2018

NATIONAL RICE R&D HIGHLIGHTS

PHILRICE BATAC

BRANCH STATION

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PHILRICE BATAC

Branch Director: Reynaldo C. Castro

EXECUTIVE SUMMARY

Rice-based Agriculture for Semi-arid Areas Program v.2 (Rice-ASAPv.2), the research and development program of PhilRice Batac, is focused on the development of technologies and provision of technical services that are appropriate to drought-prone areas typical in Northwest Luzon. Serving the Ilocos Region and portions of the Cordillera Administrative Region, the branch station's national relevance becomes more profound with the increasing severity of climate change.

The Rice ASAP v.2 encompasses "rice-based agriculture," which responds to the new thrust of PhilRice to cover not only the production side but including consumption and commerce. It emphasizes the urgency of developing appropriate technologies to reduce the continuous threat of climate change exacerbated by the impacts of international trade policies inimical to the Philippine rice industry. Furthermore, it captures the advances in science, especially in information technology, as tools in improving further the technologies and in enhancing the provision of support services to our clienteles.

The station's R&D program comprised four projects: 1) Climate and Weather Information, Systems and Enabling Tools for Resiliency (Climate WISE Tools for Resiliency); 2) Dryland Rice-based Integration and Practices for Farm Diversification (DRIP for Farm Diversification); 3) Amelioration of Dry and Adverse Places through Technologies for Sustainability (ADAPT for Sustainability); and (4) Technology and Applications Promotion for Productivity (TAP for Productivity). RiceBIS project, Development of Farmer Competence in Agribusiness in the RiceBIS Communities in Ilocos Norte, complements these programs.

Climate WISE Tools for Resiliency provided monthly weather forecasts as advisory to farmers to help increase their crop productivity. Under DRIP for Farm Diversification, the most suitable conditions for direct seeding (planting depth and seeding rate by soil texture) was studied to help boost adoption and eventually save on production costs and increase productivity. ADAPT for Sustainability involved four studies focused on developing the following: i) a water harvesting and soil conservation system; ii) a manual transplanter for small farms prevailing in Northwest Luzon to address the perpetual labor constraint during crop establishment; iii) an appropriate nutrient, irrigation, and harvest and postharvest technology package to grow aromatic and organic rice to have better product quality;; and iv) a small-capacity rice seed storage device to help increase seed availability.

TAP for Productivity aimed to enhance the provision of support services to clienteles. The project promoted technologies developed not only by the station but by PhilRice. It involves

showcasing rice and rice-based technologies to increase awareness among farmers and other stakeholders. Likewise, the station through this project, provides its services through provision of trainings, technical dispatch, exhibits, and IEC materials. Extending the areas of intervention beyond production, the RiceBIS project of the station is focused on helping rice communities increase their income through value-adding ventures. Farmers in the pilot site has already been engaged in brown rice production, including processing multiplier onion, their main crop during the dry season.

Implementing these projects, the station addresses the first three of the seven strategic outcomes of PhilRice: 1) increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner; 2) improved rice trade through efficient post production, better product quality, and reliable supply and distribution system; and 3) enhanced value, availability, and utilization of rice, diversified rice-based farming products, and by-products for better quality, safety, health, nutrition, and income.

DEVELOPMENT OF DYNAMIC WEATHER-BASED PLANTING CALENDARS FOR THE RAINFED ECOSYSTEM OF ILOCOS NORTE AND NORTHERN ILOCOS SUR

JM Maloom, JA Calapit, BM Catudan, NI Martin, RC Castro, and ES Galacgac

This study aimed to update and develop a site-specific and weather-based cropping calendar for the rainfed areas of Ilocos Norte and Northern Ilocos Sur, validate existing traditional weather lore of farmers, and generate weather advisories for rice-based farmers. It involved the collection, consolidation and analysis of weather data; formulation of new and dynamic cropping calendar; monitoring and validation of traditional weather indicators frequently used by farmers in Ilocos and Northern Ilocos Sur; and generation and localization of weather advisories for rice-based farmers.

The needed data from 1976 to 2006 were collected from the three weather stations (PAGASA Sinait and Laoag City and MMSU Agromet Batac City) for analysis during the first quarter of 2019. Initial analysis was done on the monthly weather data from MMSU Agromet station; however, it will still be updated by 2019 for better accuracy in weather forecasting. The 1988-2018 data series will be used for the same analysis. Initial survey was conducted from the Municipal and City Agriculture Offices in Ilocos Norte and Northern Ilocos Sur to determine the areas for the validation. The questionnaire to be used for the weather lore survey was finalized. Results of the survey and the weather data analysis will serve as basis in updating and generating of two planting calendars.

The 10-day regional weather forecast of PAGASA was localized to provide advisories for rice-based farmers. The advisories started by the second quarter of 2018 and were publicly viewed at PhilRice Batac lobby and bulletin board. The localized weather forecasts and information products for rice farmers will be available for 2020 WS after validating its accuracy.

These outputs contributed in achieving the outcome "increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner."

EFFECTS OF SOIL TEXTURE, SEEDING RATE AND DEPTH ON DRY DIRECT-SEEDED RICE UNDER RAINFED ECOSYSTEM

AY Alibuyog, SV Pojas, BS Pungtilan

The study aimed to improve the existing cultural management practices for dry direct-seeded rice, particularly, on soil texture, seeding rate, and seeding depth which are both related to weed infestation problems.

One of the main problems of rice cultivation is water scarcity, especially during periods of low rainfall which affect the crop's growth and yield. To identify which soil texture is best for direct-seeding, a study was conducted in three different soil textures; fine, medium, and coarse. In the three soil textures, two seeding depths; 3-5cm and 7-10cm and four rates of seeding; 60, 80, 100, and 120kg/ha were tested.

Results of the study showed that fine-textured soil was not suitable for direct-seeding as manifested by early crop failure, while the medium and coarse-textured soil were suitable for direct seeding. In medium textured-soil, seeding depth had no influence on the yield obtained but seeding rate of 100kg/ha produced the highest yield. On the other hand, yield obtained from the coarse textured soil was not significant vis-a-vis depth of seeding and seeding rate. Agronomic characteristics and other yield components as well as weed biomass were all not significant in both medium- and coarse-textured soils.

AMELIORATION OF DRY AND ADVERSE PLACES THROUGH TECHNOLOGIES FOR SUSTAINABILITY (ADAPT FOR SUSTAINABILITY)

RC Castro, MAU Baradi, and LC Taguda

A serious consequence of climate change is the deterioration of the farming environment. The ADAPT for Sustainability project aimed to address this problem. In Ilocos and parts of CAR, which are mainly rainfed and uplands, water is seriously scarce during summer months while the soil is gravely eroded during the rainy season. Storm surges and salt intrusion cause salinity problems in coastal areas. Frequent floods and poor drainage cause water to stay in the field causing zinc deficiency.

A good way to conserve water in the soil is the addition of organic matter. Organic matter increases the water-holding capacity of the soil, aside from the additional nutrients that it provides. The narrow window for field operations as a consequence of climate change also necessitates the use of machines to speed up operation. Further, the erratic weather requires the availability of planting materials whenever they are needed. Hence a technology that can store and effectively maintain the viability of seeds is vital.

The project covered four studies: 1) water harvesting in combination with soil and water conservation; 2) fertilizer, water, and postharvest management of aromatic and organic rice; 3) small-scale storage of seeds; and (4) small machine for transplanting.

Another technology package being developed to help enhance the productivity of dry and adverse environments is on pre-harvest and post-harvest management of aromatic and organic rice. The study determined the effects of water and fertilizer management on the yield and grain quality of modern and traditional aromatic rice. Plant height, yield, and number of productive tillers were not significantly different between PalayCheck System recommendation, alternate wetting and drying (AWD), and farmer's practice but AWD was the most cost-effective. A conclusive recommendation could not be deduced from the 2018 setup on the effect of inorganic fertilizer on the plant height, yield and number of productive tillers of aromatic rice as the experimental field was inundated with water coming from neighboring higher fields. In the organic fertilizer setup, application of chicken manure provided significantly higher yield and number of productive tillers of the varieties than no fertilizer application.

Adoptability of the PhilRice Water Harvesting and Soil and Water Conservation System and Integration with Good Agriculture Practices for Rice Intensification and Crop Diversification in Rainfed and Upland Farms

RC Castro, GC Banganan, and E Tobias

This study aimed to assess the adoptability of the PhilRice-developed water harvesting with soil and water conservation system and to develop good agricultural practices anchored on this technology for rainfed and upland farms.

The performance of the model for upland farms was assessed in terms of collecting and storing rain water and in minimizing soil erosion. Methods of rice crop establishment namely dibble, strip-furrow, and broadcast were superimposed as treatments to identify the most effective in minimizing soil erosion. The experiment was laid in RCBD with the alleys representing the blocks to minimize the effects of the differences in the slopes and fertility of the alleys. The storage tanks were filled up during the rainy season and the collected water was stored without losses. Grain yield ranged from 2.92 to 3.73t/ha but was found not significantly affected by the treatments. On the other hand, the biomass yield from dibble (4.26t/ha) and strip-furrow (4.34t/ha) were significantly higher than that of the broadcast (2.92t/ha). In terms of minimizing soil erosion, the treatments did not differ significantly. This observation differs from 2012 when strip-furrow was found to prevent soil erosion better. The difference in this year's observation may be due to the effects of super typhoon Ompong, which gravely hit the area. The heavy incessant rains during the second half of August might have decreased the effectiveness of the strips. The eroded soils, which ranged from 6.23 to 8.41t/ha, however, can be collected and returned to the alleys, resulting in virtually zero soil erosion – a distinct advantage of the system.

The model for rainfed farms is being established in Casilan, Umingan, Pangasinan. The initial system had collected 45,000 li of rainwater, which was used to irrigate 1,000 m^2 of watermelon. A yield of 1,355kg and a gross income of P13,500.00 were realized. With the installation of the drip irrigation component, the productivity is expected to increase.

Part of the study was the use of hedgerows for pest management. Wasps and spiders were the predominant natural enemies observed; lemongrass hedgerows attracted more wasps while pigeon pea harbored more spiders. Rice bug was dominant among insect pests. Green leafhopper was also present although no trace of tungro was observed. Overall, insect pests and diseases did not cause significant damage to the rice crop in the assessment.

Pre-Harvest and Post-Harvest Management for Aromatic and Organic Rice

MAU Baradi, JM Solero, CT Dangcil, GA Corpuz, MV Romero, RT Cruz, and MJC Regalado

The study aimed to develop and verify pre-harvest and postharvest management for aromatic and organic rice. Field experiments were established in typical irrigated lowland ecosystem in 2018 wet season at San Nicolas, Ilocos Norte to determine the effects of water management and fertilizer treatments on the yield and grain quality of aromatic and non-aromatic rice. The experimental setups were laid out in split plot design with three replications: PalayCheck system, alternate wetting and drying (AWD), and farmer's practice. The varieties used in the sub-plot were: modern aromatic Burdagol-Laguna type, traditional aromatic pigmented Gal-ong, and modern non-aromatic PSB Rc 82.

The effects of the different water management treatments on plant height, yield, and number of productive tillers among all the three varieties were not significant, implying that AWD is indeed a cost-saving technology that can be used by the farmers.

For fertilizer management, two setups were established: inorganic fertilizer (97-28-28 NPK) vs. control or no fertilizer; and organic fertilizer (chicken manure) vs. control (no fertilizer). The fertilizer treatments were assigned as main plots while the three varieties were assigned as sub-plots. In the first setup (inorganic vs. control), results showed that variety had significant effect

on plant height, yield, and number of tillers. PSB Rc 82 and Burdagol-Laguna Type produced the highest yield. PSB Rc 82 gave the greatest number of productive tillers. Gal-ong produced the lowest yield and number of productive tillers, but had the tallest plants. In the second setup (organic vs. control), application of chicken manure produced significantly higher yield and more number of productive tillers than with no fertilizer application.

Carbonized Rice Hull Insulated Bin to Reduce Rice Seed Storage Losses

LC Taguda, MAU Baradi, JB Francisco, and MJD Sinfuego

This study aimed to develop a CRH-insulated bin to reduce moisture migration and temperature fluctuation, and compare its storage performance against the metal bin without insulation and piled seeds in sacks. Currently, airtight metal bin storage is the best storage technology for seeds as it completely blocks the entry of oxygen while the oxygen retained inside the storage bin is reduced to a level where it becomes insecticidal through the respiration of the stored seeds and infesting insects. However, moisture migration and temperature fluctuation cannot be controlled, which facilitates mold growth. Carbonized rice hull (CRH), a low-cost material made from incomplete or partial burning of rice hull, has low thermal conductivity, high moisture retention capability, and pathogen-free capability, which can be a suitable insulation to control moisture migration and temperature fluctuation. Hence, a research was conducted at PhilRice Batac to compare the storage performance of CRH-insulated metal bin, metal bin without insulation and piled bags. Data parameters included moisture content, germination rate, insect count, and insect damages. The ambient relative humidity, ambient temperature, temperature of the insulation, and temperature of the stored seeds in the metal bins and piled bags were also evaluated. Results showed that moisture content of the stored seeds increased by 1.1% in piled bags, 0.3% in bins without insulation, and 0.1% in bins with CRH insulation. In addition, germination rates decreased by 9%, 3%, and 0.5%, respectively. Wider temperature fluctuation was observed from seeds stored in the metal bins without insulation but showed the lowest insect count and insect damage.

Development of Manually-Operated transplanter

LC Taguda, MAU Baradi, JB Francisco, and MJD Sinfuego

This study aimed to develop a manually-operated transplanter to address the increasing labor insufficiency during crop establishment and at the same time respond to the socio-economic and technical aspects slowing the pace of mechanization in rice production in the Philippines. The two-row manually operated rice transplanter developed by Taguda et al. (2017) was further evaluated and refined at PhilRice Batac to further improve the machine's efficiency. Seedlings established under modified dapog method were used in the technical evaluation. A series of testing, evaluation, and refinement focused on the reduction of missing hills and number of seedlings per hill were conducted.

The results of the evaluation of the Chinese model two-row manually-operated transplanter in 2016 was compared with the 2018 results of the manually-operated transplanter being developed at the station. Results showed that the Chinese model transplanter had 35% missing hills and needed 7 seedlings/hill for optimum performance when using seedling raised from modified dapog. The PhilRice model, on the other hand, had 5% missing hills and required 7 seedlings/hill for optimum performance. Based on the preliminary results, the PhilRice developed transplanter has planting efficiency advantage of 30% over the Chinese model.

TECHNOLOGY AND APPLICATIONS PROMOTION FOR PRODUCTIVITY

BM Catudan

The Technology and Applications Promotion for Productivity (TAPP) project aimed to promote rice-based technologies and information developed by PhilRice in general and by the station in particular. It intends to provide these services to both men and women equally. The project has five components namely: rice relay demo farm, vegetable demo farm, oyster mushroom production, vermicomposting, and (5) promotion of rice and rice-based products. The promotion of rice and rice-based products, the core of the project, has the following sub-components: (a) management of the Rice Science Museum and the station library, (b) provision of information and technologies (knowledge products), (c) localization of knowledge products (KPs), (d) training services, and (e) responsive provision of KPs. The promotion of rice and rice-based products is supported by the other four components of the TAPP project specifically for the hands-on learning sessions of students who underwent on-the-job and immersion training at the station. The TAPP demo setups likewise served as showcase windows of location-specific rice and rice-based technologies developed by PhilRice Batac.

By utilizing these various modalities, the station significantly contributed in spreading technologies and information to its target users.

Rice Relay Learning Farm

JM Maloom, BA Pajarillo, Jr., SV Briones, and CV Solero

The rice relay demonstration setup at PhilRice Batac was established and maintained to serve as a showcase window for the recommended package of technology in the locality. It also served as the learning field of trainees of the station. Rice was established every month starting February to ensure that different stages of the crop can be observed in one location.

Eleven relay rice plots were established. Featured variety included NSIC Rc 346 as it is becoming popular in the locality. The PalayCheck-based POT developed by the station was followed while MOET App served as the basis for the rate of fertilizer applied.

The standing crop during the first semester was exposed to water stress. Water management was very costly as the plots needed to be irrigated three times a week during the very dry months. The 5.5t/ha yield of one of the plots could not compensate for the incurred irrigation costs. Rice crop, which matured in May and June, were eaten by birds despite the environment-friendly practices. Three plots in various growth stages were also damaged by typhoon Ompong during the second semester, which brought total damage to rice in grain maturity stages. Low yield was also harvested to two plots hit at reproductive stages.

The demonstration setup served as venue during hands-on session of OJT and immersion students.

Vegetable Learning Farm

JM Maloom,JA Calapit, SV Briones, and RF Casauran

The distinct wet and dry seasons in Ilocos makes vegetables common as dry season crops. The vegetable demonstration setup at the station is a readily-available showcase window to promote environment-friendly vegetable technologies. The demo setup also served as a learning venue during hands-on sessions of training participants hosted by the station.

Bitter gourd, ridge gourd, tomato and eggplant were established three times in 2018. Finger pepper was also planted twice this year. Although eggplant and ridge gourd can withstand wet season planting, tomato and bittergourd are not usually grown in rainy months. Hence, varieties of these two crops were planted.

The harvests were turned over to the Business Development Unit of the station for marketing. The produce was sought after by buyers as the vegetables were not applied with chemical pesticides.

Oyster Mushroom Production

MRM Maoirat-Abad, and CV Solero

Oyster mushroom production used rice straw from the seed production and research setups of the station. The mushroom setup validated previous year's results on the combined effect of temperature and relative humidity. The oyster mushroom setup also served as a showcase window of the production technology developed by the station from the completed Palayamanan Plus project.

The volume of production in 2018 highly depended on the 120 fruiting bags set up every three weeks. It was observed that oyster mushroom in local conditions achieved optimum growth at 80-95% relative humidity with temperature range of 25-30^{o}C.

The setup was also showcased during the station's Lakbay Palay in November wherein the 4Ps participants showed their eagerness to learn more about oyster mushroom production.

Vermicomposting

SV Pojas and RF Casauran

Vermicompost is produced by the breakdown of organic waste, which results in rich microbial diversity and it has many nutrients that support plant growth. Continued operation of the facility proves to be very beneficial as it utilized and made use of rice straw and corn stover left during harvesting. It did not only provide additional income to the station but also served as a way of showcasing the technology especially to farmers and other stakeholders who want to venture in vermicomposting. Four to five cycles of production were established following the fine-tuned technology on pre-decomposition using the Effective Microorganism Activated Solution. Maintaining a separate bin for vermiworm production was found to be necessary to ensure availability of worms at all times. Nutrient analysis of the composts produced from rice straw and corn stover combined with manure should be done to provide information on the nutrient component. The provision of bin covers and shading materials in the surroundings of the facility helped in the prevention of predators.

One-Stop Information shop (OSIS): Promotion of Rice and Rice-Based Products

MB Alupay, SV Briones, and BA Pajarillo Jr.

As PhilRice Batac continues to develop location-specific technologies for its five coverage provinces in Northwest Luzon, it also implemented responsive and dynamic promotion activities to meet the production technology needs of farmers and other stakeholders.

Five knowledge products were localized, two of these are administrative forms. The station distributed almost 20,000 copies of knowledge products to stakeholders and hosted 1,116 visitors through the Rice Science Museum.

PhilRice Batac reached more stakeholders through 2 briefings cum on-station technology tour of walk-in clients, 6 exhibits in various fora, 16 dispatches of technical experts and subject matter specialists, and 12 batches of students for OJT and immersion. The Be Riceponsible Campaign was included during conduct of briefings, trainings ,and exhibits. Five news articles were written and submitted for online and PhilRice Magazine. The station sustained its linkage and collaboration with partner agencies through active participation in the convergence project of the Regional Agriculture and Fishery Extension Network of Region 1.

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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