2019

PHILRICE R&D HIGHLIGHTS

BICOL BRANCH STATION

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BRANCH STATION

PhilRice Bicol

Station Director: Victoria C. Lapitan

Executive Summary

PhilRice Bicol develops, adapts, and promotes technologies that make rice farming in calamity-vulnerable regions of Bicol and Eastern Visayas more resilient to climate change. The station implements these goals through six projects, namely: Capacity Enhancement and Technology Information Campaign, Rice Seed Systems (RSS), Rice Business Innovations System (RiceBIS), Reducing Vulnerability through Palayamanan® Plus Approach, Vulnerability and Risk Assessment in Stress-Prone Rice Ecosystems, and Long-Term Soil Fertility Experiment. Of these six projects, one is GAD-responsive while four are GAD-sensitive implying that the station addresses gender equity. In addition, program-based projects such as Philippine Rice Information System (PRISM) and Multi-Stress Trials of Breeding Lines in Rainfed Lowland and other projects such as Rice Crop Manager (RCM), Rice ICM 7-7 Challenge, and Development of an Integrated Crop Management (ICM) Package for Rice in Saline-Prone Areas for Increased Productivity are also being implemented to generate data and information necessary in the development of rice technologies under stress-prone environments.

In 2019, the Capacity Enhancement and Technology Information Campaign reached 13,036 rice stakeholders, which is 18% higher than the current target of 11,500 and is substantially higher than the 2,265 clients reached last year. Meanwhile, 1,376 clients (806 male and 570 female) were catered through on-station visits and field tours, training programs, workshops, and fora organized by other agencies, in which the station's technical experts served as resource persons. In addition, 10,370 rice stakeholders were reached through information campaigns (i.e., PTC, 30%; FB, 63%; info caravan and exhibits, 7%).

Mass-based technology promotions were also conducted on-station and on-farm to promote mature rice technologies, reaching 837 (507 male and 330 female) farmers, IPs, ATs during the station's Lakbay Palay and through five farmers' field days.

The station distributed 53,940 PhilRice knowledge products through the One-Stop Information Shop (OSIS) located and maintained in six state universities and colleges in Bicol (CBSUA, BUCAF, SSC, CNSC, CSU, and DEBESMSCAT), 1 in Eastern Visayas (UEP), and in five PalayTambayan sites of the RiceBIS communities (GPA, HRISIA, NFA, and UFMPC).

To provide better technology recommendations and cultural management practices to farmers in stress-prone environments, benchmarking and risk assessments were conducted, which will generate baseline data and maps. The project estimated 73,681ha or 44% of the total lowland rice area of 166,268ha that are prone to flooding (13%), submergence (7%), drought (21%), and salinity (4%). A physical map on pest incidences was also developed identifying rice bug, stem borer, and leaf folder as prevalent pests; and Echinochloa crus-galli, Leptochloa chinesis, and Echinochloa glabrescens as dominant weeds.

Results also showed low level of rice mechanization in Bicol at 27%. Some 45 agricultural machine establishments mostly located in Camarines Sur were identified to commonly fabricate hand tractor and thresher.

Online google map (MyMaps) on stress-prone rice areas containing characteristics of soils and farmers' practices in Bicol Region was also developed. For the Long-term Soil Fertility Experiment that started this year, data on yield, plant tissue, and soil fertility were collected in saline-prone areas .
In the PRISM project, location-specific data on rice area, yield, yield gap, and probable causes of the yield gap were provided to plan interventions accordingly.

For the Palayamanan® Plus project, two upland communities in Buhi, Camarines Sur and Casiguran, Sorsogon were characterized. The upland rice and rice-based communities indicated a traditional type of farming system with limited farm inputs applied and low yield (0.5-1t/ha). Mushroom production training was conducted to 57 participants (68% are female).

One on-station Palayamanan® Plus demo farm was established, which assessed the productivity and sustainability of rice/seed production, mushroom production, vermicomposting, vegetable production, and rice-fish-azolla production in a climate-change prone rice ecosystem utilizing available farm resources for biomass recycling to reduce production cost.

Under the Rice Seed Systems (RSS) project, the station partnered with six accredited seed growers to establish *Binhing Palay* farms, which will serve as demonstration areas of new and adapted rice varieties. Major issues in the seed production systems in Bicol were also identified, such as low use of accredited seed production areas due to farm tenurial status, aging, and poor technical capacity of the seed growers, lack of postharvest facilities, delays in seed certification process, and low seed production efficiency.

For the Rice Business Innovation Systems (RiceBIS) Community, seven RiceBIS clusters were organized in irrigated rice ecosystems in Albay. Initial data from the dry season cropping showed promising results from dried *palay, palay* trading, and farm machine rental services as enterprises. Net income ranged P424,531 to P1.2M and ROI of P13.35-P35.91.

These outputs have contributed to outcome 1: increased productivity, cost-effectiveness, and profitability of rice farming communities in a sustainable manner; outcome 2: improved rice trade through efficient post production, better production quality, and reliable supply and distribution system; outcome 3: enhanced value, availability and utilization of rice, diversified rice-based farming products and byproducts for better quality, safety, health, nutrition, and income; outcome 6: enhanced partnerships and knowledge management for rice R4D; and outcome 7: strengthened institutional capability of PhilRice.

PROJECT 1

Promoting Rice Science through Capacity Enhancement and Technology Information Campaign

KR Paliza, MAR Orbase, GH Morente, AF Nillo, and DBY Sadullo

The project was designed to capacitate the intended clients through training programs, seminars, *PalayAralan*, fora, and Knowledge Sharing and Learning (KSL) activities and to promote cost-reducing and yield-enhancing technologies through Lakbay Palay, exhibits, advocacy campaigns and distribution of PhilRice Knowledge Products (KPs). It has wo components: (1) Enhancing Capacity of Various Rice Stakeholders to Increase Knowledge on Rice and Rice-Based Farming and (2) Increasing Rice Science & Technology Awareness through Information Campaign.

Under Component 1, the following activities were conducted: three seminars, five *PalayAralan*, three training courses/ programs, and one *Lakbay Palay* in Bicol Region. Requests from other government and non-government agencies for station's visit (4) and technical experts (10) for their respective training were accommodated. Two batches of on-the-job (OJT) training, one work immersion of senior high school students, and one thesis mentorship were also accommodated. Using the learning farm as a tool, the project showcased at least three mature rice technologies and different cultural management in five growth stages of *palay*. Through these initiatives, the project reached 2,076 individuals, which was 38% and 94% higher than the clients reached in 2018 and 2019, respectively. For this year, about 10% (200 clients) of the total reached were farmers, of which 88% had at least 75% knowledge gained. Of the 40 female participants who attended the training, 37% were farmers; 35%, employed; and 18%, retired professionals and OFWs.

To enhance timely decision-making, agricultural knowledge was made available and accessible to the clients through the One-Stop Information Shops (OSIS) established and maintained in seven state universities and colleges (1 in each 6 provinces in Bicol and 1 at the University of Eastern Philippines in Northern Samar), five RiceBIS communities in Albay through PalayTambayan, and the Municipal Agricultural Offices which served as repository of PhilRice KPs. Rice-related technologies and information and PhilRice KPs were promoted and distributed in eight exhibits showcased in major festivities in the regions and farmers' field days; reaching 8,482 clients.

PhilRice Bicol social media page was also used as a platform to disseminate rice-related information reaching 3,252 clients. Of the total individuals reached, 54% are male and 46% are female signifying an almost equal proportion of men and women accessing the page; thus, creating an equal opportunity for access to information and space for voicing rice and rice-based related concerns. Notably, most of the page audience are young, aged 18-24 (22%), 25-34 (33%), and 35-44 (23%).

Overall, an equal number of men (51%) and women (49%) clients were reached signifying that both sexes were provided equal opportunity and access to rice and rice-based technologies and rice-related information.

Enhancing Capacity of Various Rice Stakeholders to Increase Knowledge on Rice and Rice-Based Farming

KR Paliza, GH Morente, MAR Orbase, and AF Nillo

Through various training, seminars, and fora, farmers and other rice stakeholders in Bicol and Eastern Visayas regions were capacitated on modern rice production technologies and techniques. There were 2,076 individuals (57% male and 43% female) reached through seminars (3), Palay-Aralan (5), training programs/ courses (3), Lakbay Palay (1), on-the-job (OJT) training programs (2), work immersion of senior high school students (1), thesis mentorship (1), visit to the station (4), and technical dispatch on training programs/courses conducted by other government agencies (10). The said number was 38% and 94% higher than the clients reached in 2018 and 2019, respectively. About 10% of the clients reached were farmers (200). Among the farmers reached, 88% had at least 75% knowledge gained as measured in pre and post-tests. Using the learning farm as a tool, PhilRice Bicol showcased the rice and rice-based production technologies and strategies.

Among the activities conducted, clients and stakeholders were reached mostly through the station's visit and Lakbay Palay (41%) and through technical dispatch of experts on seminars and training organized by other agencies (35%). Notably, clients rated PhilRice technical experts as excellent while a very satisfactory rating for training, seminars, and Palay-Aralan were gained from the participants. Field visits were rated satisfactory.

There were more male (57%) than female (43%) clients who attended the activities indicating that they are more interested to learn about farming. Data show that 75% of the female participants were on their productive years with ages ranging from 20 to 59 years old. These female participants were categorized as farmers (37%), employees (35%), retired professionals and OFWs (18%), and students (10%).

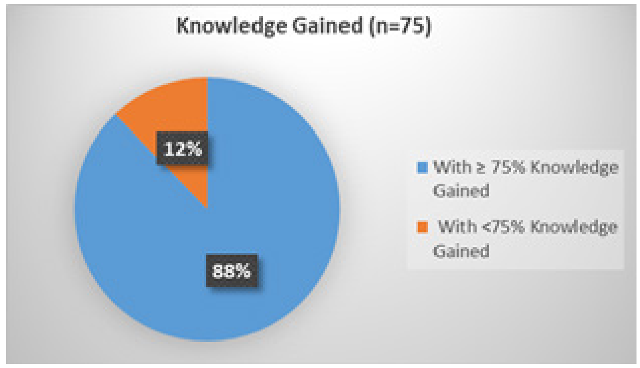

Figure 1a

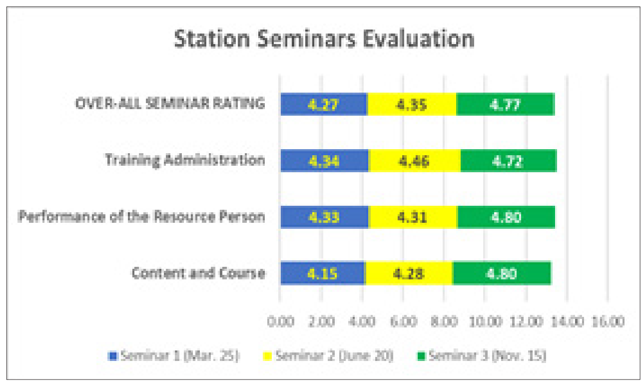

Figure 1b

Figure 1a and 1b. Proportion of farmer-participants with increased knowledge gained from Quarterly Seminar Series

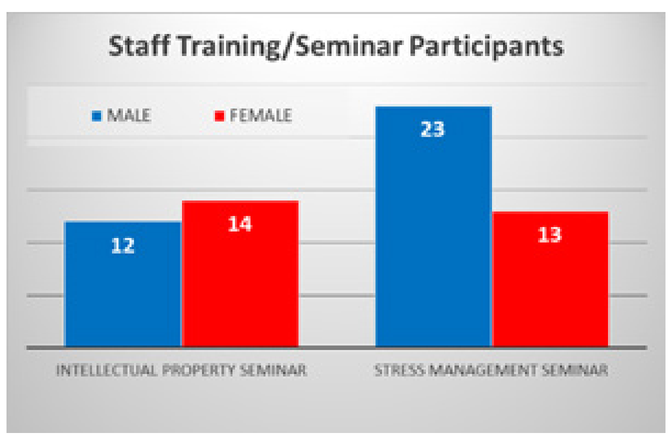

Figure 2a

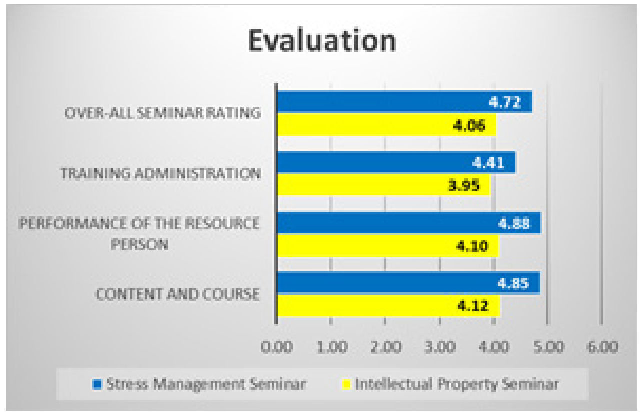

Figure 2b

Figure 2a and 2b. Evaluation of staff during training programs

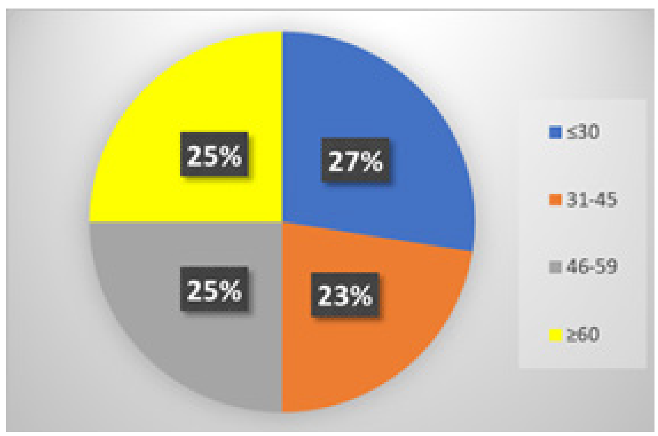

Figure 3a

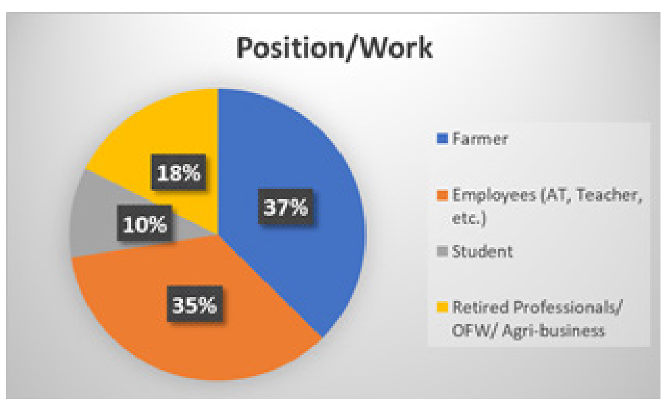

Figure 3b

Figure 3a and 3b. Summary of clients trained and reached through capacity enhancement activities

Increasing Rice Science and Technology Awareness Through Information Campaign

GH Morente, KR Paliza, MAR Orbase, and DBY Sadullo

Overall, 11,207 clients were reached through OSIS, exhibits, PTC, social media, and mass-based promotion such as Lakbay Palay and field days. This year, 53,940 PhilRice KPs were distributed through the One-Stop Information Shop (OSIS) located and maintained in the state universities and colleges (SUC) in six provinces of Bicol and one (1) in Northern Samar of EV. Five OSIS in RiceBIS communities, i.e, PalayTambayan were also installed to serve as repositories of PhilRice KPs. To further enhance the information campaign, the station joined in eight exhibits, which showcased rice and rice-based technologies. PhilRice KPs were also distributed during Lakbay Palay and other field days to 837 (507 male and 330 female) rice stakeholders. PhilRice Bicol social media page was also used as a platform to disseminate rice-related information reaching 3,252 clients (54% male; 46% female). The age group of those who access the social media page are in 18-24 (22%), 25-34 (33%), and 35-44 (23%). There were 3,064 clients who registered in the PhilRice Text Center (PTC).

Banhi para sa mga Bisakol: Strengthening the Rice Seed Systems in Bicol and Eastern Visayas Regions

RT Dollentas, JRF Mirandilla, AMD Manato, and GCC Enot

Use of high-quality rice seeds (HQS) can contribute to an increase in grain yields by 5-20%. However, utilization rate for HQS in the Philippines is low with only about 50% of the total harvested rice areas in the country. In Bicol, particularly in Catanduanes and Masbate, utilization rate for tagged seeds is only 30% (DA-RFO5, 2018 data) while only 31% in Eastern Visayas Region (DA-RFO8, 2018 data). Limited access and availability and low awareness on the advantage of using HQS are the major factors affecting low utilization.

Hence, the project intended to increase the utilization rate for HQS of inbred varieties (HQiS) through enhancing its availability and accessibility in Eastern Visayas (Region 8) and Bicol (Region 5). Specifically, it identified effective strategies and interventions that can improve the production and availability of HQS through benchmarking the current seed production systems of the 232 male and 66 female accredited Bisakol seed growers (ASGs). The project also identified the involvement of few numbers of women in the rice seed production and possibly enhance their participation in the industry. It also aimed to develop a planting map schedule, which can aid seed growers in ensuring timely availability of HQiS to the farmers. It also established Binhing Palay farms to serve as immediate source of HQiS, demonstrate the advantage of using HQiS, showcase the performance of new varieties, and identify adapted varieties in the locality.

Ninety-one ASGs or 67% of the total ASGs in Bicol were profiled and characterized. From them, five major issues were identified: unoptimized utilization of accredited seed production areas due to farm tenurial status, aging and poor technical capacity of the ASGs, lack of postharvest facilities, delays in seed certification process, and low seed production efficiency due to less number of quantities submitted for certification over the production. Thus, the following are recommended: ASG must have a leased agreement with the farm-owner for 3 years; develop new breed of ASGs and enhance conduct of training programs/courses for seed growers accreditation with emphasis on PalayCheck®, diagnostic and ICT-based tools for rice production; conduct of on-farm technology demonstration activities and training prgrams/ courses to capacitate ASGs; organize ASG into a farmers' group to avail of the mechanization programs; enhance government support to ASGs like procurement of their produced through rice programs; and strictly implement Seed Act and/or the seed certification guidelines or revisions thereof.

In addition, women are viewed as weaker farm workers. Fourteen or 22% of the ASG respondents were female who were mainly involved in farm supervision, record-keeping, and seed marketing. Generally, men workers are still preferred over female farm workers because they are stronger and more capable of doing hard labor. However, women were also found to be significant workers during transplanting as they plant more erect seedlings, follow the straight-row planting, and the 2-3 seedlings/hill. Women were also found to be the only available labor force in the community for transplanting, weeding, and harvesting. They were also preferred during rouging as they are perceived to be more meticulous than men.

Primary and secondary data are also being collected and processed to develop planting calendar maps, which will be recommended for seed growers to ensure timely availability of high-quality inbred seeds to the farmers.

The project has also partnered with six ASGs in Bicol to establish the Binhing Palay farms using foundation and registered seed class. For the dry season, the top 5 national recommended varieties were showcased with NSIC Rc 222 as the best performing and preferred variety in Camarines Sur, Camarines Norte, and Sorsogon, while NSIC Rc 238 and Rc 300 in Albay. For the wet season, new varieties such as NSIC Rc 352, Rc 402, Rc 438, and Rc 480 (Grain Super Rice) were tested and showcased in Sorsogon and Catanduanes. New Salinas rice varieties such as NSIC Rc 182, Rc 290, Rc 392, and Rc 464 were also grown in Catanduanes. Harvests for the wet season will start by end of November.

Benchmarking activities, encoding, and further analysis of data gathered on seed production systems in the Bicol Region are still in process. However, initial outputs of the project are already significant in understanding the rice seed systems in the region, identifying the gaps and bottlenecks in the existing systems and recommend interventions to improve the availability and accessibility of HQiS in Bicol. Likewise, the project helped in promoting the adoption of HQiS of new rice varieties.

Binhi Palaykasin: Invigorating the Production of High-Quality Inbred Rice Seeds in Bicol and Eastern Visayas Regions

RT Dollentas and AMD Manato

The study hoped to ensure availability and accessibility of high-quality inbred rice seeds (HQiS) in Bicol (Region 5) and Eastern Visayas (Region 8) by improving the seed production systems and practices of the accredited seed growers (ASGs). It identified gaps and constraints on rice seed systems in the regions through benchmarking the seed production practices of 232 male and 66 female members of ASGs. List was updated to 207 Bicol ASGs from last year's 172. From the list, 67% (138) are active while 67% or 91 of the active ASGs were interviewed in Masbate, Camarines Norte, with some parts of Camarines Sur will be surveyed. Of the total respondents, 14 or 22% were female. However, only 65 of 91 interviewed ASGs were included in the initial analysis as data are still being encoded.

Development of Planting Calendar for Inbred Rice Seed Production in Bicol and EasternVisayas Regions

JRF Mirandilla

Timely availability of high-quality inbred rice seeds (HQS) is crucial to ensure its utilization and adoption by the farmers. Hence, the study aimed to develop a seasonal rice planting calendar for Bicol (Region 5) and Eastern Visayas (Region 8) to aid seed growers in identifying specific periods to prepare and establish the rice seed production areas and eventually for effective and timely distribution of HQS.

For 2019, the study focused on Bicol as the pilot region. Collection of primary and secondary data such as weather data, geographical coordinates, and actual planting dates of the seed production areas are still on-going. Start of season maps were also requested from Philippine Rice Information System (PRISM) project. Maps of rice areas and planting season dates were generated using satellite images from March to September 2019. Geographical coordinates of the seed production areas of the 91 accredited seed growers in Bicol Region were collected during benchmarking activities (Study Component 1 of the Rice Seed Systems Project) and from the provincial seed coordinators. The collected geographical coordinates of the seed production rice areas will be used in projecting the ideal periods to establish the seed production areas ahead of the common practice of the farmers in the region. Data are still being consolidated.

Planting calendar map for Eastern Visayas Region will be developed after validating the outputs for Bicol.

Binhing Palay Demo: The Varietal Demonstration Cum Seed Production of High-Quality Inbred Rice Seeds for Bicolano and Bisaya farmers

RT Dollentas

The varietal demonstration cum seed production or the Binhing Palay farm was used as a modality to enhance access and utilization of HQiS of appropriate varieties in Bicol and Eastern Visayas Regions. Four Binhing Palay farms were established during dry season and three during the wet season in partnership with six accredited seed growers in selected provinces.

In the dry season, NSIC Rc 222, Rc 160, Rc 238, Rc 216, and Rc 300, were showcased in Camarines Norte, Camarines Sur, Albay, and Sorsogon. NSIC Rc 222 was the best performing variety in all sites with an average yield of 6.61t/ha. It gained the highest yield in Camarines Norte despite occurrences of flooding at early crop stage and drought at maturity. NSIC Rc 222 was also the preferred variety identified during the field day in Libmanan, attended by 107 farmers who said that the variety is high-yielding, and has high milling recovery and resistance against tungro virus.

NSIC Rc 238 and Rc 300 were the best performers in Albay. During wet season, new and promising varieties such as NSIC Rc 352, Rc 402, Rc 438, Rc 480, and Rc 222 were showcased in four sites in Irosin, Sorsogon. In Catanduanes, NSIC Rc 222, Rc 438, and Rc 480, were grown including Salinas varieties such as Green Super Rice 8 (GSR8), NSIC Rc 182, Rc 290, Rc 392, and Rc 464. Wet season harvests will start by end of November.

The Binhing Palay farms showcased the advantage of using HQiS and served as the immediate source of HQiS in the area as foundation and registered seeds. Drought, which lasted until August, caused the delay of establishing Binhing Palay farms and non-establishment in some sites.

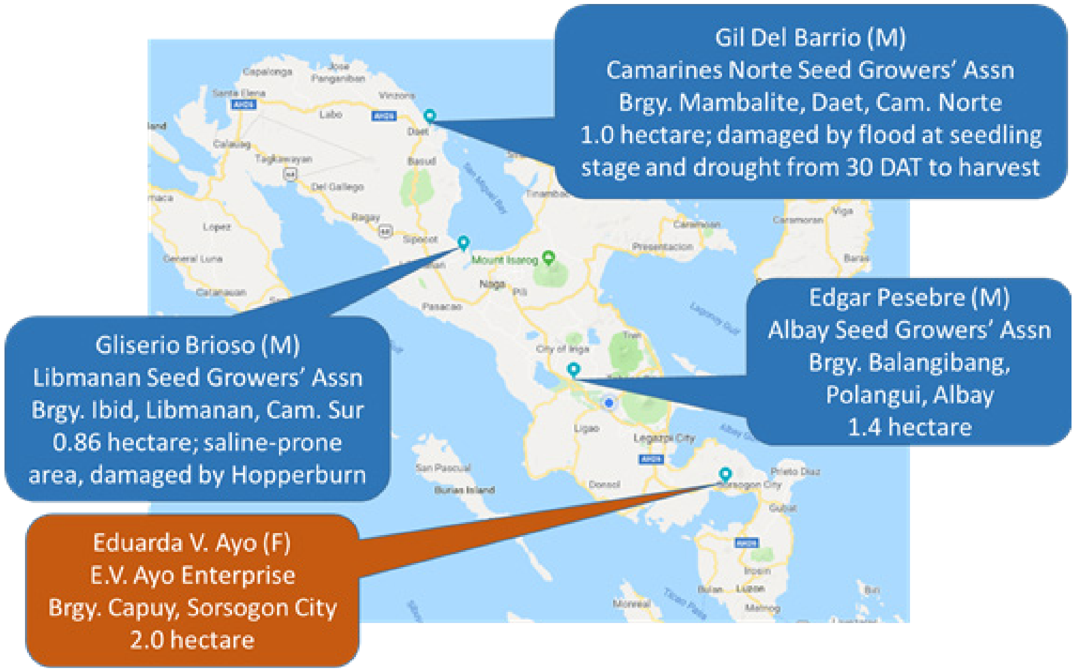

Figure 1a. Bicol Region Map showing Binhing Palay Farm Sites, 2019 DS

Figure 1b. Bicol Region Map showing Binhing Palay farm sites, 2019 WS

Rice varieties are introduced to farmers during the field day in Libmanan on May 6, 2019

Binhing Palay App is promoted to field day participants

PROJECT 3

Vulnerability and Risk Assessment of Climate Change-Affected Rice Ecosystems in Bicol Region

GB De Mesa

In Philippine rice production, floods, submergence, drought, and salinity are considered the main stress environments, which limit the attainment of a variety's full yield potential. Understanding the stress-prone rice ecosystems entails the collective information on climatic data, farming and cropping systems, local biophysical conditions (e.g., soil, plant, and biotic and, abiotic stresses) and the socioeconomic parameters (e.g., cropping calendars, varieties, seed and marketing system, indigenous knowledge and practices, coping mechanisms, cultural, absorbing capacity and economic status, level of mechanization, access to inputs, and credit). These information are necessary for the decision-makers in the rice sector to identify management strategies and suitable and location-specific technologies through careful site characterization and profiling of significant data.

This three-year research aimed to identify appropriate management intervention to help reduce vulnerability of farmers under stress-prone environments in the Bicol Region. It has three studies: (1) Benchmarking and Site Characterization of Stress-Prone Rice Areas in Bicol Region; (2) Profiling and Benchmarking of Pest Incidences in Stress-Prone Rice Areas in Bicol Region; and (3) Assessment of the Level of Mechanization in Bicol Region.

In study 1, the thorough site characterization, identification and analysis of farmers' socioeconomic status among rice farmers were benchmarked. About 166,268ha or 44% of the total lowland rice area in Bicol Region is under stress-prone rice ecosystems. The stress environment consists of 13% flood-prone; 7%, submergence-prone; 21%, drought-prone; and 4%, saline-prone. Effect of stresses is at its peak with flooding in December; submergence in November-December; salinity in August when tide is observed, and drought in April. Soil fertility status of Bicol Region shows that rice areas are moderate to high in nitrogen (N) and potassium (K) but low in phosphorus (P). Roles of women and men farmers were also identified. Men perform the hard labor from land preparation to post-harvest activities while women assist in farm activities and are more visible during planting and harvesting season.

With the information produced in this study, it is recommended to develop an effective integrated natural-resource-management interventions or programs, which include provision of appropriate and efficient irrigation control and drainage system, alternative source of irrigation facilities, stress-tolerant varieties, amelioration of saline/sea water intruded rice areas, mechanization options, delivery of more capacity-enhancement activities, and provision of affordable credit to farmers.

Study 2 was implemented to improve the productivity of stress-prone environments by providing information on pest incidences profile and recommended management intervention. The main output of the study is a database on pest incidences and a physical map that gives information on the pest incidences in Bicol Region. The major pests prevailing in stress-prone rice ecosystems were identified. A few traditional practices were noted as control measures for insect pests, weeds, rodents, birds, and GAS but still, most of the farmers resort to intensive chemical control across all stress-prone rice ecosystems. It is recommended to capacitate farmers under stress ecosystems through training and seminars related to pest management, which would also enhance indigenous knowledge on pest control. Proper monitoring of pest management practices can evaluate the impact of recommended interventions in reducing production loss and increasing yield.

Study 3 aimed to contribute to the advancement of rice mechanization in the Bicol Region. Database and physical maps on the level of rice farm mechanization and agricultural machinery establishments in Bicol Region were the outputs of the study. The level of mechanization and existing agricultural machinery establishments in the rice-producing municipalities in Bicol Region were represented through generated physical maps. An online map using Google MyMaps was also created to view its business profile and available machineries offered. There were 45 rice agricultural machinery establishments identified and geo-tagged in Bicol Region.

Characterized stress-prone rice ecosystems can support clienteles to increase yield through appropriate strategies and technologies that will combat the low yield barriers under stress-prone rice environments. The project's outputs included physical maps, infographics, and online databases that are readily available. These sources of information can be used in outlining appropriate intervention in stress-prone rice ecosystems in the Bicol Region. However, final and significant output of this project will be endorsed to other studies to be used as basis on crafting interventions to reduce vulnerability on stressed rice ecosystems.

Characterization and Benchmarking of Stress-Prone (Flood, Submergence, Drought, Saline) Rice Ecosystems in Bicol Region

GBDe Mesa, ARRivera, ARSRivera, DBYSadullo, and AF Nillo

The careful site characterization, identification, and analysis of farmers' socioeconomic status among rice farmers may generate a concrete solution for the policymakers, rice breeders and researchers to improve rice production. This study aimed to benchmark the socioeconomic profile of farmers, and characterize and map the stress-prone rice ecosystems in the Bicol Region. Survey interviews, secondary data collection, focus group discussions, participatory mapping, geo-tagging, and GIS mapping were used to generate physical maps and infographics.

Profiling and Benchmarking of Pest Incidence in Stress-Prone Rice Area in Bicol Region

AR Rivera and DBY Sadullo

Through farmer interviews and focus group discussions in selected stress-prone rice areas in Bicol, prevailing insect pests for each stress-prone environment were identified. Stem borer, grasshopper, and rice bug were the prevalent pests in saline, flooded, and submerged rice areas, while stem borer, leaf-folder, and rice bug in drought and multi-stress environments. Weeds, rodents, golden apple snail (GAS), and birds were also observed. Pests caused 50-100% reduction in yield when not controlled. Ninety-seven percent of the farmers use chemicals to control infestation. Some farmers use traditional pest management practices such as traps for rodents, fermented leaves plants (i.e., madre de cacao with chilli for insect pests), and grated neem fruit for GAS; manually weed the field; and scare away birds. However, lesser conduct of these practices was observed as they are laborious.

Fellow farmers and agriculture technicians are the main sources of information on rice farming. Most of the respondents (65%) attended seminars on rice farming and 42% on pest-related seminars. Based on the data, it is recommended to capacitate farmers under stressed ecosystems by attending training and seminars related to pests. Indigenous knowledge on pest control can also be enhanced to efficiently reduce pest incidences and production loss due to pests. Farmers endorsed for training must also be monitored if they practice the pest management strategies.

Assessment of the Level of Rice Mechanization in Bicol Region

ARS Rivera and AF Nillo

Rice farm mechanization can lower production cost, produce high-quality products, and increase farmers' income. Hence, level of rice mechanization including gaps and constraints in the adoption were assessed in Bicol's stress-prone environments. Of the 360 farmers interviewed, only 27% used rice farm machineries. Most of the farmers adopted machines for land preparation (51%) and postharvest operations (47%), while few farmers adopted machines for crop care and maintenance (8.27%). Crop establishment such as broadcasting of seeds, transplanting, fertilizer application, spraying, and weeding were done manually. Threshing and cleaning were fully mechanized. High price of machine, lack of technical know-how to operate the machine, and poor awareness on farming technologies limit mechanization.

Of the 45 agricultural machine establishments in Bicol, 17 are dealers, 13 manufacturer-dealers, 12 manufacturers, 2 distributors, and 1 manufacturer-distributor, which are mostly located in Camarines Sur. Hand tractor, rice thresher with blower, and axial-flow blower are the machines commonly fabricated.

PROJECT 4

Reducing Vulnerability to Climate Change Through Rice-Based Farming Systems Approach

GCC Enot

The project aimed to reduce the vulnerability to climate change of the rice and rice-based farmers in the stress-prone rice environments including rainfed lowland and upland areas through the following component studies: (1) Development of Climate Change Resilient Upland Rice-Based Farming System; (2) Development of Gender-Sensitive Palayaman Plus Farming System for Stress-Prone Lowland Rice Ecosystems; and (3) Assessment on the Productivity of the On-station Palayamanan Farming System.

For study component 1, the Palayamanan® Plus farming system was initiated in upland rice communities in Barangay Lubgan, Bula, Camarines Sur and Brgy. Inlagadian, Casiguran, Sorsogon.

Study component 2 of the project focused on reducing vulnerability of the rice and rice-based farmers in stress-prone lowland rice ecosystems. Target areas were characterized in another project, BIC-201, in which the results will be used in the identification of appropriate technologies in the areas.

Study component 3 assessed the productivity and sustainability of the on-station Palayamanan®, i.e., input (resources) and output (produced) system in climate change-prone rice ecosystems. On-station Palayaman had five components: rice/seed production, mushroom production, vermicomposting, vegetable production, and rice-fish-azolla production. Available farm resources were used as inputs to the different Palayamanan components for biomass recycling to reduce production cost. Actual production cost and yields were gathered and analyzed with ROI as a measure of profitability.

Development of Climate Change Resilient Upland Rice-Based Farming System in Bicol Region

GCC Enot and GH Morente

To reduce the vulnerability of the upland rice-based farming (URBFS) community to climate-change, the Palayamanan® Plus Farming System was initiated in Brgy. Lubgan, Bula, Camarines Sur and Brgy. Inlagadian, Casiguran, Sorsogon.

A focused group discussion with 31 male and 36 female participants was conducted to characterize the farming systems in the community. The farming system in Lubgan is traditional where farmers use draft animals to plow the soil, practice dry direct-seeding or broadcasting, do not apply fertilizers to the soil, and practice manual harvesting. On the other hand, the farming system in Inlagadian is more advanced as they use tractors to plow the soil and do dibbling to establish the rice crop. In both communities, chemicals are used to control pests, particularly the rice bug. Harvesting and threshing are done manually. Varieties grown are pigmented and aromatic upland rice from fellow farmers, private companies, local government units, including PhilRice. Upland rice yields are low ranging from 0.5 to 1t/ha, and most of the farmers do not own the lands they till.

More data will be collected on the resource, financial, and technical capacity of the target community to assess the vulnerability of the upland rice farmers. However, initial results indicated that upland rice farming systems need reinforcement to improve productivity and increase their vulnerability to changing climate. Mushroom production training was already conducted to 57 participants (68% are female) as potential source of income of the community. In both upland communities, 50-80% of the women participants in the focus group discussions were involved in light farm activities such as sowing, planting, weeding, and field monitoring. Hard labor such as spraying, land preparation, and hauling were performed by male farmers. Notably, women had high involvement in farm record keeping, buying of farm inputs, and selling of produce; suggesting an opportunity to develop their agripreneurial skills. Women can be trained on specific farm activities where they had notable involvement.

Assessment on the Productivity of the On-station Palayamanan Farming System

GCC Enot and JF Olivenza

The productivity of the on-station Palayamanan, i.e., input (resources) and output (produced) system, with five components; rice/seed production, mushroom production, vermicomposting, vegetable production, and rice-fish-azolla production, were assessed starting January 2019. Available farm resources were used as inputs to the different Palayamanan components for biomass recycling to reduce production cost. Farm wastes such as rice straws, grasses, leaves, and other organic material were used as organic fertilizer for vegetable cultivation. Rice hull was used as alternative fuel for fruiting bag inoculation. Rice straws were used as vegetable bed mulch and substrate for mushroom

production and vermicomposting. Actual cost of production and yields were gathered and analyzed ROI as a measure of profitability.
Available records were insufficient to provide conclusive results on the technology's profitability and productivity. Available data, however, showed that mushroom production was the most profitable with 223.8% ROI, followed by fresh *palay* production with 37.4%. Vegetable production recorded an ROI of 35.31%. Negative ROI of -69.3 % was obtained from rice-fish-azolla production due to overpopulation. Production of vermicompost is put on-hold as the shed is currently under rehabilitation.

Intensive documentation of the resources used in the production systems, including fixed cost and harvested products, is recommended to provide conclusive findings of the study. Meanwhile, data to be gathered were already laid out to produce a more significant output for rice and rice-based farming community.

PROJECT 5

Long-Term Soil Fertility Experiment

GCC Enot

Continuous and long-term use of inorganic fertilizers can have dramatic effects on soil fertility status and sustainability of production. Thus, measurement of the changes accruing in the area is important and critical in determining sustainability effects of long-term use of inorganic fertilizer on rice productivity, yield gap, and soil fertility were assessed in PhilRice Bicol in 2019 DS and WS. The experiment was laid in two-factor factorial in Randomized Complete Block Design in three replications using varieties/lines: NSIC Rc 160 (V1), NSIC Rc 222 (V2), and PR43504-14-3-1-1 (V3) and 6 levels of N-P-K i.e., 0-0-0 (F1); SSNM-30-100 (F2); 210-30-0 (F3); 210-0-50 (F4); 210-30-100 (F5); 0-30-50 (F6) for DS and replacing 120kg N rate with 80kg/ha for WS. Leaf Color Chart readings were collected for F1, F2, and F5 at 28DAT, 42DAT, and 55DAT. Yields were collected from 5m^2 per plot and 12 hills plant samples per plot at maturity for yield component. Initial data collected showed highest grain yield in F3/V3 treatment for 2019 DS with 9.7t/ha, and F2/V2 treatment for 2019 WS with 7.54t/ha. Processing of DS 2019 data, collection of yield component data for WS 2019, and soil laboratory analysis are still on-going.

Abbreviations and acronyms

AYT - Advanced Yield Trial
ABE - Agricultural and Biosystems Engineering
AEW - Agricultural Extension Worker
ATI – Agriculture Training Institute
AESA - Agro-ecosystem Analysis
AC - Amylose Content
BLB - Bacterial Leaf Blight
BLS -Bacterial Leaf Streak
BCA - Biological Control Agent
BS - Breeder Seeds
BPH -Brown Planthopper
BPI - Bureau of Plant Industry
CGMS - Cytoplasmic Genic Male Sterility
COF - Commercial Organic Fertilizer
CDA - Cooperative Development Authority
DAS - Days After Sowing
DAT - Days After Transplanting
DF - Days to Flowering
DM- Days to Maturity
DAR - Department of Agrarian Reform
DA-RFOs - Department of Agriculture-Regional Field Offices
DoF - Department of Finance
DOLE - Department of Labor and Employment
DTI - Department of Trade and Industry
DSR - Direct-seeded Rice
DS - Dry Season
FBS – Farmers' Business School
FC - Farmers' Cooperative
FSM - Farming Systems Models
FAA - Fish Amino Acid
FGD - Focused Group Discussion
FSP - Foundation Seed Production
FRK - Farm Record Keeping
GABA - Gamma-aminobutyric Acid
GT - Gelatinization Temperature
GAD - Gender and Development
GYT - General Yield Trial
GCA - Genetic Combining Ability
GIS - Geographic information system
GEMS - Germplasm Management System
GAS - Golden Apple Snail
GL - Grain Length
GQ - Grain Quality
GW - Grain Weight
GY - Grain Yield
GLH - Green Leafhopper
GOT - Grow Out Test
HR - Head Rice
HRA - Heat Recovery Attachment
HIPS – Highly-intensified Production System
HQS - High-quality Rice Seeds
HON - Hybrid Observational Nursery
HPYT - Hybrid Preliminary Yield Trial
ICT - Information and Communication Technology
IEC - Information Education Communication
IBNM - Inorganic-based Nutrient Management
ICM - Integrated Crop Management
IPM - Integrated Pest Management
JICA - Japan International Cooperation Agency
IRRI - International Rice Research Institute
IA - Irrigators' Association
KP - Knowledge Product
KSL - Knowledge Sharing and Learning
LCC - Leaf Color Chart
LFT - Local Farmer Technicians
LGU - Local Government Units
LPS - Low Pressure Steam-operated
LE-CYPRO - Lowland ecotype Cyperus rotundus
MFE - Male Fertile Environment
MSE - Male Sterile Environment
MAS - Marker-assisted Selection
MRL - Maximum Root Length
MR - Milled Rice
MER - Minimum Enclosing Rectangle
MOET - Minus-one Element Technique
MC - Moisture Content
MAT - Multi-Adaptation Trials

MCRTP - Multi-crop Reduced Till Planter
MET - Multi-environment Trial
MYT - Multi-location Yield Trial
NAAP - National Azolla Action Program
NCT - National Cooperative Test
NFA - National Food Authority
NRAM - National Rice Awareness Month
NSIC - National Seed Industry Council
NSQCS - National Seed Quality Control Services
N - Nitrogen
NBSP - Nucleus and Breeder Seed Production Project
NFGP - Number of Filled Grains Panicle
ON - Observation Nursery
OSIS - One-Stop Information Shop
OBNM - Organic-based Nutrient Management
PL - Panicle Length
PW - Panicle Weight
PVS - Participatory Varietal Selection
PWD - Person with Disabilities
PHilMech - Philippine Center for Postharvest Development and Mechanization
PRISM - Philippine Rice Information System
PhilRice - Philippine Rice Research Institute
PSA - Philippine Statistics Authority
PTC - PhilRice Text Center
P - Phosphorus
PVS - Plant Variety Selection
K - Potassium
QTL - Quantitative Trait Loci
RCBD - Randomized Complete Block Design
RSP - Registered Seed Production
RBB - Rice Black Bug
RCEF - Rice Competitiveness Enhancement Fund
RCEP - Rice Competitiveness Enhancement Program
RCM - Rice Crop Manager
RHGEPS - Rice Hull Gasifier Engine Pump System
RPH - Rice Planthopper
RSTC - Rice Specialists' Training Course
RTV - Rice Tungro Virus
RBFHS - Rice-based Farming Household Survey
KQ - Kernel Quality
SV - Seedling Vigor
ShB - Sheath Blight
ShR - Sheath Rot
SMS - Short Messaging Service
SNP - Single Nucleotide Polymorphism
SWRIP- Small Water Reservoir Irrigation Project
SRB - Stabilized Rice Bran
SUCs - State Universities and Colleges
SB - Stem Borer
TESDA - Technical Education and Skills Development Authority
TDF - Technology Demonstration Farm
TRV - Traditional Rice Varieties
TOT - Training of Trainers
TPR - Transplanted Rice
URBFS - Upland Rice-Based Farming
WS - Wet Season
WCV - Wide Compatibility Variety
YSB - Yellow Stem Borer

We are a government corporate entity (Classification E) under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos.

With a "Rice-Secure Philippines" vision, we want the Filipino rice farmers and the Philippine rice industry to be competitive through research for development in our central and seven branch stations, coordinating with a network that comprises 59 agencies strategically located nationwide.

We have the following certifications: ISO 9001:2008 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

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