThaiPhil Advance Agitech Company recorded the lowest production cost of PhP7.34/kg of palay with an actual yield of 6.51t/ha. Enviro Scope Synergy produced the highest potential yield of 8.42t/ha in WS 2021 while Philvin Trading harvested the highest actual yield of 6.50t/ha. Partial budget analysis showed that BioPrime Agri Industries Incorporated cultivated palay with the least production cost of PhP6.68/kg of palay with an actual yield harvest of 5.94t/ha.

Extracore Project 16

Enhancing the Productivity, Sustainability, & Profitability of Rice-Rice-Mungbean & Rice-Rice-Corn Culture Through Improved Technology Intervention

Joy Bartolome A. Duldulao (WS2021-2022), Rene E. Valdez (DS2021-WS2021), Jim Allen T. Tabirao

The project validated farmers' observations that decreased rice yield is correlated to the continued adoption of rice-rice-mungbean cropping pattern. They also observed that rice yield is sacrificed due to high amounts of N required by corn in a rice-rice-corn cropping pattern. Generally, the project aimed to determine the productivity, sustainability and profitability of rice-rice-mungbean and rice-rice-corn cropping patterns in Region II and CAR. Specifically, it (a) assessed the effect of nutrient interventions on the yield of rice, mungbean and corn; (b) determined the nutrient dynamics in the soil as affected by the two cropping patterns; and (c) determined the ROI of each cropping pattern.

In DS 2021, two experimental sites in San Manuel and Victoria, San Mateo were established. Soil analyses before crop establishment showed that NPK levels in San Manuel was 2.9N-18.4P-19K and in Victoria was 3.10N-23.3P-26K. For treatment 1, 25kg mungbean/ha and 1 bag urea/ha were used while treatment 2 used zero fertilizer and 20kg mungbean/ha. After mungbean cropping in San Manuel, NPK levels for T1 were 3.6N-12.5P-21K while for T2 were 2.83N-11.93P-0K. In Victoria after mungbean set-up, T1 were 3.77N-13.4P-47K while for T2 were 3.73N-7.97P-38.67K. In San Manuel, results showed that planting of mungbean increased the N and K content of the soil by 0.7 and 2 for T1 while NPK content for T2 decreased. In Victoria, planting of mungbean increased the N and K content of the soil by 0.67 and 21 for T1 and K content by 12.67 for T2. Based on soil analysis, planting of mungbean after rice increased the N and K content of the soil.

In terms of yield, results showed that in Victoria, T1 outperformed T2 with a yield advantage of 5.4%. In San Manuel, T2 outperformed T1 with a yield advantage of 13.9%.

Rice crop for WS 2021 after planting of mungbean was also established in the same sites. Results showed that in San Manuel, T1 with 170-45-45 NPK/ha yielded 9.5t/ha outperforming T2 (farmer's practice) with a yield of 8.3t/ha or a yield advantage of 15%.

Extracore Project 16

For Victoria, results showed that T1 with 170-45-45 NPK/ha yielded 7.8t/ha over T2's (farmer's practice)7.4t/ha or a yield advantage of 5%.

NPK levels in San Manuel after rice set-up were 3.08N-7.54P-230K for T1 and 2.72N-9.84P-221.33K for T2. In Victoria, NPK levels after rice set-up were 2.35N-4.35P-282K for T1 and 2.55N-3.75P-277.67K for T2. Based on soil analysis N and P content of the soil decreased while K content increased.

Production cost and ROI of two farmer-cooperators from DS and WS 2021 were gathered and interpreted. It showed that the income from DS is higher than the WS in the two sites. BPH infestations contributed to low net income. Planting mungbean after rice in the wet season gives additional income for farmers and additional N content for the soil.

For return on investment of two cropping seasons, San Manuel had an ROI of 179% in DS and 92% in WS. For Victoria, it had an ROI of 254% in DS and 86% in WS.

Lay-outing of the experimental area of mungbean

Transplanting of six 10m x 10m experimental plots in San Manuel and Victoria, San Mateo, Isabela