2023 PhilRice R&D Highlights

BATAC BRANCH STATION

Philippine Rice Research Institute
Central Experiment Station
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Contents

STATION

PhilRice Batac

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EXECUTIVE SUMMARY

DA-PhilRice Batac fulfills a pivotal role in advancing resilient, diversified, productive, and sustainable rice farming by developing and disseminating appropriate technologies in response to the ever-present threat of climate change, and by improving farming practices in adverse rice environments. Its R4D agenda is rooted in rice-based agriculture for semi-arid and adverse places (Rice ASAP), highlighting the urgent need for appropriate technologies to mitigate the impacts of climate change. The Station leverages scientific advances, particularly in information technology, to improve its technologies and provide more efficient support services to its clients. It further seeks to promote inclusive growth by extending its reach to the vulnerable segments of the industry, aiming to create a sustainable and equitable future for the rice-farming communities in its coverage area.

In 2023, the station implemented 15 research-for-development (R4D) activities consisting of seven station-based core projects and studies, two program-based, two division-based funded projects, and four externally funded projects.

The major R4D accomplishments of the station are grouped as follows: breeding for healthier rice (low-Glycemic Index and High-Iron and Zinc Rice); evaluation of elite rice lines for drought; crop management; smart water technologies; precision agriculture; mechanization; Rice Business Innovations System (RiceBIS); technology out-scaling; and deployment of Malusog Rice.

The projects and studies focused on:

1. Breeding for healthier rice
    a. mutation-induced lines for low-glycemic index (Low-GI) rice
    b. confined testing of iron and zinc-biofortified transgenic rice (HIZR)
2. Evaluation of elite rice lines for drought such as the AFACI Project
3. Crop management
    a. Fine-tuning of an Integrated Crop Management (ICM) for rainfed rice areas

b. Evaluation of approved fertilizers for the best nutrient management
c. Effects of plant density and Nitrogen fertilizer levels on the growth and yield performance of direct-seeded and transplanted rice under rainfed lowlands
d. Refining ratooning technology
e. Smart water management system

4. Precision agriculture like the PRISM
5. Palayamanan model farm
6. Mechanized model farm
7. Deployment of technologies through Smart ICM
8. Deployment of Malusog Rice

Technologies developed by the station have reached farmers, local farmer technicians (LFTs), Agricultural Extension Workers (AEWs), and other clientele through training programs conducted under the Rice Business Innovations Systems (RiceBIS) and Branch Development Initiatives (BDI), also known as the Sharing Updated Rice and Rice-Based Technologies Appropriate for Ilocos Network.

Mature technologies that have been developed by DA-PhilRice Batac and information generated by its decision support group have been utilized by various R&D initiatives. The information on available irrigation on both ground and surface water was used as support tools for on-station field setups. The station-developed technologies for vegetable, oyster mushroom, vermicompost production, composting facilities (from BSWM), and fish culture were applied in the Palayamanan model farm and vegetable technology demonstration area of the Station. The MP seeder and mechanized transplanter were among the machines promoted in the BDI areas.

CORE-FUNDED PROJECT 1:

Sharing Updated Rice and Rice-Based Technologies Appropriate for Ilocos Network (BIN-210-000)

Sonia V. Pojas, Nonilon I. Martin, Cynthiamay O. Lapat, Mhilton Arvy R. Bacarisa, Florence B. Tolentino, Rica Mae G. Gomez, Franzel Monique D. Bonilla, Shannel M. Cabansag, Maribel B. Alupay, Benjamin A. Pajarillo Jr., John Mark M. Bumanglag, Anielyn Y. Alibuyog, Bethzaida M. Catudan, and Arnold S. Juliano

The project aimed to refine and demonstrate the Palayamanan model farm, showcasing yield-enhancing, cost-reducing technologies and appropriate digital tools for rice production. The technology demonstration and production of seeds of promising varieties is also an important component to promote newly released varieties. Likewise, the project develops/localized, shared IEC materials and promoted rice and rice-based information through various media platforms. Moreover, the documentation of all branch development initiatives was integral to the project. The project had three components: Technology Management and Services; Strategic Communication; and Database Management. The first component showcased the station-developed technologies through the Palayamanan model farm and promoted newly released and suitable varieties for stress-prone environments. Appropriate technologies in the areas of responsibility were also scaled. Components of the strategic communication were the following: localization and distribution of IEC materials, posting of updates and activities on the Facebook page, knowledge-sharing and learning (KSL) activities, and writing of articles.

The Palayamanan model farm featured oyster mushroom, vermicompost, and vegetable production, utilizing farm wastes to generate additional income. The project supported good agricultural practices (GAP) to minimize harmful pesticides and overuse of inorganic fertilizers. It employed Cropping Mix app to select appropriate vegetables for planting, improving productivity and income. Technologies such as the multi-purpose seeder and drip irrigation are also showcased. Crops such as watermelon, mungbean, eggplant, pepper, tomato, and leafy vegetables were successfully grown during the dry season (DS, bossting the station's income.

The station's commitment to promoting appropriate rice technologies sustained the collaboration with the Local Governments of Bauang, La Union and Sarrat, Ilocos Norte. Among the technologies scaled were the use of high-quality seeds, mechanized crop establishment, and nutrient management using the MOET App. As part of the services to our stakeholders, the knowledge and sharing of technologies to requesting clients were responded to accordingly.

Various activities under strategic communication were conducted. Important activities and updates on rice production were constantly shared with our stakeholders through various media platforms- posting of the Facebook page, IEC materials, magazines, newsletters, websites, and radio engagements. Participation in exhibits and festivals has become an important avenue for extending and sharing updated technologies with all our stakeholders.

The project reached 992 farmers (633 men and 359 ladies) during the Lakbay Palay; 336 farmers (199 men, and 137 ladies) through training, technical dispatch, and briefings on crop establishment such as modified dapog, MP seeder, and mechanized transplanting, nutrient management, vegetable production, tilapia farming and management, and oyster mushroom production. The technical assistance provided along with the technology demonstrations established and the adoption by farmers of the technologies has unlocked a positive impact increasing the productivity and income of farmers.

Development activities of the station were all documented in the database system established. The databases include the trainings conducted by all sectors, techno-demos, seed distributions under BDI, and technical dispatches. The extent of reach and number of extension workers, local farmer technicians, farm school owners, farmers, and other stakeholders trained in the Ilocos Region on a per municipality level are already mapped.

CORE-FUNDED PROJECT 2:

Operationalization of Agricultural and Biosystems Engineering (ABE) Unit in PhilRice Batac Branch Station

Lex C. Taguda, Massimo Vico U. Quinajon, Arnold S. Juliano, Richard Paul F. Pungtilan, Mary Ann U Baradi, Anielyn Y. Alibuyog, John Mark M. Bumanglag, Eduard Edison M. Cacao, and Harley M. Quemquem

The ABE unit consists of four components: the Farm Service Center (FSC); General Maintenance; Engineering Technology Assessment (ETA); and Farm Machinery Related Training (FMRT). The FSC handles the repair, maintenance, and operation of farm machinery and equipment. General Maintenance maintains all agricultural facilities, including the experimental field. The ETA component evaluates farm machines and equipment. FMRT carries out farm machinery-related trainings requested by clients within and outside the station.

The ABE unit earned a gross income of PhP187,953.00 from custom-hiring services for farm machinery and equipment, with an excellent customer satisfaction rating (5) from all clients served. The FSC component also crafted and implemented a planting plan with a detailed map in close collaboration with the R&D and BDU, which served as the basis for farm machinery field operation-scheduling; Solar-Powered Irrigation System (SPIS) irrigation-scheduling for the various setups at the experimental field; and a maintenance plan for all farm machinery and equipment, which served as the foundation for timely repair and maintenance. Also, the FSC collaborated closely with PMU to conduct a semestral inventory of farm machinery and equipment.

General Maintenance ensured the upkeep of the experimental field, including the SPIS, in coordination with IMS key personnel. It facilitated the procurement and replacement of the faulty engine in the station's rice mill facility, ensuring continuous operation. It was involved in the site validation, monitoring, and inspection of various infrastructure projects at the station. The ETA component tested and evaluated the Mobile SPIS. ABE unit personnel were tapped as resource persons during hands-on operation of farm machinery and equipment, as well as in related lectures during RCEF trainings. Training requests related to farm mechanization from cooperatives in Banna, City of Batac, and Pasuquin, and from the Ilocos Norte Agricultural Colleges (INAC) in Pasuquin, all in Ilocos Norte were also catered to.

CORE-FUNDED PROJECT 3:

Smart Water Management System: Understanding Resources and Adopting Modern Technologies for Improved Farm Management

John Mark M. Bumanglag, Shaira Lee A. Vinoya, Mary Ann U. Baradi, Anielyn Y. Alibuyog, Bethzaida M. Catudan, Lex C. Taguda, Cariel Q. Abad, and Richard Paul F. Pungtilan

The Station's experimental farm operates in a rainfed rice ecosystem, relying on precipitation, groundwater, and rainwater-harvesting structures for irrigation. The use of engines and pumps to extract water significantly increases production costs, and water shortages often occur during crop growth, especially in the dry season. Flash floods during the typhoon season (August to October) further impact crop yields. To address these problems, the project aimed to develop a water-sensitive cropping system for increased yield and income. It characterizes water resources, validates irrigation demand in the farm, and assesses and adopts cost-reducing water management technologies.

The 7-ha Station farm was divided into 12 blocks, accessed through five gravel roads. Its 19 tube wells are the primary sources of irrigation water. One was installed with the Solar-Powered Irrigation System (SPIS) with 400m distribution pipes passing along farm blocks. Two small farm reservoirs (SFR), ponds, and a creek at the farm perimeter are the other sources of supplemental irrigation. A topographic map with detailed information on irrigation resources was generated.

Scarce rainfall in January–April led to a groundwater-level decline reaching the deepest average level at -5.8m. The level rose by 0.5m after harvesting of dry season crops, intensified by a 20.9–23.0mm rainfall in late May. A stable supply of groundwater for irrigation, average level of -2.5 m and above, was observed from July to early December. Water from tube wells surfaces during the typhoon days in July–October. Groundwater in late October gradually dipped to -2.9m in December as the dry season set in with increased pumping activities to sustain dry crops. Aside from rainfall, several factors such as farming practices, land cover, topography, and soil properties influence the groundwater level fluctuation.

Rainfall in June–July saturated soil in the area and water surfaced at SFRs, ponds, creeks, and canals in late July. Water in SFR was maintained at 0.5–3.3m deep until the end of 2023. Water flows through the creek and canal at 0.1–0.3m depth at sufficient weekly total rainfall at 2.8mm minimum. Rare rainfall from October to December led to drying out of water channels and ponds.

The pumping capacity and fuel consumption of conventional pumps were estimated at 2.7–1.4l/s and 0.3–0.5l/hr, respectively. Pump performance varied at different groundwater levels (head). The pumping rate was reduced by 0.1 – 0.4l/s at a 1m increase in pumping head. Pumps can yield 11.9–30.7 m3 for every liter of fuel.

The technical performance of SPIS water sources and solar radiation. SPIS starts operating with a minimal pumping rate of 0.3 l/s in the morning and maximum potential at noon reaching 8.4 l/s (highest in July). Lower average pumping rates at 2.9–4.3 l/s were observed during deep groundwater levels and low solar radiation in March–May and August–November, respectively. The daily capacity of the SPFS 8 was estimated at 128.8 m3 during the dry season and 147.5 m3 in the wet season.

Several free-flowing water systems exist in some parts of the City of Batac. These were established by penetrating a geologic formation called a confined aquifer. It is likely that this geologic formation stretches through the Station farm. To validate this assumption, drilling a borehole at a total depth of 192m (630 feet) below the ground surface was pursued on October 1–10. Two solid rock layers, considered impermeable layers, were penetrated in 35m and 171m with 18–20cm thickness. These layers maintained groundwater at the upper layers. Minimum-pressure groundwater did not permit water to the surface of the well.

CORE-FUNDED PROJECT 4:

Establishment of Mechanized Dryland Model Farm with Integration of Various Location-specific Technologies

Lex C. Taguda, Richard Paul F. Pungtilan, Arnold S. Juliano, Massimo Vico U. Quinajon, Mary Ann U. Baradi, and Anielyn Y. Alibuyog

Before the establishment of the Mechanized Model Farm, the plots for each block for the whole DA-PhilRice Batac experimental field were consolidated and leveled using a tractor-attached laser leveler through the "WateRice Project" in 2021. The field used to be divided into ten blocks, each with approximately 6-12 small plots. After the land consolidation and leveling, the number of plots was reduced to two to four wider plots. Hence, the establishment of a 0.7-ha mechanized model farm became feasible utilizing one block of the field with a total investment cost of PhP54,580.20. The model farm comprises a farm machinery ramp, drainage, and irrigation facility, which consists of a drop box and permanently installed irrigation pipes with strategically-positioned water gate valves. A bund was constructed in the middle to divide the total area into two equal plots for ease of irrigation and machine operation.

A technology demonstration setup was established for rice (DS2023) and hybrid yellow corn (WS2023) to compare the performance of the Model Farm with farmer practices in terms of yield input and labor efficiency. The Farmers' Practice (FP) setup was 0.58ha. The Model Farm used a tractor-attached harrower and mechanical transplanter, while the FP setup used a hand tractor and manual transplanting following the straight-kulong method. Production costs were PhP49,025.5 for the mechanized setup and PhP47,829.47 for the FP setup. The higher mechanized cost was incurred by fuel consumption, additional labor for replanting and higher golden apple snail (GAS) damages since younger seedlings (17 DAS) were transplanted, among other items. The Model Farm yielded 5.2t/ha compared to 4.7t/ha for the farmer's setup, a 9.61% yield advantage.

During the 2023 WS Lakbay Palay, 405 farmer-participants were asked to provide feedback on the model farm, 403 (99.5%) of whom valued the size of the consolidated farm and the advantages of the farm machinery ramp; 402 farmers (99.2%) valued the importance of the drop box; 395 (97.5%) valued the advantage of using permanently installed irrigation pipes; and 398 (98.3%) showed interest adopt the mechanized model farm technology.

CORE-FUNDED PROJECT 5:

Fine-tuning of an Integrated Crop Management (ICM) for Rainfed Rice Areas

Ria C. Yate, Janet Q. Polipol, Jude Michael Cabbat, Ahlfie James G. Galanza, Rica Mae G. Gomez, Angelica L. Bitanga, Bethzaida M. Catudan, and Benjamin A. Pajarillo Jr.

The project aimed to fine-tune important rice production components of an integrated crop management (ICM) for rainfed areas, including fertilizer and water management, seedling age and number, and land preparation.

In the first two years of implementation of the project, two studies were conducted: Study 1 – Performance of rice as affected by seedling age and number; and Study 2 – Appropriate fertilizer management - fertilizer rate and timing of application.

In Study 1, 96 plots were established in 2023WS with two treatments for variety (NSIC Rc 222 and Rc 480), four treatments for seedling age (14 DAS, 21 DAS, 28 DAS, and 35 DAS), and four treatments for seedling rate (2, 3, 4, and 5 seedlings/hill). For the mid-maturing Rc 222, optimal seedling ages and rates were determined: 14 DAS - 2 seedlings/hill; 21 DAS - 3 seedlings/hill; 28 DAS - 2 seedlings/hill (with a slight increase in yield at 4 seedlings/hill); and 35 DAS - 3 seedlings/hill. For the short-maturing Rc 480, recommended seedling ages and rates varied: 14 DAS - 3 seedlings/hill; 21 DAS - 3 seedlings/hill (with a higher yield at 5 seedlings/hill); 28 DAS - 5 seedlings/hill; and 35 DAS - 2 seedlings/hill (as additional seedlings couldn't compensate for reduced tillers).

In Study 2, 32 plots examined two fertilizer rate and six timing treatments. Analysis showed no substantial interaction between fertilizer rate and timing on yield. Instead, significant yield differences were observed due to fertilizer rates alone and timing alone. This suggests that regardless of fertilizer amount, improper timing can lead to yield loss. Conversely, inadequate fertilizer amounts also reduce yield regardless of timing. In rainfed areas, fertilizer application timing can be advanced or delayed up to 5 days from key growth stages in 3-split applications, or 5 days before in 4-split applications to avoid yield reduction. However, considering water constraints, a 3-split application is economically preferable.

CORE-FUNDED PROJECT 6:

Refining Ratooning Technology for Rice Harvested Main Crop

Ria C. Yate, Rica Mae G. Gomez, Janet Q. Polipol, and Bethzaida M. Catudan

Ratooning, an age-old practice in rice production, offers the potential to increase yields with minimal labor and resources by allowing stubbles to regrow after the main crop harvest. Despite its potential, ratooning remains underutilized due to limited farmer adoption, partly due to low ratoon rice yields. This project aimed to address the issue by monitoring and documenting farmers' best practices for ratoon crops. By validating and packaging these practices for dissemination, the project seeks to accelerate ratooning adoption rates and optimize yields.

A one-page quick survey form was distributed to 124 city and municipal agriculture offices in Region I to identify areas practicing ratoon cropping. Results showed that 14 municipalities ratooned, with the majority in Pangasinan (10), followed by two in Ilocos Norte, and one each in Ilocos Sur and La Union. Initial validation at the farmer level indicated that ratooning in 81.5ha was unintentional and mainly practiced in irrigated areas with rice-rice, rice-ratoon-rice, and rice-rice-ratoon cropping patterns. Among the inbred varieties identified, NSIC Rc 216 provided the highest yield, followed by Rc 480, Rc 160, and Rc 222. Farmers who ratooned hybrids claimed that they obtained similar yield levels as those from inbreds. The cutting heights varied based on variety and harvesting method. If the main crop was manually harvested, the rice plant was cut 2–3cm above ground level, just above the 1st node, or in between the 2nd and 3rd nodes. The cutting height of the main crop that used combine harvesters was 30-75cm above the ground surface (if traditional variety). Water and nutrient management varied across municipalities, suggesting a lack of standardized production technology. On average, ratoon yields were approximately 24% of main crop yields in Region I.

CORE-FUNDED PROJECT 7:

Effects of Plant Density and Nitrogen Fertilizer Levels on the Growth and Yield Performance of Direct-Seeded and Transplanted Rice in Rainfed Lowlands

Sonia V. Pojas, Casey C. Pamagtingam, Jessie Faith E. Cabuntocan, Angelica P. Bitanga, Anielyn Y. Alibuyog, Mary Ann U, Baradi, and Santiago R. Obien

This project investigated the impact of nitrogen fertilizer and planting density on the growth and yield of direct-seeded and transplanted rice at PhilRice Batac. Three studies were conducted, two on transplanted (inbred and hybrid) established in August 2023 and one on direct-seeded inbred rice established in October 2023. The studies followed a split-plot design, with nitrogen levels as the main factor and plant densities as the sub-plot factor, replicated three times. Four levels of N fertilizer were applied: 0, 100, 200, and 300 kg/ha. The fertilizer treatments were applied in 4 splits based on the amount/rate per application schedule. Five plant densities were also used in the direct-seeding experiment; 20, 40, 60, 80, and 100 kg/ha; for the transplanted, 1, 2, 4, and 6 per hill were used for inbred, and 1, 2, and 4 seedlings planted per hill for hybrid.

Results of the direct-seeding study showed that the application of 100kg N/ha was the optimum level giving a grain yield of 4127.87kg/ha and a seedling rate of 60kg/ha was the optimum with a grain yield of 4014.12kg/ha. The highest nitrogen level of 300kg/ha influenced plant height, number of tillers and panicles, panicle length, and filled and unfilled grains. No significant interaction effects were observed in all parameters.

The effects of the different nitrogen levels and seedlings planted per hill were also significant for transplanted inbred (NSIC Rc 480) and hybrid (Mestizo 1). The highest grain yield of Rc 480 was from plots with 200kg N/ha. Significant effects of nitrogen levels (100, 200, 300kg N/ha) were observed on plant height, tiller, and panicle counts.

The high infestation of rice bugs significantly injured Mestizo 1, which resulted in the insufficiency of data in some of the treatment plots, hence, yield cannot be analyzed statistically. Application of 300kg N/ha showed the best effect in terms of plant height, tiller count, panicle count, and panicle length. The interaction effects of nitrogen levels and seedling numbers were insignificant in all the parameters.

CORE-FUNDED PROJECT 8:

Rice Business Innovations System (RiceBIS) Community

Leah May dC. Tapec, Jessica M. Solero, Ruby May Eliza S. Espiritu, and Lenie C. Ruiz

The RiceBIS Project was implemented in 2017 in the City of Batac and in 2020 in Banna, Ilocos Norte. Farmers were organized into a cooperative and capacitated on production, processing, organizational, and business management. They were linked to other government agencies to win support in agroenterprise development. Through collective marketing, RiceBIS communities were able to venture into milled rice, brown rice, input retailing, and custom service. Realizing the importance of further helping the RiceBIS communities in scaling up their business ventures, the RiceBIS 2.0 is being implemented for the year 2023-2028. The two communities of the RiceBIS 1.0 - the Rayuray Farmers Agriculture Cooperative (RFAC) in Batac and the Zanjera Sto. Niño Agriculture Cooperative (ZSAC) in Banna were the take-off sites of the project.

The Coops were continuously monitored and coached on the establishment of agro-enterprises, development plans were crafted to guide them. A benchmarking activity was also initiated to help the farmers learn additional knowledge and skills in managing their agroenterprises. As part of the Women's Month celebration, livelihood training for women farmers was conducted.

Moreover, SWOT analysis was done to help the cooperatives focus on their strengths, solve their weaknesses, seize new opportunities, and reduce threats. The business capacity of each cooperative was also assessed to identify needed interventions for the scaling up of their agro-enterprises.

Their financial transactions were monitored to ensure that all was in the right track. RFAC, netted PhP28,255.02 for brown rice production, PhP226,472.48 for milled rice, PhP28,792.36 for palay trading, and PhP22,282.54 for custom service provision. For ZSAC, they made a net income of PhP217,061.00 from palay trading, PhP154,918.00 from fertilizer loan-out, and PhP260,592.70 from custom service. ZSAC received their PhP5M loan from DBP in August which they used as additional capital for their agroenterprises and purchase of hauling trucks and combine harvester.

CORE-FUNDED PROJECT 9:

Scaling out of Rice ICM Technologies for higher farmers' adoption rate (SMART ICM)

Bethzaida M. Catudan, Rica Mae G. Gomez, Ruby May Eliza S. Espiritu, Leah May dC. Tapec, and Jessica Solero

The project aimed to strongly and deeply involve the LGUs and other potential partners of the rice value chain within a locality such that it becomes the take-off point for the convergence of different players involved in rice production. During WS 2023, the RiceBIS 1.0 sites (Phase 1 in the City of Batac and Phase 2 in Banna) in Ilocos Norte were the pilot areas for scaling of mature technologies. Baseline information was gathered, including rice area (ha), cropping pattern, variety used, and nutrient management practices, among others.

Through focused technology transfer, nutrient management using the MOET fertilizer recommendations was deployed for farmers' adoption. MOET setups were established to chart location-specific fertilizer recommendations since Ilocos Norte was not included in the Soil Fertility Map developed by RCEF. To intensify its promotion, a 1-ha technology demonstration was established at each site. Briefing was conducted to inform the farmers of the fertilizer recommendations based on MOET results. To ensure more accurate application of the recommended fertilizer rates given the typical small parcels managed by rice farmers in the Ilocos, a matrix of the quantities of the fertilizer to be applied in an interval of 1,000m2 area was provided. Based on the monitoring of the fertilizer management implemented by the farmers in WS 2023, adoption rate of the MOET fertilizer recommendations was 38% in Banna and 35% in the City of Batac. The adopters attained 13% and 5% higher yields than the non-adopters, respectively.

CORE-FUNDED PROJECT 10:

Philippine Rice Information System (PRiSM)

Nonilon I. Martin and Cariel Q. Abad

PRiSM utilizes satellite data, remote sensing, GIS, and crop modeling to estimate rice areas planted and seasonal yields. This generated information is validated through field monitoring, which is conducted in 16 regions using standardized field protocols and smartphone-based data collection forms and applications. Field protocols cover monitoring field locations, farm profiles, photos, crop growth stages, management practices, and damages due to flood and drought.

These data are collected in active monitoring fields (MFs) as identified by the regional partners.

In 2023, PRiSM monitored 10 and 82 MFs across Region 1 during the first and second semesters, respectively, distributed in 11 municipalities across four provinces. Data collected included field profile, cultural management, crop/field status, production data, fertilizer usage, and crop cut. Some 120 rice and non-rice validation points were gathered per region, per semester. The team monitored 10 Tropical Cyclones (TCs) and conducted 2 TC field damage assessments. Early-planted rice areas were validated during the 2nd semester. All available and validated field data were used for satellite imagery analysis, calibration of thresholds for rice classification, and accuracy assessment of rice area, yield, and flood-affected rice maps. PRiSM also surveyed prevailing prices of fresh and dry palay from January to September. Summary reports were submitted to the PRiSM Unit, and the Bantay Palay App was used from October to December for price surveys.

CORE-FUNDED PROJECT 11:

Evaluation and Packaging of Fertilizer Products for Balanced Nutrition of Irrigated Lowland Rice (Fertilizer Derby)

Joel G. James, Angelica L. Bitanga, and Robin S. Ladera

The project evaluated FPA-approved fertilizer products for rice production. In 2023DS, Enviro Scope Synergy Incorporated and Inavet Nutrition Technologies Inc. were compared to PhilRice Technology and Farmers' Practice. NSIC Rc 480 was used in the field trial, while Rc 442 was used during WS 2023. During theWS 2023, VVZ Corp. Incorporated was included in one fertilizer trial, showcasing the nutrient management technologies using a mechanical transplanter. Both field trials were established at DA-PhilRice Batac with full supplemental irrigation from a shallow tube well. Cultural management based on the PalayCheck System was applied to all the participating entries with the only variation on the nutrient management protocol of each participant.

In 2023DS, Inavet Nutrition Technologies Inc. gained the highest actual yield of 5.88t/ha, and crop cut yield of 8.15t/ha. PhilRice technology produced the second biggest actual yield of 4.98t/ha and crop cut 6.05t/ha, followed by Enviro Scope Synergy Inc. with 4.20t/ha and crop cut 6.21t/ha and Farmers' Practice actual yield of 2.52t/ha, 4.29t/ha crop cut.

During WS 2023, Farmers' Practice gained the highest actual yield of 5.91t/ha, and crop cut yield of 6.66t/ha, trailed by the Inavet Nutrition Technologies Corp with an actual yield of 4.83t/ha, 6.59t/ha crop cut, followed by VVZ Corp. Incorporated actual yield 4.77t/ha, 5.98t/ha crop cut, and Enviro Scope Synergy Inc. 4.60t/ha, 5.84t/ha, PhilRice technology with 4.24t/ha, 5.22t/ha. In DS 2023 the cost of production ranged from PhP64,942.43/ha to PhP75, 107.74 /ha; WS 2023 cost ranged from PhP 51,070.53/ha to PhP70, 403.04 /ha. Cost per kilogram output during DS 2023 ranged from 25.82kg/ha to 12.77kg/ha while during WS 2023 ranged from 15.05kg/ha to 10.71kg/ha.

CORE-FUNDED PROJECT 12:

Performance Evaluation of the Gear-Transmission Power Tiller with Multiple Applications for Dryland Conditions

Arnold S. Juliano, Lex C. Taguda, Richard Paul F. Pungtilan, and Massimo Vico U. Quinajon

Agricultural mechanization increases the efficiency of farm operation and utilization of inputs and lowers production costs and postharvest losses. The gear-transmission power tiller with multiple farm attachments such as rotovator, harrow, riding-type leveler, transplanter, and paddy seeder was developed and field-tested. The prototype equipped with 10hp diesel engine has a forward speed of 2.77 km/h, fuel consumption of 1.97Li/h, actual field capacity of 0.12ha/h (0.96ha/day), and field efficiency of 70% using the rotovator attachment. In using the harrow attachment, the prototype has a forward speed of 3.4km/h, fuel consumption of 1.7Li/h, actual field capacity of 0.29ha/h (2.32ha/day), and field efficiency of 78%. In using the riding-type leveler attachment, the prototype has a forward speed of 3.8km/h, fuel consumption of 1.8Li/h, actual field capacity of 0.48ha/h (3.84ha/day), and field efficiency of 75%. In using rice transplanter attachment, the prototype has an average distance between hills of 16.05cm, an average depth of planting of 5.53cm, an average number of seedlings/hill of 7, percentage missing hills of 4.42 %, an actual field capacity of 0.14ha/h (1.12ha/day), and field efficiency of 77%. In using paddy seeder attachment, the prototype has an actual capacity of 2.64 ha/day (0.33 ha/hr) with 85.14% field efficiency using 1st gear setting of the prototype. Its average numbers of seedlings per sq.m. for low, medium, and high setting are 97, 114, and 196, respectively. Based on the data gathered, the prototype shows a promising performance. According to the study, the machine can significantly lower the operating cost by 10.59% for land preparation, 35.92% for manual transplanting, and 39.17 for mechanical transplanting, as compared to the manual operations.

A complete set of the GTPT with LP and CE attachments was deployed to DA-PhilRice Batac. Training of operators and engineers in actual field operation was conducted with positive feedback. The unit was demonstrated during Lakbay Palay with positive impressions from almost all participants.

EXTERNALLY FUNDED PROJECT 1:

Development of Low-Glycemic Index Rice through Induced Mutation and Marker-Assisted Selection

Teodora E. Mananghaya, Mae Rose M. Maoirat-Abad, Ria C. Yate, Rheumel Kheem A. Albano, Janet Q. Polipol, and Harley Q. Gorospe

NSIC Rc 160 was mutated using gamma-irradiation, chemical, and double mutagenesis. Trait-based SNP genotyping exposed that 489 of 500 mutant lines evaluated had favorable alleles to Saltol, 473 to drought, but no allele was positive to NAL1, DEP1, Pi33, Pb1, and Pik. RM01-742-224-12-84 showed multiple traits exhibiting alleles for Saltol, drought, Pi54, and Pik for blast resistance. Seven mutant lines exhibited positive allele to three SNP markers for waxy genes; five of the lines showed high amylose content and have resistant starch at 1.01-4.05. Three mutants had high resistance to starch and may have potential for intermediate- to low-GI rice lines.

Distributed were 500 copies of an IEC material 'Understanding Low-GI Rice," a policy brief "Increasing Awareness on Low Glycemic Index and Healthier Rice Options for Filipinos" was drafted.

EXTERNALLY FUNDED PROJECT 2:

Field Trials of Genetically Engineered High-Iron and Zinc Rice Event IRS 1030-031 and IRS 1030-039

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The world's most common micronutrient deficiencies are in iron and zinc. In the Philippines, anemia among infants (6 months to 1-year-old) has risen to 48.2% while of stunting remains high at 35.1% in 6-7- year-old schoolchildren (FNRI-DOST, 2018); Zn deficiency causes stunting. Biofortification of rice to increase micronutrient content is one of the sustainable options to complement existing approaches to alleviate this "hidden hunger". Milled grains of popular rice varieties contain approximately 2ppm Fe and 16ppm Zn. The transgenic approach for biofortified rice has targeted 10ppm of Fe and 28ppm of Zn in milled grains to fulfill approximately 30% of the estimated average requirement (EAR) in humans.

The dry season 2023 field trial of High-Iron and Zinc Rice Events was completed in June 2023, as being declared by the BPI-Biotech, DOST, and other regulating bodies during the final fallow period monitoring. The field trial generated data for environmental risk assessment and agronomic performance; collected grains and straw for nutrient composition analysis and protein expression analysis; and harvested seeds that will be used for the next trial if needed.

All pertinent data required by the project were gathered in accordance with government procedures and guidelines, and biosafety measures were strictly observed during trial.

EXTERNALLY FUNDED PROJECT 3:

Malusog Rice in Region I

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During the DS 2023, Malusog Rice was planted in a total area of 8.63ha in the City of Batac, Dingras and Piddig, Ilocos Norte, and 4.10ha in Balungao and Mangatarem, Pangasinan. In the WS 2023, 4.51ha were planted with MR in DA-PhilRice Batac and Piddig; 8ha in Pangasinan under the seed and grain production areas. The DS average yield in Ilocos Norte was 3.6t/ha, with the highest yield of 5.2t/ha; WS average (4.5t/ha) was higher, with 6.6t/ha as highest yield - all obtained by Mr. Raquimar L. Alonzo in Piddig. In Pangasinan, DS yield was 5.3t/ha; a lower 4.6t/ha in the WS. Briefings, exhibits, taste tests, farm walks/field days, social media postings, e-newsletter publications, and radio interviews were pursued. Malusog Rice was also promoted during the National Women's Month in March, Nutrition Month in July, and National Rice Awareness Month in November.

EXTERNALLY-FUNDED PROJECT 4:

Stress Tolerant, High Yielding Rice Variety Suitable for AFACI Member Countries and Germplasm Utilization for Value Added (GUVA)

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Drought, salinity, high and low temperatures, and submergence, severely impact local farming communities that have to live with low grain yields, particularly in the rainfed ecosystem that obtains in approximately 1.5 million hectares nationwide. One field setup for stress and non-stress conditions with 140 entries (100 from IRRI, 30 from PhilRice, 5 local and 5 global checks) was maintained in Cabuusan and Pias, Currimao, Ilocos Norte.

Under stress conditions, yields ranged from 175 to 4746kg/ha, averaging 2265kg/ha. Non-stress conditions saw higher yields ranging from 1371 to 7666kg/ha, averaging 4002kg/ha. Selected were 14 entries under stress conditions with an average yield of 3354kg/ha. Under non-stress conditions, 12 entries were identified with the highest yields averaging 6113kg/ha, ranging from 6206 to 7666kg/ha. Under stress conditions yield advantage of top-performing entries over the best check variety, IRRI 176, ranged from 1 to 42 percent; under non-stress conditions, 1 to 25 percent.