2020

PhilRice R&D Highlights

Rice Seed Systems Program

Contents

PROGRAM

Rice Seed Systems Program

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EXECUTIVE SUMMARY

The Rice Seeds Systems (RSS) Program ensures that an adequate volume of high-quality seeds (HQS) of different varieties of different classes and types are produced, accessed, and distributed through the formal and informal seed systems. The RSS Program contributes to the attainment of the Institute's outcomes on the following: (1) increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner; (2) enhanced value, availability, and utilization of rice and by-products for better quality, safety, health, nutrition, and income; (3) science-based and supportive rice policy environment; and (4) advanced rice science and technology as continuing sources of growth. To achieve its goals and objectives, the program implemented projects that cover both inbred and hybrid rice, which are implemented across PhilRice stations; and heirloom rice, which PhilRice-CES and PhilRice-Isabela managed.

Despite the challenges brought about by the COVID-19 pandemic, the branch stations continued to gather baseline information on the availability of HQS and the status of distribution and utilization in their respective areas of coverage. The results helped them develop and improve their local rice seed systems, which will be implemented in 2021 under their Branch Development Initiatives. This is to ensure that the goals and objectives of the RSS Program will still be continued. In addition, all the branch stations, including PhilRice-CES, established and managed varietal trials cum seed production to increase awareness of farmers on the advantages of using HQS, see the performance of the newly-released varieties (500-series) and identify the best adaptable varieties in the areas through participatory varietal selection. For instance, farmers from Zambales, Aurora, Isabela, and Negros Occidental preferred NSIC Rc 506, Rc 508, Rc 510, and Rc 512 because of their high yields, resistance to pests and diseases, adaptability to their local conditions, and good-eating quality.

Meanwhile, PhilRice-Batac purified and rejuvenated the seeds of the two most popular traditional varieties (Ballatinaw and Waray) in Abra that ensures the availability of these varieties for the farmers in the areas. Likewise, PhilRice-Bicol, through its *Binhing Palay* Farms, produced HQS of adverse environment varieties such as rainfed, upland, saline prone, and multi-stress that farmers can also access. In addition, there are training activities conducted such as the Modified Farmer

EXECUTIVE SUMMARY

Field Schools on PalayCheck System, which capacitated farmers in Aurora, Bataan, and Zambales to produce their own HQS through the informal seed systems, and the Inbred Rice Seed Production Training, which trained prospective seed growers in Albay, Camarines Sur, and Sorsogon. To date, there are already 16 farmers from Aurora, Bataan, and Zambales who signified their interest to become accredited seed growers. All these efforts help ensure that HQS of adaptable and farmers' preferred rice varieties are available, accessible, and affordable at all times.

The program, in partnership with the Seed Component Group of the Department of Agriculture (DA), has developed two implementing guidelines: the issuance of special accreditation to seed growers to plant foundation seeds (FS) of inbred rice and open-pollinated varieties of corn (Administrative Circular 06, Series of 2020), and the revised implementing guidelines on seed multiplication, production, maintenance, and distribution of recommended superior food crop cultivars (Department Circular 08, Series of 2020). These were approved by the DA Secretary last May 11, 2020, and published in national newspapers last September 3, 2020. In addition, two internal administrative orders on the Use of the Improved Seed Production Protocol, the Minus-One Element Technique (MOET), and the MOET App for fertilizer management of the seed production of the Business Development Division (BDD) were issued in December 2020. It was proven that improved seed production and postharvest operations and the use of the MOET-based fertilizer management would improve seed quality and obtain higher seed yield. All these efforts will help achieve the program's goal of ensuring timely availability and accessibility of higher seed classes of different rice varieties, thereby guaranteeing the timely production and distribution of HQS of the different rice varieties needed and preferred by the rice farmers.

Meanwhile, the previously issued AOs (AO 2019-004 and AO 2019-005) were continuously implemented by the respective divisions, including the suggestions for the continuous assessments of seed production and postharvest operations in CES and branch stations such as the regular rouging at critical stages of the rice crop, and timely harvesting, threshing, drying, and cleaning. All these have contributed to the improved seed production efficiencies (SPE) for breeder seeds, with 66% for 2019 dry season (DS), 85% for 2019 wet season (WS), to 89% for 2020DS. In addition, 100% SPE for registered seeds at BDD-CES and selected branch stations were maintained this 2020DS. PhilRice-Agusan has also improved its operations making the seeds available from harvest for only 32 days, which is close to the ideal 30 days set if no dormancy was observed. This observation indicates that if postharvest operations are well programmed, the 15 days for Bureau of Plant Industry - National Seed Quality Control Services (BPI-NSQCS) to do the analysis and certification can be followed.

Results of the assessment of seed quality after harvest and during storage conducted this 2020DS from the seeds produced and stored in 2019DS confirmed that DS seeds are better in seed viability and vigor than WS produced. This is a good input to BDD seed production planning to address seed availability any time of the year. This can also be recommended to DA-Regional Field Offices to procure only DS-produced seeds for their buffer stocks. On the other hand,

the rice seed ordering system (via Kiosk), the geo-tagging app, and the seed production traceability information system developed will help in easy validation of the seed growers' (SGs) seed purchases and allocate the volume capacity based on accredited area. The geo-tagging app will also capture the location where the seed was planted and the actual area, which will aid policymakers in seed sourcing and positioning in case of calamities. Also, the nucleus seed to breeder seed (NS-BS) seed production traceability information system will facilitate seed traceability whenever a problem occurs in the seed production system. If these systems are well integrated into the BDD-IS, it will ensure more efficient monitoring and processing of seed purchases, facilitate the application of SGs for certification at PhilRice and BPI-NSQCS, and document the seasonal seed production process of the Plant Breeding and Biotechnology Division.

For the Public Hybrid Rice Seed Systems, targeted foundation seed production of 9,000kg S-line, 3,000kg P-line were not achieved, while the 1,500kg A-line and 500kg R-line of M1 and M20 parentals exceeded its targets by at least 343% for A-line and 422% for R-line. For S-line and P-line, only 52% of S-lines and 54% of P-lines were produced due to delayed BPI payment, which affected the seed production. Four public hybrids such as Mestiso 55, Mestiso 73, Mestiso 99, and Mestiso 103 are being tested for commercialization. Meanwhile, the F1 seed production trial of M20 in Buenavista, Quezon was established to cater to the needs for F1 seeds in Luzon and Visayas. In addition, about 129,598kg of F1 seeds of Mestizo 1 and Mestiso 20 were produced by accredited seed growers, which are available to any interested region. Despite the COVID-19 pandemic, a total of 20 technology demonstration fields were established and maintained in National Rice Techno Forum sites in Bukidnon and Butuan City; in Provincial Derbies in Ilocos Sur, Ilocos Norte, La Union, and Pangasinan; in-state colleges and universities in Tarlac, Quirino, Isabela, and Cagayan; and in selected PhilRice Stations. Five on-site/virtual field days and 12 field walks were conducted in these techno demo fields, where public hybrids also performed well. Across techno demo sites and cropping seasons, M20's yield ranged from 5.33t/ha to 8.73t/ha, while M1's yield ranged from 4.03t/ha to 9.3t/ha. Lastly, 200 bags (18kg per bag) of M20 were procured by the project to make the seeds available in PhilRice-Isabela. This will cater to farmers requesting public hybrid rice seeds via the PhilRice Text Center and PhilRice Facebook page.

For the heirloom rice project, 300 heirloom rice varieties were collected and characterized based on standard descriptors and are now conserved at the PhilRice Genebank. Through this, rare, unique, and near extinction heirloom rice varieties were identified and conserved, which can be repatriated should the farmers need them. Since heirloom rice varieties have excellent eating qualities, nutritional value, and health-promoting properties, it is necessary to evaluate the collected heirloom rice varieties to determine their market potentials. To help the farmers better market these heirloom rice varieties, 75 varieties with market potential were selected and evaluated for grain quality and proximate and phytochemical properties. Generally, anthocyanins, phenolics, and antioxidants were observed in all the varieties evaluated, but they have higher values when the rice is unpolished.

This suggests that most of the health-promoting properties of the heirloom rice varieties are localized in the bran layer. Meanwhile, to increase the yields and incomes of heirloom farmers, production and postharvest operations have to be improved. Farm machines used in the lowlands, such as the micro-tiller, thresher, and rice mills, were customized to suit the needs of the farmers and the conditions in the areas. These customized machines were field-tested, and five units each of these customized machine prototypes will be fabricated as per request of DA-RFO CAR. The Rice Engineering and Mechanization Division is also evaluating the possibility of patenting these utility models.

While the RSS Program is already terminated this December 2020, as recommended by the Think Tank Team, the goal of ensuring availability, accessibility, and affordability of HQS of different rice varieties must still continue. The component activities such as developing and improving the seed systems in specific areas and the establishment of varietal trials cum seed production must be continued by the branch stations under their Branch Development Initiatives. These will ensure that preferred and adaptable varieties are identified and made available to the farmers. To improve the seed production efficiencies of the BDD of all stations, the improved production and postproduction protocol already institutionalized should be followed, and all operations should be strictly supervised by a competent technical staff or seed production specialist. Consequently, the needed infrastructure and facilities to maintain seed quality must be established and improved, such as the reversible flatbed dryers seed cleaners with gravity separators to ensure the production of high-quality seeds, and the installation of shallow tube wells and pumps to allow earlier crop establishment and ensure readily available water when needed thus, addressing, the timely availability of FS and registered seeds to PhilRice clients. In addition, to increase seed yield and reduce fertilizer cost in seed production, the adoption of the Minus-One-Element (MOET) Technique kit and the MOET App as a tool in nutrient management in all BDD seed production plots must be used.

Meanwhile, the presence of public hybrids in the market must be maintained. The basic seed production and pre-commercialization activities must be strengthened, while the seed production and marketing are recommended to be handled by the BDD. Moreover, BDD should take a more proactive role in marketing the public hybrids for increased farmers' adoption. In addition, the Rice Seed Information System being developed must be fast-tracked and integrated into the systems developed for RSSP, RSIS, and Rice Competitiveness Enhancement Fund for deployment in 2021 so that the issues of seed production traceability, distribution monitoring, and seed demand forecasting are addressed. Accordingly, the heirloom rice project should be continued to address the gaps identified in Phase 2. The development of nutrient and pest management technologies is necessary to improve the heirloom farmers' nutrient and pest management practices, thereby increasing their farm yields and incomes. Ultimately, the policies and guidelines already in place should be continuously implemented and followed by the respective actors to sustain the gains created by the RSS Program.

PROJECT 1

Assessment/Improvement of Seed Production Protocols and Postharvest Operations

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The project is composed of three studies, namely: Evaluation of the Current Rice Seed Production Systems in CES and Branch Stations (RSS 002-001); Enhancing Rice Seed Production in all PhilRice Branches through Adoption of the MOET Kit and MOET App Technologies (RSS 002-002); and Ensuring Genetic Purity and Assessing Seed Quality after Harvest and during Storage in CES and Branch Stations (RSS 002-003).

In 2020, travel to branch stations was restricted owing to the pandemic COVID-19. Thus, the suggested improvement in the seed production protocol was assessed in three stations only, PhilRice-Agusan, PhilRice-Bicol, and PhilRice-Isabela. Seed sampling was ideally set 14 days after harvest in the suggested improved protocol; however, this was not achieved in the three stations evaluated. Very close to the set timeline for seed sampling was PhilRice-Bicol at 17 days, followed by PhilRice-Agusan at 19 days, while PhilRice-Isabela sampled the seeds at 34 days. This delayed process consequently affected seed availability. Seed availability in 2020 DS for PhilRice-Agusan was only 32 days from harvest. This was the shortest among the three stations, showing a great improvement in their operations. Furthermore, results of analysis and tags were also received by PhilRice-Agusan. Meanwhile, the certifying agency of PhilRice-Bicol completed the tests 35 days from harvest, but the results of the analysis and tags were not yet received. The delay in seed sampling even became an advantage to the certifying agency since all test procedures were done in less than 15 days.

RSS 002-00 aimed to increase the seed production volume and fertilizer use efficiencies through the adoption of the MOET kit and MOET App by the seed production unit of Business Development Division. MOET tests were conducted before 2020 dry season (DS) by CES, Central Mindanao University, and Agusan stations to generate variety-specific fertilizer recommendations. A total of 14 variety-specific fertilizer recommendations were implemented in 2020 DS across the three branch stations with an average yield advantage of 0.63t/ha relative to BDD's fertilizer management practice. The result was consistent with the previous cropping seasons in terms of delivering positive yield advantages starting at 0.63t/ha [(2018 wet season (WS)], 0.44t/ha (2019DS), and 0.24t/ha (2019WS). This 2020WS, no branch station participated in the trial except for PhilRice CES. Travels were restricted due to the pandemic, which meant monitoring the trials would be impossible hence, branch station setups were canceled. However, at BDD PhilRice

CES, five varieties were provided with MOET App recommendations based on the MOET kit test for 2020 WS. Results show an average yield advantage of 0.93t/ha, which was the highest so far from the four trials at the PhilRice CES BDD area.

Seed assessment of inbred carry-over seed lots produced in 2019 DS was conducted. Seed samples received from branch stations were from PhilRice-Bicol, PhilRice-Los Baños, and PhilRice-Midsayap. The only station with inbred samples submitted for re-testing was PhilRice-Midsayap, where the decline in registered seeds quality was observed in NSIC Rc 442. Its germination rate was only 74%, which was the lowest value obtained in all varieties tested. In contrast, NSIC Rc 480, a foundation seed from PhilRice-Bicol had 88%. Although lower than 90%, the percentage obtained was higher than the standard 85% required for commercial viability. The DS harvest maintained its quality under storage for eight to nine months. However, the rapid decline in seed viability of NSIC Rc 442 should be looked into and verified because it might be a varietal response to storage. If the variety is included in the regional varietal preference but exhibits poor storability, then this variety must be replaced.

PROJECT 2

Enhancing the Production and Promotion of High-Quality Inbred Rice Seeds

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The project developed options or strategies for an effective rice seed system for the rapid delivery and deployment of quality seeds of new or improved rice varieties at the farm level. The strategies identified to enhance the production and promotion of high-quality inbred rice seeds in areas with a limited number of seed growers include capacity enhancement on the production of high-quality inbred rice seeds, location-specific adaptability trial, and the use of strategic communication interventions. These strategies will greatly contribute to increased production, promotion, and adoption of high-quality inbred rice seeds. With enhanced awareness and knowledge on the benefits of using high-quality inbred rice seeds and producing their own quality seeds, farmers would save on production costs, maximize their yield potential, and have seed security for the next cropping seasons.

In 2020, three Training of Trainers (TOT) on the Production of High-Quality Inbred Rice and Seeds and Farm Mechanization were conducted with 55 (29 male and 26 female) agricultural extension workers, local farmer-technicians, farm school owners, and staffers. The first batch of training was postponed halfway due to the lockdown caused by the pandemic last March 2020. Meanwhile, these capacity-building activities for men and women stakeholders were co-implemented under the Rice Competitiveness Enhancement Fund Program.

Location Specific Adaptability Trial (LSAT) Technology Demonstration Farms (TDFs) were established and managed in selected municipalities of Aurora, Bataan, and Zambales to showcase the performance of the newly-released varieties using the PalayCheck System as a technology platform. Aside from demonstrating the performance of the newly-released varieties, the LSATs also served as seed production of High-Quality Seeds (HQS) of these varieties, which can be a source of HQS in the areas. In addition, it also served as a learning field for the participants of the Modified Farmer Field School on High-Quality Inbred Rice and Seed Production in the three provinces. Through the Participatory Variety Selection conducted during Farmer's Field Days, the best adaptable and preferred varieties were also identified from the different varieties tested. The results collected show that the LSAT helps increase the availability, accessibility, and affordability of high-quality inbred rice seeds that are preferred in the targeted areas.

To improve farmers' access to rice seed information, the project utilized the Short Messaging Service and knowledge products previously developed. In 2020, the project distributed RTB on "Pagpaparami ng Dekalidad na Binhi Sa Sariling Bukid" to 400 farmers in the project sites. Posters on rouging were also distributed to the farmers and partner local government units. The project also distributed USBs especially designed for the RSS program, including reading materials and the PalayCheck System presentations, to 200 farmers and 100 agricultural extension workers in the three provinces.

PROJECT 3

Development of Rice Seed Information System

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The project developed an Information System (IS) to improve the higher seed class production traceability for PhilRice. This system facilitates efficient planning and monitoring of the seed production activity, thus minimizing or eliminating the vulnerability of data loss due to poor file organization and difficulty identifying the cause of the problem when seed quality is compromised. The integration of ICT in the higher seed (HS) class production process will improve its traceability through organized, secured, and backed-up documentation of planned field activities and data collection.

The IS developed under the Rice Seed Systems (RSS) Program in 2020 were the program dashboard and the Plant Breeding and Biotechnology Division Seed Production Traceability System, which includes a production planner, a field data collection app, and a seed growers' profiling system.

The RSS program dashboard is a web-based interface that currently displays Seed Growers' (SG) profile data collected from the SG profiling system. At the same time, the PBBD Seed Production Traceability can document seasonal strategies through the seed production-planning interface, wherein users can input a strategy and easily review its success, facilitating its re-implementation in the next seed production season. This traceability system was introduced to key implementers from the division for testing and evaluation.

PROJECT 4

Enhancing the Rice Seed System in North-Western Luzon

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The short-term goal of the Philippine Government is to raise the national yield average of rice to 6t/ha. One avenue to attain this is the use of high-quality seeds. To implement this project, Abra was chosen as the project site being one of the provinces with the lowest average yield in both irrigated and rainfed ecosystems. To help Abra increase its rice yield, a localized rice seed system involving both the formal and informal seed sectors shall be developed.

In developing a localized rice seed system in Abra, characterization of seed growers was conducted before any intervention was done. Male and female accredited seed growers in the province were surveyed to assess their rice production practices and constraints and determine socio-demographic characteristics related to sustained engagement in rice seed production. Key Informant Interviews with DA Regional Field Office 1 and the Office of the Provincial Agriculture (OPAG) were likewise conducted to draw information on the status of the rice seed system in Abra. A technology demonstration of varieties was established every season to identify the best-performing and those preferred by the local farmers. Untagged seeds of harvests from these setups, especially newly-released inbred varieties that were not yet in the mainstream seed production, served as start-up seeds of interested farmers. The problem of increasing incidence of mixtures, especially the heirloom pigmented Ballatinaw, is affecting its marketability. Together with another popular traditional rice variety (TRV), Waray, the seeds of Ballatinaw were purified and revitalized for two seasons. After processing the harvest from the second round of the revitalization process, planting materials shall be turned over to OPAG Abra for seed increase. The revitalized seeds will replace the existing recycled seeds used by TRV farmers in the province. In parallel, information campaigns on the merits of using high-quality seed are necessary. The project also translated to Iluko the texts and narratives of a rice technology bulletin and a video developed by the Development Communication Division of PhilRice CES to prepare the localized versions of these materials. The plan to conduct a specialized seed production training program for inactive accredited seed growers in Abra was not realized owing to the COVID-19 policy restrictions, which prevailed in 2020.

The project's ultimate goal to develop the rice seed system in Abra and Apayao has evolved into developing an informal seed system for seeds of newly-released inbred varieties and older varieties that have demand but are not in mainstream seed production, particularly NSIC Rc 146, NSIC Rc 23, and NSIC Rc 27. To ensure that these varieties are made available to farmers, the initial commitment of a seed cooperative in Apayao was sought. Seeds of the five newly-released varieties from the techno demo in 2020 wet season are currently being processed. The coop will be provided starter planting materials of these varieties, including varieties with local demand but not in the mainstream seed production.

PROJECT 5

Rice Seed System in Northeastern Luzon

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The Rice Seed Systems (RSS) Project in Isabela will contribute to DA's goal of increased agricultural production and productivity by laying the foundation for the development of a broad-based and competitive seed industry that draws its strength both from the formal and the informal seed system. Generally, the project aimed to improve farmers' access to adequate quantities of high-quality seeds of preferred and suited varieties in Cagayan Valley and Cordillera Administrative Region. Specifically, it aimed to: a) increase and sustain the production of registered seeds at the branch station to maintain seed availability for seed growers; b) improve the formal rice seed distribution system and develop informal seed system for adverse rice environments (saline-prone, drought-prone, upland, and heirloom); and c) increase adoption and utilization of high-quality seeds through developed varietal promotion plan.

As effective fertilizer application with the optimum recommended rate is important in increasing harvest in the stations' seed production fields, yield optimization trials were conducted during the 2020 dry season (DS) and wet seasons (WS). Results showed that increasing the N and P application rate from the current 97-28-58 to 120-28-58 (DS) and 120-28-88 (WS) recorded an average yield of 6,021.53 kilograms per hectare (kg/ha) and a yield increase of 436.59kg/ha. The result, however, needs to be validated further for another two cropping seasons, including the Rice Crop Manager trial, before recommending for adoption at the station seed production areas.

Planting data from DA CAR and Region II have some similarities in seed class utilization. In CAR, from a total of 85,533.81ha area planted, 16,426.47ha or 19.20% used hybrid seeds, 41,575.56ha or 48.61% used tagged seeds, and 27,531ha or 32.19% used good seeds from tagged, traditional varieties, or farmer-saved-seeds. As initiated by the RSS Isabela project, recommended varieties from varietal trials in the saline prone areas like NSIC Rc 330 and NSIC Rc 468 and drought-prone inbred varieties for rainfed/upland areas like NSIC Rc 23, NSIC Rc 25, NSIC Rc 27, NSIC Rc 29, and NSIC Rc 192 need to be seed multiplied for 2021 DS and be readily available for seed growers/farmers. For traditional varieties, starter seeds for uplands, namely: Mimis, Palawan Red, Palawan White, Pinili, Pinilisa, and Guyyod will be requested from the Genetic Resources Division to be handled by upland farmers' organization for propagation, ensuring a sustainable seed banking system through a rollover seed exchange.

Varietal Trials of newly released varieties established in Region II and CAR demonstrated the location-specific suitability of each variety. NSIC Rc 512 yields highest in Cordon, Isabela; NSIC Rc 508 and NSIC Rc 514 in Gattaran, Cagayan; NSIC Rc 506 in Solano, Nueva Vizcaya; and NSIC Rc 510 in Tabuk City, Kalinga. Field walks conducted raised awareness of men and women farmers on different seed classes and newly released varieties suitable in their localities based on the PTD showcased.

PROJECT 6

Improving the Quality and Rice Seed Availability and Accessibility in CALABARZON and MIMAROPA

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The Rice Seed System (RSS) project in Los Baños focused on analyzing the seed flow in CALABARZON by gathering the planting calendar of all the municipalities/ cities and conducting on-farm characterization of the newly released inbred rice varieties and documenting the seed production protocol of Business Development Division (BDD). Owing to the implementation of quarantine protocols brought about by the COVID-19 pandemic, which restricted mass gathering activities, the project focused on data gathering using phone interviews, gathering information through secondary sources, and improving the seed production protocol through science-based decision-making.

The first study is profiling of high-quality seed production and utilization in Regions IV-A and IV-B. For the year, the planting calendars of CALABARZON in 2018 and 2019 for both the wet season (WS) and dry season (DS) were gathered through phone calls and interviews. Information generated shows that comparing 2018 and 2019, the planting dates in WS and DS had shifted earlier by a month. From November for the DS and June for the WS, the planting calendar of the region beginning 2019 was October for DS and May for WS. In terms of the length of crop establishment, both the planting calendar for the 2018 WS and DS were about three months. During 2019, the DS planting had lengthened to four months while that of WS remained for three months. To cope with the changing seed sale schedule, information gathered was relayed to the BDD group for possible adjustments in their planting calendar. From the typical January to February seeding for DS and June to July for WS, BDD is now adjusting their transplanting period in December for 2021 DS. This could result in the availability of registered seeds in April 2021. In time for the early planters and the peak planters in CALABARZON.

The performance of five newly-released inbred varieties (NSIC Rc 506, Rc 508, Rc 510, Rc 512, and Rc 514) for WS condition in Los Banos was conducted using adaptability trials. The activity focused on characterizing these varieties' performance for agronomic, pest and disease resistance, and grain quality. Based on the overall performance of these five newly-released varieties, only the NSIC Rc 506 can be recommended in CALABARZON in case there is a need to replace any of the six recommended varieties currently being promoted. The combination of plant height of less than 110cm, resistance to common pests and diseases in the province, resistance to lodging, and acceptable eating quality are the main strengths of this variety. However, late maturity is its disadvantage. It is also complicated given that NSIC Rc 506 is only recommended for Visayas regions; hence it may affect the legality of seed production and distribution through government procurement channels if promoted in Luzon.

PROJECT 6

During the WS, the BDD Los Baños produced seeds of NSIC Rc 160, Rc 216, Rc 218, and Rc 480. The seeds were sown in staggered starting from the fourth week of June until the fourth week of July. Biotic factors such as heavy bacterial leaf blight damage and rice tungro virus infection affected all of the varieties planted during the tillering stage. This resulted in leaf damage and viral infection of at most 10%. During the grain filling stage, several typhoons, which passed through Luzon also brought strong winds and rains, which caused several parts of the seed production site to lodge. Yield damage caused by typhoons is estimated at 30%. The remaining standing healthy plants passed the final field inspection conducted by the Bureau of Plant Industry - National Seed Quality Control Services. Seed processing and seed certification are still ongoing.

PROJECT 7

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

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By 2022, PhilRice aspires to have a competitive Philippine rice economy. To realize this, the Institute, through its research and development initiatives, targets to increase the national average of rice yields from 4t/ha to 5t/ha and reduce production cost from the national estimate of P12/kg to P8/kg. One of the strategies is the use of high-quality seeds (HQS), particularly modern rice varieties that can increase grain yields by 10% resulting in higher productivity.

Effective promotion and enhancing the availability and access of farmers to HQS are significant considerations to increase their utilization rates. Thus, in partnership with the accredited seed growers (ASGs) in Bicol and Eastern Visayas Regions (EVR), the project intends to make HQS of appropriate rice varieties available and accessible to Bisakol (coined from the word Bisaya and Bikolano, referring to the inhabitants of EVR and Bicol regions, respectively) rice farmers. The project primarily focused on the following three significant aspects: (1) increase the volume of production of high-quality inbred seeds (HQiS); (2) ensure timely availability of HQiS; and (3) make HQiS of promising and preferred varieties accessible to the farmers. In addition, it also identified the reasons for the low involvement of women (15% or 34 out of 233 ASGs) and approaches to enhance their participation in the rice seed industry.

To increase the production volume of high-quality inbred rice seeds in Bicol, gaps and issues for improvement on inbred rice seed production systems were identified through individual interviews with 134 active ASGs (108 male and 26 female) until 2019. Observations revealed the following are the bottlenecks to have adequate HQiS production in Bicol: (1) aging seed growers; (2) poor adoption of the PalayCheck® System and recommended management practices for inbred rice seed production; (3) underutilized area for seed production; (4) lack of postharvest equipment and facilities; and, (5) lengthy seed certification process, i.e., seed sampling to release of results. Accordingly, suggestions were as follows: (1) recruit young seed growers; (2) improve training on for rice seed production; (3) stringent implementation of the three-year notarized agreement between the seed grower and farm-owner; (4) provision of support to seed growers in terms of farm equipment and facilities; and, (5) review and ratification of protocol for seed sampling. In addition, women are viewed as feeble farm workers but can be organized as service providers for transplanting, rouging, weeding, and harvesting, especially in farm labor-depleted areas. Wives can also be of great help to the seed growers for farm record keeping and financial management.

Retooling and refresher courses were also initiated to help enhance the production of HQiS in Bicol. Based on benchmarking activities, slight modifications in the inbred rice seed production module were made to emphasize the PalayCheck® System, the use of diagnostic and ICT-based tools for rice, and the recommended management for inbred rice seed production. Basic inbred rice seed production training and retooling activities were conducted in partnership with Bureau of Plant Industry - National Seed Quality Control Services and Provincial Agriculture Offices in Sorsogon, Albay, and Camarines Sur. A total of 72 individuals were trained (62 male, 10 female), of which 64% are seed-growers as a requirement for renewal of their accreditation, and 36% are farmers aspiring to be seed-growers. Crash courses on Minus-One-Element Technique (MOET) and MOET App were also conducted with 9 ASGs (7 male, 2 female) in Camarines Norte.

To help ensure timely availability of seeds, planting calendars for inbred rice seed production was initiated for Bicol. The average rice area map of Bicol for 2018 and 2019 was generated, the weekly start of the season for each province was identified, pertinent weather data was collected, and the locations of accredited seed growers were plotted on a map as an input to develop the seed production planting calendar proposed for Bicol Region.

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 for DS and WS cropping both through formal and informal seed systems. *Binhing Palay* farms were established in all Bicol provinces in partnership with four seed growers associations, two seed network members, and nine non-seed-grower-farmers. Through the *Binhing Palay* farms, the seed growers and farmer-partners produced an estimate of 24,552kg seeds of newly released varieties for irrigated land, 3,080kg for rainfed, 26kg for saline-prone, and 1,576kg for multi-stress environments for 2020 WS and DS. All seeds produced by the seed grower cooperators were marketed in their provinces, particularly Camarines Norte, Albay, Masbate, and Catanduanes. In some areas, seeds produced by farmer-partners were used as planting materials for the next cropping by the farmer-cooperator and their fellow farmers in the community. In addition, NSIC Rc 480 (Grain Super Rice), NSIC Rc 438, NSIC Rc 400, NSIC Rc 506, and NISC Rc 460 were identified as promising and preferred varieties by farmer-cooperators, especially in Camarines Norte, Albay, and Sorsogon. In addition, based on tiller count, rainfed variety NSIC Rc 426 seems promising in Masbate. Severe drought or scarcity of irrigation water during DS and several typhoons during WS resulted in crop failure in most sites. Likewise, restrictions due to COVID-19 restricted activities such as site monitoring, actual yield data gathering, field days, and establishment of expansion sites in Eastern Visayas Regions.

Overall, the project helps understand the rice seed systems in the region and identify gaps and bottlenecks that need to be addressed to ensure the availability and accessibility of HQiS in Bicol. Likewise, it also helped promote and adopt new and promising rice varieties both in irrigated and adverse ecosystems, which could eventually help make the Filipino rice farmers and the Philippine rice industry more competitive.

PROJECT 8

Strengthening Rice Seed Systems in the Visayas

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Philippine rice programs specifically address major recurring problems, such as the considerably high production costs and low yields per unit of land. These bottlenecks were found significantly correlated to the interrelated effects of the environment and intervention system being applied. Access and availability of high-quality recommended rice varieties that could potentially address this problem also remain a challenge to most local farmers. During the first quarter of 2017, *palay* production in Western Visayas was 552,044 metric tons (mt) from the harvested areas of 174,016ha. This production consisted of 266,212mt for irrigated and 285,832mt for rainfed ecosystems (PSA, 2017). In this regard, much effort is still required to boost rice yield to accommodate the growing food demand in the Visayas farmers and even the whole country.

To improve the accessibility and availability of recommended and preferred rice varieties in Region VI and VII, the Rice Seed Systems (RSS) project aimed to address the gap in the seeds system through its two studies. The studies intend to promote the use of high-quality seeds (HQS) and recommend location-specific varieties. Study 1: "Increase Utilization of High-Quality Seeds to Improve the Rice Seed System in Central and Western Visayas" has established community technology demonstrations participated by six local farmers using 1.5ha in Sitio Cabarles, Murcia. The farmer-cooperators participated in the short refresher course on varietal selection, land preparation, and seed purification. One farmer who was assisted in the production of HQS was able to produce and sell seeds as registered seeds thru PhilRice Negros Business Development Division (BDD) Unit. The study also evaluated the seed system of farmer-leaders in Negros Occidental. The survey results showed that 79% of the respondents were using HQS where 71% of which are certified seeds. The varieties NSIC Rc 222 and Rc 216 were the most preferred varieties for dry season (DS) and wet season (WS), respectively. On the other hand, Study 2: "Promotion of High-Quality Seeds of Location-Specific High-Yielding Varieties in the Visayas," evaluated location-specific varieties for both irrigated and rainfed varieties across provinces in the Visayas. Six varieties were assessed across sites based on identified popular and modern germplasms. Each setup covered 450m² (5m x 5m/plot at 3 replications/variety). Crop management interventions were uniform across sites based on the PalayCheck® System. Yield data across sites during the DS revealed that NISC Rc 358 obtained the highest yield with 5.83t/ha, followed by PSB Rc 10 with 5.10t/ha. In Aklan, the result supported that all varieties established were comparable with yields between 4t/ha to 5t/ha. In Negros Occidental, the well-performing varieties are NSIC Rc 222 and Rc 400, which both reached 4t/ha. At the same time, in Bohol (the only province involved

in Region VII), NSIC Rc 358 obtained the highest yield of 5.8t/ha, followed by PSB Rc 10 and Rc 18, which yielded 4.9t/ha and 4.7t/ha, respectively.

During the WS and DS, only two irrigated sites from Damsite, Murcia and rainfed sites from Aboabo, Murcia in Negros Occidental were pursued due to the pandemic. Despite the continuing pandemic crisis, establishments and data gathering were accomplished. NSIC Rc 400 produced the highest yield for irrigated ecosystems with 4.8t/ha, followed by NSIC Rc 222 and Rc 358 with yields of 4.5t/ha and 4t/ha, respectively. Whereas for the rainfed ecosystem, NSIC Rc 216 gained the highest production with 4.5t/ha, followed by Rc 472 with 4t/ha yield. The results are essential to verify and recommend adaptable varieties in the locality.

PROJECT 9

Rice Seed System in Northeastern Mindanao – PhilRice Agusan

Alona P. Tape and Sherlyn Dawn D. Taglucop

The project comprises two studies: (1) Improving the rice seed distribution channel in Northeastern Mindanao through demand and supply analysis; (2) and Building a sufficient rice community through enhanced technical capacities of rice farmers in Northeastern Mindanao. Rice Seed System (RSS) in Northeastern Mindanao aimed to improve the farmers' access to a sufficient supply of high-quality rice seeds in the regions. This year, it is implemented in Surigao del Norte, a non-RCEF beneficiary province.

This project was designed to employ an improved and reliable delivery channel to strategically position and transport seeds from areas with high seed surplus to areas with a high demand for high-quality seeds (HQS) but with limited or without access to seed growers. It aimed to develop mechanisms to boost the adoption and utilization of HQS that will educate more farmers on the latest rice production technologies, especially from the outskirt areas. The project also aimed to capacitate new seed growers and retool the existing ones, particularly in areas without accredited or registered seed growers, to ensure that seed requirements across seasons will be covered. Lastly, RSS aimed to offer solutions to the challenges of quality seed production and efficient delivery of seeds to every rice farmer of non-RCEF beneficiary provinces in Northeastern Mindanao.

A focus group discussion (FGD) was conducted last September 17, 2020, at the Convention Hall, Capitol Compound, Surigao City, Surigao del Norte. One of the identified issues during the discussion was the lack of HQS in the province. There are only 11 accredited seed growers in the province, and only nine are active in seed production. They also raised their concern about the unavailability of seeds due to their different planting and harvest seasons. Interventions and possible solutions were also discussed. Developing new seed producers in every rice municipality was suggested to address the limited seed source in the province. The FGD results will be one of the bases on how to craft an effective distribution channel for the province.

Benchmarking of accredited seed growers (ASGs) in Caraga Region was done to assess the status of seed supply and its sources. Based on the analysis, the average age of the respondents is 50. This shows that there is a need to hone younger seed producers in the region. There were three major problems in seed production identified during the survey: (a) Lack of facilities and equipment for seed production; (b) insufficient water supply; and (c) delayed certification results from seed laboratories. Even though most ASGs are members of an association or cooperatives, they still have limited access to their facilities and equipment.

Another output is the sex preference of ASGs for laborers. Results showed that more than 50% of respondents prefer male laborers for their farm activities. According to them, females are better off in doing household chores and record-keeping. This information will be utilized to assess the production and supply gaps for HQS in the region.

Overall, the project will propose a seed distribution channel that will address the availability and accessibility of HQS in Surigao del Norte.

PROJECT 10

Rice Seed System: An Approach for Sustainable Rice Production Operation in Southwestern Mindanao

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The key driving force behind rising agricultural productivity and promoting agricultural development, especially sustaining higher rice productivity, is a proper seed system analysis of the production operation, certification, delivery, and distribution. Thus, this project was conducted to improve the current rice production system and make high-quality rice seeds available and accessible among men and women rice farmers at the right time within South Western Mindanao. This was implemented through the conduct of the two components, namely, (1) Evaluation of the rice seed production and distribution pathway; and (2) Demonstration and evaluation of newly-released varieties adopted in Southwestern Mindanao. The project generated information for the seed production operation, delivery, and distribution system of PhilRice Midsayap and other identified seed growers for the improvement of the rice seed system mechanism within Southwestern Mindanao.

Component 1 of the project showed that most rice seed grower cooperatives know the technical requirements and certification procedures for rice seed production operations. In terms of using high-quality seeds in the community through proper seed delivery and distribution schemes, an increase of 15% in seed growers' awareness level was attained. It also generated maps on the rice cropping calendar within Southwestern Mindanao that provided information on the proper positioning of high-quality seeds in the target areas. In addition, it enhanced the technology adoption among men and women rice farmers in the target areas through adaptation of released varieties in Mindanao by establishing technology demonstrations. Results of component 2 of the project showed that most of the rice varieties planted at Poblacion 5, Ampatuan, Maguindanao had higher yields than other sites. Good cultural management such as the time of planting coincided with good weather conditions resulting in low pests and disease damages. Also, efficient water and nutrient management greatly influenced the yield and yield components of some rice varieties tested in specific locations. Among the rice varieties evaluated were NSIC Rc 204H, Rc 222, Rc 360, and Rc 400, which resulted in higher yields ranging from 6.64t/ha to 6.92t/ha across sites.

PROJECT 11

Inbred Rice Seed Systems

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The Inbred Rice Seed Systems aims to address the key issues of seed security – availability, accessibility, affordability, and utilization. Generally, the project proposed to improve farmers' access to adequate quantities of different inbred rice varieties at the right time and the right price. To answer this, the project has three subprojects, namely:(1) Assessment/improvement of seed production protocol and postharvest operations; (2) Enhancing the production and promotion of high-quality inbred rice seeds; (3) and Development of the rice seed information system.

The assessment and improvement of seed production protocol and postharvest operations answer the problems in seed production. Studies include evaluating the current production and postproduction practices in PhilRice CES and branch stations, enhancing the seed production through the use of Minus-One-Element Technique (MOET) and MOET App technologies, and ensuring genetic purity and assessing seed quality.

The improvement in the seed production protocol was assessed in three stations only — Agusan, Bicol, and Isabela. Based on the evaluation, most of the stations failed to do the seed sampling at the right time. Delay in the sampling leads to a delay in the availability of seeds.

To ensure seed availability in the area, seed producers need to have enough supply of seeds. One way to solve this is to improve production by utilizing cost-effective tools and technology. MOET tests were conducted to generate variety-specific fertilizer recommendations for PhilRice CES and the branch stations. A total of 14 variety-specific fertilizer recommendations were implemented in 2020 dry season (DS) across three branch stations with an average yield advantage of 0.63t/ha over Business Developemnt Division's (BDD) fertilizer management practice. This 2020 wet season (WS), no branch station participated in the trial except for PhilRice CES due to the pandemic situation. Travels were restricted, which meant monitoring the trials would be impossible; hence, branch station setups were canceled. However, at BDD PhilRice CES, five varieties were provided with MOET App recommendations based on the MOET kit tests in 2020WS. Results showed that average yield advantage of 0.93t/ha was realized from the four trials at the PhilRice CES BDD area.

Assessment of seed storage and seed viability was done in selected branch stations that submitted samples (Los Baños, Bicol, and Midsayap). Out of all the samples, only NSIC Rc 442 from PhilRice Midsayap showed a decline to 74% germination rate, yet it is still eligible for sale. The decline might be a varietal response to storage and should be looked into and verified. If the variety was included in the regional varietal preference, it should be replaced if it continues to exhibit poor storability.

PROJECT 11

The second subproject, "Enhancing the production and promotion of high-quality inbred rice seeds," answers most of the issues in seed security. It answers seed availability and accessibility issues by training key stakeholders in seed production through the informal seed system, and eventually into the formal seed system. The project also covered the extensive promotion of using high-quality seeds through knowledge products and promotional video, audio, and text content. The subproject has three studies: (1) Capacitating the rice stakeholders on the production of high-quality inbred rice seeds, (2) Location-specific Adaptability Trial (LSAT), and (3) Development of the Rice Seed Information System. Studies 1 and 2 are now under the RCEF program.

The LSAT showcased newly released 500-series varieties in its techno demo and varietal trial setup. Varieties used are NSIC Rc 506, Rc 508, Rc 510, Rc 512, Rc 514, and other varieties were Rc 460, Rc 480, Rc 369, Rc 218, and Rc 216. The study showed that varieties are location-specific, and yield varies with location and environment. Among the new varieties, Rc 506, Rc 508, and Rc 512 showed great potential and were liked by many farmers during the field days.

Another accomplishment of the study is the conduct of three Modified Farmers' Field Schools focused on high-quality inbred rice seed production. It was attended by 87 farmers, who are now producing their own high-quality seeds. Although another batch was established, it was replaced by a day training on PalayCheck System due to the pandemic. It was attended by 30 farmers in Bataan, five of whom have committed to being seed producers in their locality. Recently, one farmer graduate from Casiguran was already an accredited seed grower.

The last subproject is the Development of the Rice Seed Information System. The subproject aimed to develop an information system to improve the higher seed class production traceability of PhilRice. This will facilitate the planning and monitoring of seed production in PhilRice CES and branch stations. A data collection app was also developed for easy collection of benchmark or baseline data of the seed growers, which will be used by the RSS branch station project leaders.

PROJECT 12

Public Hybrid Rice Seed Systems (PHRSS) Project

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The project's main objective is to develop a strong and sustainable public hybrid rice seeds system so that high-quality public hybrid parental and F1 seeds are accessible, affordable, and available at all times. This could be achieved by producing the required volume and quality of nucleus, breeder, foundation, and F1 seeds of commercialized public hybrid rice; validating the performance, grain qualities, and resistance to pests and diseases of pre-commercialized public hybrids; promoting public hybrid rice seed production and cultivation through training, technology demonstration, and communication; and marketing of public hybrid rice parental and F1 seeds.

For subproject 1, titled "Pre-Commercialization, seed production, and monitoring," the F1 seed production protocol for Mestiso 99 and 103 in wet season (WS) under Los Banos condition was completed. There are available parental lines enough to cover more than 80ha of foundation seed production of Mestizo 1 (M1) and Mestiso 20 (M20). There were 5,175kg S-lines, 3,045kg P-lines, 5,142kg A-lines, and 2,110kg R-lines foundation seeds produced. A total of 206.9ha of F1 seed production were monitored and supervised, and 129,598kg of F1 seeds were produced. Site selection and establishment of 0.5ha F1 seed production trials of M20 were conducted in Buenavista, Quezon, which is eyed as a potential M20 F1 seed production area.

For subproject 2, titled "Capacity building and promotion," nine (9) meetings were conducted with the seed growers. A total of 20 technology demonstration fields were established and maintained. Five (5) on-site/virtual field days and 12 field walks were conducted in the techno demo fields. Across techno demo sites and cropping seasons, M20's yield ranged from 5.33t/ha to 8.73t/ha, while M1's yield ranged from 4.03t/ha to 9.3t/ha. There were two titles of KPs produced and distributed to farmer-cooperators in technology demonstrations and seed production trials. Twenty (20) social media contents were produced and posted, and five magazine and seven website articles were published. There were 11 radio interviews on hybrid rice technology conducted with duration ranging from 15min to 1hr. A webinar series and two online lectures or presentations on hybrid rice technology were also conducted.

For subproject 3, titled "Marketing of public hybrid rice seeds in support for a rice-secure Philippines," 200 bags (18kg per bag) of M20 were procured to make the seeds available in PhilRice stations, particularly in Isabela and Los Baños. A total of P16.32M were collected from the Bureau of Plant Industry from July to October as payment of the parental seeds delivered.

Meanwhile, this project had provided hybrid rice-related information access to men and women stakeholders, especially the farmers. The hybrid rice-related knowledge products were distributed to 115 men and 71 women farmers during field walks or field days and meetings. On-site field walks and field days were also conducted, reaching 128 male and 54 female farmers. These project activities had given the men and women stakeholders an option to help improve their lives, particularly through increasing their yields and income.

All of these accomplishments had contributed to the major final outputs on seed production and distribution, in extension support, education, and training services, and in achieving the following target outcomes: (1) increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner; (2) enhanced partnerships and knowledge management for rice research for development; and (3) strengthened institutional capability of PhilRice (and partners).

PROJECT 13

Conserving and Increasing Productivity and Value of Heirloom Rice in the Cordillera

Glenn Y. Ilar, Jerry D. Batcagan, Marilyn C. Ferrer, and Marissa V. Romero

The Heirloom Rice Project Phase II, titled: "Conserving and Increasing Productivity and Value of Heirloom Rice in the Cordillera," is a 3-year collaborative project of PhilRice with DA-Regional Field Office (RFO) CAR as lead implementer and the International Rice Research Institute (IRRI) as co-implementer, and was funded by DA-Bureau of Agricultural Research. It aims to increase income and sustain the heritage and food security in the rice terraces of the Cordillera. The project consisted of two components in which interventions were focused on providing support for heirloom rice farmers in the provinces of Benguet, Mountain Province, Kalinga, and Ifugao.

To ensure the preservation and conservation of heirloom rice, the project helped collect and characterize the heirloom rice (HR) varieties conserved in the PhilRice Genebank. The 100 heirloom rice varieties collected through the seed fairs were cleaned and dried before storage. To date, 300 heirloom rice varieties were characterized using the standard descriptors from vegetative to reproductive stage. The postharvest processing of these samples is still ongoing. Meanwhile, from these collected heirloom rice varieties, 50 HRs with market potentials were selected by DA-RFO CAR and forwarded to the Rice Chemistry and Food Science Division for grain quality and nutritional analyses.

One of the aims of the project is to help the heirloom farmers in marketing their products. This is because heirloom rice varieties are reported to have excellent eating qualities, nutritional value, and health-promoting properties. Hence, as a prerequisite, there is a need to analyze the samples with market potential in terms of grain quality and nutritional contents. To fully explore their nutritional benefits, 25 varieties in different provinces in the Cordillera were evaluated for grain quality and proximate and phytochemical properties. The majority of the heirloom rice varieties (n=16) passed the recommended value for brown rice (>75.0%) and total milling recovery (>65.1%). For head recovery, 19 samples obtained Grade 1 to premium class (>48.0%). In general, most of the heirloom rice varieties evaluated had good to excellent milling potentials. Most of the samples had medium grain length (n=20) and intermediate grain shape (n=19), and mostly (n=13) had intermediate amylose content ranging from 17.6% to 21.7%). Five samples had waxy amylose content, which means they become sticky when cooked. In terms of gelatinization temperature, most of the samples (n=22) had low classification. Meanwhile, unpolished Lebba produced the highest anthocyanin content (39.45mg C3GE/kg), total phenolic content (3.67mg GAe/g), and total antioxidant activity (6.73mg TE/g) among all the samples. In terms of polished grains, Talabtab had the highest anthocyanin content (15.74mg C3GE/kg), while Mapili had the highest total phenolic content (0.35mg GAE/g) and total antioxidant activity (0.44mg

TE/g) activity. Generally, anthocyanins, phenolic, and antioxidants were higher in unpolished form than in polished samples. This suggests that most of the health-promoting properties of the heirloom rice varieties are localized in the bran layer.

On the other hand, one of the problems of heirloom rice farmers that needs to be addressed is the postharvest losses. During storage in their granaries ("alang" in local terms), a considerable volume of *palay* and milled rice get damaged by rice weevils. This results in large percentages of broken grains recovered during milling. These should be further milled into rice flour for rice cakes and other native delicacies to fully utilize these by-products. With the help of IRRI, the team conducted an on-site demonstration of carbon dioxide (CO_2) fumigation as weevil control. Subjecting the rice to low oxygen eradicates weevils and other detrimental pathogens. The use of Super Grain Bags or any hermetic storage to lengthen the shelf life of the *palay* or milled rice was also introduced.

Meanwhile, given that heirloom rice farming is mostly through manual labor of family members or "*bayanihan*," the introduction of machines like the micro-tiller, lowland threshers, and rice mills can be a good option to help the farmers improve their production. Such machines can fill the labor gap in the highlands. However, to suit the local conditions, there is a need for a design modification. Two machines, such as the micro-tiller and thresher, were customized to suit the needs of the farmers and the conditions in the areas. These customized machines have undergone field testing and are now ready for fabrication. In 2021, five units each of these customized machine prototypes will be fabricated for testing as requested by DA-RFO CAR. Evaluation of the REMD for a possible patent application is also being done.

In addition, there are also lowland technologies that are tested and modified to suit the Cordillera condition, such as the dapog technology, community rat trap barrier system, rice-duck technology, and controlled irrigation. There are promising results and good information generated from these trials, which will be featured in the leaflets that will be developed and printed by DA-RFO CAR. Consequently, to support the capacity enhancement activities implemented by partner LGUs, flipcharts of the PalayCheck System and the postproduction management for heirloom rice production were developed and submitted to DA-RFO CAR for printing and distribution to agriculture extension workers and partners. Also, the curriculum for the Farmers Field School and Training of Trainers on heirloom rice production were updated, which will be used on future batches of training.