

2018

NATIONAL RICE R&D HIGHLIGHTS



PHILRICE LOS BAÑOS

BRANCH STATION



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PHILRICE LOS BAÑOS

Branch Director: Rhemilyn Z. Relado

EXECUTIVE SUMMARY

PhilRice Los Baños caters to the needs and addresses rice production constraints in Regions IV-A and IV-B. Though many of the rice producing farms in these regions are irrigated lowland, there are still rice areas that are classified under the rainfed ecosystem. Hence largely, the branch conducts research to increase productivity and profitability of rice and rice-based farming systems in the target ecosystems. Specifically, development and promotion of new inbred rainfed varieties with high yield potentials, pest and disease resistance, and acceptable grain qualities was prioritized.

For the breeding component, 343 early to advanced generation breeding lines with tolerance to drought conditions were selected and forwarded to the inbred rice development program in 2018. Value-adding technologies of rice by-products (e.g., bran) for use in fortification strategies are also being studied. Another station effort is to conserve genetic resources of rice and *Azolla* species. Three hundred fifty-three *Azolla* accessions are also being ex situ conserved at the Station through the in-vitro method and modified field nursery.

Development of two-line hybrids based on thermo-sensitive genetic male sterile system (TGMS) is still being pursued. For this year, hybrid entry PRUP 11, a TGMS-based hybrid bred at the Station, was recommended for release by the NCT to the National Seed Industry Council (NSIC) for national cultivation. For the evaluation of hybrids, 4 promising F1s evaluated in the hybrid preliminary yield trials (HPYT) were found to have higher yields than the check variety.

The station is likewise entrusted to evaluate TGMS parentals and promising hybrids for grain quality and resistance to major pests. Results showed that majority of the entries were susceptible to blast, bacterial leaf blight, and tungro virus infection while intermediate for sheath blight infection.

Seed production studies to help increase parental and F1 seed yields were being undertaken at PhilRice Los Baños. The hybrid nucleus and breeder seed production at the station supports the national hybrid rice commercialization program by producing and supplying to the PhilRice stations the needed pure breeder seed of the parentals. NBSP produced breeder seeds (for M1 and M20) enough to plant

around 100-ha foundation seed production (FSP) while seeds good for 40-ha FSP were dispatched by the project. In support to the pre-commercialization project of the Hybrid Rice Program, parental lines of Mestiso 32 were also purified. Similarly, the project characterized and evaluated four parentals of promising hybrids.

Hybrid seed research was done and it was noted that seeds of TGMS hybrid parental lines stored in mid-elevation environment at ambient condition where it was produced can extend high seed viability and vigor to up to 54 weeks. However, prolonged seed viability and vigor is ensured provided that it is fumigated before storage and packed in sack with plastic liner. If proven effective, this technology will ensure good seed quality of TGMS foundation seeds for a longer period of time without the need for a costly cold storage facility.

The implementation of the Philippine Rice Information System (PRISM) was already deployed to PhilRice stations. Data gathering on information on rice yield, yield gaps, and the causes of these yield gaps were conducted and submitted to the PRISM national coordinator.

The station's development group worked with the research sector to achieve the stations' share in achieving a rice-secure Philippines. As a whole, these projects aimed to promote, provide, and develop technologies, practices, and policy recommendations to improve productivity, income, and competitiveness of rice and rice-based farmers and stakeholders.

In an attempt to address specific issues of the rice industry in Region IVA and IVB, the study on Regional Rice Analysis was done by conducting an extensive provincial rice profiling. Results of the study were packaged in two primer series booklets.

One key thrust of the development sector is conducting Knowledge Sharing and Learning (KSL) activities to increase the awareness of PhilRice's stakeholders regarding the technologies and programs of the Institute. Various KSL activities were conducted year-round using different strategies such as KP caravans and exhibits.

The station is also engaged in six extra-core funded research and development projects. Project 1 is the National Rice Cooperative Testing Project (NCT)-Component A- Grain Quality (physical attributes). For the NCT screening, 678 entries from 16 different ecosystems were analyzed for their physical attributes following the NCT method of grain quality evaluation this 2018. Results of analysis showed that majority of the entries were long and slender with Grade 1 to Grade 2 chalky grains. On its development thrust, family dynamics analysis was completed and regular trainings of IP Agta farmers were conducted throughout 2018 of the Project 2 titled, "Phase II of Enhancing the Capabilities of Bicol's Agta IPs through Palayamanan Approach."

Two DA-BAR funded projects were approved for implementation this year. First is the Development of Sustainable Rice Straw Management Practices and Technologies

for Food (Rice Straw based Mushroom Production) and Bioenergy in the Philippines (RiceStrawPH) which commenced early this year. The Station staff assisted in the implementation of some project components. Rice straw-based mushroom production baling technologies and practices was demonstrated in Negros Occidental and Nueva Ecija. Likewise, engineering designs of localized rice straw baler, mushroom fruiting bagger, and mushroom dryer to attain sustainable rice straw-based mushroom production were prepared. The second DA-BAR funded project titled, “Market Segmentation for Brown Rice: The Case of Metro Manila” started in the 3rd quarter of 2018 and preliminary activities for the study are underway.

The components of research and development at the station were funded by core and extra-core sources to maximize benefits from collaborative research with the University of the Philippines Los Baños, International Rice Research Institute, other research institutions within the Los Baños science community and the DA regional field units. Interrelationships of the studies conducted at the station and the aforementioned respective are shown in Figure 1. The reported outputs are grouped according to the following components: 1) Stations’ Research Initiatives, 2) Development and Extension Initiatives, 3) Hybrid rice research and hybrid basic seed production, and 4) Extra-core Research and Development initiatives.

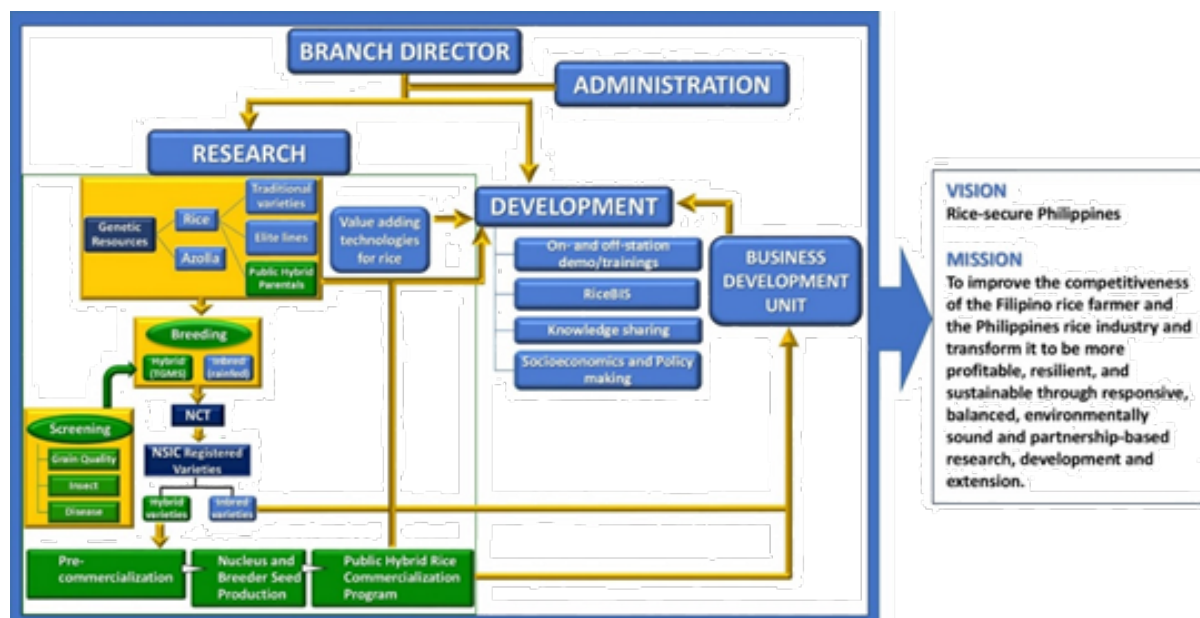


Figure 1. PhilRice Los Baños Station framework

General objectives of the station’s research sector are as follows:

1. Conserve, characterize and distribute of rice germplasm collection and working materials in variety development and Azolla species.
2. Continuously develop stable and improved TGMS lines and two-line hybrids with at least 15% yield advantage over the best inbred check variety that are pest

resistant and with acceptable grain and eating qualities.

3. Evaluate TGMS parentals and promising hybrids for grain quality, and resistance to major pests and grain physical characteristics of materials for the NCT.
- 4.b Produce basic seeds of parentals of public released hybrids and improve hybrid basic seed production techniques to keep purity and for optimum seed yields.
5. Develop new inbred varieties for rainfed and water-stressed environment with high yield potentials, pest and disease resistance and acceptable grain qualities.
6. Contribute to the alleviation of malnutrition cases in Region IV through value-adding technologies in rice.

For the development sector, the objectives are:

1. Help address specific issues of the rice industry in both regions by conducting an extensive provincial rice profiling.
2. Effectively transfer knowledge and information using timely and relevant KSL activities by engaging rice stakeholders in Regions IV-A and IV-B.
3. Provide first-hand experience to the rice stakeholders (farmers from Region IVA and IVB, students, and trainees) by showcasing the different technology packages through the diversified, integrated, and intensified rice-based production system that can increase the production level and income of the rice farmers.
4. Strengthen farmer's resiliency to climate change, enhance the promotion of different high yielding rice technologies, and increase rice awareness through technology demonstrations and trainings for rice stakeholders of Region IVA (CALABARZON).
5. Develop a model of a community transformation that is participatory and market-driven while improving the competitiveness of rice and rice-based farming communities in Sariaya, Quezon through several clusters which would serve as farmers; support system in carrying out rice production and rice-based enterprises.

For the extra-core research and development activities, the following are the objectives:

1. Evaluate the grain quality (physical attributes) of submitted NCT entries.
2. Increase production and reduce inputs through development, dissemination, and adoption of appropriate crop management technologies in both irrigated and rainfed ecosystems.
3. Develop and improve practices and technologies of rice straw management for food through optimization of rice straw-based mushroom practices and development of appropriate equipment for rice straw.
4. Identify the target market of brown rice through market segmentation.
5. Generate a brochure type catalog on the agromorphological and molecular profile of collected MIMAROPA and Bicol Region's popular traditional varieties.
6. Enhance the productivity of the IP farmers thru integrated and diversified rice-based farming systems to achieve food security and poverty reduction in the Agta Communities.

REGIONAL RICE ANALYSIS FOR CALABARZON AND MIMAROPA: A GUIDE FOR POLICYMAKERS AND RICE PROGRAM LEADERS

JLO Canilao

This project helped address specific issues of the rice industry in Regions IV-A and IV-B by conducting an extensive provincial rice profiling. Researchable areas in this project included: 1) profiling of adopted crop management practices to increase yield and productivity; 2) analyzing the implication of rice self-insufficiency of CALABARZON within Luzon and rice security on a national scale; and 3) providing recommendations on increasing income, competitiveness, and poverty reduction in MIMAROPA. Overall, this project contributed to the Institute's strategic Outcome 4: a science-based and supportive rice policy environment specific to the station's area of coverage.

Profiling of crop management practices in Region IV-A and IV-B

JLO Canilao

There is a need for an extensive provincial rice profiling (from crop management practices, institutional arrangements, to labor households) as provinces have different challenges and strengths; requiring PhilRice to implement are-specific strategies. This study aimed to analyze the different rice crop management practices in Regions IV-A and IV-B. To achieve this, the following activities were conducted: 1) research and collection of secondary data from reliable agricultural databases; 2) editing, cleaning, and analyzing data collected; and 3) report submission and formulation of recommendations. As a result of this research, two primer series booklets were drafted for Regions IV-A and IV-B, which present information on the rice industry that would serve as a guide to our rice leaders.

Knowledge sharing and learning for rice stakeholders in Regions IV-A and IV-B

JLO Canilao

KSL activities enable knowledge exchange among groups, communities, and individuals. Knowledge can be in the form of information, skills, or expertise. According to Huysman (2000), knowledge sharing can be made through 1) acquisition of knowledge, 2) reuse of knowledge, and 3) development of knowledge. Presently, the information and communication technology or ICT largely supports the KSL process of delivering information about rice and agriculture.

To increase the awareness of PhilRice's stakeholders on the technologies and programs of the Institute, various KSL activities are conducted year-round using different strategies: localization and distribution of knowledge products (KPs) for visitors and during events; KP caravans and exhibits; forum and discussion of technologies on rice;

quarterly seminar series; and serving as resource persons in trainings, forums and seminars hosted by partner agencies. These activities fall under PhilRice Strategic Plan 2017-2022 Outcome No. 6 – Enhanced partnerships and knowledge management for rice research for development (R4D).

The station's One-Stop Information Shop or OSIS stretches its purpose through the establishment of mobile OSIS in several schools, security of files through a database, and accessions to several online research portals through *Palay-Aklatan*. These activities serve as gateways in transporting and exchange of information on the latest rice technologies and programs.

PhilRice Los Baños One-Stop Information Shop

JN Puerto and RMO Tumangquil

The OSIS employed multi-strategic approaches through four study components: 1) Palay-Aklatan; 2) exhibits/museum; 3) PhilRice database; and (4) visitors services.

Two mobile OSIS schools were monitored and maintained through visits and regular distribution of IEC materials and KPs. Meanwhile, nine regional and thematic rice exhibits (7 major, 2 minor) were displayed during events across Regions IV-A and IV-B. Through the exhibits, IECs materials and KPs were widely distributed. As part of the exhibits/museum component, the Scientists' Corner was launched at the station featuring large displays of murals and donated books of prominent scientists including Dr. Bienvenido Juliano and Dr. Santiago R. Obien.

Database management component provided backup and safely kept copies of documents, photos, videos, and other files for references acquired from the staff. The database management has helped in effectively disseminating 52,426 copies of IEC materials during station visits, exhibits, and station events.

A growth in the number of station visitors was observed. Through OSIS, the station accommodated 1,410 visitors (male: 728, female: 628).

Pinoy Rice Seminar Series

JLO Canilao

As part of its KSL strategy, PhilRice Los Baños conducted three thematic quarterly seminar series. Experts from various institutions were invited. This study shared the latest research outputs, technologies, and issues on rice and the industry. Collaborations with the academe, government, and R & D institutions were strengthened. Likewise, the audience were not limited to station staff. Individuals and groups from universities, farmer organizations, private organizations, and LGUs around Region IV-A and IV-B, the National Capital Region, and from other provinces participated. In March 2018, the event was formally launched as the Pinoy Rice Seminar Series or PRSS. Evaluation of participants across all seminars ranged from Very Good to Excellent.

ON-STATION DEMONSTRATION AND TRAININGS FOR RICE STAKEHOLDERS

KCO Saraos

The on-station demonstration and trainings for rice stakeholders were composed of training on best technologies in the learning farm, Lakbay Palay, and the Palayamanan Plus.

For 2018, two school work immersions for two semesters and 26 station tours with hands-on activities were hosted by the learning farm. Lakbay Palay 2018 with the theme “*Binhing Dekalidad, PagpaPALAYang Maunlad!*” was also conducted. The activity highlighted hybrid seeds, inbred seeds, and other climate resilient varieties.

Training on Best Technologies in the Learning Farm

JS Baldoz

This study is composed 1) Palay-Aralan: PhilRice Los Banos Learning Farming and 2) Trainings, which aimed to promote holistic and comprehensive technology packages that are sustainable and cost-effective. This year, the learning farm hosted two school work immersions for two semesters, internship requests, and 26 station tours with hands-on activities.

Lakbay Palay

KCO Saraos

Lakbay Palay 2018 updated the rice farmers and its stakeholders with new technologies, campaigns, and R&D activities of PhilRice. Four hundred participants mostly composed of farmer-leaders from CALABARZON and representatives from different agencies and SUCs attended the activity.

With the theme, “*Binhing Dekalidad, PagpaPALAYang Maunlad!*,” Lakbay Palay presented how hybrid seeds, inbred seeds, and other climate resilient varieties were produced.

Palayamanan Plus Los Baños

FS Aguilar

Crop diversification and crop intensification are ways for farmers to increase their income and ensure household food supply. Under this system, rice biomass like rice straw can be incorporated in the soil as fertilizer or used as substrates in organic composting and in mushroom production.

To utilize rice straw, PhilRice Los Baños engaged in mushroom production as one of the model components of Palayamanan Plus. Rice straw is mixed with sawdust at 70-30 ratio. *Pleurotus florida* or commonly known as oyster mushroom is used in cultivating mushroom as it is favorable and adaptable in the temperate environment of the country. A single fruiting bag has an average yield of 150-175g/ bag for one month in a single cycle. Harvested mushrooms were delivered to the BDD office to be sold at P250 a kilo.

The station also implements vermicomposting production, in which rice straw is used as substrates. Mushroom wastes incorporated with carabao manure are also used as substrates. Vermicompost costs P7 a kilo while African Night Crawler costs P150-P250 a kilo. Most clients were visiting rice farmers and stakeholders.

PhilRice experimental and production far area also utilizes vermicompost, which produces vermi tea. This is used as biocontrol agent and organic foliar fertilizer when sprayed to the rice plants during seedling until maturity stage. Vermi tea is also used and sprayed at the vermicomposting bins to hasten the decomposition of the substrates.

The station *Palayamanan* Plus model also produces brown, red, and black rice and sells them at P50-P60 a kilo.

OFF-STATION DEMONSTRATION AND TRAININGS FOR RICE STAKEHOLDERS OF REGION IV-A

JS Baldoz

Apart from coping with climate change and increasing rice productivity, the Institute's vision of a Rice-secure Philippines can also be attained with the help of the rice consumers. A strategy used to engage the rice consumers included showcasing traditional and modern rice varieties at different growth stages at the Rizal Park in Luneta. Established in 2001, the Rice Garden aimed to educate the general public about rice and its importance to Filipinos.

Strengthening Resiliency of Mulanay Rainfed Farming Communities to Climate Change

AJ Roa, JS Baldoz

A *Palayamanan+* technology demonstration was set-up in the Barangays of Bagupaye and Sta. Rosa in Mulanay during the dry season, where lack of water is a major problem. The demo showcased farming technologies such as rice biomass utilization (organic fertilizer production, carbonized rice hull utilization, mushroom production, mulching, and vermicomposting), vegetable production (proper seedling preparation), and capillarigation technology.

During the wet season, a participatory technology demonstration was conducted in Brgy. Bagupaye to help farmers address proper nutrient application due to lack of irrigation caused by delayed rainy season. Using different treatments (Fish amino Acid (FAA), Vermi Tea, Fermented Plant Juice (FPJ), Fermented Fruit Juice (FFJ), 15-15-30 (synthetic foliar fertilizer), Orgamin (commercial foliar fertilizer), and No application (Control)), the study was carried out. Results showed that treatments used have significant effect on crop cut yield and number of unproductive tillers. By means of crop cut yield, results showed that FAA got the highest crop cut yield among others, followed by Orgamin (mean=3.63). FPJ, FFJ, and 15-15-30 shared comparable means while Vermi tea and Control remained in the bottom with means of 2.60 and 2.33, respectively. In terms of unproductive tillers, FAA recorded zero unproductive tillers. Comparable results were also derived from vermi tea, FPJ, FFJ, and orgamin.

Promotion and Monitoring of Commercial Public Hybrid Rice in CALABARZON

JS Baldoz

Technical briefings, seminars, trainings, and promotion through radio were conducted to promote hybrid rice utilization in the region. Series of technical briefings were held in the region (Naic, Cavite; Sta. Cruz, Laguna; Rosario and Nasugbu, Batangas; Morong and Teresa, Rizal; and Tayabas, Quezon). The program also conducted trainings on hybrid rice cultivation to AEWs, AgRiDocs, and LFTs. The station also conducted a series of School on the Air program tackling hybrid rice production. The project had reached more than 1,500 farmers who previously did not have knowledge on hybrid rice and used to believe that cultivating the variety is more expensive than the commercial varieties. Their belief on hybrid rice as GMO was also debunked.

Harnessing the Rice Garden in Promoting and Enhancing Rice Awareness and Appreciation in the Urban Setting

FS Aguilar

More than a mere showcase of rice plants, the Rice Garden serves as an advocacy hub for rice campaigns, most notably the Be Riceponsible Campaign from 2013 up to present. The 300-sqm. Rice Garden is strategically located in the northwest section of the Rizal Park facing the Quirino Grandstand, which is a popular spot for holding major events such as concerts and rallies. The project educated the general public about rice and its importance to Filipinos; rice production from breeding to harvesting; and recent farm technologies. The intended audience are the youth and the city dwellers.

November is declared as the National Rice Awareness Month. As part of the celebration, PhilRice Los Baños conducted the 16th Ceremonial Rice Harvesting at the Rice Garden with 400 participants composed of elementary and high school students. Partners from DOT-NPDC, DA-BPI, The Asia Rice Foundation and from the Department of Agriculture graced the event. With a theme “Quality Rice. Quality Life” it engaged students through *Palay-Indakan* and *Palay-Bigkasan*.

Utilization of protein concentrate from rice bran as encapsulant of β -carotene in model food systems for improved in vitro delivery

Dr. Floirendo P. Flores, Maria Jannell Feliz A. Magnaye, and Dr. Lotis E. Mopera

Vitamin A is an important micronutrient that affects several biological functions, such as immunity, growth, and gastrointestinal activity. As humans cannot biosynthesize vitamin A, it should be supplied from the diet. β -carotene, a precursor of vitamin A, is widely distributed among fruits and vegetables but the recommended daily intake is difficult to achieve due to its low bioavailability and stability resulting in the prevalence of vitamin A deficiency in children under 6 years old and pregnant and lactating women. Until Golden Rice becomes commercially available in the country, microencapsulation methods for β -carotene to improve stability and bioavailability may be employed. This study attempted to encapsulate β -carotene in rice bran protein concentrate by spray drying and complex coacervation for rice fortification. Characterization of the resulting encapsulated products included encapsulation efficiency, yield, moisture content, water activity, antioxidant activity, storage properties, surface morphology, thermal properties, and infrared spectra. Moreover, their release properties during simulated in vitro digestion were evaluated.

Conservation and Management of Rice Genetic Resources in PhilRice Los Banos

WB Abonitalla, EE Sajise, TH Borromeo, and S Bon

This study aimed to conserve and keep safe germplasm collection and working materials in variety development; to seed increase and/or regenerate germplasm materials ensuring the maintenance of genetic integrity and diversity; to characterize and evaluate the germplasm collection to facilitate effective utilization; to identify accessions with important desirable traits often sought by plant breeders; to develop sound seed and data retrieval system useful to the breeders in collaboration with PhilRice Genebank staff.

The germplasm conservation and maintenance in PhilRice Los Baños holds 2,915 rice accessions including traditional varieties, selection and elite lines, wide hybridization derived lines, TGMS lines, promising hybrid pollen parents, and highly selected NCT lines. Likewise, 233 WFP lines were added in the total collections. There were 376 rice accessions grown for seed increase and characterization.

The harvested plants in the dry season were already processed and are on standby for packing, while the harvest during 2018 WS are still on processed for postharvest. Sufficient amount of seeds was harvested for both seasons. All standby materials are placed in a sealed jar and plastic with silica gels and desiccants.

Accessions have diverse and unique traits in terms of morphology and agronomic characters. Some has diverse color and sizes of awns (pinkish, reddish, straw and long-short awn). Accession were either tall or short. Some are glabrous and pubescent types. The characteristic data are still for encoding.

Genetic Improvement of Locally Adapted Rice Cultivars and Elite Lines for Upland and Drought Prone Rainfed Lowland Environment

VC Lapitan, MJT Mercado, and G Flancia

This study screened and identified tolerant rice varieties and donor parentals for breeding and to generate improved rice varieties resilient to drought with high and stable yield through identification and development for drought tolerance. At present, the rapid land conversion of favorable rice lowland areas to human settlements places the rainfed lowland and upland areas as important potential systems for food production. This ecosystem further faces low crop productivity due to its unfavorable condition. The study generated several breeding lines and selected the lines that showed desirable phenotypic characteristics under stress prone condition. There were 333 F3 lines, 75 F5 lines, and 35 F6 lines selected and forwarded for line development while 250 advance lines will be forwarded for MET and 8 lines in NMET trial for 2019 cropping respectively. The study also produced 2 advance lines recommended for NCT recommendation with average trial yield of 4.5t/ha.

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).

PhilRice Central Experiment Station; Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Tel: (44) 456-0277 • Direct line/Telefax: (44) 456-0354

BRANCH STATIONS:

PhilRice Batac, MMSU Campus, Batac City, 2906 Ilocos Norte
Telefax: (77) 772- 0654; 670-1867; Tel: 677-1508; Email: batac.station@philrice.gov.ph
PhilRice Isabela, Malasin, San Mateo, 3318 Isabela
Mobile: 0908-875-7955; 0927-437-7769; Email: isabela.station@philrice.gov.ph
PhilRice Los Baños, UPLB Campus, Los Baños, 4030 Laguna
Tel: (49) 536-8620; 501-1917; Mobile: 0920-911-1420; Email: losbanos.station@philrice.gov.ph
PhilRice Bicol, Batang, Ligao City, 4504 Albay
Tel: (52) 284-4859 to 60; Mobile: 0918-946-7439 ; Email: bicol.station@philrice.gov.ph
PhilRice Negros, Cansilayan, Murcia, 6129 Negros Occidental
Mobile: 0949-194-2307; 0927-462-4026; Email: negros.station@philrice.gov.ph
PhilRice Agusan, Basilisa, RTRomualdez, 8611 Agusan del Norte
Telefax: (85) 343-0768; Tel: 343-0534; 343-0778; Email: agusan.station@philrice.gov.ph
PhilRice Midsayap, Bual Norte, Midsayap, 9410 North Cotabato
Tel: (64) 229-8178; 229-7241 to 43; Email: midsayap.station@philrice.gov.ph

PhilRice Field Office, CMU Campus, Maramag, 8714 Bukidnon
Mobile: 0916-367-6086; 0909-822-9813
PhilRice Liaison Office, 3rd Floor, ATI Bldg, Elliptical Road, Diliman, Quezon City
Tel: (02) 920-5129

SATELLITE STATIONS:

Mindoro Satellite Station, Alacaak, Sta. Cruz, 5105 Occidental Mindoro
Mobile: 0917-714-9366; 0948-655-7778
Samar Satellite Station, UEP Campus, Catarman, 6400 Northern Samar
Mobile: 0948-754-5994; 0929-188-5438
Zamboanga Satellite Station, WMSU Campus, San Ramon, 7000 Zamboanga City
Mobile: 0975-526-0306; 0910-645-9323

 www.philrice.gov.ph www.pinoyrice.com  (0917) 111-7423  [rice.matters](https://www.facebook.com/rice.matters)  prri.mail@philrice.gov.ph

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